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From January 1, 1909, to June 30, 1909

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FIFTY-FOURTH YEAR

NEW YORK CHICAGO PITTSBURGH LONDON

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INDEX

Forty-sixth Quarto Volume—January 1, 1909, to June 30, 1909

AUTHORS

GENERAL INDEX

[*Illustrated articles are indicated thus*; Editorials thus†; Letters to Editor thus‡.*]

A

B

C

GENERAL INDEX—Continued.

[*Illustrated articles are indicated thus*; Editorials thus†; Letters to Editor thus‡.*]

GENERAL INDEX—Continued.

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GENERAL INDEX—Continued.

[*Illustrated articles are indicated thus**; *Editorials thus*†; *Letters to Editor thus*‡.]

GENERAL INDEX—Continued.

[*Illustrated articles are indicated thus**; *Editorials thus*†; *Letters to Editor thus*‡.]

T

NEW PUBLICATIONS.

FOREIGN RAILWAY NOTES.

[*See also General Index, under subjects and names.*]

INTERSTATE COMMERCE COMMISSION RULINGS.

[*See also General Index.*]

STATE COMMISSION RULINGS.

[*See also General Index.*]

PERSONAL.

[*Portraits are indicated thus**.]

OBITUARY.

[*Portraits are indicated thus**.]

RAILROAD CONSTRUCTION.

RAILROAD CONSTRUCTION—Continued.

RAILROAD CONSTRUCTION—Continued.

RAILROAD FINANCIAL NEWS.

Railroad Age Gazette

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CONTENTS

Representatives of the railway commissions of five states met at Chicago recently and issued a manifesto on the subject of the safety of pedestrians on railway tracks. The records of the great number of deaths and injuries were reviewed, and the conclusion was reached that the legislatures will not act until the state railway commissions insist on action. This is an elementary truth which it is well to state; but will the lawmakers act, even after the commissions do "insist"? The problem is a very difficult one. In the doings of this conference, as published, too much stress is laid on the passage of laws. As everyone knows, the need is not so much for new laws as for the enforcement of old ones. The commissioners seem to appreciate this, but apparently not with sufficient force. They suggest that the police power be given to track foremen the same as it is now given to conductors of trains; but that would be only to scratch the surface of the question. The most valuable function of a state railway commission is to elucidate and publish useful facts, which, if not made plain by experts, will not be known or appreciated by the public; but in this case the facts which ought to be heralded are hard to get. For example, why are magistrates so lax in their treatment of trespassers who are brought up for trial? Why do juries give a trespasser a verdict for damages, when in justice the railway ought to recover damages from him? What different treatment should be accorded police officers and constables to induce them to voluntarily and habitually arrest lawbreakers? Why do people like to risk their lives for the purpose of saving forty seconds at a crossing? How can a railway of moderate size raise $500,000 this year with which to abolish grade crossings and at the same time accept $500,000 *less* for passenger fares than it received last year? How accurately do these commissioners interpret public sentiment when they mourn over the loss of the lives of 5,000 trespassers yearly? Are not ninety-nine out of every hundred people entirely resigned, calm and satisfied under the present situation?

In refusing authority to the Delaware & Hudson to issue its own bonds to take up notes which were sold to provide money for the purchase of, in one case coal property and in the other an electric railway, the New York Public Service Commission, Second District, by no means finally passes on the general question of the propriety of the refunding of securities issued before the new Public Service law. The lack of general underlying principle is emphasized by granting permission to issue bonds to refund securities sold for the acquisition of certain other properties previous to the passage of the new law. In the case of advances made to the coal company, all of whose stock is owned by the Delaware & Hudson, the argument of the commission runs smoothly. If these advances are to be funded, the mortgage should rest on the coal property and not on the railway company. The coal company's property is valuable and could be mortgaged. The argument is not so plain when it comes to the advances for the acquisition of the Hudson Valley electric property. It is pointed out that there has been some juggling with the stock of the United Traction company so that the notes were not issued directly for the acquisition of the Hudson Valley property, but this is a detail. All the evidence seemingly goes to show that money was advanced by the railway company for the legitimate purpose of buying the property of the Hudson Valley company, an electric road, which in part parallels the steam railway. The purchase was made in good faith. The property as it stood may not have been worth the purchase price to anybody else, but at that time the directors had a perfect right to judge of its value to the railway company and to pay the necessary price. As the Hudson Valley company is operating at a loss now, it is hard to understand how the company itself could dispose of securities to reimburse the railway for advances made to it, and the notes now outstanding are an undoubted obligation of the railway company. In the case of the purchase of the Troy & New England, the Public Service Commission has permitted the railway company to issue its own bonds to refund notes sold for the acquisition of this property. The difference in the two cases narrows down either to a difference in the value of the properties or a difference in the use to which they were to be put. The commission argues that the ownership of the Troy & New England is advantageous to the railway company, since it is in the legitimate line of an extension. The purchase of the Hudson Valley company is not a good bargain and should not be made a charge on the railway company. Of course it is entirely too much to expect of the paternal government by commissions, that it should only inquire as to the validity and propriety of the note issue at the time it was made, and not try to go behind and determine for itself whether the purchase made in good faith is now of advantage to the railway company. This would be entirely too simple an argument, but as long as the inquiry has been made so carefully as to what is for the ultimate good of the railway company, why shouldn't the Public Service Commission at least help the officers of the company out by suggesting a way in which notes like those issued for the Hudson Valley company's property could be properly and legally refunded?

CONNECTICUT'S PUBLIC UTILITIES BILL.

The state of Connecticut is a commonwealth which has had her full share, and somewhat more, of railway and street railway problems to solve, and especially those problems which relate to public necessity and convenience. She has also, unfortunately for herself, been one of those states where a railway commission vested with ample permissive powers has been allowed to become a political and partisan body, inefficient in practice and bearing, among other sins of omission, the blame for an enormous volume of street railway stock watering. As a logical outcome the question of imperfect supervision of public utilities corporations became in the last legislature a burning one. The Governor of the state took an active hand and threatened during the last weeks of the session to call an extra session unless something was done. The result was a public utilities plan by indirection. A special commission of five was named to consider the subject and report to the legislature which is to meet at some time during the present month. Its work, after a number of public hearings, is now at hand in the draft of a bill filling 74 pages and providing for a public utilities act and a commission that is to succeed the present body which has purview only of steam railways and street railways.

As the latest product of the general tendency during the last two years to enlarge in this country the scope and functions of public service commissions the proposed Connecticut act, though not yet law, is interesting and significant. As was to be expected, it enlarges the area of supervision by adding gas, electric, water, express, telephone and telegraph corporations to the new commission's charge. But the commission remains with but three members who, while the objects of supervision are greatly increased, have but small increase except at one point—rates—of actual powers. At the vital point, however, of a higher *personnel* conditions are bettered. Salaries are raised from the present $3,000 a year to $7,500; the old proviso for a lawyer, civil engineer and a "business" man on the commission gives place merely to "three competent persons" subject to removal by the Superior Court for "misconduct, material neglect of duty or incompetence" on complaint of the Attorney-General; the term of service is lengthened from four to six years; and the general assembly with its two houses, instead of the senate alone as now, must confirm the Governor's appointment. The idea of making the appointment subject to the veto of the popular legislative body is obvious and somewhat suggestive. The salaries and costs of the Connecticut commission are now taxed on the railway and street railway corporations. Under the new measure the state pays them and wisely. Not so clearly wise is a proviso which excludes from the commission any stockholder of a company which is subject to the commission's supervision. The man not a shareholder in a railway, electric, gas, water, telephone or telegraph company yet fit for a utilities commission is a rare and unique character; and, if he is a shareholder and forced to reinvest to qualify, his field of reinvestment is certainly limited, and what is more serious for him, likely to be unfamiliar.

After the state's rough experience in trolley stock watering a drastic enactment against hydraulics was to be looked for. In the new bill it is forecast in provisos that no securities can be issued other than for cash or for "property found by the commission to be of equivalent value," nor shall any stock be issued at less than par nor bonds at less than market value as determined by the commission. Stock and scrip dividends are specifically prohibited and bonds—except for refunding—cannot be issued to an amount exceeding capital stock actually paid in. It will be seen that the stock issue feature does not go to the length of the Massachusetts statute which compels sales at or in practice, very near the market price; and issue of a high-priced stock at par, that is to say, cutting a "melon," evidently is not treated in the Connecticut bill as a stock dividend even qualifiedly. The experience of Massachusetts in this direction and the finding of the special commission of that state against the "market value" restraint on new stock seem to have reached over the southern state boundary. If a corporation wants to lease or buy out another corporation it can do so, but, of course, only for "equivalent value" as found by the commission, and it must have a special permit from the commission if the property is bought with stock, bonds or notes running more than 12 months. This lets a corporation buy out another with very short notes, but at the later risk of running the "equivalent value" gauntlet—a somewhat novel provision.

The sections of the proposed act which make for publicity and honest returns are very severe on their face, less so when more carefully scrutinized. Twenty-five per cent. of the outstanding stock, bonds or notes can call on the commission for a special examination or the commission may examine on its own initiative, may employ experts and call for persons and papers under subpoena. When returns of the companies seem defective or erroneous the commission may require their correction. The old law has too many of these "mays" in place of "shalls" and "musts." Why they reappear so often with the merely permissive features which in the past have been at the root of so many of Connecticut's troubles with the public utilities corporations is hard to understand. Had the features of the existing law in comparatively few cases been mandatory instead of permissive the state would hardly be seeking a general utilities commission now. It would have been a question of an improved type of commissioners rather than of amplified law. Finally the new bill takes the state on her first excursion in regulating rates which, after hearing, can be fixed by the commission on appeal of municipal authorities. But from any order of the commission relating to rates or any other matter either party at interest can appeal to the state courts.

These four subjects—the make-up of the commission, capitalization, publicity and rates—represent the salient points of public interest in the voluminous new Connecticut measure. Collectively they show good tendencies and good aims but always with the modifying fact that the ounce of personality in a commission outweighs in practice the pound of law.

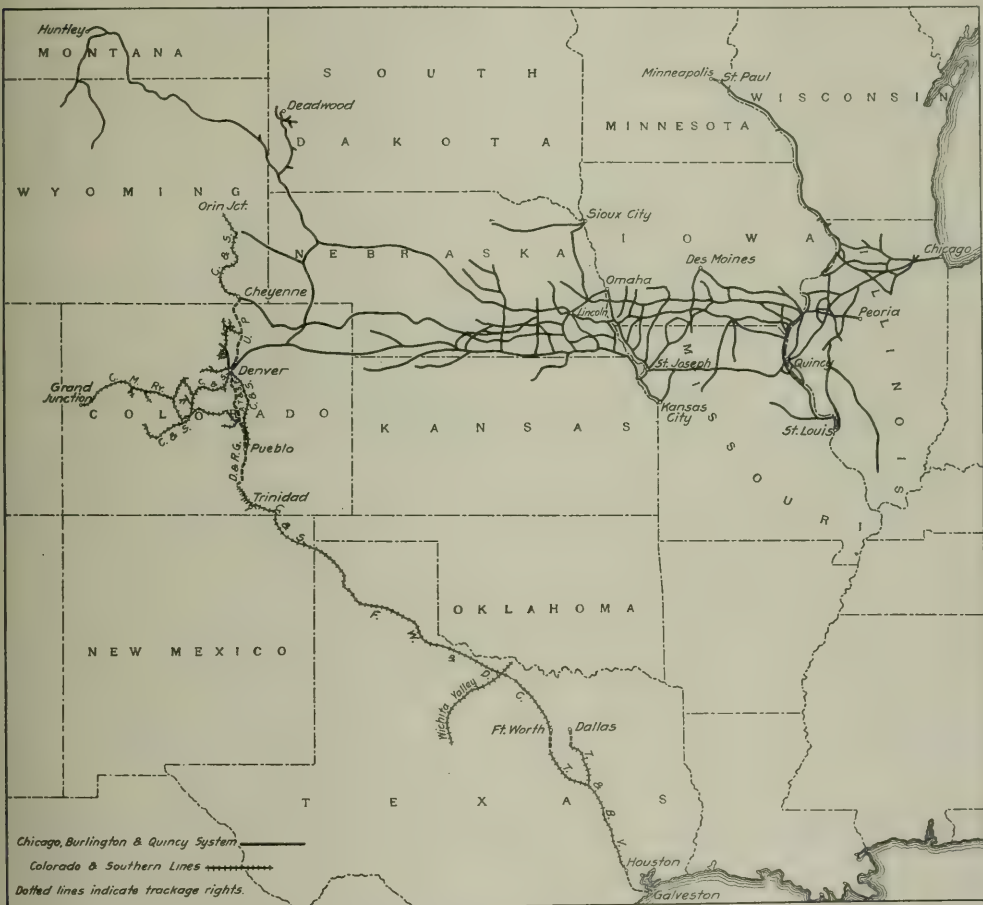
THE COLORADO & SOUTHERN PURCHASE.

The recent acquisition of the Colorado & Southern by the Chicago, Burlington & Quincy through a purchase for cash of a controlling interest in the $31,000,000 common stock, gives the Hill roads their much-talked-of outlet to the Gulf. The advantages of such a purchase by the Burlington are obvious from an examination of the accompanying map, and from the history of the Colorado & Southern, its somewhat conglomerate character is explained. In 1890 the Colorado Central, the Georgetown, Breckenridge & Leadville, the Denver & Middle Park, the Denver, Marshall & Boulder, the Greeley, Salt Lake & Pacific, the Denver, Texas & Gulf, the Denver, Texas & Fort Worth, the Road Canyon, the Chicosa Canyon, the Canyon Agua, the Colorado Central of Wyoming and the Cheyenne & Northern were consolidated and incorporated as the Union Pacific, Denver & Gulf, with a total of 915 miles, owned and controlled by the Union Pacific. The names of the constituent roads are expressive enough to one who knows the geography of Colorado. Most of them were short lines; many built without any real prospect of being able to originate any profitable traffic, and a great number of them with almost impossible grades.

In 1893 the property was placed in the hands of receivers, and in December Frank Trumbull, now president of the road, was made receiver, and Grenville M. Dodge became chairman of the consolidated bondholders' protective committee. In 1898 the Julesburg division was sold to the Union Pacific. In January, 1899, the new company, the Colorado & Southern, took possession of the old U. P. D. & G, and also of the Denver, Leadville & Gunnison, the total mileage operated at that time

being about 1,141 miles. This included trackage rights over what is known as the Julesburg division of the Union Pacific, giving the C. & S., as will be noticed on the map, an entrance from Denver into Cheyenne. The company also acquired a majority of the capital stock of the Fort Worth & Denver City, whose road extends from Texline, Tex., to Fort Worth. From this time on the interests controlling the Colorado & Southern were closely connected with the Chicago, Rock Island & Pacific. In August, 1905, the company bought the Trinity & Brazos Valley, extending from Cleburne, Tex., to Mexia, and later sold a half interest to the Rock Island company, and, as will be seen from the map, the company has trackage rights into Houston, Tex.

As an allied property, the Colorado & Southern was not into Cheyenne, but Mr. Hill would have no difficulty in building his own line, or rather in extending one already partly built, and he now has fine terminal properties both in Denver and in Houston. Joint control of the Trinity & Brazos Valley could be used against Mr. Hill by the Rock Island, but if Moore-Hawley interests had been opposed to the Burlington's entrance into Gulf territory, it seems unlikely that the sale would have been made.



The Chicago, Burlington & Quincy and the Colorado & Southern.

particularly useful to the Rock Island, except in so far as it gave the Rock Island the best terminal property in Denver. As the road has been operated in the last two or three years, it might fittingly be described as a snug, independent trunk line between Colorado and the Gulf, and as such was remarkably successful in operation. The loss, then, to the Rock Island interests is not great, but the gain to the Burlington should be important. Of course, it would be possible for the Union Pacific to refuse to grant trackage rights any longer

THE NEW HAVEN ELECTRIFICATION LOG.

From the opening of the electric service on the New Haven road, in July, 1907, right up to the present there have been many rumors current, appearing periodically in the daily press, about the troubles that were being experienced, and the conclusions drawn varied from prognostications of absolute failure and breakdown to a glossing over of what was happening as a mere trifle, that could be easily remedied. During this period, also, the suburban travelers have been loud in their complaints regarding defective service. Meanwhile, the technical press, in the absence of accurate and authentic information, has been almost silent, and comment on the part of those most interested, whose decision would be of the greatest value, has been withheld. Rumor said that

there had been trouble, and that was about as far as information went.

With such a condition existing, it was a wise and far-sighted move on the part of the railway company to release such a paper as that of Mr. Murray on the log of the New Haven electrification, which appears in another column. Publication of this important document, and adequate comment on it, has been delayed because of the press of matter involved in the production of the annual statistical number, which appeared last week.

It is safe to say that a paper of this character has never before been presented to any scientific association. It has long been a platitude among engineers that one learns more from his failures than from his successes; and here comes a clear, honest and wholesome record of trouble and failure in the case of a great undertaking, capped by a statement of the means that were taken to avoid further trouble and turn failure into success. This is a bold thing to do, and probably would not have been done did the engineers and contractors and railway officers not feel that success was now not only assured but already at hand.

To the mechanical and electrical engineer, the story of the paper is invaluable. It shows the progress of events; how unexpected matters had to be taken in hand and developed because the chain of parts did not act as each individual link had acted by itself and gave promise of acting in unison with others. The paper is remarkably free from assumption and statement of opinion, and is confined almost exclusively to the facts of operation and the means of betterment employed, and it is only towards the end that the writer states that the burden of proof as to which may be the better system has been shifted from the alternating single-phase to the direct-current system. This statement is followed by a summary from which the inference may be drawn that the New Haven operators believe the single-phase system to be the one of the future for heavy trunk line traffic, while they consider that the direct-current will probably hold its own for street and urban service.

From the log that is published, it appears that the power house troubles, at least those of a serious nature, have been entirely overcome, and that, in the future, there will only remain those that are apt to arise in any station of such magnitude, which are to be expected in the regular course of events. The line, too, has been put in such shape that the early troubles have about disappeared, and it only remains to tune up the locomotives, and by making such changes as experience will suggest from time to time, develop them towards a point of maximum efficiency and minimum cost of repairs. Of course no statement can yet be made that will indicate where these boundaries are. At present, the cost of repairs per mile are falling, but, owing to the youth of the service, they have not yet touched the figures reached elsewhere. Consequently, a further decrease is expected, prior to a later rise, when the locomotives commence to be taken in for general repairs.

It is shown, too, that these engines are well up to and even surpass the builders' guarantees, as evidenced by the remarkable work done on Labor Day, 1908, when the average mileage for the 38 locomotives in service was 212 for each, with some making more than 300 miles, and this with a maximum distance of 34 miles between terminals.

The paper, as we have said, deals almost exclusively with the facts relating to the locomotive and the electrical equipment behind it, and stops there. It shows that both of these have been brought to a condition of satisfactory efficiency; a condition where the safety of the public and of the employee is well cared for, and where train delays will probably be no greater than must be expected where so heavy a traffic is to be cared for. There is nothing in this to indicate the relations of the locomotive to the rails, or whether the track must be of a more or less substantial character than it is where the steam locomotive is used. The discussion regarding this matter, that flourished so vigorously a year ago, has well-nigh died out, and we are assured that all is well, though there is an omission to state whether or not that "well" is obtained as the result of an abnormal strengthening of the track, and a corresponding increase of expense for maintenance.

But this aside, the presentation of the case of this greatest of single-phase operations with so much frankness is a matter upon which all who are interested in electric traction in any way are to be congratulated, and it is to be hoped that the example that has thus been set will be followed by others who have a tale to tell of woes encountered and overcome, since, by the telling, many may be guided in their work and thus avoid the pitfalls that will otherwise surely lie in their way.

To sum up the matter, it is evident that the New Haven engineers believe in the system that they have installed. At the same time, it is quite natural that all should not agree with Mr. Murray's conclusion, and that such differences of opinion should be brought out in the discussion. This was the case, and that side of it will be presented next week, since the limits of space prevent it from being done in this issue. We shall also welcome correspondence and further discussion in our columns.

UNION PACIFIC.

From the point of view of the stockholders, although there is a sharp distinction between the Union Pacific as a holding company and as an operating railway company, the separation of these two functions and the examination of one alone is absurd. This is not so to the practical railway man. In our review of this company's operation for the 1907 year, we pointed out this distinction between the banking and the operating activities of the company and commented on both. While it is impossible entirely to ignore the banking features of this year's report, since, for instance, the ability of the company as an operating company to get new capital for additions and betterments may depend upon its credit as a banking company, still, from the railway man's point of view, the principal interest lies in what has been done by the railway organization, operating continuous mileage from Omaha, Neb., and Kansas City, Mo., to Spokane, Wash., and Portland, Ore.

Covering such vast territory, and handling such an enormous amount of all classes of freight, the Union Pacific reflects quite accurately business conditions. Its problems have been the problems of the railways of the country on a large scale, and its solution of these problems must be the admiration of operating officers. Increased efficiency was the aim, especially of the second half year's operation. From July 1, 1907, nearly to January, 1908, the business offered was extraordinarily heavy. Labor, materials and supplies were not only expensive, but were actually scarce, and the demand for railway equipment was in excess of the supply throughout the larger part of the United States. Thus the tons of revenue freight carried one mile amounted to 3,065,584,431 for the six months ended December 31, 1907, an increase of about 7.5 per cent. over the tonnage in the corresponding six months of the previous year. The falling off in business of the Union Pacific in the second half of the fiscal year is plainly brought out by a comparison of the tons of revenue freight carried one mile, amounting to 2,206,355,382, for the six months ended June 30, 1908, with the tons carried for the corresponding six months in the previous year. This comparison shows a decrease of 22.6 per cent. No harder strain could be put on the operating organization of the road than this; yet the rail lines were operated on a basis of 54 per cent. last year as compared with 52 per cent. in the previous year.

Taken as a whole, operating revenues decreased but 0.35 per cent., and amounted to $76,039,225 last year, and total

operating expenses increased by less than 4 per cent., amounting to $41,694,035, and since the close of the fiscal year, the showing has been much better. One cause for the increase in operating expenses was an increase of nearly 12 per cent. in the number of revenue passengers carried one mile, the total number being 760,532,906 last year. The handling of this increased passenger traffic was of course a direct charge to conducting transportation, while the decrease of 7.6 per cent. in tons of revenue freight carried one mile, the number being 5,271,939,813 last year, was partly offset by an increase in the empty freight car mileage. The revenue from the passenger business amounted to $16,641,468, an increase of 11.6 per cent. over the previous year, and the revenue from freight amounted to $52,899,158, a decrease of 3.5 per cent.

The increase in revenue from passengers came almost entirely from the increased number of passengers carried, since the average distance each passenger was carried totaled 118 miles last year as compared with 120 miles in the previous year, and the receipts per passenger per mile were 2.188 cents in 1908 as against 2.189 in 1907. The decrease in revenue from freight came from a decrease in the number of tons carried and a slight decrease in the length of haul, the average haul being 403 miles last year as against 405 miles in the previous year. The increased receipts per ton per mile of 1.003 cents last year as compared with the already very high receipts of 0.96 cents per ton per mile in 1907, indicate the high grade freight carried. Unfortunately there is no table classifying by commodities this freight tonnage.

The increase in operating expenses already mentioned came largely from increased cost of conducting transportation, this account showing an expenditure of $21,214,179 last year, nearly 13 per cent. higher than in the previous year. The principal increase was in the cost of fuel for locomotives, for which $6,582,430 was spent last year as against $5,169,702 in the previous year, an increase of 27 per cent. While this is the largest increase in transportation expenses, it is only typical of the others, every item shown under this head having increased. There was no attempt to cut maintenance charges to improve the showing of the road at the expense of proper up-keep of the property. The following table gives the costs of maintenance of way per mile operated, and the unit costs of repairs and renewals of equipment:

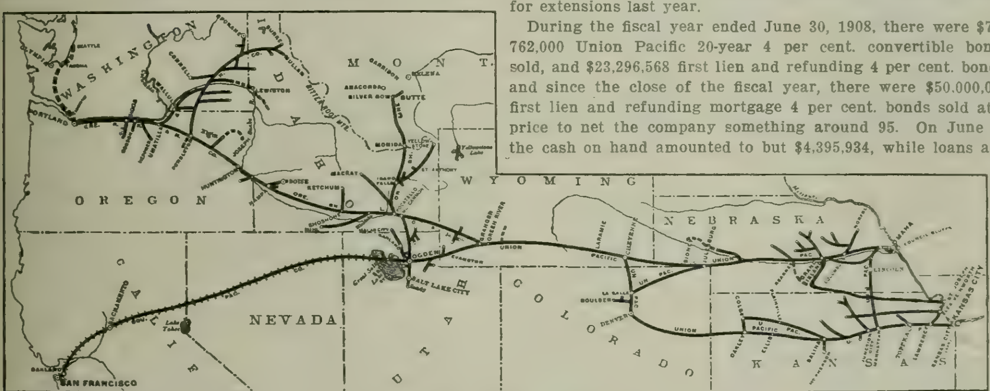
	1908.	1907.
Maintenance of way	$1,539	$1,782
Repairs and renewals of locomotives	3,069	2,933
Repairs and renewals of passenger cars	1,037	1,092
Repairs and renewals of freight cars	113	127

These expenditures are liberal in the extreme when compared with the Union Pacific's competitors and would be considered ample for an eastern trunk line.

Notwithstanding the increase in empty car mileage, the average train load was 512 tons last year, an increase of 37 tons, or 7.8 per cent., over the previous year. Another saving is shown in the reduction of the ratio of light and helping locomotive miles to revenue service total train miles, this ratio being 8.06 per cent. last year as compared with 8.98 per cent. in the previous year, a decrease of over 10 per cent. The average number of loaded cars in freight trains going east and north was 22.17 as against 21.91 in the previous year; going west and south, 23.33 as against 22.98. This increase in loaded cars in train and in revenue freight train load reflect the advantages derived from the improvements made during the past years in the grades and curvatures.

During the past year, this policy of improvement of grades and curvatures was carried on, and $5,688,877 was charged to capital account for additions and betterments. Of this, $1,800,645 was spent for additional main track. The Union Pacific has been steadily building second main track for the last few years, and will in time be a double track road from the Missouri river to Ogden, Utah. The policy of the Union Pacific, as we have pointed out before, has been one rather of improvement than of extension, although extensions that are a direct benefit to existing lines have not been neglected. There was $3,662,929 charged to capital account for extensions last year.

During the fiscal year ended June 30, 1908, there were $73,762,000 Union Pacific 20-year 4 per cent. convertible bonds sold, and $23,296,568 first lien and refunding 4 per cent. bonds, and since the close of the fiscal year, there were $50,000,000 first lien and refunding mortgage 4 per cent. bonds sold at a price to net the company something around 95. On June 30 the cash on hand amounted to but $4,395,934, while loans and bills payable amounted to $41,189,646. This is a reduction in the loans and bills payable from $69,050,220 shown on June 30, 1907. The Union Pacific during the year loaned the Southern Pacific $42,376,389, the total amount of this demand loan amounting to $45,376,389. The demand loans of the San Pedro, Los Angeles & Salt Lake, representing money advanced by the Union Pacific, amounted to $2,625,308 on June 30, 1908, as compared with $50,000 on the same date in the previous year.



The Union Pacific System.

The Southern Pacific connection from Ogden to San Francisco is shown.

The profitableness of the Union Pacific's investment business is indicated by a balance of $16,019,692, income from other than transportation operations. This is greater by $4,790,468 than income from this source last year, so that the surplus of $12,188,752 after payment of dividends was only slightly smaller than the surplus in 1907.

Since the close of the fiscal year, reports of the Union Pacific to the Interstate Commerce Commission have shown steady increases in business and decreases in expenses, and prospects for the present fiscal year are much better than were the prospects at this time last year.

The following table shows the results of operation of the Union Pacific and its auxiliary companies, rearranged according to our usual method. The figures are all taken from the 1908 annual report of the company, and may in some cases

be rearranged so as to no longer correspond with those published in the 1907 report:

	1908.	1907.
Average miles operated.......	5,781	5,645
Freight revenue	$52,899,158	$54,809,074
Passenger revenue	16,641,468	14,912,508
Total operating revenue.......	76,039,225	76,308,598
Maint. of way and structures.	8,898,301	10,022,748
Maint. of equipment.........	7,991,447	7,867,081
Transportation	21,214,179	18,780,080
Total operating expenses.......	41,694,035	40,148,478
Taxes	2,444,726	2,076,945
Net revenue	31,900,464	34,083,075
Gross income	47,920,156	45,553,206
Net income	35,719,400	36,176,921
Dividends	23,530,648	23,530,036
Additions and betterments.....	......	1,959,002
Surplus	12,188,752	10,687,883

NEW PUBLICATIONS.

Index to Railway Documents of the State of New York.

The Carnegie Institution of Washington is publishing an index of economic material in documents of the states of the United States. The New York documents, from 1789 to 1904, are being indexed and prepared for the Department of Economics and Sociology of the Carnegie Institution by Adelaide R. Hasse, Librarian of the Department of Public Documents of the New York Public Library. This index is of the highest value and gives a good illustration of the extremely important work which the Carnegie Institution is undertaking in furnishing aid for work of this sort, which will not bring in a direct money profit to any publisher, but will be of the highest national value.

The documents relating to railways in New York state in the index at hand are indexed in several different ways, and the system followed is good and clear.

Letters to the Editor.

JURISDICTION OF I. C. C. QUESTIONED.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The attempt to find scriptural authority for the Interstate Commerce Commission, apropos of the Santa Fe pass, in your issue for December 18, will not bear analysis. The passenger who "paid his fare and went" was the disgruntled prophet Jonah. He embarked for Nineveh upon a water line engaged in foreign traffic, and therefore not amenable to the Commission. At an early stage of his voyage he was discovered in the hold and summarily ejected over the side of the vessel, without, so far as is related, receiving any refund. Upon his arrival in the water he was taken as a free passenger by a great fish over which the Commission will hardly claim jurisdiction; though what might be said on that point by a higher Federal authority can only be guessed. It certainly was not a common carrier. The unregulated "great fish" carried its deadhead passenger safely to shore.

The moral of this story to all who pay their fare is almost too obvious for comment. It is better to stay at home unless you can travel on a pass. The next time Jonah started for Nineveh he walked.

C. H. ALKHAT.

It is painful to have our clear and cogent logic so ruthlessly "knocked"; but a railway man who has failed to get his annual renewed is to be pardoned many things.—EDITOR.

PASSES AND THE SCRIPTURES.

Omaha, Neb., December 23, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to the editorial on passes in your issue of December 18, page 1,570, your Santa Fe official didn't look close enough. The weight of the Biblical evidence is against him, as well as common sense. Had he turned to the Book of Exodus he would have read that the Israelites were *passed* through the Red Sea, and in the Book of Joshua, that they were *passed* through the Jordan. That number of free travelers would have made his pass book look sick. When the Lord sent out the seventy He said: "Carry neither purse, nor scrip, nor shoes * * * and into whatsoever house ye enter first say: 'Peace be to this house' * * * And in the same house remain, eating and drinking such things as they *give* * * * ." Doesn't this mean a pass"? Again, in Matthew x:8, he says, "freely ye have received, freely give." Does this mean that the Santa Fe official shall receive passes freely and give none in return?

As you will remember, Jonah was in a hurry when he paid the fare and went. But he was forced to change his route, and was given a free ride before he reached the dry land. He had a "pass" part of the way. All of the "redeemed" are to be passed through the celestial gates. The Psalmist says: "Open to me the gates of righteousness; I will go unto them." As he had the right to be passed, is the Santa Fe road so much better that it will compel the righteous to pay their way?

That official ought to study his Bible, because "Salvation is free," if railway rides are not. Even Isaiah says: "Ho, every one that thirsteth * * * come, buy wine and milk without money and without price." Seriously, the rule against passes is too severe. It is sectionalizing the people. We had enough of sectionalism in 1861-65. A more judicious, liberal system should be adopted.

E. F. TEST.

As the value of the scriptures depends so largely on their being thoroughly studied, this exegesis from Omaha, in past years sometimes looked upon as a wicked city, is most welcome. Here we have authoritative assurance that the pass privilege rightfully applies also to dining cars. What could be more comforting? The Interstate Commerce Commission should reverse its policy and use its influence with Congress to have the law modified.—EDITOR.

PRIVATE CARS.

Chicago, Ill., December 14, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In a paper read before the meeting of the Association of Transportation and Car Accounting Officers at Cincinnati, December 8, 1908, Robert J. Bailey, Secretary of the Individual Car Owners' Association, attempted to prove that the railways of the United States shirked their duty in failing to provide equipment sufficient to take care of the increase in traffic from 1904 to 1908, and that it devolved on the individual car owners to come to the rescue of the suffering public.

In support of this claim, Mr. Bailey presented several pages of fragmentary statistics, and summed up his deductions in the following paragraph:

"The increase in the building of freight cars is shown as 20.5 per cent., and the general increase in coal and pig iron of the United States in the same period is 41 per cent. The difference in percentage of cars actually built and that which was required is equal to about 200,000 freight cars. This statement bears additional significance from the fact that there are over 200,000 privately owned freight cars in the United States."

Even admitting that Mr. Bailey's figures approximate accuracy, it would be interesting to learn who handled this enormous surplus for which the railways failed to provide cars. It is obvious that these commodities, if produced, were transported somewhere and by someone.

Mr. Bailey does not claim that these 200,000 private cars all came into existence since 1904. In fact, according to Mr. Midgely, not less than 125,000 of these same private cars

were doing business as early as 1901, so that at best the private cars took care of but little more than their proportion of the increase.

As a matter of fact, however, Mr. Bailey not only uses incomplete and inaccurate figures, but he uses them in such a manner as to produce results that are misleading, to say the least.

It is noted that the 20.5 per cent. increase in equipment referred to applies to all classes of cars, while the 41 per cent. increase in production covers coal and pig iron only. According to Mr. Bailey's figures, he shows an increase of only 29 per cent. in general commodities. It is noted also that the increase in commodities is calculated in tons, while the additional equipment is expressed in cars. It is hard to believe that a man in Mr. Bailey's position could overlook the increase in tonnage capacity of the freight car equipment of the country. In fact, as he refers to this increase in another part of his paper it is most curious that he fails to consider it in connection with the increase in the number of cars.

The Interstate Commerce Commission furnishes very complete statistics covering this particular question. Taking first all classes of cars, we find that from 1904 to 1907, the total freight car equipment (excluding private cars), increased from 1,668,341 to 1,991,557, a numerical increase of 323,216, or 19.4 per cent. The increase in total capacity, however, was much greater. In 1904 the average capacity of all cars was 30 tons. The Interstate Commerce Commission figures for 1907 are not yet available, but reliable figures from another source place the average for 1907 at 34 tons. Combining the numerical increase with the increase in capacity, we have a total increase in tonnage capacity of 16,953,805 tons, or 33.4 per cent.

Taking coal cars alone the discrepancy between Mr. Bailey's deductions and the cold facts appears much wider. In 1904 the Interstate Commerce Commission reports 622,568 railway coal cars in service, the capacity of these cars averaging 33 tons. Neither the number nor the capacity of this class of cars for 1907 has as yet been made public by the Interstate Commerce Commission, but assuming the number as 38 per cent. of the total cars, and the capacity at 39 tons per car (based on reliable data from a private source) the increase in coal carrying capacity is from 20,760,045 in 1904 to 29,514,849 in 1907, an increase of 8,754,804 tons, or 42.2 per cent.

Mr. Bailey attempts also to show that railways get the bulk of all of the profit which is derived from the coal business. He says:

"In our particular commodity of coal we figure our net earnings not to exceed 15 cents per ton. The shipments of lake coal during 1906, including those to Erie, Ashtabula, Cleveland, Huron and Toledo, amounted to a total of over 14,000,000 net tons. The shipments made to Erie, Ashtabula and Cleveland by one road produced a net revenue of $30 per car, on the basis of a 50-ton car. We furnish the coal and the car to transport it, and it nets us $7.50. The railway furnishes the rails and the transportation and it nets them $30. The difference is 43 per cent. in favor of the railway."

If there is any railway in that territory that can handle freight business at such a profit it has kept it pretty well concealed in the annual reports. It is probable that the rate on coal to the ports mentioned will not average over $1.10 per ton, or $55 for a 50-ton car.

To make a net profit of $30 per car the road would have to show an operating ratio of about 45 per cent., while the Interstate Commerce Commission shows the average for roads in that particular group as running 70 per cent. and higher for several years past.

There is a well-known adage relating to the inevitable truthfulness of figures. Unfortunately, no one has ever been able to convince us that the converse of the proposition also holds good.

STATISTICS.

RAILROAD TAXATION IN WASHINGTON.

Seattle, Wash., November 11, 1908.

To the Editor of the Railroad Age Gazette:

In the various states there is a great diversity in methods of taxing the property of public utility corporations, but few of which are fair to the tax paying public and to the public utility concerns, or satisfactory to either. The primitive method of appraising all property by local assessors, placing their valuations upon the tax rolls, and dividing the taxes for state, county and municipal purposes has been in use in the last few years in only three states, Rhode Island, Oregon and Washington. The trend of legislation and public opinion in most states is away from local taxation and towards taxation of public utility concerns for state purposes only.

Washington for the past few years has been making efforts to modernize its system of taxing public utility corporations. At the general election on November 3 a constitutional amendmend to provide "that taxes shall be uniform upon the same class of subjects and shall be collected and levied for public purposes," and which was passed by the state legislature in February, 1907, was lost by a considerable margin. For a state that has operating within its boundaries 32 steam and electric roads and numerous logging roads and tramways, the result is unfortunate, as it keeps the state committed to a system of corporation taxation that is inadequate and unfair.

In 1905 a state tax commission and a state railroad commission were established in Washington to endeavor to solve the taxation problem. These commissions made exhaustive reports. The many methods of taxation in vogue in the various states were divided as follows, there being 19 states having at least two methods, and some that have more, for levying corporation taxes:

Taxes for state purposes only	10
General property tax, state levy	35
General property tax, local levy	3
Tax on capital stock	4
Tax on capital stock and bonded debt	3
Tax on gross receipts	12
Tax on net earnings	1
Special taxes	4

The commission recommended that the direct tax for state purposes only be adopted.

This year railroad properties have been assessed according to the rate in each county upon a valuation in that county determined by the state tax commission. The assessments have been increased about 100 per cent. since 1907, but the tax rate has been slightly lowered. The intention of the state tax commission was to assess all railroad property at 60 per cent. of its value, but this was found to be higher than the valuation upon other property in any county, and it was therefore impossible to enforce a flat valuation of 60 per cent. against railroad property. Railroad property was then assessed in each county at the same rate as other property.

The aggregate assessment is $84,000,000 for steam and $14,000,000 for electric lines. In 1907 the aggregate for steam and electric lines, including both operating and non-operating property, was less than $44,000,000. The great and unfair variation of the tax rate for different roads and counties is shown by the county assessments of 51.6 per cent. in Spokane county, 46.7 per cent. in King county and as low as 23.4 per cent. in Chehalis county. Taking the railroad commission's figure for the actual value and the county assessment percentages, the Oregon & Northern is assessed for main line property at the rate of $9,763 per mile in Whitman county, $13,120 in Walla Walla county and $16,000 in Columbia county. The Northern Pacific ranges from $43,014 per mile in Spokane county to $25,598 in Skagit county. The Great Northern varies from $47,825 in Spokane to $26,237 in Skagit county. These variations cannot be remedied by the state board of equalization under the present system of county assessments, and the county assessors, limited as to time and powerless to make investigations necessary to a proper determination of value, cannot place a fair assessment upon railroad property.

The proposed amendment to the constitution aimed to give the state legislature power to tax the railroads as a whole without cutting them up into pieces and distributing them among the counties. The conclusion of the states that have handled the problem recently is that the satisfactory method for assessment and taxation of public service corporations is by a board appointed for that purpose and the best results are obtained by taxation of this class of property for state purposes only.

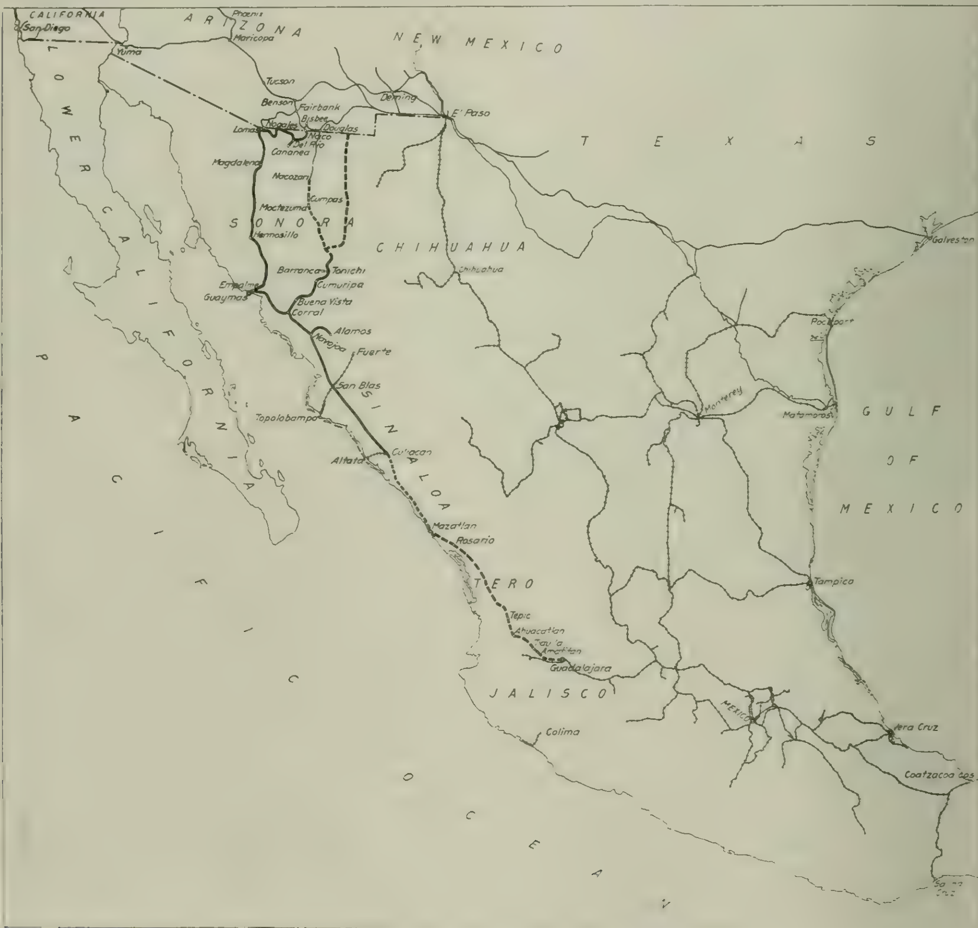
The development of Washington depends upon the development of its railroad systems. The Chicago, Milwaukee & St. Paul, the North Coast and the Oregon & Washington are all building extensively and their valuation will soon reach $150,000,000. Some method for taxing this property fairly must be provided. It is no longer a question of more law, but of less and more efficient law; not a question of elaborating and amplifying the tax systems, but a question of offering the least possible amount of national, state and local interference with the management of the railroads that is consistent with good service to the public. There is a tendency to forget that the "square deal" has two sides—the public side and the railroad side.

L. P. ZIMMERMAN.

Contributed Papers.

THE SOUTHERN PACIFIC LINES IN MEXICO.

The construction by the Southern Pacific Company of a main trunk line and various branches on the west coast of Mexico under concessions granted by the Mexican Government is one of the most important railway developments in America today. Six hundred miles of these lines are already completed and in operation; 170 additional miles will be finished and ready for operation by January, 1909, and the entire network



Map of the Southern Pacific Lines in Mexico.

Other principal Mexican railways are shown by the lighter, cross-hatched lines.

of lines will be pushed to completion as rapidly as the best, most approved and most economic methods of building will permit. The enterprise is a gigantic one involving the expenditure of many millions of dollars. Perhaps the best evidence of its importance is the fact that the work has progressed continuously throughout the financial depression.

Besides opening up a new territory rich in natural resources, the completion of the main trunk line will establish a direct and continuous route connecting the City of Mexico, Guadalajara and other points in Mexico with Los Angeles, San Fran-

cisco, Portland and the ports of Puget Sound. This will make possible a continuous train service of about 3,500 miles, the longest north-and-south line in America, and the longest in the world, until the Cape-to-Cairo line is built (if it ever is!) by the British Government. In order to understand clearly the significance of the various lines embraced in the enterprise the main line will be considered first, and then the branches separately.

MAIN TRUNK LINE.

This line enters the Republic of Mexico at Nogales, the twin American-Mexican city on each side of the international boundary between Arizona and the State of Sonora. From this point the line of the Sonora Railway extends through

Natives Clearing the Right of Way.

Magdalena and Hermosillo to the port of Guaymas, on the Gulf of California, a distance of 263 miles. This line, which has been in operation for many years, is now owned and controlled by the Southern Pacific Company, and over its tracks the through trains will be run. The Government has recently granted a concession for the reconstruction of this entire line and the Southern Pacific has already concluded arrangements for raising the track, putting in new ties, reballasting, replacing the old bridges with new ones, and substituting heavy rails for those now used, so that the roadbed of this part of the line will be raised to the high standard of construction which prevails on the new part south of Guaymas. By the terms of the concession this reconstruction must be completed within two years from the date of the concession.

From Guaymas south to Guadalajara the entire line, 860 miles in length, will be one of original construction. Leaving Guaymas the road has a general southeasterly course passing through Corral, the point of crossing the Yaqui river, and Navojoa, the crossing of the Mayo river, entering the state of Sinaloa about half way between Navojoa and San Blas, at which latter place the Fuerte river and tracks of the Kansas City, Mexico & Orient are crossed; thence to Culiacan, the capital of Sinaloa, crossing the beautiful Culiacan valley and river just before entering the city. From Culiacan the line proceeds to Mazatlan, situated on the Pacific Ocean at the mouth of the Gulf of California. This is the chief seaport city of the west coast of Mexico, and the only one which will have both a north and south rail outlet when the line is completed. Here the route gradually leaves the coast, passing through the territory and city of Tepic, thence to Guadalajara, the capital of the state of Jalisco and second city of the Republic. The line between Guaymas and Culiacan, a distance of 340 miles, has been completed and is in operation; since the first of August a through daily passenger and Pullman service has been maintained between Culiacan and Tucson, Ariz., a distance of 750 miles.

The length of the line between Culiacan and Mazatlan is about 150 miles. The construction of this section is being pushed rapidly with large forces from each end and the section will be completed and placed in operation early in January, 1909, when a through daily passenger and Pullman service will be inaugurated from Tucson to Mazatlan, a distance of 900 miles. From Mazatlan to Guadalajara the length of the line will be about 360 miles. The construction of this section is now in progress from Mazatlan south and also from Guadalajara north and the work at each end is being pushed with all the despatch consistent with economic construction. By the terms of the concession the entire line must be completed by November 6, 1912. The concession for the line south of Navojoa was granted directly to the Southern Pacific Company. All the other lines are being built under concessions granted to the Cananea, Yaqui River & Pacific Railroad Company, a Mexican corporation owned and controlled by the Southern Pacific Company.

BRANCH LINES.

The concession to the Southern Pacific authorizes the construction of as many branches on either side of the trunk line from Navojoa to Guadalajara (each branch not to exceed 150 kilometers in length) as may be desired. The branches desired may de designated at any time prior to the sixth day of November, 1915. No concession for the construction of parallel lines within a zone of 30 kilometers on each side of the line can be granted to any other company prior to November 6, 1920.

Alamos Branch.—This branch in reality extends from Corral via Navojoa to Alamos, a distance of 91.84 miles, for the reason that it was built under one of the Cananea, Yaqui River & Pacific concessions. In the practical operation of the lines, however, the part between Corral and Navojoa is regarded as the main line of the system, so that the Alamo branch proper begins at Navojoa and its length is only 36 miles. This branch has been in operation since the first of the year. Alamos is a beautiful and picturesque city, situated in the foot hills of the Sierra Madre mountains, the center of

Protection from Insects in the Engineers' Camp.

a rich and extensive mining and agricultural territory, with freight and passenger traffic to make this line an important feeder.

Yaqui River Branch.—This branch diverges from the main line at Corral, 69 miles east of Empalme. The line from Empalme to Corral was built under the concession of the Cananea, Yaqui River & Pacific Company, so that the portion of the main line between these points is a part of this branch. From Corral the road proceeds in a northeasterly direction following the Yaqui river, passing through Buena Vista, Cumuripa, Tonichi and several other towns of considerable importance, to the junction of the Yaqui and Bavispe rivers, thence with the courses of the Bavispe and San Bernardino rivers to a point on the international boundary near Douglas,

Ariz. This road will penetrate the heart of the region characterized by Baron Humboldt as "the mineral storehouse of the world." Heretofore the development of this section has been retarded on account of the lack of transportation facilities and the presence therein of bands of Yaqui Indians. The new railway will furnish the needed transportation facilities; and experience teaches that Indians are never a menace after the coming of the railway. This branch is destined to become one of the largest carriers of ore metal and mining machinery and supplies on the continent. It is completed to a point 20 miles north of Cumuripa, and 51 miles north of the junction with the main line at Corral. Construction is being pushed with a large force north of this point. Under the concession this line must be completed to the international boundary by May 11, 1914. Its length from Corral to the boundary is 388

Tracklaying Gang at Work.

miles. From Tonichi a short branch of 4½ miles will be built to the coal fields of Barranca.

Nacozari Branch.—This line leaves the Yaqui river line at its junction with the Moctezuma river and follows the Moctezuma, passing through the towns of Moctezuma, La Junta and Cumpas to its terminus at Nacozari. At Nacozari a connection will be made with the tracks of the Nacozari Railroad, a branch line of the El Paso & Southwestern extending from Douglas, Ariz., to Nacozari. The mineral deposits of the territory tributary to this line are known to be extensive, some of the ores being so rich that they are now transported by pack trains distances as great as 90 miles and shipped to the Douglas smelter, yielding handsome profits, despite the expense of this primitive method of transportation. The Pilares mine at Nacozari contains one of the largest deposits of low-grade sulphide copper ore in the world, and a new concentrator of 2,000 tons daily capacity has just been completed at Nacozari by the Moctezuma Copper Company for treating this ore. Construction work on this branch was begun at Nacozari, where a large tract of land has been secured for depots, warehouses, roundhouse, shops, yards and terminals. Its length is 111 miles. The concession requires its construction to be completed by May 11, 1914.

Nogales-Cananea Branch.—This 75-mile branch leaves the main line at Lomas, a station on the Sonora Railway two miles south of the international boundary at Nogales. It parallels the boundary line between Arizona and Sonora, following the beautiful valley of the Santa Cruz river, and terminates at a connection with the Cananea-Naco line at Del Rio, seven miles north of Cananea. It will be finished and put in operation by the middle of December. In addition to the considerable local traffic which this line will develop, its construction is of great importance, because it gives a western outlet and continuous line to the traffic Cananea.

Cananea-Naco Branch.—This line has been in operation for several years. It is 39 miles long, and extends from the great mining camp of Cananea to the international boundary at Naco, where it connects with the main line of the El Paso & Southwestern from Benson to El Paso. The revenues of this line from the transportation of the output of the copper mines, and from the volume of freight and passenger traffic incident to the operations which have been conducted on so grand a scale at Cananea, have been large.

ENGINEERING FEATURES.

All the lines built or under construction will compose a system of 1,785 miles. From the standpoint of construction, this mileage may be divided as follows:

	Miles
Cananea, Yaqui River & Pacific R. R. Co.'s concessions.	781
Southern Pacific Company's concession	741
Sonora Railway Company (reconstruction)	263
Total	1,785

The maximum grades and curvatures are as follows:

Main Line.—From Empalme to Navojoa, 122 miles, the maximum grade is 0.5 per cent. and the maximum curve 3 deg. metric (chord of 20 meters; 4 deg. 34 min. with chord of 100 ft.). Large rivers crossed are the Yaqui and Mayo.

From Navojoa to Culiacan, 219 miles, the maximum grade is 0.5 per cent. and the maximum curve 4 deg. metric (chord of 20 meters; 6 deg. 6 min. with chord of 100 ft.). An average force of 2,000 men and 1,500 head of stock was used in grading, bridging and track-laying. Large rivers crossed are the Fuerte, Sinaloa and Culiacan.

From Culiacan to Mazatlan, 140 miles, the maximum grade is 0.5 per cent. and the maximum curve 3 deg. metric (4 deg. 35 min. with chord of 100 ft.). An average force of 700 men and 500 head of stock was used in grading, bridging and tracklaying. Large rivers crossed are the San Lorenzo, Elota and Piaxtla.

From Mazatlan to Tepic is 188 miles. The maximum grade from Mazatlan to the Santiago, 158 miles, will be 0.4 per cent.

Roberts' Tracklaying Machine at Work.

and the maximum curve 6 deg. metric (9 deg. 0 min. with chord of 100 ft.). From Santiago river to Tepic the maximum grade will be about 2 per cent. Large rivers crossed are the Presidio, Rosario and Santiago.

From Tepic to Guadalajara is 180 miles. Definite location of this section is now in progress, but the maximum grade has not been determined. During the past year an average force of 1,200 men and 50 head of stock has been employed in grading and bridging north of Guadalajara.

Alamos Branch.—From Navojoa to Alamos, 36 miles. Maximum grade 2.8 per cent., maximum curve 6 deg. metric (9 deg. 9 min. with chord of 100 ft.).

Yaqui River Branch.—From Corral to the international boundary, 388 miles. Maximum grade 0.5 per cent., maximum curve 6 deg. metric. During the past year an average force of 500 men and 400 head of stock has been used in grading, bridging and track-laying on this branch.

Nacozari Branch.—From Nacozari to mouth of Moctezuma river, 111 miles. Maximum grade 1.5 per cent., maximum curve 12 deg. metric (18 deg. 17 min. with chord of 100 ft.). An average grading force of approximately 300 men and 50 head of stock has been used on this work during the past year. The first 20 kilometers of this line is heavy canyon work along the Moctezuma river.

Lomas-Del Rio Branch.—From Lomas Station on the Sonora

Type of Concrete Bridge Used.

Railway to Del Rio, a distance of 75 miles. Maximum grade 2.6 per cent., maximum curve 6 deg. metric. During the present year 800 men and 400 head of stock have been employed in grading, bridging and track-laying on this branch.

Naco-Cananea Branch.—From the international boundary at Naco to Cananea, 39 miles. Maximum grade 2.45 per cent., maximum curve 5 deg. 15 min. metric (8 deg. with chord of 100 ft.).

TRAFFIC FEATURES.

Mention has been made of the mineral resources of the territory traversed by these lines. A large tonnage of ocean freight will be handled from Guaymas, the port furthest north on the mainland of the Gulf of California, and from Mazatlan, which is at the confluence of the gulf with the Pacific Ocean. The latter, by reason of its geographic position, is the most convenient port on the west coast of America for the immense cargoes carried by the "trade wind" vessels plying between America and India, China, the Philippines and the Hawaiian Islands. All of this ocean freight is now carried 2,000 miles north to San Francisco. Upon the completion of the line to Mazatlan this will become the port of discharge and their cargoes will be carried by the railroad to Guadalajara, Mexico City and other points in Mexico, and by fast freight north to the United States and Canada. The traffic from Mazatlan to Guadalajara and the City of Mexico is sure to be very large because this route affords the best approach to these two great cities from any point on the Pacific.

It goes without saying that the through freight and passenger traffic upon a direct line connecting two such cities as Guadalajara and Mexico City with Los Angeles, San Francisco and the Pacific coast of the United States will be heavy. Mexico City, like the tomb of Mohammed to the Mussulman, is the Mecca of all Mexicans, and the map shows an immense territory in Sonora and Northern Sinaloa, whose inhabitants can now reach the capital only by the circuitous route to Benson, Ariz., thence to El Paso, and from there over the Mexican Central to the City of Mexico. All this traffic will be diverted to the new line and its volume will be multiplied many times with the shortening of the distance and the increased facilities which will be afforded. The freight traffic which the country will furnish will be large in volume and will consist of live stock of all kinds, and a great variety of agricultural products, fruits, vegetables and timber. Among the agricultural products may be enumerated corn, beans, garbanzos (peas), sugar (crude and refined), alfalfa, sorghum cane (used as a forage for live stock), and agave, from which a fiber that is the highest-priced in the market is extracted. The fruits are of the finest quality and consist of the orange, banana, lemon, mango, chirimoya (known as vegetable ice cream), cocoanut, date, aguate, papaya (an appetizing breakfast fruit similar to the cantaloupe and from which is extracted the purest form of pepsin known), zepete, plum, strawberry, blackberry, melon, and in the mountainous sections the apple, peach and pear. The fruits which have been the source of such wealth to California are indigenous to the soil of the west coast of Mexico and are ready for market months in advance of the California product. The oranges grown in Sonora are the sweetest and have the most delicious flavor of any grown in America, with the possible exception of those of the Salt river valley in Arizona. The state of Sinaloa presents exceptional opportunities to the truck-gardener for raising winter fruits and vegetables. These can be produced there for the markets of the United States at a season when they cannot be supplied from any other section. Most fruits and vegetables may be grown there every month of the year.

The forests along the coast contain fine specimens of mahogany, ebony, maple, rosewood, lignum vitae, mora, willow and many other varieties of beautiful and valuable trees. In the hills and mountains are found the sycamore, cypress, spruce, pine, madroña, elm, walnut, cedar and oak, all similar to these species found in the United States, and in addition about 175 varieties of trees never seen in the forests north of this section.

The lands along the coast are for the most part covered with a dense growth of trees and underbrush and some grass, though the latter is not abundant. It is claimed that the forage from this underbrush will support more live stock to the same area than the famous bunch grass of the Northwest region. In the foot hills of the Sierra Madre range are magnificent grazing lands where conditions for stock breeding are ideal and the climate unsurpassed.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

VIII.

Though gas engines might be considered for dealing with a load which resulted in a much better load factor on the station, say 70 per cent. to 100 per cent., and which had not the same momentary variations, they could not, on account of the absence of overload capacity, deal with a load such as that now under consideration without very excessive capital expenditure. This is the position to-day and is likely to remain the position for some considerable time. In saying this I have fully in mind the possibility of saving and disposing of the by-products if gas were utilized.

It is important when working with steam turbines to use superheated steam, and I recommend that the steam should be generated at a pressure of 200 lb. per square inch above atmospheric pressure and superheated to a temperature of 300 degrees centigrade. For generating this steam I recommend the use of water-tube boilers as, with this type of boiler, superheaters can be very conveniently arranged, and they have the following further advantages:—

(1) They are very adaptable to constant changes of load on account of their quick steam-rising properties.

(2) They allow of the construction of large combustion chambers, such as are necessary to deal economically with brown coal.

(3) They can be fitted with chain-grate stokers, which are

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

the most reliable and efficient stokers for the conditions under consideration.

(4) The boilers are easily kept clean and the repair bill is a minimum.

I have devoted considerable thought and attention to the question of burning brown coal, if and when this should be available, and the specification for boiler plant specially provides for this. In addition to providing specially large combustion chambers and grate area, I propose to utilize induced draught, the fans being specified to produce a difference of pressure equal to one inch of water at the boiler dampers.

In designing the Yarraville power station I have taken into account not only the power required for traction purposes, but also that required for the Newport workshops, station lighting, etc. The accompanying table gives the more important technical details for each of the four stages.

The station is designed to deliver electrical energy as three-phase current at a periodicity of 25 complete cycles per second and at a voltage between phases of 12,000 volts. The voltage is chosen because it is the highest voltage for which I can recommend that turbo-generators should be wound and because it is sufficiently high for economically transmitting the electrical energy the necessary distance to the several sub-stations. A periodicity of 25 complete cycles per second is chosen as the most adaptable for any general developments likely to take place. It is also the most suitable for the operation of 800-volt rotary converters.

Technical Details of Plant in Proposed Power Station at Yarraville.

Generating Plant.	Port Melbourne and St. Kilda branches.	Stage I.	Stage II.	Stage III.
No. of generating sets installed.	3	4	6	8
Normal continuous capacity of each set, in E.H.P.*	5,000	5,000	5,000	5,000
Capacity of each set for 2 hrs., in E. H. P.*	6,000	6,000	6,000	6,000
Number of spare sets	2	2	2	2
Number of sets working at peak	1	2	4	6
Overload capacity, during peak in E. H. P.	6.000	12,000	24,000	36,000
Maximum load to be dealt with in E. H. P.	3,480	12,000	22,100	35,000
Boiler House Plant.				
Continuous steaming capacity of boilers installed in lbs. of steam per hour.	80,000	200,000	320,000	480,000
Approximate percentage of spare boilers allowed for cleaning and repairs, per cent.	25	25	19	17
Continuous steaming capacity of boilers working in lbs. of steam per hour	60,000	150,000	260,000	400,000
Peak steaming capacity of boilers working in lbs. of steam per hour.	75,000	188,000	325,000	500,000

*The actual outputs specified for (Specification No. 2) allow a margin on these figures for low power factor and abnormal working conditions.

The following is a general description of the proposed plant and its arrangement:

Buildings.—The buildings will be steel-framed structures carried on concrete foundations. The engine room is designed to entail the minimum amount of labor in operation and to admit of all machinery being kept in view and accessible to the overhead crane.

The coal, after being unloaded from a steamer at the station wharf, or from the railway trucks, as the case may be, will be delivered to coal bunkers situated above the boilers, by automatic coal conveying gear.

Generating Units.—The engine room will contain turbo-generators of the Parsons, Curtis, or other type, depending on the tenders received, and the steam will be exhausted from them into condensers arranged with suitable circulating and air pumps capable of maintaining the highest vacuum commercially possible. The capacity of each turbo-generator will be 6,000 h.p.* This size of turbo-generator is chosen because it is about the maximum size of alternator that can be conveniently built for 1,500 revolutions, the highest speed for which a 25-cycle generator can be built, and, with steam turbines, the higher the speed the better is the economy.

*The size of generator is really too large if you were to consider dealing with the Port Melbourne and St. Kilda branches only, as only one would be working out of three provided (three are necessary to allow two sets spare). On the other hand, a smaller size would not be so economical and would not be the best size when the station came to be extended.

To deal with the lines covered by Stage I, the station will contain four generating sets, two of which will easily be able to deal with the load, thus allowing two generating sets as spare. It can, however, be readily extended as may be required from time to time, though the intention is that it should not be extended beyond a total of 10 units, this being the greatest number of units that can, in my opinion, be advantageously operated in one power station. When this number is reached it may, in general, be taken that it is better to commence a second station entirely distinct from the first. From the chart already referred to, it will be seen that the maximum peak load, even if all the lines be converted to electric traction, is estimated to amount to about 35,000 h.p.. Six of the above turbo-generator units would, therefore, be capable of dealing with this load, and assuming two units spare, we obtain a total of eight units as the equipment of a station to deal with the requirements of the whole of the suburban railways on present estimates. This allows two additional units, without extending the station beyond what it was originally designed for.

Boiler-house Equipment.—The boilers will be of the water-tube type and will deliver steam at a pressure of 200 lbs. per square inch above the atmosphere and superheated to 300 degrees centigrade. The coal will be fed into mechanical stokers by gravity, the stokers being specially designed to burn the coal with a maximum of economy and smokelessly. The ashes will be raised by special hoists into the bunkers provided for the purpose.

Switch-house.—The switch-gear will be situated in a special switch-house, where there will also be a control-room, from which all the generators and the feeders going out of the power station will be controlled. This control-room will be connected by telephone with the engine-room, the boiler house, and the various sub-stations.

Operation Offices.—The necessary operation offices are provided in a part of the switch-house building.

The technical details of the proposed plant are dealt with fully by the specifications presented with this report. The specifications suggested to cover the construction of the power station are:

(1) Steel work for engine and boiler-house, including the complete boiler-house equipment, piping, coal and ash handling gear and overhead traveler (specification No. 1).

(2) Turbo-alternators and condensing plant (specification No. 2).

(3) Switch-gear, control panels, motor generators, auxiliary motors, main wiring and lighting (specification No. 3).

(4) Foundations, jetty, sidings and auxiliary buildings (specification No. 4).

It is impossible to draft specification No. 4 or draw detailed plans for these works until the type of plant under specifications Nos. 1, 2 and 3 has been definitely decided on. For instance, the specification for the boiler-house equipment leaves the actual number of boilers open, so that a manufacturer may quote for either a smaller number of large boilers or a larger number of small boilers, always providing the steaming capacity required is obtained, with the necessary spare plant. This allows manufacturers to quote on their standard apparatus. Further, some turbo-generators are arranged with vertical shafts and others with horizontal shafts, and this affects the design of foundation. The specification is specially arranged to cover either type of plant in order that you may be free to accept the most satisfactory proposition, taking everything into consideration.

(To be continued.)

WILLIAM H. NEWMAN'S CAREER.

Mr. Newman's effectiveness began 25 years ago, when he was appointed traffic manager of the Missouri Pacific. In those days he had distinctly the Southern and Southwestern flavor. Not much given to talk, he had the quality of concentration to an unusual degree. He would approach his subject first from one point in a tentative way and feel his ground as he advanced. No man was quicker to discern the strength of opposition and none more ready to turn the subject and reorganize his forces for another line of approach, but he was tenacious to the last degree in pushing the object of the chase and would frequently tire out his opponents and make his point by nominal concessions and the clever adoption of alternatives. He then seemed to be the strongest man in the traffic field, and in due time came into the Chicago and North Western organization, of which the Omaha Company was a part.

In Marvin Hughitt he found a man of qualities differing widely from those with whom he had been associated. Clean cut, positive, diplomatic, exacting, but helpful and considerate to those associated with him. It was his experience with Mr. Hughitt that served to smooth a certain rough edge sometimes in evidence in Newman's business manner and it taught him to practice a little more of the diplomatic method, but did not in the least detract from his strong points.

Newman never seemed to take into consideration what the other fellow thought about anything. The mistaken policy of finding out the opinion of his superior before having one for himself was not his way. In conference with his superiors he would give his opinions and reasons with as much freedom and back them up with as much confidence as with a subordinate, but if authoritatively overruled he would carry out the policy dictated.

When he came to the Great Northern Railway as Vice-President in charge of traffic he met an entirely new situation and had to deal with new conditions and a policy in some respects greatly at variance with that prevailing on the North Western. Until then Mr. Hill had few, if any, men who dared to express adverse opinions. It is tolerably certain that none such was expressed without danger to its holder. Mr. Newman came into the camp and took his stand with reference to questions concerning policy and details of traffic matters in that turbulent quarter apparently quite unconscious of Mr. Hill's precedents.

With his keen insight into character and watchfulness of results, Hill soon discovered that this man's judgment was worthy of respect and it was soon evident to those in daily contact with him that Newman's ideas were not infrequently but unconsciously adopted as his own. I do not believe that Newman ever dodged an issue with Hill. His common sense, placid courage and utter disregard for anything like playing policy doubtless gave to Hill a new sensation, won his confidence, and when Newman left the road to go to the Lake Shore he designated his successor in W. W. Finley, the friend who had been his companion in the southwest and who is now president of the Southern Railway.

It well may be that Mr. Newman leaves the service with mixed feelings. When he came to New York, more than seven years ago, he had, apparently, the chance of a lifetime to round out his career by pushing the New York Central again to the foremost place among the railways of the world. Fortune, the fortune that he wanted, knocked at his door, for Mr. Callaway in his brief term had barely pointed the way out, and Mr. Newman had the knowledge and the qualifications for doing the work. It would have been difficult to find a better traffic officer. In his service under such autocrats as Marvin Hughitt and James J. Hill, he had shown dogged persistency and diplomatic skill in carrying out his plans, after repeated refusals to approve them. On the Missouri Pacific and on the Lake Shore he had shown administrative capacity and the peculiar quality which we call a knowledge of men. He rarely made a mistake in choosing members of his staff, and he organized the New York Central on the lines indicated by Mr. Callaway.

It is probably unfortunate that the organization is primarily departmental, instead of divisional, but this was only a minor cause for the failure to maintain any consistent policy in developing the territory and perfecting the transportation machine for doing its work economically and in a way most satisfactory to the public. Unquestionably he was so qualified if he had been aided and supported by a competent board of directors. He would probably have succeeded fully, instead of partially, if he had been unhampered.

The board had always been well balanced in respect of members capable of giving the best financial advice, with the result of really skillful financial management and high credit. A list of the remaining members constitutes a humorous paragraph. The reader needs no commentator; it is concentrated absurdity. A weak board is not simply a negative defect in the organization. Its power for mischief is shown in such purchases as the burdensome Boston & Albany and the relief of members of the family by buying in their bad investments.

Unwise, as some of these undertakings have been, their losses have been quickly measurable in money, and are not to be compared with the injury done to the company by a consistent policy of inaction until driven to it in cowardly fashion by public clamor. This is traditional. The Central was nearly the last important company to apply the life-saving air brake to its trains. The New Hamburg disaster to an unbraked train raised such a riot of indignation that the directors, cowering with fear of indictment for manslaughter, made the quickest known application of power brakes to its entire passenger stock. Similar incidents, such as the great tunnel collision, are still fresh in the memory of newspaper readers. On this road, accidents with great loss of life, and resulting public remonstrance, have been the causes for improvements. Foresight and plans by the officers have been ignored until they were emphasized by killings and threats.

But these are not the only injurious effects of a weak board of directors. With a considerable proportion of members physically incompetent, mentally unfit, or largely non-resident, or inattentive, there is left room for the whimsical, or mischief-making, member to acquire and exercise the power of veto and interference. This we have had, and probably no one saw it earlier, and found it to be an impasse, than did Mr. Newman. Why did he not then resign and put the responsibility where it belonged? Probably because of the pronounced dogged element in his character, and a cheerful poise which no worry ever affects, combined with the knowledge that he was making substantial, although unsteady, progress such as another might not be able to make under absurd directorial control.

A railway needs a one-man government. Heads of departments should be specialists. The ideal president is a fully informed man of broad perspective, who can bring to bear on one detail the whole weight of his diversified knowledge, so that there will be no blunders resulting from one department's not properly allowing for the effect of its actions on other departments. President Newman had the qualifications for this work. He gave the man at the head of each department full authority, but he also kept his own finger on the machine. He was always ready in conference and advice, and had the faculty of bringing out all sides of a question, and clarifying and broadening a man's ideas. A subordinate who came to him with a problem which he had studied out was liable to be met with the statement: "You're all wrong." But it was said in a cheerful fashion, calculated to put the man on his mettle so as to encourage a strong argument defending his position.

He carried in his mind the geographical and strategic traffic position of almost every road in the country. In other than traffic matters, however, he had to make close studies as

problems arose. In doing so, he went into detail and learned all about it, but without losing his perspective. When it became necessary to electrify the New York terminal he appointed a commission and studied all sides of the question. This study was so complete that when it was finished he had a concrete problem to submit to experts for estimates, etc., leaving no loose ends to complicate things after the experts had made their report.

President Newman's retirement from railway service is not alone a loss to the New York Central lines. He exerted wide influence in directing the general railway policy of the country.

PENNSYLVANIA RAIL RECORD BLANKS.

The Pennsylvania rail committee has prepared the blanks shown in the accompanying cuts for keeping a record of rail failures. In reproducing these blanks, they have been in most cases condensed. In the actual sheets for dividing statistics according to the individual manufacturers, for example, there are spaces headed by the names of a number of different makers, while we show only one or two.

These blanks are divided into four groups. The first group shows information obtained at the mills during the process of manufacture. Of these, the first is the report of chemical and physical examination. This combines in one blank information regarding the particulars of rolling, chemistry, drop test, percentage of crop from the ingot, and shrinkage allowance at the saws. The carbon content is determined for every heat; and the other constituents as provided for in the specifications. The next is the certificate of inspection, which is a certificate to the railway company that the rails which have been accepted conform to the specifications. It gives also a statement of the rails that have been rejected and the reasons therefor. The third, which is the report of shipment, we have not reproduced. This blank has spaces to be filled out with data showing the kind of rail, weight, section, manufacturer, consignee, order number, etc., and below is a table in which is designated the number of each car, the number of rails of each length, total rails, and shippers' rates in pounds. One copy of this report goes to the Chief Engineer, and two copies to the General Superintendent, one of which is for the Division Superintendent. It is sent by the inspector. The fourth blank is a laboratory report of examinations of special rail; it may also be used for reporting check, analyses against the mill analyses.

The second group consists of those relating to rail statistics which are sent in by division officers. They are entirely distinct from those used by the accounting department. The first of these is the report of rail failures in main track. On this blank are recorded the complete particulars of the rail that has failed, so far as its location and the known physical conditions surrounding it are concerned. On the back of the blank a classification or description of rail failures has been placed, so that the failures may be grouped together for intelligent study. This form has been adopted by the American Railway Engineering and Maintenance of Way Association, as form M.W. 1,200. The next is the superintendent's monthly report of rail failures in main tracks. This is to be filled out once a month from the preceding form. On it the information obtained from the original reports is concentrated, and on the back of it is data similar to that on the preceding blank. The third is a statement of rails existing in main tracks. This is an annual statement to be made by the engineer in charge of each division, showing the different kinds of rail in the main track at the end of the year.

The third group consists of blanks for statistical compilations of rail failures for purposes of study. There are four forms in this group and they are intended to be kept together. The first is not reproduced herewith. It is a cover enclosing the other three forms, and when filled out tells the division and year to which the enclosed blanks refer. The other three

M W 840

PENNSYLVANIA RAILROAD COMPANY

PHILADELPHIA BALTIMORE & WASHINGTON RAILROAD COMPANY
NORTHERN CENTRAL RAILWAY COMPANY
WEST JERSEY & SEASHORE RAILROAD COMPANY

Sheet No ____ of ____ Sheets

REPORT OF CHEMICAL AND PHYSICAL EXAMINATION

of ____ Rails ____ Process ____ lbs per yard ____ Section
Manufactured by ____ Steel Co., at ____ Works
For ____
Order No ____ Date of Report ____ 19
No of Passes in Rolls ____ Bar held on average of ____ seconds at ____ Pass
Shrinkage allowance at Saws ____ inches on 33-foot rails.
Distance between supports on Straightening Press ____
Weight of Tup ____ lbs Height of Drop ____ feet. Distance between Supports, 3 feet
Average Number of Rails per Heat ____

	HEAT No	PERCENTAGE OF CROP FROM INGOT			CARBON	MANGANESE	PHOSPHORUS	SILICON	SULPHUR			DROP TEST DEFLECTION INCHES	REMARKS
		No. of Ingots	% from Top	% from Bottom									

INSTRUCTIONS
One copy of this report to be forwarded to the Chief Engineer

Correct ____ Inspector
Approved ____ Chief Inspector

Chemical and Physical Examination.

M W 842

PENNSYLVANIA RAILROAD COMPANY
P B & W R R N C Ry W J & S R R

CERTIFICATE OF INSPECTION

Of ____ Process Rails ____ lbs per yd. ____ Section
Manufactured by ____ Steel Co at ____ Works
For ____

Mr ____ Chief Engineer Date ____ 19 ____

The following Steel Rails have been inspected and accepted according to contract

Rails are certified to be within the limits of the Specifications of the ____

and approved as per details given below

All Rails have been inspected and approved for Chemical Analysis, Physical Tests, Section, Weight, Straightening, Drilling, Sawing, Length, Stamping, Finish, Quality.

All Rails are marked on the web with maker's name, date of manufacture, heat number, and position occupied in the ingot Date of rolling ____

No of Rails rolled ____ No of Rails accepted ____

No of Rails temporarily rejected and cause ____

No of Rails condemned and cause ____

This Certificate covers the run from
Heat No ____ to Heat No ____ both inclusive.

NUMBER OF RAILS OF EACH LENGTH

Length		33	30		27½		25		Total
Number									

CALCULATED WEIGHT			SHIPPER'S SCALE WEIGHTS		
TOTAL POUNDS	TONS	POUNDS	TOTAL POUNDS	TONS	POUNDS

Amount accepted under this Certificate ____
Total amount of Order ____
Balance due on Order ____

TRIAL WEIGHTS			
HOURS	WTS	HOURS	WTS
6A		6P	
7"		7"	
8"		8"	
9"		9"	
10"		10"	
11"		11"	
12M		12M	
1P		1A	
2"		2"	
3"		3"	
4"		4"	
5"		5"	

INSTRUCTIONS
One copy of this Certificate is to be made out and forwarded to the Chief Engineer

Correct ____ Inspector
Approved ____ Chief Inspector

Certificate of Inspection.

PENNSYLVANIA RAILROAD COMPANY

Laboratory Report of Chemical and Physical Examination of Rail and Other Track Material

PHYSICAL TEST

Remarks

Laboratory Examination of Special Rail.

M. W. 34

PENNSYLVANIA RAILROAD COMPANY

8 x 10½ Copying Ink

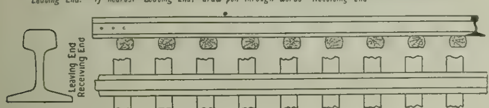
P. B. & W. R. R. N. C. RY. W. J. & S. R. R.

______________ Division

REPORT OF RAIL FAILURES IN MAIN TRACKS

Section No. ______ Date of Report ______________ 19___

1 Original Weight per yard ______________ lbs.
2 Rail Section ______________
3 Brand on Rail ______________
4 Heat No. on Rail ______________
5 Letter on Rail ______________
6 Length of Rail ______________
7 Location ________ ft. ________ of Mile Post ____
8 Which Track? ______________
9 On Curve or Straight Line? ______________
10 High or Low Rail, if on Curve? ______________
11 State Degree of Curve ______________
12 Superelevation of Curve at break ______________
13 Were Tie Plates used? ____ If so, what kind ______
14 Month and Year Rail was laid ______________
15 Was Rail Broken, Defective, or Damaged? ______
16 Date and Time found ______________
17 Was Rail Removed or Spliced? ______________
18 If Removed, give date ______________
19 State exact gauge of Track at break ______________
20 Was Rail much or little worn? ______________
21 Was Break over or between Ties? ______________
22 Was Break square or angular? ______________
23 Distance, center to center of ties on each side of Break ______________
24 Condition of Ties each side of Break ______________
25 Condition of Line and Surface ______________
26 State kind of Ballast ______________
27 Was Track properly ballasted? ______________
28 State kind of material under ballast ______________
29 Was Track well drained? ______________
30 Was Roadbed frozen? ______________
31 Condition of Weather (wet, dry, warm or cold, freezing or thawing) ______________
32 If Break was at Splice, state name of splice, number of holes, and whether it was full bolted or insulated ______________
33 If accident or detention of trains was caused by break, state circumstances ______________
34 If damaged, describe nature and cause, if known. (See instructions on back) ______________
35 If defective, describe location of flaws or defects, and, if possible, what caused them. (See back of Report for description of failures.) ______________
36 Draw on diagram Lines of Break, or partial fracture, such as long pieces from side of head, and half moon pieces from base, showing dimensions. Hollows in head should be shown on end section. Defects may also be indicated on diagram. Mark distance from end to break. If break is nearest "Receiving End" draw pen through words "Leaving End." If nearest "Leaving End," draw pen through words "Receiving End."



37 State cause of breakage as near as you can ______________

Approved: Correct:

______________ Supervisor ______________ Foreman

INSTRUCTIONS AND DESCRIPTION OF FAILURES ON BACK

Failures in Main Tracks.

INSTRUCTIONS

A The Foreman [illegible] the break [illegible] [illegible] rail [illegible]

B The Superintendent [illegible] the Engineer M. W. and a copy to the Assistant Engineer

C Mile Post number from {South / East} end of [illegible] used

D The "Letter" [illegible] to the right of the Heat Number

E The [illegible] of the report [illegible] immediately [illegible]

DESCRIPTION OF RAIL FAILURES

When describing Failures of Rails the following terms should be used:

1 BROKEN RAIL. This term is to be confined to a rail which is broken through, separating it into two or more parts. A crack which might result in a complete break will come under this head.

2 DAMAGED. Under this head will be included all rails broken or injured by wrecks, broken wheels, or similar causes.

3 FLOW OF METAL. This term means a "Rolling out" of the metal on top of the head towards its sides without there being any indication of a breaking down of the head structure; that is, the under side of the head is not distorted.

4 CRUSHED HEAD. This term is used to indicate a "Flattening" of the head and is usually accompanied by a crushing down of the head as shown in the sketch.

5 SPLIT HEAD. This term includes rails split through or near the center line of the head or rails with pieces split off the side of the head. When this term is used, it should be further defined by stating whether it is or is not accompanied by a seam or hollow head.

6 SPLIT WEB. This term is a longitudinal split along the axis of web generally starting from the end of rail through the bolt holes.

7 BROKEN BASE. This term covers all breaks in base of rail and should be described and illustrated on sketches on front page.

Reverse Side of Sheet Reporting Failures in Main Tracks.

INSTRUCTIONS

A. The Assistant Engineer will make out two copies of this report from the Section Foreman's reports and send them to the Superintendent who will forward one copy to the General Superintendent, and one copy to the Engineer M. W. not later than the 10th day of the following month.

B. Mile Post Number from {South / East} end of Division to be used.

C. The term "Main Tracks" is intended to cover all running tracks including third and fourth tracks used by freight trains, also passing sidings or other tracks used regularly by passenger trains.

DESCRIPTION OF RAIL FAILURES

1. BROKEN RAIL. This term is to be confined to a rail which is broken through, separating it into two or more parts. A crack which might result in a complete break will come under this head.

2. DAMAGED. Under this head will be included all rails broken or injured by wrecks, broken wheels and similar causes.

3. FLOW OF METAL. This term means a "Rolling out" of the metal on top of the head towards its sides, without there being any indication of a breaking down of the head structure, i. e., the underside of the head is not distorted.

4. CRUSHED HEAD. This term is used to indicate a "Flattening" of the head and is usually accompanied by a crushing down of the head as shown in the sketch.

5. SPLIT HEAD. This term includes rails split through or near the center line of the head or rails with pieces split off the side of the head. When this term is used, it should be further defined by stating whether it is or is not accompanied by a seam or hollow head.

6. SPLIT WEB. This term [illegible] split along the axis of web generally starting from the end of rail through the bolt holes.

7. BROKEN BASE. [illegible] the base of rail.

Reverse Side of Superintendent's Monthly Report.

give, first, a summary of rail failures by years; second, a comparison of the number of failures of rails of different sections or patterns rolled by different companies; and, third, the position in the ingot of the rails which failed.

The fourth group of blanks is for reporting the actual measurements of rail sections laid in the track at stated periods, in order to determine the relative wear of rails of different composition and manufacture. The first of these forms is not reproduced herewith. It is a cover for enclosing the other forms in the group, and when filled out tells what

M. W. 34 B—Copy Ink
10½ x 8

Sheet No. ____ of ____ Sheets

PENNSYLVANIA RAILROAD COMPANY

P. B. & W. R. R., N. C. RY., W. J. & S. R. R.

SUPERINTENDENT'S MONTHLY REPORT OF RAIL FAILURES IN MAIN TRACKS

on the ______________ Division ________ FOR the Month of ______________ 190

DAY OF MONTH FOUND	LOCATION OF RAIL							DESCRIPTION OF RAIL							NATURE OF FAILURE							REMOVED OR SPLICED	TIME IN SERVICE WHEN FOUND	IN SPLICE	NOT IN SPLICE	STATE CAUSE OF FAILURE WHEN KNOWN, AND REMARK ON DEFECTS IN COLS. 16 to 22, INCL.
	MAIN LINE OR BRANCH NAME	MILE POST		Which Track	Curve or Tangent	Degree of Curve	Superelevation	Weight per Yard	Type of Section	Length	MARKS ON RAIL				Broken	Damaged	Flow of Metal	Crushed Head	Split Head	Split Web	Broken Base					
		No									Manufacturer	Date Rolled	Heat No	Letter												
1	2	3	4	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

Total Failures (Col 1?) Grand Total of Failures for Month (Col 24)

USE FOLLOWING MARKS FOR MAKING ENTRIES IN COLUMNS
In Col. 5, use E. B. P. for East Bound Passenger, etc.
In Col. 6, use T. for Tangent; I. C. for Inner Rail on Curve; O. C. for Outer Rail on Curve.
In Col. 16, 17, 18, 19, 20, 21, 22, 25 and 26, use figure "1" to designate proper column.
In Col. 23, use R. for Removed and S. for Spliced and Left in Track.

CORRECT ______________ Assistant Engineer

APPROVED ______________ Superintendent

Superintendent's Monthly Report.

classes of rails are concerned and the dates they were laid and removed. There are two location diagrams of rails laid. The one shown here is on the scale 2 in. = 1 mile. This is a location diagram on a large scale for reporting a single group of a special kind of rail under observation. It is filled out with plans of track, curvature being indicated in the usual way, and also profiles, giving gradients. The locations of the rails in question are then indicated with respect to these diagrams. Different kinds of rail, Bessemer, open hearth, etc., may be shown in different colors. The other location diagram we have not reproduced. It is similar to the above, but on a scale 1 in. = 1 mile. It is filled out with a plan only, showing the location of all of a certain kind of rail that may have been sent out for trial. As many sheets as may be necessary are used. Except for the different scale, it is similar in form to the other blank. The next is a diagram illustrating wear. Each individual rail measurement made is recorded on this blank. Considerable trouble may be saved by printing on the blank the particular rail section that is being studied. The space under "scheme of marking lines of wear" is filled in with a key showing what color or kind of line illustrates the measurements taken on each date.

M W 34J

PENNSYLVANIA RAILROAD COMPANY
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY
NORTHERN CENTRAL RAILWAY COMPANY
WEST JERSEY & SEASHORE RAILROAD COMPANY

Statement of Steel Rails existing in Main Tracks of ______________ Division

______ Main Track December 31, 19____

LOCATION				YEAR LAID	BRAND	WEIGHT PER YARD	Type of Section	LENGTH IN FEET OF TRACK			
FROM		TO						LAID PREVIOUS TO 19__	NEW STEEL LAID 19__	___ STEEL LAID 19__	REMARKS
M.P.	+Ft.	M.P.	+Ft.					1	2	3	4

No. Ft. 60 lb. Rail ______ No. Tons ______
" " 70 " " ______ " " ______
" " 85 " " ______ " " ______
" " 100 " " ______ " " ______

Column 3 to be used for any special rail, such as Re-rolled or Sawed and Re-drilled.
Two copies of this report to be made out and forwarded by the Assistant Engineer to the Superintendent, who will forward one copy to the General Superintendent and one copy to the Engineer M. of W. as soon after the close of the year as possible.

Correct ______ Assistant Engineer

Approved: ______ Superintendent

Annual Statement of Rails in Main Track.

M W 34C

PENNSYLVANIA RAILROAD COMPANY
P. B. & W. R. R. N. C. RY. W. J. & S. R. R.

______
System or Railroad

Comparative Number of Failures of Steel Rails of Different Section or Pattern, Rolled by Different Steel Companies

Record for Period Ending ______ 19__

Steel Company and Mill Where Rail was Rolled	Rail Weight per yd lbs	Rail Section or Pattern	No. of Tons of Rail Laid in Tracks	KIND OF FAILURES							AGGREGATE LENGTH AND WEIGHT OF RAILS WHICH FAILED	
				Broken	Flow of Metal	Crushed Head	Split or Piped	Split Web	Broken Base	Total	Total Weight in Tons	Percentage of Tons Laid
Carnegie Steel Co												
Edgar Thompson Mill												

Failures Grouped According to Makers.

M. W. 34 D

PENNSYLVANIA RAILROAD COMPANY
P. B. & W. R. R. N. C. RY. W. J. & S. R. R.

______ Division

SUMMARY OF RAIL FAILURES IN MAIN TRACKS
(COMPILED FROM M. W. FORM 34 A)

______ lb. ______ Section, Rolled by ______ Steel Co. ______ Record for Period ending ______ 19____

	Year Laid	Tons of New Rail Laid	NUMBER OF RAILS WHICH HAVE FAILED EACH YEAR BELOW													KIND OF FAILURES						AGGREGATE LENGTH AND WEIGHT OF RAIL WHICH FAILED		
			19	19	19	19	19	19	19	19	19	19	19	19	Total	Broken	Flow of Metal	Crushed Head	Split or Piped	Split Web	Broken Base	Total Length in Feet	Total Weight in Tons	Percentage of Tons Laid
	19																							
	19																							
	19																							
	19																							
	19																							
	Totals																							

Note

Rails broken or injured by wrecks, broken wheels or similar causes, are not to be included in this report.

Summary of Rail Failures by Years.

M. W. 34 K

PENNSYLVANIA RAILROAD COMPANY
PHILADELPHIA BALTIMORE & WASHINGTON RAILROAD COMPANY
NORTHERN CENTRAL RAILWAY COMPANY
WEST JERSEY & SEASHORE RAILROAD COMPANY

______ DIVISION

POSITION IN INGOT OF STEEL RAILS WHICH FAILED Sheet No. ______

For Period of ______ ending ______ 19 of ______ Sheets

______ Type of Rail Section

KIND OF FAILURE	CARNEGIE STEEL COMPANY																ILLINOIS STEEL COMPANY															
	100 LB.								85 LB.								100-LB.								85-LB.							
	A	B	C	D	E	F	Unknown	Total	A	B	C	D	E	F	Unknown	Total	A	B	C	D	E	F	Unknown	Total	A	B	C	D	E	F	Unknown	Total
Broken																																
Flow of Metal																																
Crushed Head																																
Split Head																																
Split Web																																
Broken Base																																
Totals																																

NOTE The letters A, B, C, etc., denote the position of the Rail in the Ingot, "A" being the top rail, "B" the second, etc.
The percentages which the record figures are of the total, are to be put above the record figures in the columns under A, B, C, etc.

Position in Ingot.

A = ...shown in Red. B = shown in Yellow.

Summary.

Month and Year												
Kind of Rail	A	B	A	B	A	B	A	B	A	B	A	B
Total sq. in. Wear												
Aver. sq. in. Wear per Section												
Increased Wear per cent.												

PENNSYLVANIA RAILROAD COMPANY

P. B. & W. R. R. N. C. RY. W. J. & S. R. R.

....Div.

LOCATION DIAGRAM
OF

....Rails.

Laid in 19.................. Removed in 19

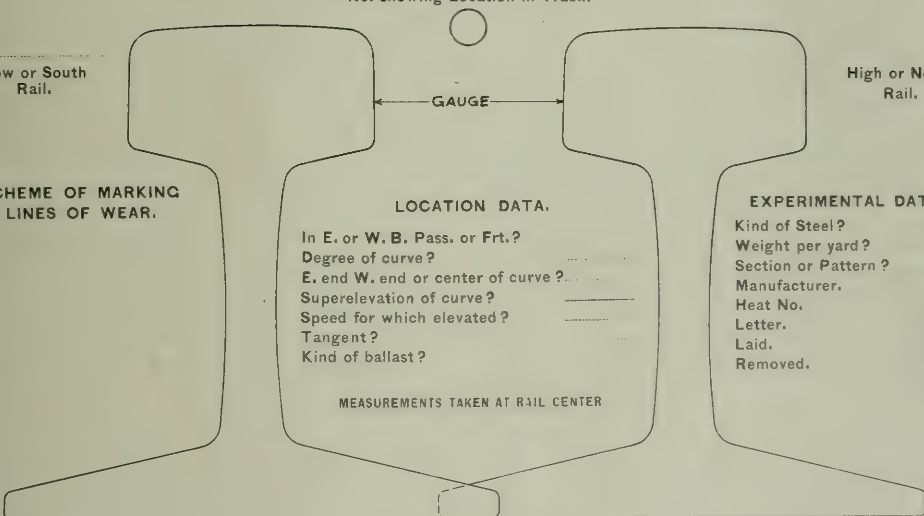
Between.................................and

Office of Engineer M. W.

Scale 2 in. = 1 m. Date.................

Location Diagram for Single Group of Special Kinds of Rail.

No. showing Location in Track.



SCHEME OF MARKING LINES OF WEAR.

LOCATION DATA.

In E. or W. B. Pass. or Frt.?
Degree of curve?
E. end W. end or center of curve?
Superelevation of curve?
Speed for which elevated?
Tangent?
Kind of ballast?

MEASUREMENTS TAKEN AT RAIL CENTER

EXPERIMENTAL DATA.

Kind of Steel?
Weight per yard?
Section or Pattern?
Manufacturer.
Heat No.
Letter.
Laid.
Removed.

Measurements of Area Abraded.

Sq. in. abraded		
High Rail	Diff.	
	Area Abraded	
Low Rail	Diff.	
	Area Abraded	
Date of Measurement		

PENNSYLVANIA RAILROAD COMPANY

P. B. & W. R. R. N. C. RY. W. J. & S. R. R.

.. Div.

DIAGRAM SHOWING LINES OF WEAR
OF

Rails

Laid in 19.................. Removed in 19

Between.................................and

Office of Engineer M. W.

Scale full size Date

Diagram Showing Lines of Wear.

RAILROAD ACCOUNTING AND THE HEPBURN LAW.

BY ARTHUR C. GRAVES, M.A.
New Haven, Conn.

IV.

THE POWER TO PRESCRIBE ACCOUNTS.

This brings us now to the last provision of the Hepburn Act affecting railroad accounting, and this last, so sweeping in nature, seems to include all else in it. It is:

"The Commission may, in its discretion, prescribe the forms of any and all accounts, records and memoranda to be kept by the carriers * * * including the accounts, records and memoranda of the movement of traffic as well as the receipts and expenditures of money. The Commission shall have access at all times to all accounts," etc., "kept by carriers, and it shall be unlawful for such carriers to keep any other accounts," etc., "than those prescribed by the Commission."

In our presentation of this subject we have said in another connection that railroad accounting is a science that requires long service to understand its spirit and genius. It has grown up and developed side by side with railroad operation and management. It is under the presiding influence and oversight of the manager and operator that railroad accounting should be guided and controlled, according to such methods as are best adapted to his operating conditions. In no other business is the discretion of the manager and freedom of action so necessary. In no other business is the interference of the government in methods of bookkeeping and accounting so unnecessary and so little to be desired. Furthermore, there is no business in which accounting has so intimate a relation with operation, with economy and with managerial skill as in railroading. This is so because railroad companies in this country have such extensive operations, covering so many miles of lines, in so many states, and under such diversified geographical conditions that personal supervision and oversight over all operations are, of course, impossible. But in railroad management close scrutiny of the returns of all operations takes the place of personal operating supervision, and all returns and expenses of operation must pass under the examination of the management or some directing official in the form that he desires and can most readily understand, and also that comparisons with former results on the same division and results of corresponding operations on the other divisions of the road may be quickly made and read intelligently. The compilation and working up of statistical data is one of the utmost importance and absolutely necessary to efficient management. Hence it will be seen that for the government to dictate the books and accounts to be kept by the carrier must ultimately be destructive of economy, efficiency and skill in management. The interference of an outside party like the government in such an important detail of railroad management as the accounting must bring about a relaxing of discipline and finally demoralization in administration. The accounting department of a railroad has a larger force of employees than any other department of the general administration. Government dictation in railroad bookkeeping is destructive of personal ambition and all spirit of loyalty among railroad employees. It will be seen that in railroad accounting, so intimately connected as it is with railroad management, dictation by the government amounts to interference with the actual operation of the road which, of course, belongs to the railroad manager.

Marshall M. Kirkman, in Vol. X. of his series on "The Science of Railways," page 38, there lays down the principle which all students of railroad operation recognize as fundamental: "It is neither desirable or practicable for the government, or anyone else, to prescribe, except in a general way, what books a railroad company shall keep or the forms and methods that shall be observed. How the accounts shall be kept, how the amount of their earnings shall be summed up, * * * or otherwise, are not matters about which anyone need concern himself. Owners will look after them and more wisely than anyone lese because they are more directly affected than anyone else. To define what books shall be kept and what forms shall be observed in writing up accounts is to deaden, to destroy, in fact, the interest felt in the subject by the thousands of intelligent and progressive men employed in this department of the service, and, in doing so, deprive the corporations of the invention and introduction of better and more economical methods from time to time that the study and experience of their employees would otherwise suggest. It would be quite as sensible and practicable to seek to restrict the ingenuity and interest of men in other branches of business."

In relation to railroad publicity of accounting we have shown that of all corporations, or of all industries, in this country those that the least require a paternal oversight on the part of the government to supervise or regulate their accounts are the railroad companies, and the injustice of it all is that they are receiving the most.

It is very difficult to state what are the reasons for the adoption of this provision and the object which it seeks to attain. We are not familiar with the forces or influences which brought about its passage. It has been stated by some of the members of the Interstate Commerce Commission that the object of this law is to enable the Commission the better to detect and punish flagrant cases of rebating. This position on the part of the Commission seems most remarkable. While it is true that the Commission has a tremendous scope of power under this law authorizing it to prescribe the very books and accounts to be kept by carriers, sufficient to embarrass railroad economy and to demoralize discipline, yet this seems a very impracticable procedure, and to suppose that this one body as railroad bookkeeper can scrutinize or keep account of every transaction or negotiation attending the vast number of freight shipments made daily by 800 railroad companies operating 224,000 miles of lines in a country carrying the tremendous commerce that we do is absurd.[13] To attain this end would mean an army of government inspectors numbering hundreds of thousands, if not over a million, covering the entire land in every little freight agent's office at an enormous expense to the government and the people, while the opportunities and temptations for corruption and graft would be simply appalling and would prostitute the entire railroad industry to the pettiest kind of politics. If the Commission should really use the law for this purpose it would bring about its repeal at the hands of an indignant public more quickly than anything else possibly could.[14]

The situation in respect of railroad management in this country stands like this: authority of management has been greatly curtailed and wrested from boards of directors by state and federal laws. The authority of the Interstate Commerce Commission has been greatly increased, but its own responsibility or sense of duty not at all increased. The Government or Commission is responsible to no one, it has nothing to lose, while the investor and stockholder, who fur-

[13] This idea was actually put forward to the writer as one of the objects of the law, in personal correspondence with one of the Interstate Commerce Commission and, strangely enough, in seriousness, too. The position seems impractical and ludicrous. But see address of Prof. Henry C. Adams, the Commission's statistician, at Washington, October 11, 1907, before the Association of Government Accountants. His remarks indicate that the Commission under this law has no definite aim save to augment its own political influence in the management of American railroads. See able review of Dr. Joseph Nimmo, statistician and economist, on the judicial regulation of railroad affairs as opposed to administrative control.

[14] The advanced position taken now and then by the Commission in its efforts to stop rebating does not impress one with its earnestness. In fact, the Commission is disingenuous in this matter. Revelations of the last two years in rebate cases show that many of them occurred prior to the passage of the Hepburn Act and have been brought to light simply through the exercise of powers given the Commission under the Elkins Act. That law (Elkins Act), had it been faithfully enforced by the Interstate Commerce Commission and the Department of Justice, would have been fully as effective in preventing rebating as the Hepburn Act. This is the testimony of a majority of well-informed men on the subject.

nish the capital, have everything to lose, yet their voice in the financial management through their directors is reduced to a minimum. As to railroad directors and managers, they are responsible to all sorts of regulations imposed on them, responsible to federal and state commissions, to shipper and to investor. Yet in financial matters they have little authority, no latitude of discretion, no freedom of action. Held responsible by the public, they are powerless agents in the hands of many commissions which have all financial authority divided among them without one cent of capital at stake.[15] This sort of thing, of course, if followed to its logical conclusion, would crush individuality and demoralize the people, while the government would become more and more arbitrary and despotic.

In the very unfortunate results which have ensued after one brief year of railroad operation under the Hepburn Law and which we have briefly rehearsed, all people suffer, the shipper as well as the investor. But the investor and stockholder, whose rights are seldom regarded by politicians and never by commissions, have a complaint also against the president and directors of our railroad companies. It is that, while objecting in speech and written statement they have yielded with a singular facile compliance to the unlawful demands of the Commission in respect of railroad accounting. To protest by speech and public interview when partisan feeling is running high is of little avail. We think that, regardless of fears and personal inconvenience, in a broader and higher appreciation of their position, as trustees of the transportation interests of the country in which are invested thirteen thousand millions of dollars of private capital and personal savings, the most tremendous industry, perhaps, in the entire world, they should appeal to the protection of the Federal courts to check the autocratic assumption of unconstitutional power on the part of the Interstate Commerce Commission.

THE LOG OF THE NEW HAVEN ELECTRIFICATION.*

BY W. S. MURRAY,
Electrical Engineer N. Y., N. H. & H. R. R.

The object of this paper is to bring the actual operation of the New Haven single-phase electrification as closely as possible to those who are truly interested in its merits and faults. If the writer can feel that this object has been accomplished, the reward for the effort will be sufficient.

In advance of freely opening up the subject without mental reservation, it may be well to say that he is not unmindful of the adverse construction and criticism that will be placed by some upon the facts he intends to present. Having carefully weighed this, however, he has concluded that it should not be permitted to stand in the way of, or militate against, the sounder and analytical judgment of those intent upon a fair consideration of the facts as they exist.

The first intention was to make the subject of this paper "The Errors Made in the Electrification of the New Haven System," but realizing what capital such an "admission" would make for those few who are inclined not to be fair-minded on this important matter, the title has been changed, and the body of the paper built upon a description of the faults, major and minor, that have been made, and their effect, by log sheet reference, upon operation. After all, the citation of "how not to do it" is far more valuable than "how to do it." It may be at some sacrifice of pride to discuss one's errors, yet there is something so valuable in the exposition of an error that this, in itself, is ample compensation for its acknowledgment. There seems to be, too, something altruistic about a mistake or "wrong"; for in its death there is born a "right," and one can never really get on intimate terms with his mistake until his rightful complement has been substituted. After a railway has changed from a steam to an electric schedule, the natural question immediately follows: "Is it a success?" The answer to this question involves almost an infinity of analytical judgment. Electrical engineers have no greater professional or moral responsibility before them than the presentation of all available data, in which will be included information of pertinent application in the solution of the vast electrification problems of to-day. To those entrusted with the responsibility of such decisions is due every possible help and light. Engineering conclusions are based on 5 per cent. theory and 95 per cent. practice; practice being made up of experience and an acceptance of existing allied conditions. We want nothing unless we know all about it before it is ours. If we are wise, we should not be so particular about its merits as its demerits. Perfection cannot exist. This applies to electrification as to other things.

The duty assigned to the engineers of the New Haven Railroad was to provide for the electrical operation of their trains. At the early period of April 1, 1905, when we settled down to this responsible task, the data in the field, upon which to base real conclusions, were about 5 per cent., in comparison with the experience now available. If "Ignorance maketh the brave" I can only say that I am more than thankful we were so ignorant at the outset. I do not believe that this remark will need any explanation here. Could we have read the history of our errors, rather than have made them, I question whether we would have had the temerity—though I confess our convictions would have been the same—to ask the president of the New York, New Haven & Hartford Railroad Company to put up with the criticism, abuse, and unfair remarks that have been made by those ignorant of the facts, and of others who, perversely, were intent upon their own selfish, narrow course with manifested abandonment of all purposes to acquaint themselves with the nature, the scope, and the possibilities which lay easily within their knowledge, merely by the asking. To-day I am thankful to say, this negative attitude is giving way to the alarm made manifest by undisputed facts, which demand their own recognition. I have no personal desire to make any other engineer think as I do. If he sees the facts as I see them, then we will vote alike. To those who may be interested in my conclusion in regard to the New Haven Railroad electrification, I can simply say that if I were in favor of its use three years ago, that now, standing on the more stable ground of experience, particularly in regard to the department of faults, I am doubly in favor of it to-day. I shall, of course, be interested in those who share this opinion after reading this paper, but I shall be doubly interested in them if their conclusion has not, in the slightest degree, been influenced by my own, but has been formed entirely upon the contemplation of the faults severally cited. And let me quickly add I shall be equally interested in those who honestly disagree with this opinion.

Unlike steam traction, where the number of links in the delay chain is but one, electric traction has its delay chain composed of three links; namely, the power house, line and locomotive. A failure in anyone of these links may produce train delay or delays. Measured by the degree of their seriousness, these links, in the order of their effect on delays, may be mentioned in the order given. This is, of course, immediately apparent in that the power house affects all operation; the line, a considerable portion of the trackage, involving, possibly, several trains; and the locomotive is usually confined to its individual troubles, only infrequently affecting following trains. This order naturally has application to all forms of electrification, direct current, single phase or polyphase.

In the conception of the form of power house, line and locomotive to be used in the New Haven system, ignorance and lack of experience led those pertinently interested in its success to believe that while the chain of power generation, and its transmission and utilization for traction, was of a new character, that its links, however, were made up of principles long recognized and reliable. They were right in this conclusion, except that it did not include certain phenomena which could not have been anticipated, due to the combination of these old principles in the form of this new chain. For example, there was nothing particularly disturbing about an 11,000-volt, 25-cycle, three-phase power house, from which was to be taken most of the power from one of the phases

[15] Next to the Interstate Commerce Commission the Public Service Commission has done the most to bring about the present half demoralized condition of railroad affairs in New York State.

*From a paper read at a meeting of the American Institute of Electrical Engineers December 11, 1908.

generated; or of a 300-ft., 11,000-volt, single-phase transmission line, from the terminals of which the same voltage was to be distributed, east and west, along the right-of-way of a railway; or of a locomotive with a transformer installed upon it to take 11,000 volts and step it down to 600 volts to supply 300-volt single-phase railway motors. Power houses of this character have been designed the world over, except perhaps that single-phase current in the amount to be utilized had not been used elsewhere. Transmission lines of 60,000 volts had been in constant use. And, except that there was a moving contact in connection with the current that was to go to the step-down transformers on the locomotives, transformers of many times the capacity and voltage were in universal use. The single-phase motor, indeed, may be said to have been new so far as the size required for the New Haven service is concerned, but tests made upon smaller units demonstrated beyond peradventure its tractive qualities and showed its characteristic curves to be closely similar to those of its prototype, the direct-current motor. This reasoning, in close consideration of each class of apparatus, per sé, has proved itself correct, and such irregularities as have existed in the initial electric service, which the New Haven road offered to the public, while deserving the condemnation which the public can unfailingly offer, have been due to the ramification of a series of faults that have developed entirely outside the zone of previous experience. The delays (and public criticisms of them) have followed even into this late day, when the electric service is far better than the steam service it has replaced. It has occurred to me that certain engineers, who are unbelievers in the single-phase system, may interpret this paper as an apology. To them I would say, as I do to the public, it is an apology for having delayed any of their appointments. To others, it is needless to add that the citation of these troubles is given in the hope that they will, as they easily can, avoid them in the future.

THE SERIOUS FAULTS.

Power House.—The electric power supply for the New Haven road is derived from four 11,000-volt steam turbine generators, three of which have an electric capacity of 3,750 kilovolt-amperes single phase; the fourth unit consisting of a 6,000 kilovolt-ampere, three-phase generator, which can also supply single-phase current to the system.

Although the generators as originally designed were made exceptionally strong, and particular attention paid to their insulation, due to the necessity of grounding one phase, it was found that the utilization of so much single-phase current from a three-phase star-wound generator produced a stray magnetic field completely out of the path of normal lamination. As a result it was impossible to develop for continued operation more than 66 per cent. of the normal rating of the generators. Overloads of any character produced abnormally rapid heating, making such operation dangerous, although the generators were guaranteed to carry 50 per cent. overload for two hours, and 100 per cent. overload for two minutes in order to meet the sudden drafts of currents required for a schedule such as exists on the New Haven road. Indeed, at the very start the actual drafts of current showed that the generators must meet imperatively the guarantees as to normal and overload capacities if the electrification were to be successful. These, then, were the power-house conditions that confronted the New Haven road on beginning the work of propelling alternating-current trains. The power house being the heart of an electric system, to add more would be to say less in describing a critical situation.

I trust it is not to be my pleasure to meet the prophet, who says, "This could have been anticipated." Suffice it to say that after three unsuccessful attempts at complete correction, each, however, affording some constructive results—months being absorbed in the dismantling and readjusting of the parts of these generators—the final attempt was successful and the generators are to-day operating in the power house, fulfilling the guarantees mentioned previously. But this last mentioned fact is insignficant when compared with the valuable information that has been derived, which will permit all other generators to be manufactured without the fault described.

Line Insulation.—The years of experience which we have had in the study of insulating various voltages led to what was considered a very conservative insulation in the various parts of the line. Messenger cables had to be insulated from the intermediate trusses and at their anchor-bridge termini. The trolley copper conductor was suspended from the messengers and had to be insulated at points where it entered the oil switches on the anchor bridges. Trolley wires had to be insulated from each other at section breaks. On curves, both messengers and trolley wires had to be strained over the center of the tracks through the agency of pull-off posts at the side of the tracks, the pull-off wire being insulated between tracks and the pull-off column itself. Feeder wires had to be insulated from their supporting cross-arms and at points where they pass under highway bridges. None of these problems in insulation had the appearance of an especial character and, indeed, did the roadbed provide traffic only for electric trains, the problem would have been simplicity itself. A pressure of 11,000 volts being the prevailing dielectric strain, the problem was to provide sufficient insulation at all the points mentioned above.

Of the effect of steam locomotive discharges upon insulators, there was no initiative by which to be guided, and it became necessary to decide upon the factors of insulation that would be required. It was thought that ample provision had been made, it proved otherwise. Experience has proved that, in places, just double the amount is required. It was quickly noted that the greatest number of insulator failures occurred wherever the insulation was subject to the direct blast of the steam locomotive. To correct the difficulty, therefore, it was found necessary to double up on anchor insulators. The intermediate messenger insulators proved adequate and it was not found necessary to increase the impregnated stick insulation between trolley wires at curves, but wood stick insulators had to be added in series with the moulded material insulator between the pull-off wire and pull-off post. The original insulators on the anchor-bridge switches were made of moulded material and for them was substituted porcelain. It was not necessary to change the feeder insulators on the catenary bridge struts. While very little trouble has been experienced with the form of insulation used for supporting the feeders under highway bridges, it is anticipated that trouble will follow if this is not changed. The present form consists of the corrugated spool-type insulator, for which there will be substituted a regular porcelain double-petticoat insulator.

To-day, instead of line failures being the rule, they have become the exception.

Circuit-breakers.—The momentary energy involved in a short-circuit produced upon a line fed by high power, high-speed turbines is very great. Under the sub-title "*Power house*" it was stated that the generators were operating under their guaranteed capacities. Internal heating, due to stray magnetic field, was the cause of the generators failing to meet their designed capacity. This heating was completely cured by the simple addition of a short-circuited winding surrounding the rotating member of the generator, similar to that used in the well-known squirrel-cage type of induction-motor rotors. It is interesting to note here, however, that while the heating is entirely eliminated by this short-circuited winding, its effect on the occasion of a short-circuit is to allow more current to flow. This tendency, however, is controlled by a method later to be described. In the New Haven system, as the current from the power house was fed directly to the line and from there to the locomotives without transformation of voltage by transformers, the inductive element to counteract the surging current was practically negligible; under these conditions there resulted short-circuits which no circuit-breaker apparatus then designed could be relied upon to take care of.

Here it is expedient to point out the very marked difference in operating conditions between circuit-breakers used on a system that is grounded and one that is not. In either case, it is, of course, good practice to ground the frames of all circuit-breaker apparatus. In the case of the grounded system, this virtually brings one terminal of the generating system directly to the frame of the circuit-breaker; with the other terminal of the system connected to the jaws (contactors) of the breaker, it is readily seen that on the occasion of a heavy current surge, due to short-circuit, should the arc extend itself through the walls of the oil tank (wherein the circuit is broken), this would be a direct leakage to ground establishing a short-circuit around (or in shunt) to the circuit-breaker jaws, which action, of course, renders the circuit-breaker useless, and subjects it to the damaging effect

of the arcing locally produced until interrupted by another circuit-breaker in series with the circuit. On the other hand, where the system is not grounded, even should the walls of a circuit-breaker be broken down, as explained above, there would be no electrical connection (unless the neutral be grounded) between the circuit-breaker frame and the generator, and thus no return path for the current. I desire to draw particular attention to this point, for while the circuit-breakers used in our case open short-circuits, since the current surges have been practically eliminated, I believe that the lining of the oil tanks should have an especially high insulation factor on grounded systems.

The failure of circuit-breakers, either in the power house or on the line, naturally produced train delays of large or small magnitude. It was difficult to believe that these large circuit-breakers were incapable of taking care of the short-circuits, and some time was wasted in thinking this way. Therefore, we reluctantly but surely arrived at the conclusion that the conditions would have to be changed.

The remedy was simple. Instead of feeding the main line with a direct transmission straight from the power house bus-bars to the trolleys directly opposite the power house, the current was fed into the line over feeders connected to it at Port Chester and Stamford. By the introduction of this ohmic resistance, amounting to not more than 2 per cent. normal drop on the system, we were immediately released from the disastrous effect of short-circuits on our circuit-breaker apparatus. Instead of losing as many as half-a-dozen circuit-breakers in a day, not that many were reported out of commission for a month and, of course, they were not damaged to the extent as the others nor did they cause any serious delays.

For the feeder resistance, above described, there has since been substituted impedance coils installed in the leads of the generators. These coils act as shock absorbers, protecting the generators. Later, it is to be expected that there will be installed a circuit-breaker across the terminals of these impedance coils, which, for normal operation, will shunt the current through them, the breakers opening under stress of abnormal flow of current and automatically closing when normal conditions are restored.

Trolley Wire.—In the month of May, 1908, it became evident to us that within at least one month from that date, if some change were not effected in the contact wire, that the New Haven electric service would cease. While this truth was so plain, it may be best described by the fact that daily reports were showing that the copper trolley wire was breaking at various points; and where it was not broken it had become so badly kinked at the hanger points that it was impossible to operate electric locomotives upon the line without serious arcing. This resulted in violent surging on the locomotive transformers, and, at times, on account of the extremely poor contact of overhead shoes on the line, in reducing the voltage to such a low value as to prevent a sufficient supply of power to enable the locomotive to perform its schedule. An examination of the hard-drawn copper trolley wire throughout its length proved that even after only a few months operation upon it, its cross-section had been so materially reduced as to point to its short life with a continuance of operation upon it. Especially was this true in the vicinity of the many low highway bridges where the trolley wire approaches the bridge on a 2 per cent. gradient. This fault and dilemma were indeed serious. The cause of the difficulty was perfectly apparent; namely, the hard spots in the line which existed at the hanger points.

Many suggestions were offered. None of them, however, offered the speedy installation that was paramount. Mr. McHenry, Vice-President of the New York, New Haven & Hartford Railroad Company, made the suggestion that an auxiliary wire be suspended from the present copper wire by clips at its midpoint between the hangers, and followed up the suggestion that this auxiliary wire be made of steel, of the same cross-section as the 0000 grooved hard-drawn copper above it. It took two weeks for the manufacturer to draw two miles of this wire. It was installed immediately upon its receipt on the main line between Port Chester and Harrison. On the night of its completed erection a special seven-car train with two locomotives was operated upon it for several hours. Previously to the installation of the steel wire there had been installed a section of hard alloyed wire suspended in a manner similar to that of the steel. The electric train was operated upon them both, officials from both the railway company and the contracting company being on hand to note their comparative merits. It was the general consensus of opinion that there was less sparking on the hard wire, and the general tendency was towards adopting that rather than the steel. Though admitting that the operation was better, the steel seemed to be of an entirely satisfactory commercial nature, and all present finally concurred in this conclusion. It is undeniably true that hard alloyed wire would, from a purely operative point of view, be the better of the two, and yet the commercial aspect, which would naturally include its cost, had to be considered, particularly in reference to so large an immediate order as one involving 100 miles of single-phase electric trackage. Again it is important to note that the steel, besides having the advantage of being a cheaper, harder and stiffer wire, also possesses a lower coefficient of expansion and higher elastic limit, especially valuable characteristics for the service desired. We found that we would be considerably delayed in the delivery of the steel, but an immediate order of 20 miles followed by another for 40 was placed, and as much hard alloyed wire put up as could be obtained between the date of the conclusion to use the auxiliary wire and the final arrival of the first shipment of steel. The auxiliary wire construction on the main line, as described, prevails throughout the whole system, except at the approaches of and under a few very low highway bridges, where the contact system consists of two wires strung in the same horizontal plane.

The New Haven trains have been operating now on the auxiliary wire for several months, and absolutely no kinking has been noted at the hanger points, with the attendant result of a smooth and almost sparkless overhead contact.

Locomotives.—There were originally purchased 35 locomotives, which was considered an adequate number to take care of the New Haven passenger service. These locomotives, considered *per se*, were rated on a half-unit basis. That is to say, the half unit was designed to handle about 75 per cent. of our trains, the remaining 25 per cent. to be handled by two units. Only a short experience in commercial operation revealed two important facts. The first one of a very encouraging nature, the second, decidedly otherwise. The first was the proof that the two main parts of the locomotive; namely, the transformer and motors, had sufficient capacity to more than handle the manufacturer's guarantees. The second was the discovery that many of the auxiliary electrical and mechanical parts of the locomotive equipment were not of equivalent capacity. The strength of the chain being measured always by its weakest link, it was immediately seen that the locomotives would be able to handle trailing loads in excess of their guarantees if the auxiliary parts were made of sufficient capacity to furnish the necessary current for the overload conditions. It was simultaneously apparent that more locomotives would be required to provide for an increase of train service and the reduction of time schedule, and an order was promptly placed for six additional ones; before accepting their design, however, a careful survey was made of all the component parts of the locomotives at hand, in order to determine the changes necessary to be incorporated in the six new engines. To accomplish this it was found necessary to make a number of electrical and mechanical changes, the nature of which is apparent in the following tabulation:

MECHANICAL.	ELECTRICAL.
Air Reservoir System. Revised.	*Ammeters.* Revised.
	Battery. Charging relay installed
	Blowers. Commutator slotted. Waste rear bearing.
Boilers. Installed.	Armature laminations ground
	Bearing raised above center
	Motor winding revised
Stack hood removed.	*Controller.* Bushing riveted
	Shoe and trolley switch installed.
Bell Rope. Installed.	*Circuit-breaker.* Fused.
	Tank bolt secured
	New type installed.
	Compressor. Commutator slotted.
Blowers. New design installed.	Armature laminations ground.
	New governor installed.
	Bearing raised above center
	Cut out Boxes. New drums
Guide on present damper rod.	*Fuse.* In alternating current heater circuit.
	New auxiliary fuse box (wooden.)
Extra guard on shutter.	Auxiliary motors separately fused.

MECHANICAL.

Bolster. Reinforced on truck.

Brakes. New release spring.

Cylinder leads lengthened

Check nut on adjuster.

Compressor. Drip pans installed.

Exhaust pipe installed.

Air cooled cylinder head.

Check-valve. In whistle pipe

Gage. On oil tank.

On steam line.

Journal-box. Revised gibbs.

Quill-plate. Washers installed.

Running-board. On roof.

Semielliptic springs. 14 leaf.

Safety valve. On control resistance.

Safety-chain. Made heavier.

Torque rods. Heavy installed.

Uncoupling lever. Revised.

Pony wheels. Installed.

Valve. On oil line to boiler.

ELECTRICAL.

Grounding switch. Installed.
Control revised.
Shutter in cover.
Heater switch. Shield installed.
Heater bus bar line. Reinsulated.
Couplers repaired.
Headlight. Adjusted properly.
Porcelain switch installed.
Motors. *Holders* reinsulated.
New cross—connecting leads.
Housing asbestos lined.
Linen tape on commutator end.
Side commutator covers perforated.
Perforated S. I. commutator covers.
Field clamp bolt secured.
Motor-generator. New switch.
Preventive coils. Revised.
Supporting frame revised.
Direct-current relay. Connection to "—S" switch.
Washer installed.
Resistance. Insulated.
Capacity increased
Connected ahead of motor.
Switch group. Revised shunts.
Revised studs.
Revised arc shields.
Copper reverse switches.
One-turn blowout coils.
Air ports enlarged.
Alternating current frames insulated.
Cylinder alining set screws.
Reinforcing wooden strip.
Interlocked reverse switches.
Fitting alternating current switches.
Group covers perforated.
New B. O. coil pole piece alternating current.
Switch. Block on direct current case.
Main switch, connection modified.
Canopy switch handles insulated.
Shunt remounted. Direct current ammeter
Trolleys. Control revised (alternating current).
Side bearing springs (alternating current).
Insulate back cross-rod (alternating current).
Shield for high tension lead (alternating current).
Spring shortened (direct current).
Insulator filled and painted.
Temperature Indicators.
Third-rail shoes. M. I. bracket.
Pin replaced by bolt.
Jumper installed.
Shoe levers cut off.
Fuse boxes—Refitted.
Wattmeter. (Auxiliary) installed.

The most important electrical changes made were in the switch-groups and brush-holders of the motors. The former lacked carrying capacity and the latter sufficient insulation. To these shortcomings were due the greatest number of our first train delays. The most important mechanical changes necessary were the reinforcement of the truck bolsters and installation of pony wheels. The especial reference to these electrical and mechanical changes must not be construed as diminishing in any way the force of necessity of the others, as they were all considered absolutely necessary in order to preserve a low cost of electrical and mechanical maintenance.

With the exception of the installation of pony trucks, the six new electric locomotives arrived within five months of the date of their order. In their design were included all of the changes above specified. To be noted here is the marked value of the spring type of armature and field suspension begun with the New Haven locomotive motors, thus making flexible the entire motor suspension. Indications already predict that this arrangement in combination with the pony trucks will reduce materially the track and locomotive maintenance and repairs. To-day the reconstruction, as above described, has been effected on over 90 per cent. of our locomotives.

This last and serious fault with which we had to contend completes the major difficulties that were constantly threatening the regularity of electric service.

It seems to be the time and place, here, to draw attention to a point in design concerning the New Haven locomotives that has been so persistently misrepresented by those who seem to have been ignorant of the facts. The specifications upon which the locomotive units were purchased, as stated hereafter, were that each unit would handle a normal trailing load of 200 tons. The writer, by careful measurement of the weights of all the trains (trailing loads) in the New Haven service, found that they averaged 212 tons. It seemed good engineering that if 75 per cent. of the service could be handled by locomotives rated upon a basis of 200 tons trailing load, that that would be the correct locomotive unit size; using two units for the remaining 25 per cent. of the trains. To-day, three years after this decision, we find that 73 per cent. of our trains can be handled with single units, 27 per cent. requiring two units. The percentage is slightly different from the original, as the service is slightly heavier.

Coincident with the use of the first double-unit locomotive trains there was started a rumor that the New Haven locomotives did not have the capacity for which they were designed. To dispel this idea forever, I judge the best argument is to refer to a table, wherein are stated the trains whose weights were in excess of trailing loads the locomotives were designed to carry. [This table shows that in the week from Oct. 18 to 24, on the miscellaneous trains running in local and express service between the Grand Central Station and New Rochelle and Stamford, including a total of 78 trains, in which all but 6 of the 41 locomotives participated, the trailing weight of the trains ranged from 222 to 400 tons when hauled by a single unit and from 538 to 853 tons when hauled by two units, with a percentage of overweight for the whole of from 3.2 to 70.4, and not an instance of normal loading.—Editor.]

I trust that the above clears up any erroneous ideas concerning the capacity of the New Haven locomotives, and will justfiy the future double-unit trains entering and leaving the Grand Central Station.

Recapitulating, I believe my brother engineers will agree that with the coincident difficulties described in our power house, line, circuit-breakers, trolley wire, and locomotives, the work of instituting electric service was not exactly laid over a bed of roses. These are the serious faults the system possessed and the description of our method of elimination of them that I am glad to be able now to place before you. We cannot blame the public for making the complaints they have against the New York, New Haven & Hartford Railroad Company's electric service, for to the traveling public there is nothing so exasperating as a train delay. It is fitting here also to say how appreciative the engineers of the New Haven road feel for the calm and generous suspension of judgment on the part of those engineers who have reserved opinion until it could be based on facts which time only could so demonstrate as to permit presentation. There are many other little faults and difficulties here and there throughout the system, but the five described, though not fundamental in their effect, since they have been removed, were none the less the most serious.

THE MINOR FAULTS.

Generator Burn-outs.—Previously to the rearrangement of the feeders or the installation of the choke-coils in the power station, the short-circuits that were experienced on the line naturally had a deleterious effect on the generators. The prodigious rush of current naturally produced severe strains in the armature windings, strains whose mechanical intensity was made manifest by the movements of the coils. Therefore, during this period of violent short-circuits, frequently the generator coils were grounded and burned out. Since the rearrangement of feeders or the installation of choke-coils, the violent short-circuits have disappeared and with them the damaging effects on the generators. It has been found advisable, from time to time, to connect different generator terminals to the line. By this arrangement the three phases of the generators are in turn worked equally.

Distribution.—Although the arrangement of the line in its present feed and trolley connections effects the highest economy in loss of power by transmission, it is questionable to my mind whether this economy is worth some of the disadvantages which accrue from this arrangement. Until we had experienced the heavy current surges, due to short-circuits, it seemed reasonable that, should a short-circuit occur on the line, the two circuit-breakers which immediately fed that short-circuit would be the ones to respond. We were quite correct in this conclusion, but did not go far enough, as other circuit-breakers seemed to feel it their duty to relieve the situation and their location with respect to the correctly involved breakers was quite varied. Of course the ideal con-

dition would be to have only the two breakers adjacent to the short-circuit open, as by this arrangement the voltage would remain on all trolleys except the one in which the ground is involved. This operation can be effected, and at the time of this writing an effort is being made to obtain these results in practice.

A less efficient method of line transmission than that described in the previous paragraph (using the same amount of copper for each case) is one in which each track has its own individual voltage supplied to it and is kept separate from the other trolleys.

Contact Wire.—While the auxiliary wire, as previously described, was the panacea of our difficulties, and has given an excellent account of itself since having first been placed in operation, it is fair to believe that even a more sparkless operation can be obtained from an auxiliary wire which, instead of being attached by a rigid clip to the overhead copper conductor, is simply suspended from it by a loop, thus permitting the contact wire to rise slightly as the upper pressure of the pantagraph shoe travels along its surface. The contact wire should be anchored by turn-buckles to permit slacking and straining of the wire in winter and summer seasons, respectively.

Hard Spots in Line.—Irregularities in the contact wire may be due to two causes. First, those that exist in the wire as it is manufactured; secondly, those formed on account of hard spots. The former can be taken out; if not, they are usually ironed out in the course of the operation of the shoe on the trolley. The three principal sources of hard spots are derived from hangers, section breaks and deflectors.

1. It has been shown in the foregoing how the hanger hard spots have been eliminated.

2. The original main-line section-break consisted of a rectangular impregnated wood frame suspended under the anchor bridges. The trolley wires were carried on opposite sides of this rectangle lapping, of course, a sufficient distance in the center so as to permit a short period of simultaneous contact of the shoe with both trolleys, thus preserving continuity of current to the locomotive in passing from one section to another. It was found that these rectangular section breaks were prone to get out of shape, introducing a very rough spot in the line, its effect being, on the passage of the shoe, to draw long arcs which frequently extended themselves to ground. Our new section break containing all the flexibility obtained by the auxiliary wire, has been constructed by simply staggering the messenger insulators of each trolley 16 in., thus permitting the anchor bridge trolley wires of the same track to pass at this distance. Each trolley wire is dead-ended to a wood impregnated stick insulator, supported by the messenger of its opposite section. By this arrangement practically all inertia is taken out of the section break and a sparkless passage between sections is obtained.

3. The auxiliary wire construction has been, of course, applied to the deflectors, and this has greatly reduced the tendency to spark at these points. In order to prevent the pantagraph shoe from engaging the wrong trolley wire at turn-outs on diverging tracks, the mesh construction of the overhead frog has up to this time been the only solution, but this method seems unduly cumbersome and even a greater improvement is anticipated than that secured by the application of the auxiliary wire.

Signal Wires.—The catenary bridge struts carrying the cross-arms for the by-pass or feeder wires, likewise carry the cross-arms upon which are installed the signal wires. The voltage placed on these signal wires is entirely distinct from the propulsion voltage, it being 2,200 volts and 60 cycles. The proximity of the wires of these two systems has been the cause of short-circuits between them, resulting in double failures. It would seem that as the signal system should be so completely separated from the propulsion system, it should be installed on an entirely separate pole line. If, however, right-of-way conditions make it absolutely necessary that the supporting structures of the catenary system should support also the signal wires, then the two circuits should be made as distinctive as possible, the propulsion system having its wires on the cross-arms on the railway side of the struts, the signal wires being installed on the opposite.

Locomotive Current Collectors.—An efficient pantagraph shoe has proved itself a very difficult problem. The present cost is about .06 of a cent a locomotive-mile. We have made various experiments with aluminum, phono, copper and steel rigid and spring-supported pantagraph shoes. While this feature does not present a serious aspect, it is none the less a most interesting study. Shoe life is also seriously affected by the amount of soot deposited by the locomotives upon the overhead wire. While we have obtained mileages varying between 600 and 1,500 miles per shoe with various types used, other roads of lesser speed and not subject to the effect of locomotive stack discharges, have obtained as high as 25,000 shoe-miles.

THE LOG OF OPERATION.

Electric Passenger Service.—So great was the demand for electric service that in July, 1907, long before we were ready, as the records of our operation have proved, the first commercial service was begun between New Rochelle and the Grand Central Station. With all speed possible the electrification was pushed eastward and local service was established from Port Chester in August, 1907. Local service from Stamford followed in October, and finally, on July 1, 1908, all through and local passenger trains were under electric schedule between Stamford and the Grand Central Station. It is, therefore, beginning from this date of July 1, 1908, that I have compiled data of our operation as taken from our records. We are not proud of it, but we believe that you now know of some of the obstacles that stood in the way of its immediate betterment at that time.

Comparison Between Steam and Electric Service.—It had been the hope of the writer to be able, even at this early date, to make an absolute comparison between electric service and the steam service which it has replaced between Stamford and New York, including all passenger trains. On account of the speed restrictions that have been introduced on the electric service until all locomotives have been reconstructed with the new pony truck equipment, it is impossible to compare train-minute delays, for the reason that steam locomotives are permitted to make up time while to electric locomotives this privilege is denied. Later, when this restriction is removed, and especially after a period of time more extensive than that offered by the present comparatively short period of operation, these data can be presented. Particularly worthy of notation here in comparing steam and electric service, it is necessary to bear in mind that while the operation of the power house does not differ from that of ordinary practice, there is a marked individuality (which initiative always brings), in connection with the operation of the line and locomotives. While every credit is due the present organization charged with the responsibility of line and locomotive operation, it cannot be forgotten that these two main links of the system are essentially new in their adaptation to the heavy conditions presented by the New York, New Haven & Hartford train service. Operation of this character is so far beyond the scope of previous experience that it was absolutely impossible to foresee and prevent all contingencies. The methods for the prevention of failure and delay were necessarily based upon the results of actual, practical operation.

Individual and collective train-minute delays in electric zone, due to failures in power house, line, and locomotive.—[The tabular statement accompanying the paper gives, in detail, the amount and causes of the daily delays to trains for the months of July, August, September and October, 1908. The failures are attributed to the power house, the line and the locomotive. In August there were two power house failures resulting in a total of 132 minutes delay, both of the turbines, and these were the only ones chargeable to that source in the four months.

On the line there were nine delays aggregating 182 minutes in July; all but one being chargeable to the circuit breakers, and that one was lack of current in the direct-current rail. In August there were 14 delays aggregating 452 minutes, of which six, totaling 322 minutes, were due to circuit breakers; five with 84 minutes from the insulators; one for five minutes from a ground on the signal wires, and two of 17 minutes from third rail troubles. In September there were nine line delays with a total of 71 minutes, with but three and 27 minutes chargeable to circuit breakers; there were four delays with a total of 24 minutes due to line ground; one of 16 minutes due to grounded insulator, and one of four minutes

due to the signal wires. In October there were ten line delays of 277 minutes, of which but four, giving 89 minutes, were due to the circuit breakers; one was a direct-current circuit breaker of 31 minutes and is scheduled as a mean failure; three were insulator failures of 128 minutes.

On the locomotive there were 27 failures in July, to which 583 minutes are charged. They are miscellaneous in character with perhaps a more frequent recurrence of pantagraph failures than any other. In August there were 38 failures, causing 407 minutes delay, of which three, with 150 minutes, were due to water over the rails in the direct-current zone, and one with 11 minutes to the engine despatcher, so that the locomotive failures drop to 34 and 246 minutes, in which the third rail shoes and the pantagraph play the most prominent part. In September the engine failures were 30 in number, charged with 224 minutes. In this there were three charged with 12 minutes because of low direct-current voltage; one derailment of a pony truck that lost 28 minutes, a hot box three minutes and a hot tire 10 minutes, so that the electric features, in which the pantagraph is still prominent, are responsible for but 24 failures and 171 minutes. In October there were 31 failures charged with 243 minutes, but of these seven and 86 minutes were for hot boxes, brakes sticking, air hose and similar failures, and were in no way chargeable to the electric engine in itself. The direct-current shoes, the pantagraph and the switches still furnished the major portion of the failures.—EDITOR.]

The segregation of these failures based upon train-minute delays offers a quick and interesting comparison. It is to be noted that the last two months indicate a great improvement over the two preceding ones. From the chart have been taken the train-minute delays that have amounted to over 300 minutes per diem, which are treated separately in the following paragraph. My reason for doing this is to make the data inclusive of ordinary operating days, in order to get the monthly comparison of train-minute delays for what might be termed ordinary service. It is interesting in reviewing the "cause of delay" in this table to note that 90 per cent. of the causes are of an inconsequent nature, and might be reasonably expected when considered in the light of an initiative service.

Serious failures in system causing over 300-minute delays.—It is to be noted that these failures are indicated by the dates of July 14, 16, 20, 26 and 27; August 6 and 8; September 8 and 26, and October 19. A description of the cause of one applies to all of them, except those of July 16 and October 19. In every instance, excepting the two dates mentioned, the tie-up was due to simultaneous failure of several circuit-breakers, due to a short-circuit, thus temporarily disorganizing the distributing system, preventing the electrification of trolley wires.

On July 16, the White Mountain Express left the rails just east of Greenwich station, tying up both eastbound tracks, and causing excessive train-minute delays. Except for the electric rail bonds which suffered destruction, no other electrical apparatus was disturbed. One of the electric locomotives attached to this train was immediately returned to service, the other following it the next day after light repairs were made to its pilot and third-rail shoe mechanism.

On October 19, although the impedance coils in the generator station were in action, a ground occurring on the bus-bars of the anchor bridge directly outside of the power station, in combination with a defective circuit-breaker, produced a short-circuit which destroyed the operating mechanism of the breaker in question. This unfortunately occurred at a time when temporary connections had been made between the power house and line; on this account a serious delay was experienced in restoring the voltage to the line.

It is interesting to note that since the complete inauguration of electric service, the serious failures in the system have been reduced from five to one.

Engine Repairs.—Under "faults" is described the necessity in detail of our engine reconstruction. Since 100 per cent. service has been established, it has occurred to me that the shop reports concerning the daily number of engines which are out of service on account of repairs or for other reasons, would be interesting. On account of the reconstruction being done on the locomotives, it has been found necessary to give up on an average three electric locomotives at Stamford and three at New Haven, the new bogie trucks being installed on the engines at New Haven. Thus out of 41 locomotives we have had only 35 to handle the complete passenger service. This has resulted in requiring that the New Haven locomotives handle the service with virtually no spare engines. [Tables are given under the headings of inspection and repairs, indicating how few have been the engines in the shop for the past three months, and is an attest of this requirement.

These tables show that during July 38 engines were withdrawn from service for reconstruction, or an average of 1.41 per day. Two were out of service for a day each for experiment and test. Ten had trucks installed and were out of service for one day each. Nineteen were pulled off for inspection, or at the rate of 0.71 per day, and 34, or 1.26 per day, were taken off for miscellaneous repairs. Of these four were for loose tires; three for broken axles, and seven for truck troubles. There was one hot box, a case of too much side motion, and the rest were electrical troubles.

In August 36 engines were reconstructed with an average of 1.39 per day. Three days were used for experiment and test. Trucks were installed on six engines. Ten were hauled off for a day each for inspection and 45 engine days were consumed in repairs, or at the rate of 1.73 per day. Five of these days were spent on the trucks, and three in waiting for wheels.

In September 58 engine days were spent in reconstruction; two in experiment and test; 41 in installing trucks; five in inspection and 10 in repairs. With the exception of one day spent on wheels, the balance were for electric troubles due to grounded switches and motors.

In October 84 engine days were spent in reconstruction; seven in experiment and test; 60 in installing trucks, none in inspection and but three in repairs.

During this period the train service was heavy and constant, as shown by the following schedule:

	Total No. of Trains	Average Per Day.
July	3,475	112.1
August	3,502	135.
September	3,295	132.
October	3,380	125.

EDITOR.]

The Capacity of the Electric Locomotive.—The capacity of the electric locomotives was based upon their ability to handle a trailing load of 200 tons in local service with stops averaging those that exist between stations between New York and New Haven. As a matter of fact, the station stops between Stamford and New York average very much greater than between New Haven and New York, and as very quick turns are made at both termini, the service may be said to be more severe under these conditions than under the guaranteed conditions of purchase. It is interesting to note the trailing loads, taken at random, hauled by the New Haven electric locomotives for the week ending October 24, 1908. [The range of these has already been noted, and it may be added that the average, as given in the table, is 309 tons per engine.—EDITOR.]

Comparative Steam and Electric Engine Mileage.—September 5, last, Labor Day, offered an interesting day to note what mileages could be made by the electric locomotives. Table IX. gives an individual record for each of the 38 electric locomotives in service that day. [A table giving an individual record of the 38 engines in service on that day shows that a total of 248 runs were made, or an average of 6.5 per locomotive, and that in making these runs, the total mileage amounted to 8,051, or an average of 212 for each locomotive. —EDITOR.]

In obtaining an average for all electric locomotives of 212 miles, it is to be remembered that this was made for all classes of service, express, express-local, and local, and further that the mileages were made over three short terminal runs; namely, Stamford, Port Chester and New Rochelle to New York, the distances being approximately 34, 26 and 17 miles, respectively. As indicated in the table, several engines made eight runs, two of them nine and one ten. It is difficult to get an exact comparison for steam locomotive-mileages. All of the electric engines are confined to one division, while the steam locomotives do inter-division service. However, using the records of the 1906 steam service for Labor Day and considering steam locomotives doing mileage in and out of the

present electric zone, out of 117 locomotives the following record is to be noted:

10	made	over 300 miles.
20	"	between 200 and 300 miles.
21	"	" 150 and 200 "
34	"	" 100 and 150 "
32	"	under 100 miles.
117		

Thus with division limits double that of the present electric division, and with the additional advantage of inter-division runs, the electric mileage for this concrete case averaged 34 per cent. better than the steam mileage.

THE ELECTRIFICATION IN ITS RELATION TO MATTERS OTHER THAN TRACTION.

Telegraph and Telephone.—Single-phase electrification affects telegraph and telephone systems whose wires lie parallel with and in close proximity to the railway. The corrective for this disturbance has proved to be simple and not costly. Briefly described, it consists of compensating transformers whose secondaries are a part of the telegraph and telephone wires and whose primaries receive their voltage from pilot wires strung on the same cross-arms as those bearing the telegraph and telephone wires, and thus having impressed upon them the same voltage, by electromagnetic induction, as the telegraph and telephone wires. The transformer secondary voltage is approximately equal and opposite to the induced voltage on the telegraph and telephone wires and thus constantly compensates for it throughout all ranges of induction due to the single-phase wires.

An interesting commentary on the efficacy of the compensating transformer is that its use obviated the necessity of any change in the physical location of the telegraph and telephone lines within the zone of induction, and has thus been the means of removing what at first was rightly considered a very offensive attribute of the single-phase system.

Public Safety.—As no fatality to the traveling public has happened by reason of the high-voltage wires since the system has been in operation, this would indicate the safety involved in its construction. The catenary form of construction as applied to the suspension of the trolley wire virtually eliminates all danger of these wires falling. On the other hand, the feeder or by-pass wires are not suspended by messengers, and although the 300-ft. spans used in this construction are not uncommon, it has been considered a wiser policy to reinforce all such spans which are above passenger platform stations. It may be of interest to state also that the scheme of reinforcement is not to cradle or place supplementary wires in connection with this span, but simply use a steel wire with a large factor of safety reinforced by copper for conductivity conductor and supported from the struts by insulators. The resistance to ground of this construction will be far in excess of the ordinary insulator used in the open construction with the steel wire connected to it in such a manner as to make impossible the burning of this wire in two in the case of the insulator breaking down.

Foreign Wires.—All electrifications are subject to foreign wire crossings. As in the case of suspension of high-voltage wires over passenger platforms, instead of using supplementary catenaries or cradles, the safer (and incidentally the cheaper) method of crossing is to use at the crossing heavier (and possibly guyed) poles, better insulation, and larger wires than are commercially necessary in the other parts of the foreign transmission line. High factors of safety with economy are obtained following this policy.

COMMENTARY.

Lightning Protection.—An ideal arrangement of catenary construction in relation to lightning protection would be to have the overhead messenger system grounded, and from it suspended by insulators a secondary catenary system, to which in turn would be attached the contact wires. Even in the New Haven case, where the overhead messenger system is not grounded, lightning has given but slight trouble. This is probably due to the very great number of grounded steel trusses and struts projecting above the electrified wires. Lightning was the indirect cause of one of our delays, but played only a small part in the real cause which can be attributed to the surge of current occurring at the time lightning caused a ground. At that time the feeders had not been rearranged, nor had the impedance coils been installed in the power-house circuits. On the occasion of this ground, due to the lightning, we lost several of the anchor bridge circuit-breakers; this naturally tied up the distributing system, preventing the proper restoration of voltage to the trolley wires. The conditions are now such that the circuit-breakers will relieve short-circuits due to this cause.

Grounds.—Structures supporting high-voltage insulators should be grounded. Particularly is this true of structures foreign to the railway company, such as highway bridges. This arrangement insures a prompt response of the circuit-breaker apparatus, and carries out the good practice universally applicable, that the material supporting the insulator be grounded. This principle has application in wood-car construction. Positive grounds between Pintsch gas pipes and both car trucks should be made to avoid any arcs being drawn under the car body. On two occasions the gas in the Pintsch mains of New Haven cars has been set on fire on account of connection with electrified wires. While the percentage is low, being two cars in about 400,000 during the period involved, with little damage in either case, and that to the cars, it is a matter not to be ignored.

Many of our catenary bridges, of both the intermediate and anchor type, serve to support signals. Signal men have been entirely free from coming in contact with the high-tension wires, by the simple provision of grounded close mesh screens interposed between the signal platforms and the high-voltage wires. The value of two grounds can be rated considerably higher than twice that of one.

Tell-tales.—Tell-tales in connection with an overhead system offer a peculiarly difficult problem. It is quite apparent that the pantagraph current collecting device would get into either electrical or mechanical difficulties with the present form of tell-tales. We have experimented at some length in trying to produce an electrical horn that would be automatically sounded by an approaching train. There is nothing particularly difficult in getting the automatic action or in producing a noise. The superiority of the tell-tale over the horn, however, is that no matter how much noise the freight train is making, the tell-tale always notifies, while in the case of the horn should the freight train be making more noise than it, the notification is lost. A horn if used for this service should be a large one.

As a matter of fact, the necessity of tell-tales is a bit of a relic of the barbaric past. In the days of hand brakes, the brakeman had to walk the roofs of cars, and low bridge warnings were necessary. To-day the braking is all done from the engine cab, except in yards where, of course, the overhead wires have their normal height of 22 ft. from the rails, permitting safe clearances for manual operation of the brakes.

Train lighting and heating.—On account of the necessity of wiring for electric heating and lighting some 2,500 coaches, it seems reasonable to retain the present method and apparatus of heating and lighting the trains in the electric zone. To accomplish this it was only necessary to supply each electric locomotive with a small steam boiler used solely for train heating. The Pintsch gas system has been retained intact. Later, when the service is sufficiently extensive, all trains will be heated and lighted by electricity.

All multiple-unit cars are to be heated and lighted by electricity. The problems of heating and lighting a multiple-unit train and a locomotive train are quite different. In the former the current is fed into the train at several points, as many as there are motor cars; in the latter it can be taken only from the locomotive (if there are two locomotive units, of course, it can be supplied from both). Again, in the case of the multiple-unit equipment, the supply of current is along progressive points of the train-length, thereby not requiring train bus-bars of excessive copper section, while in the case of the locomotive train, the supply, whether from one or two units, will be at the head end of the train, thus requiring a transmission of considerable length. A train of 12 cars, for instance, would be between 700 and 800 ft. long. Allowing 24 kw., maximum, for heat and light per car, would require the delivery of about 300 kw. apparent power. An investigation of this department in electrification has brought out some interesting details, particularly in reference to locomotive transformer design and electric car jumpers.

Fatalities.—As has been pointed out, we have had several fatal accidents, due to men coming in contact with electrified wires. We are none the less concerned that in every instance they were men employed by the company. In each instance the accident was due to carelessness or violation of instructions, and most of the accidents occurred during the period of construction. The operating period has provided a less number of these unfortunate events, and the records to-day now seem to indicate that the future will be free from this most regrettable feature.

Cross-catenary versus bridge-bents.—The excellent results of a year's experience with cross catenary construction in our Port Chester yard, where as many as ten tracks are spanned, is tempting encouragement for its application to main line work. Should the cross-catenary be used, anchor bridges should be spaced at close intervals, say one per mile. The question of the use of cross-catenary versus the bridge-bent on multitrack roads, however, depends largely upon the right-of-way conditions. Cross-catenary struts have to be guyed. In many instances right-of-way limits will require the guy to be placed on foreign land. If the additional cost of the foreign land brings the catenary bent up to or more than the cost of the bridge-bent it loses its object.

Single versus double-catenary construction.—Lack of operating data led the engineers of the New Haven road to take no chances with the overhead construction, and the double catenary was considered the safest. The adoption of single, double, and compound systems of catenary suspension is so intimately and definitely related to the number of tracks, the length of longitudinal spans, and the cost of transverse supporting structures and foundations, that the determining of the most economical type of catenary construction must necessarily include the consideration of these factors, and for this reason simple standardization adapted to all conditions is impossible.

Single-phase operation.—The New Haven system provides that the volt manufactured in and leaving the doors of the power house, is the same physical volt that knocks at the doors of the locomotives. Thus the line is the single link that unites the power house and the locomotives. All such adjuncts as step-down transformers, synchronous converters, storage-batteries, and low-voltage distributing systems with their necessary attendant complement of help is dispensed with. The Cos Cob power house has the usual number of men for a station of its output, and the locomotives are operated by the electric locomotive engineer with the customary assistant present for emergency. This crew holds good for single or double-unit trains. An emergency repair train is the guardian of the line, attending to all matters pertaining to its repair and maintenance. Including the night and day crews of the emergency train, the number of men employed to maintain the distribution system is nineteen. This covers about 100 miles of single track, including yards.

Conclusion. The writer will not use the conventional method of summing up and making recommendations. The paper has been written with the intent to lay before the members of the American Institute of Electrical Engineers a practical picture of the New Haven single-phase electrification, describing the first suit of clothes it wore and what it is wearing now. He is conscious of the innumerable little points of real interest that time and opportunity have not permitted him to insert here, but he trusts to the discussion to bring them out. The description of the faults and how they were handled will answer for the usual column of recommendations. In concluding, an interesting definition of engineering comes to mind; namely,

Engineering is the art of making a dollar earn the greatest interest.

The writer has intentionally omitted the discussion of the operating costs of a direct current versus an alternating current system; but, bearing in mind the preceding definition, it is his belief that in the electrification of steam roads to-day straight alternating current traction is the agency through which that title can be earned.

History sustains the undeniable truth that alternating current is the preferred agent for the transfer of electricity where either distance or capacity is involved. A railroad involves both. Granted, therefore, that the alternating-current traction apparatus has received the trade mark of practicability, what further argument does it need in its favor?

In connection with the New Haven electrification I wish to speak of the privilege of association with Mr. E. H. McHenry and Mr. Calvert Townley. Upon Mr. Townley devolved the responsibility of decision as to the form of electrification selected. Neither the object nor the scope of this paper can include a description of the analytical course of procedure preparatory to the conclusion that the New Haven road would adopt the single-phase form of electrification. Suffice it to say that Mr. Townley's conviction to accept this responsibility were sufficiently strong to lay the foundation of this work. To Mr. E. H. McHenry, whose serious illness had prevented his filling the office of vice-president in charge of matters pertaining to engineering, fell upon accession to that office, the responsibility of ratification or disagreement with the policy as set forth by Mr. Townley. That ratification is better written in the details of the electric zone itself, as in each department of power house line and locomotive may be seen the betterments due to his suggestion. To him is due the credit of the practical issue of this electrification.

This paper would indeed be incomplete did I not refer to the splendid courage and indomitable pluck of our contractors, who through a fire of criticism and business depression perseveringly stuck to their belief in the principles they were advocating. They can now have the satisfaction of viewing something begun and something finished; for while there may be many improvements to accrue to the alternating-current, single-phase system, the trunk-line principles have by them been laid and demonstrated.

STANDARD ATLANTIC AND MOGUL LOCOMOTIVES FOR THE HARRIMAN LINES.

The American Locomotive Company has recently completed the last of an order of 125 locomotives for the Harriman Lines. This order included 43 consolidation locomotives, 30 moguls, 10 Atlantics, 24 ten-wheelers and 18 switchers, all of which were built to designs and specifications which have been adopted as standard for all the roads, included in this system.

This standardization of the different classes of locomotive equipment of the associated lines was first inaugurated in 1902. At first the specifications covered four types of locomotives; i. e., the Atlantic type passenger, Pacific type passenger, consolidation freight and heavy switchers. Since that time, however, standard designs for ten-wheel and mogul types have also been adopted.

The purpose of thus standardizing the various designs was not only to secure interchangeability of details between locomotives of the same type, but as far as possible, without the sacrifice to the efficiency of the design, to adopt standards which would be common to all the different types necessary to meet the requirements of the different lines. How well this purpose has been accomplished is shown by a comparison of the designs of the Atlantic and mogul type engines, included in the above-mentioned order and illustrated herewith.

The Atlantic type engines were designed for burning bituminous coal; while of the moguls, 15 are oil burners and the remainder, one of which is shown in the accompanying illustrations, used coal as fuel. Except, for the changes in design incident to the use of oil for fuel, the two classes of moguls are identical in design. The Atlantic type engine had a total weight in working order of 197,000 lbs., of which 100,400 are carried on the drivers, while those of the mogul type have a total weight in working order of 179,200 lbs., with 152,500 on the drivers. It might be mentioned here, in passing, that this weight places these last-mentioned engines among the heaviest of their type ever built, the only moguls having a greater weight, built by the same company, being those for the Vandalia, which weighed 187,000 lbs., and are the heaviest of their class in the world. With the larger diameter driving wheels of the Atlantic type engines, it is possible, however, in spite of the smaller weight on driving wheels of this type, to

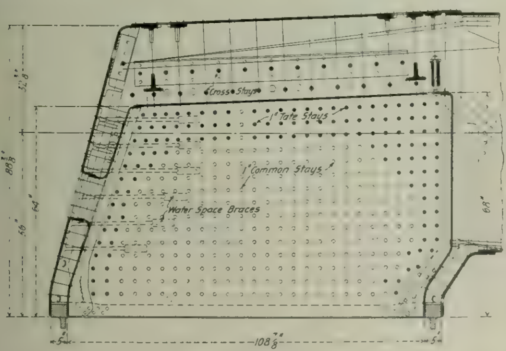
use the same boiler pressure and same size cylinders for both classes of engines.

Each class is equipped with cylinders 20 in. diam., 28 in. stroke, provided with piston valves 12 in. diam. The valves of each type have a maximum travel of 6 in. with 1 in. steam lap and 1-16 in. exhaust clearance and the lead in full gear of 3-32 in. The motion in both cases is indirect, but in the Atlantic type engines the rocker shafts being located ahead of the forward driving wheels, the link is connected with the downward extending arm of the rock shafts by means of a transmission bar which straddles the front axle. As a while in the mogul it is an inverted T. In the location of the flexible stay bolts we find general agreement in the two boilers with the small modification in the details of the arrangement required by the difference in the form of the firebox. Still there is enough of a variation to attract attention. For example, in the Atlantic engine the three top rows of side bolts are flexible, while, in the mogul, only the two top rows are flexible. The clusters in the corners are nearly identical and there are two vertical rows at the front and back. The reason for this is that though there is but 5⅝ in. difference in the length of the side sheets, there is also a difference

Standard Atlantic Locomotive for the Harriman Lines.

result of the above, the same cylinder heads, valves, valve bushings, pistons, piston rods, crossheads, connecting rod bearings, rock shafts, eccentric straps and eccentrics are common to both classes of engines. In fact, as far as the valves, valve bushings, crossheads, rock shafts, eccentrics and straps are concerned, these details are also standard for the ten-wheel engines, built by the same company and illustrated in the Sept. 18, 1908, issue of the *Railroad Age Gazette*.

The cylinders of both designs, here illustrated, have the same spread of 88 in. and the same distance, 43 in., between

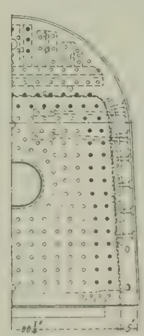


Firebox for Standard Atlantic Locomotive for the Harriman Lines.

frame centers and take a common frame section, so that the deck plates, reverse shafts and driving boxes are common to the two classes.

Both boilers are of the straight top, crown bar type, and have the same diameter and the same inside dimensions of firebox; although in the case of the mogul, the mud ring slopes down at the front end and the throat sheet is vertical, while the mud ring of the Atlantic type is straight and the throat sheet is sloped. There is also a slight difference in the arrangement of the sling stays for the crown sheet, that for the Atlantic locomotive having flat crown bars at the front end,

of 5 in. in the depth of the firebox, or approximately the spacing of one horizontal row of stay bolts. So that by putting in three rows of bolts in the Atlantic engine, which has the greater depth, the distance of the lower row of flexible stays from the foundation ring is kept practically the same in both locomotives, or 56 in. and 56¾ in., respectively. The reason for the adoption of this distance is probably based on experience; for, as we have seen before, there is a wide variation in the use of flexible staybolts between roads that are operated in the same territory.



Half Back End of Boiler.

The back head is fitted with the water space braces, that have come into use with the increase in the width of the water leg at the sides. When this width was 4 in. and of nearly uniform dimensions throughout, the whole of its height, the unstayed flat surface in the back head between the side sheet and the first vertical row of stays was not great enough to require special bracing. But with the water space increased to 5 in. at the foundation ring, and widening to 6 in. or more at the crown, there is a flat surface of from 7½ in. to 8½ in. that requires some special support, hence the introduction of these new braces for the water space. Their form is clearly shown in the engraving and they are riveted to the side and back sheets. In the Atlantic engine it will be noticed that there is a break in the top horizontal rows of flexible bolts and that three rigid bolts are introduced. This is to permit of a cab attachment that would interfere with the projection of the flexible head. It is for such places as this that it is especially desirable to have a flexible bolt that will go in flush with the surface of the outside sheet.

With the diameter of the boilers the same for both classes, it is possible to use the same smoke stacks, smoke box—front and door, dome ring base and cap, throttle pipe, dry pipe elbow and end and minor details. At the same time, a comparison of the amount of heating surface in the two designs shows that this standardization of the boiler design has been

effected without any sacrifice of the efficiency of either design for the particular class of service for which it is intended. With the greater length of flue of the Atlantic type, a total heating surface of 2,649 sq. ft. has been obtained as compared with 2,102 sq. ft. of the mogul type. This gives a ratio of tractive power multiplied by the diameter of drivers to total heating surface or, in other words, a B.D. factor of 717 in the passenger engine which, although not as low as in some other recent examples of engine of the same type, is about the average and would indicate the large boiler capacity for sustained high speeds. Some of the other more important details which might be mentioned as common to both classes of engines are steel cabs, sand boxes, injectors, injector checks, throttle levers, engine truck axles, engine truck boxes and grate bars.

Each engine is provided with a Vanderbilt-type tender with a cylindrical tank having a capacity of 7,000 gallons of water and a fuel capacity of 14 tons. The tender frames are of angle irons and the tenders are carried on two four-wheel trucks of the Andrews cast steel side frame type. Some of the tender details, which are common to both types are as follows: Axles, bolsters, journal boxes, truck center plates, springs, side bearings, wheels, air brakes, tender frame body bolsters, and draft gear.

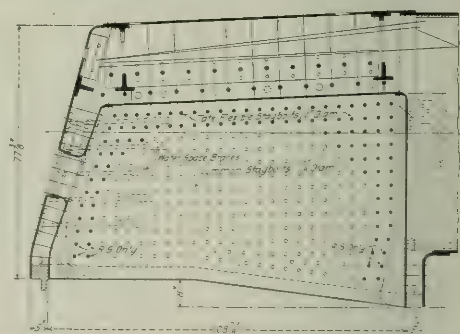
The following are some of the principal dimensions of these locomotives:

	Mogul.	Atlantic.
Cylinder diameter	20 in.	20 in.
Piston stroke	28 in.	28 "
Wheel base, rigid	15 ft. 2 in.	7 ft.
" " total	24 ft.	27 ft. 7 in.
" " engine and tender	53 ft. 2 11-16 in.	57 ft. 3 11-16 in.
Weight on drivers	152,500 lbs.	100,400 lbs.
" total	179,200 "	197,000 "
" engine and tender	313,000 "	339,380 "
Heating surface, tubes	1,956 sq. ft.	2,475 sq. ft.
" " firebox	146 " "	174 "
" " total	2,102 " "	2,649 "
Grate area	49.5 " "	49.5 "
Journals, driving	9 in. x 12 in.	9 in. x 2 in.
" front truck	6 in. x 10 "	6 " x 10 "
" trailing "		8 " x 12 "
" tender	5½ in x 10 "	5½ " x 10 "
Steam pressure	200 lbs.	200 lbs.
Firebox, length	108 in.	108 in.
" width	66 "	66 "
" thickness, crown, sides, back	⅜ "	⅜ "
" " tubesheet	½ "	½ "
" water space	5 "	5 "
Tubes type	Shelby seamless	seamless
" material	steel	O H steel
" number	297	297
" diameter	2 in	2 in.
" length	12 ft 8 "	16 ft 0 in.
" thickness	.125 "	125 "
Stack diameter	20 "	20 "
Tank type	cylindrical	cylindrical
" capacity, water	7,000 gals	7,000 gals.
" " coal	14 tons	14 tons
Tank capacity, oil	2,940 gals	
Valves type	piston	piston
" travel	6 in.	6 in.
" lap	1 "	1 "
" exhaust clearance	1-16 "	1 16 "
" lead	3-32 "	3 32 "
Wheels, diameter, driving	63 "	81 "
" " front truck	30½ "	33½ "
" " trailing truck		51 "
" " tender	33½ in	33½ "
Tractive effort	30,222 lbs.	23,506 lbs.

Weight on drivers / Total weight =	85.10*	50.96*
Weight on drivers / Tractive effort =	5.04	4.27
Total weight / Tractive effort =	5.90	8.38
Tractive effort x diameter drivers / Heating surface =	905.79	711.17
Heating surface / Grate area =	42.48	53.51
Firebox heating surface / Total heating surface =	6.94*	6.56*
Weight on drivers / Total heating surface =	72.55	37.90
Total weight / Total heating surface =	85.25	74.36
Displacement of 2 cylinders, cu. ft. =	10.18	10.18
Total heating surface / Displacement of 2 cylinders =	206.48	260.21
Grate area / Displacement of 2 cylinders =	14.34	14.34

*Per cent.

Standard Mogul Locomotive for the Harriman Lines.



Firebox for Standard Mogul Locomotive for the Harriman Lines.

The export of locomotives from Germany has been unusually great in 1908, for the first eight months nearly 70 per cent. greater than in 1907. The export statistics give, not the number, but the weight of the exports, which was 308,863 tons this year, with an aggregate value of $8,300,000. More than one-fourth of these exports were to France; while Spain, Brazil and Egypt also were good customers. Italy took more than any other country, but not many more than in 1907.

General News Section.

On the St. Louis & San Francisco a change has been made in the organization of the operating department, and hereafter the seventeen trainmasters will be known as assistant superintendents. The new title will carry with it increased authority and additional duties.

On Saturday, December 19, the Middle division of the Pennsylvania Railroad moved more freight cars than in any other day since the beginning of the depression in business in the fall of 1907. The number of loaded cars passing Denholm, counting the movements in both directions, was 6,857.

The United Traction Co., running street railways in Albany and Troy, replying to complaints of insufficient heat in its cars, says that the electric power, which is supplied by natural water falls, is only barely sufficient to move the cars, leaving none for heat. The long continued drouth has produced a situation which is unprecedented.

The delays to passenger trains in New York State in the month of October, as reported by the Public Service Commission, Second district, averaged 22.9 minutes for each late train. The average delay, based on total number of trains run, was 4.1 minutes. The total number of trains reported was 57,712; per cent. of trains on time at the end of the division, 82.

It is said that the railway companies operating in Indiana will ask for the repeal of the "full crew law" of that state. They point out that a crew of five men is not necessary on an express train, and that the law works a hardship. It is said also that the companies have arranged to keep a close watch on legislation in the next session, especially against labor legislation. The railway labor organizations have appointed a legislative committee also to be present at each session.

On Monday, December 21, the subway and elevated lines of the Interborough Rapid Transit Co., New York City, carried 1,800,000 passengers, which is about 200,000 more than the number carried in the heaviest day of the Christmas season one year ago. The elevated lines carried a slightly smaller volume of traffic this year than last year, but in the subway the movement increased 30 per cent. The extension of the subway from Bowling Green to Brooklyn has largely increased the number of passengers.

The Minnesota Supreme Court on December 24 rendered a decision holding that the Great Northern and the Chicago Great Western must pay a tax of 4 per cent. of gross earnings. The Great Northern contested the present gross earnings tax law upon the grounds that the territorial legislature fixed the tax to be levied upon the roads now composing the Great Northern at 3 per cent. The Chicago Great Western contested the law upon the ground that the original territorial charter fixed its tax at 2 per cent. The court holds that the present statute impairs no contractual or other vested right of the roads and is not repugnant to either the state or Federal constitution.

Surprise tests on the Pennsylvania Railroad in October numbered 22,831. The reports show that in 22,749 cases the employees obeyed the rules to the letter. Of these cases, 3,365 were tests of observance of block signals set in unexpected ways, and the percentage of observance was 99.1. To ascertain the thoroughness with which employees observe emergency signals, such as fusees, torpedoes, etc., 3,357 trains were tested, and in 99.6 per cent. of the cases the rules were obeyed perfectly. The other tests covered cases of trains running ahead of schedule, and signalmen being on hand at the relieving hour. Special attention is being given to the latter subject in order to insure that the men shall obey the eight-hour law implicitly.

The General Managers of the Pennsylvania Lines East and West of Pittsburgh announce that the examinations of applicants for the Frank Thomson scholarships will be held in June, 1909. These scholarships, amounting to $600 a year, were established in 1907 by the three children of the late Frank Thomson. After 1910 there will be eight holders of scholarships, and this number is expected to be maintained in succeeding years. The examination will be open to the sons of some 173,000 men, that is, of all employees of the Pennsylvania and its controlled lines. The College Entrance Examination Board of New York City will conduct the examinations. Applications are to be sent before June 3 to Thomas S. Fiske, Secretary, sub-station No. 84, New York City.

The extension of education for the benefit of farmers is now proceeding at such a rapid pace that it is difficult to keep track even of the names of the different enterprises, to say nothing of describing their nature and extent. The Boll Weevil Special is rapidly succeeded by an expedition for the demonstration of the most suitable methods for the extermination of fruit tree pests. This is to be run on a special train by the state of Pennsylvania, over the Cumberland Valley Railroad. Mr. Surface, State Economic Zoologist, says that instruction on this subject has been carried on for the past two years by demonstrators who have visited the orchards; but evidently the orchards are too numerous and the work has not kept pace with the needs, so now, apparently, the orchards are to be brought to the railroad stations. The lecturers are to give their attention to the orchards in the day time and to the owners at night.

The Attorney-General of Kansas on December 24 filed a petition in the state supreme court for an order to oust the St. Louis & San Francisco from doing business in that state. This company was organized under the laws of Missouri. The petition of the Attorney-General alleges that it has never made any application to the charter board of Kansas for permission to engage in business in the state as a foreign corporation and that no permission has been given to it to engage in business in the state. The capitalization of the company at the time of incorporation in 1896 was $50,000,000 and under the Kansas law it should have paid to the state a charter fee of $25,000. Its capitalization was subsequently increased to $100,000,000 and it is alleged that it then should have paid to the state of Kansas an additional charter fee of $25,000. In 1907 its capital stock was increased to $200,000,000, at which time it is alleged that it should have paid to the state a capitalization fee of $50,000. It is alleged that the road has refused to pay any of these fees and that it therefore has no authority to do business in the state.

Telephone Despatching Without Station Operators.

The arrangements being made for the use of telephones on 123 miles of the Union Pacific—North Platte to Sidney—were briefly noticed in our issue of December 18, page 1600. An officer of the road gives the following details: "The signals to be used at the three 'blind sidings' will be the U. P. standard semaphores, constantly lighted by acetylene gas. There will be two signals at each place, one eastbound and one westbound. They will be operated by the despatcher at North Platte by means of the Gill high-speed selector, the same apparatus that will be used for calling the offices on the line. There will be two station selectors at each blind siding, one to operate the eastbound signal and one to operate the westbound. The Gill selectors are made by the United States Electric Company of New York City. There will be buttons assigned in the calling device for each blind siding, the same as for each office, and the despatcher operates the signals exactly as he calls an office. There will be an answer-back arrangement, so the despatcher will know the semaphore arms have moved. After a conductor, whose train has been stopped, finishes his telephoning with the despatcher, he will put the semaphore at normal, working it from the booth in the same manner that signals are moved by operators at stations.

"The booths will be the U. P. standard, without windows.

They will be lighted by acetylene gas, the light being started automatically as the conductor steps on a mat on the floor of the booth. When doors of booths are opened the telephones will be connected with the line, and this will be disconnected when the doors are closed. The telephones will be placed in iron boxes, which will be locked with switch locks. The keys cannot be taken out of the locks without locking the boxes.

"Egry train-register boxes will also be placed in these booths and supplied with Form 31 train order blanks in roll form, so that conductors can make three copies. The conductor can take out but two copies; one copy must remain in the box to be gathered up at intervals for use in checking the work. These boxes will be equipped with locks, so that neither the train order blanks nor the completed copies can be tampered with.

"The telephone equipment for this line will be furnished by the Western Electric Company of Chicago. The line will be constructed of copper wire weighing 210 lbs. per mile and the two wires forming it will be transposed every 80 rods to provide against interference from telegraph wires on the same poles and from other outside influences."

We understand that the despatchers will be instructed to use these unattended telephones only for extending rights—never for restricting.

Engineers to Visit Panama.

President Roosevelt has invited the following engineers to accompany Mr. Taft on his trip to Panama this month: Arthur P. Davis, Chief Engineer Reclamation Service; John R. Freeman, Providence, R. I.; Allen Hazen, New York; Isham Randolph, Chicago; James Dix Schuyler, Los Angeles, and Frederick P. Stearns, Boston. Mr. Alfred Noble was the first engineer invited by the President, but he was unable to leave his present work. It was on his recommendation that the President selected the above six engineers.

What Next?

A petition has been filed with the New York State Public Service Commission, Second district, by the 19 motormen employed by the Rochester & Eastern, protesting against a recent order requiring the abolition of curtains between the motor-cab and passenger compartments on all the cars.

The main argument for the change is that it will add to the comfort of the passengers by reason of their being able to see the track some distance in advance of the car. The motormen, however, cite instances where serious collisions happened when the approaching danger was seen by the passengers, who were immediately thrown into conditions of great excitement and while standing and walking around the car were seriously injured; whereas, if they had remained quietly in their seats they would not have been hurt.

Inquiry Concerning Railway Discipline in New York.

As a result of investigations of accidents on railways, the New York State Public Service Commission, Second District, has ordered each railway to furnish by February 1 the following papers and information, to wit:

1. Five copies of all printed rules for the operation of its road.

2. A statement showing for each of the following classes of employees engaged in the operation of its road, namely: (a) engineers, (b) firemen, (c) conductors, (d) trainmen, (e) flagmen, (f) brakemen, (g) switch tenders, (h) gatemen at crossings, (i) flagmen at crossings, (j) towermen, (k) telegraph operators, (l) train despatchers, (m) any other employees engaged in operating trains, what examination or inquiry, if any, is made previous to their employment in or promotion to such positions as to their mental and physical capacity, experience and general fitness for the proposed employment.

3. A statement showing what steps are taken to require of each employee a competent knowledge of the operating rules governing his duties and conduct as such employee.

4. A statement showing what examinations or investigations are made from time to time, either regularly or otherwise, to keep informed as to whether employees of the said classes are familiar with the rules and instructions governing their duties and conduct, and what measures are taken to improve the effectiveness of operating rules from time to time and their applicability to disclose accident situations.

5. What record, if any, is kept of violations of rules and instructions by any of the aforesaid employees.

6. Any other information which may, in the opinion of the chief operating officer of each of said corporations, be of use to the commission in investigating the causes of accidents so far as such accidents arise from neglect or non-observance of rules and instructions by employees.

Track Inspection Premiums on Queen & Crescent.

The following premiums have been awarded by the Queen & Crescent as a result of the annual track inspection made on December 15, 16 and 17: For best division between Cincinnati and Meridian, M. J. Connerton, Roadmaster; honorable mention. For best district between Cincinnati and Meridian, L. L. Waters, Supervisor; \$75. For best section on Cincinnati division, J. Baker, Foreman, \$50; second best, E. Massey, Foreman, \$25. For best section on Chattanooga division, J. McCabe, \$50; second best, J. Mitchell, \$25. For best section Alabama Great Southern, M. Dyer, \$50; second best, B. H. Wright, \$25. Additional prize for the best section between Cincinnati and Meridian, M. Dyer, \$10.

Rule H.

The rule against smoking by trainmen is being rigidly enforced on the E. & A. division of the Pennsylvania. Recently several trainmen living in New Castle were transfered from passenger to freight duty because they were caught smoking. Trainmen caught smoking are liable to immediate discharge.—*Exchange.**

The Universal Fare Ticket.

The Missouri, Kansas & Texas is now using, in place of mileage tickets, similar tickets which represent money instead of miles. Since the reductions in fares ordered by the legislatures of different states last year, the use of mileage tickets has been found inconvenient, if not impracticable, on account of the different rates in different states, and we are informed that the use of tickets representing money has been found a satisfactory substitute. The tickets can be used for the payment of extra baggage charges or storage, or meals in dining cars, or in fact any purpose which the railway company may find desirable. The new tickets are made by the Universal Fare Ticket Co., 305 Equitable building, St. Louis, Mo. The circular of the company shows two forms of ticket—one of 2,000 coupons made good for the bearer, and one of a slightly different form, designed to be issued for the exclusive use of a single person. In form A the coupons are ¼ in. high by about ½ in. wide, and each coupon represents one cent. Crosswise of the ticket there are five coupons and, measuring lengthwise, a length of 2½ in. contains 50 coupons. In the other form, which is like common forms of mileage tickets, each coupon extends entirely across the ticket, and is about ⅛ in. wide.

Railway Employees' and Investors' Association.

The Executive Committee of this Association met in Chicago on Tuesday last and appointed as secretary of the Association C. D. Kellogg, of Cedar Rapids, Iowa, editor of *The Railway Conductor;* and Mr. Morrissey, the president, in conjunction with Mr. Kellogg, will at once begin the active work of organization. A constitution and by-laws have been adopted. Mr. Morrissey proposes to organize the employees

*"A rule which cannot or ought not to be enforced, ought not to exist." *From an Ancient Edition of the Standard Code.*

of each road; then to form state organizations of the employees of each road, to be followed by state organizations of the employees of all the roads in each state. All railway employees will be asked to become members. Mr. Morrissey thinks that the organization can be supported by a small membership fee.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; June, 1909.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Pl., New York; May, 1909; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York; Jan. 12, 1909; New York.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
Association of Railway Claim Agents.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; January; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

International Railway General Foremen's Convention.

The annual convention of the International Railway General Foremen's Association will be held in Chicago in May, 1909. C. E. Cook, Royal Insurance building, Chicago, is Secretary.

Traffic Club of Chicago.

The monthly meeting of the Traffic Club of Chicago will be held at the Grand Pacific hotel on January 5 at 12:30 o'clock p. m. The speaker will be Arthur Hale, Chairman of the Committee on Car Efficiency.

American Society of Mechanical Engineers.

The next monthly meeting will be held in the Engineering Societies building, New York, on Tuesday evening, January 12. The paper will be by Carl G. Barth, of Philadelphia, Pa., on "The Transmission of Power by Leather Belting," illustrated by lantern slides. It will be a summing up of the theory and practice of belting, in which conclusions are drawn from the work of Lewis, Bancroft, Bird and others, who have made experiments on the transmission of power by belting. Charts have been prepared by the author for the solution of belting problems.

Traffic News.

The Ohio Supreme Court in a decision on December 23 upheld the validity of the law passed by the legislature last winter authorizing railways to collect a penalty of 10 cents from passengers who pay fares on trains.

During the months of January and February Canadian Pacific trains No. 1 and No. 2 will not run between Montreal and Winnipeg, nor between Calgary and Vancouver. Trains 96 and 97 will continue to run through between Montreal and Vancouver.

In the United States Circuit Court at New York Dec. 23, Hammacher, Schlemmer & Co. pleaded guilty to having shipped piano tuning pins as "iron screws," and to securing a lower rate thereby. The defendant was fined $500 on each offense in the indictment.

The Supreme Court of Mississippi, in a recent decision, reaffirms a former decision to the effect that if a railway charges demurrage on freight cars delayed by consignees, it must be held liable for a similar charge when it fails to deliver goods on time.

The British ship Conway left Gulfport, Miss., last week loaded with 11,000 bales of cotton, 200 tons of cottonseed meal and other freight, for England and France. This is the first shipment of Mississippi cotton made directly from a Mississippi port. The freight was carried to Gulfport by the Gulf & Ship Island.

The western railways have decided to keep their freight houses in Chicago open daily hereafter until 5.30 p.m. Some months ago the Chicago lines all agreed to close their freight houses at 5 o'clock, but shippers protested and the time of closing was made 5.15 p.m. This hour of closing did not prove satisfactory to the western roads.

The Atchison, Topeka & Santa Fe has been cited for contempt by the Oklahoma Corporation Commission for alleged violation of the Commission's milling-in-transit and demurrage orders. The Chicago, Rock Island & Pacific has been cited for contempt for an alleged violation of the demurrage order. In the Rock Island case it is charged that the road was ten days in hauling a car of freight from Oklahoma City to Watonga, 50 miles.

J. L. Bennett has been appointed by the United States Circuit Court at Chicago a special master in chancery to take testimony in the Missouri river jobbers' case. This is the suit begun by the railways running from the Mississippi to the Missouri river to contest the order of the Interstate Commerce Commission requiring the reduction of the Mississippi-Missouri proportionals of through class rates from the Atlantic seaboard to Missouri river points.

In the United States District Court at Trenton, N. J., Dec. 21, a preliminary injunction was granted restraining Jacob L. Simon, Joseph Abrams, Michael Uslander and Thomas Morgan, all of Paterson, from selling non-transferable commutation tickets on the Erie Railroad for passage between New York and Paterson. The railway says that it loses large sums annually by this practice, the "brokers" lending the tickets for use by individuals for single rides.

At Little Rock, Ark., on Monday last, T. H. Bunch, a grain dealer, was fined $15,000 for accepting rebates from the Iron Mountain railroad. The defendant pleaded guilty in three cases, and the fine assessed by the court was $5,000 in each case. Similar indictments are pending against the railway company and its former traffic manager. Bunch was indicted last April by the United States grand jury for the Eastern district of Arkansas. The indictment charged him with receiving rebates on shipments of grain transported from Kan-

sas City to Little Rock. It is also charged that he received elevation allowances in violation of the act.

The Southern Pacific Terminal Company, the Galveston, Harrisburg & San Antonio and the Southern Pacific have applied to the Federal court at Galveston, Tex., for an injunction to restrain the Interstate Commerce Commission from enforcing its order prohibiting the Southern Pacific Terminal Company from giving E. H. Young exclusive use of its wharf at Galveston. Complaint was made by Carl Eichenberg against the exclusive privilege given to Young and the Commission held that the discrimination in favor of Young was illegal. On December 18 a demurrer filed by the Commission was overruled, and the Commission was given 15 days to answer the petition of the complainants upon its merits.

The Interstate Commerce Commission, which is engaged in making a list, as complete as possible, of all the private railways in the country, finds in Massachusetts 32 different concerns, though in the cases of 18 of them there is no information as to the length of track. Of those for which mileage is given there are the American Steel & Wire Company, 7 miles; Cape Ann Granite, 2 miles; Fore River, 10 miles; Granite Railway, 5 miles; Keith Car & Manufacturing Company, 7 miles; Milford Pink Granite Quarry, 9 miles. The total mileage recorded is 47.8 miles. In addition to these the Boston Terminal Company, 3.6 miles; Boston Wharf Company, — miles, and the Union Freight Railroad (Boston), 2.3 miles, are reported in a separate class.

According to a press despatch from San Francisco, December 29, one hundred mass meetings were held in California on Tuesday last to protest against the proposed increase in transcontinental freight rates which has been announced to go into effect January 1. These remonstrances against the action of the railways have been managed by an executive committee said to have been appointed by the shippers of the state. Every important city in the state held a meeting, and the speakers declared that the railways are guilty of the imposition of a $10,000,000 annual tax on California consumers, that being the estimated difference between the rates now in force and those which the companies seek to collect after the first of the year. As to the names of the authorities who made this "estimate," and the data on which it is based, the despatch gives no information.

A federal grand jury at Chicago has been investigating the relations between certain packing concerns at Chicago and the railways. Much secrecy has been observed regarding both the offense suspected and the persons against whom the inquiry is directed. Numerous reports have been put in circulation connecting various railways and concerns with the investigation, but the only facts that have become known are that several officers and employees of Nelson Morris & Co., Chicago packers, have been subpoenaed as witnesses and that papers relating to loss and damage claims have been taken from the files of some of the railways by representatives of the government. The impression among railway officers is that the government suspects violations of the Interstate Commerce Act and having little specific evidence to work upon has thrown out a dragnet to see what it can get.

The Cleveland, Cincinnati, Chicago & St. Louis has brought suit in the superior court at Indianapolis, Ind., to restrain the Indiana Railroad Commission from enforcing an order requiring it to deliver freight in carloads to the Winona Interurban Railway and the Spencer & Hogan Company, of Warsaw, Kosciusko county. The Big Four says there is no ordinance allowing the interurban company to unload freight cars in the streets of Warsaw. It also sets up that it is a member of the American Railway Association, whose members have a mutual interest in the exchange of freight, each paying a daily rate of 25 cents a car for other companies, and who have a mutual arrangement for the repair of cars. The Winona Interurban, not being a party to this arrangement, the Big Four claims it would be illegal for it to interchange freight with it without a corresponding arrangement. The Big Four also attacks the order upon the grounds that the law creating the Commission is unconstitutional in that it unites legislative, judicial and administrative functions and that if the order were enforced it would interfere with interstate traffic and deprive the steam road of its property without due process of law.

A conference between California shippers and the railways regarding the advances in transcontinental freight rates was held at San Francisco Dec. 16. The shippers presented general arguments against any advance in freight rates whatever. An interesting feature of the controversy over the advance in rates to the Pacific coast is that while the coast shippers are opposing the advances, shippers at inland points, such as Spokane and Salt Lake City, are taking the side of the railways and contending that the advances are reasonable. F. H. McCune in the Carson City (Nev.) *News* says that the development of Utah, Nevada and other inland states would in the long run inure to the benefit of San Francisco, but that the business men of San Francisco shortsightedly seek advantages in transportation which have the effect of preventing the development of inland territory.

O.H.—B.O.—S.L.&C.—O.R.—K.D.

Two prize hogs, valued at $2,000, are confined in a pen at the Wabash Railroad stock yards, Peru, Ind., and have been there for more than a year as the result of a controversy. The two hogs, with another equally valuable, were purchased from a man in Missouri by John H. Miller, a well-known stock breeder and exporter. In the purchase agreement it was stipulated that the hogs should reach Peru on or before a certain date, at which time Mr. Miller was to make a shipment of live stock to Buenos Ayres, Argentina, but the hogs came a day after Mr. Miller had left with his stock.

The Wabash took possession of them and reported to the shipper, who called on the Missouri Pacific for damages. The road refused to settle. The claim agents for the two companies have held frequent conferences, but the matter still remains open. In the meantime one hog valued at $1,000 has died, and more than $200 worth of feed has been eaten by the two remaining.—*Indianapolis News.*

Obstacles to Chicago's Shipping Development.

George C. Sikes has made a report to the Chicago Harbor Commission in which he discusses obstacles to Chicago's water shipping development. Lack of direct street car connections with docks is a main obstacle to the development of passenger boat business at Chicago. Where a boat takes goods from a railway in Chicago it pays 14 cents a ton for unloading the car, a usage that prevails at no other port on the lakes. Chicago river must serve as the harbor for a number of years to come and it is recommended that all the remaining center pier bridges be replaced by bascule bridges. Another suggestion made is that a few piers be built projecting into the lake north of the mouth of the river. Mr. Sikes thinks that the railways have adjusted their lake and rail rates so as to practically shut out independent boat competition for package freight. Having become masters of the package freight business between Chicago and the seaboard, the railways, he says, now appear to be seeking control of the grain movement east. Chicago is not a vessel owning city. Aside from harbor improvement, about all the public can do to encourage home ownership of shipping is to provide more liberal tax laws and to enact incorporation laws designed to meet the needs of boat companies. Mr. Sikes suggests inquiry into the railway terminals in Chicago, which are badly arranged and unsatisfactory.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has ordered all steam boats operating in the state to meet the rail rates within the state where such rates are lower than the steam boats rates. The steam boats are allowed, however, to charge in addition the actual cost of insurance of the freight. Rates between intermediate landings and from towns and cities to landings where no actual rail line competition exists need not be reduced on account of short line rail competition.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF OCTOBER, 1908.

(See also issues of December 11, 18 and 25.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$104,716	$37,570	$151,446	$20,044	$32,530	$3,115	$43,170	$4,572	$103,431	$48,015	$349*	$3,600	$44,066	$5,423
Alabama Great Southern	309	214,188	69,731	314,478	51,139	58,768	7,593	94,898	9,566	221,964	92,514	631*	11,490	80,393	23,043
Belt Ry. Co. of Chicago	21	......	......	176,541	8,216	19,543	.....	67,199	5,638	100,596	75,945	....	5,750	70,195	‡19,176
Bessemer & Lake Erie	201	726,977	23,744	756,211	66,963	105,033	5,458	170,422	6,517	354,393	401,818	....	4,000	397,818	61,002
Central New England	294	206,203	31,345	249,926	50,051	23,415	2,693	80,801	3,859	160,819	89,107	....	5,600	83,507	48,045
Charleston & Wn. North Car.	340	116,330	21,813	144,764	21,383	20,702	2,238	49,997	3,476	97,796	46,968	....	4,100	42,868	15,634
Chicago, Peoria & St. Louis	255	115,458	33,474	156,518	22,645	30,029	6,040	57,912	4,831	121,457	35,061	....	4,600	30,461	‡4,028
Cincinnati, New Orleans & Tex. Pacific	337	517,454	117,513	665,790	91,391	128,092	16,479	201,064	18,601	455,627	210,163	3,691*	19,642	186,830	15,872
Cleveland, Akron & Columbus	210	129,696	36,286	179,836	24,402	26,107	2,324	57,218	2,781	112,832	67,004	....	7,000	60,004	12,176
Cleveland, Lorain & Wheeling	194	353,999	18,890	396,870	33,793	64,097	5,984	113,359	6,367	223,600	173,270	....	9,406	163,864	‡32,004
Colorado Midland	338	147,978	32,175	207,684	31,426	27,795	9,858	85,669	5,688	160,436	47,248	390*	8,400	38,458	‡19,819
Cumberland Valley	162	158,446	55,800	225,259	25,332	22,617	4,137	71,615	4,682	128,383	96,876	600	3,713	93,763	‡17,481
Detroit, Grand Haven & Milwaukee	191	97,274	45,306	165,913	30,614	14,849	4,770	63,744	3,307	117,284	48,629	56*	2,711	45,862	23,835
Elgin, Joliet & Eastern	239	211,016	55	218,929	23,274	33,587	2,692	69,903	6,336	135,792	83,137	....	9,500	73,637	‡17,562
Evansville & Terre Haute	310	123,752	52,252	196,323	31,709	24,468	5,075	58,048	6,182	125,482	70,841	313*	9,035	61,493	‡3,285
Georgia	307	224,498	63,512	306,889	53,323	36,155	7,499	110,158	6,651	213,786	93,103	....	1,625	91,478	‡15,605
Georgia Southern & Florida	395	100,525	50,394	169,107	12,812	46,051	5,019	57,042	8,585	129,509	39,598	1,310	7,552	33,356	6,657
Grand Trunk Western in U. S.	336	332,656	148,419	506,698	54,310	58,297	22,428	183,201	10,210	328,446	178,252	689*	32,000	145,563	98,080
Gulf & Ship Island	307	135,387	30,500	176,088	33,950	25,168	1,450	54,886	7,106	122,560	53,528	....	3,685	49,843	11,075
Indiana Harbor Belt	103	126,180	......	129,522	31,709	13,753	1,520	80,263	4,594	131,839	2,317*	6,790	3,136	1,337	‡17,502
Kanawha & Michigan	177	194,803	29,451	228,584	37,472	50,671	2,189	66,673	2,308	159,313	69,271	27*	6,600	62,644	46,321
Lehigh & Hudson River	97	122,939	4,329	129,749	19,739	9,312	884	47,912	3,472	81,319	48,430	....	2,500	45,930	25,805
Louisiana Western	198	124,015	42,913	174,851	14,333	21,429	4,255	47,909	6,474	94,400	80,451	549	4,925	76,075	‡633
New Orleans & North Eastern	196	208,036	44,450	269,638	32,550	46,605	7,473	86,934	9,446	183,008	86,630	293*	6,750	79,587	6,137
New York, Philadelphia & Norfolk	112	198,296	29,824	242,940	20,221	44,231	4,304	86,673	11,254	166,683	76,257	....	6,215	70,042	‡20,774
New York, Susquehanna & Western	151	152,696	50,572	227,136	26,889	23,404	1,803	78,996	4,177	135,269	91,867	2,670	15,089	79,448	‡12,781
Peoria & Eastern	352	174,485	59,736	258,873	31,653	46,645	4,641	98,763	4,122	185,824	73,049	....	9,505	63,544	‡78,044
Pittsburgh & Lake Erie	191	1,057,520	103,055	1,190,966	123,847	107,852	13,097	251,340	28,349	524,485	666,481	226*	17,500	648,755	‡200,961
Richmond, Fredericksburg & Potomac	83	82,204	53,458	151,220	14,761	24,578	2,374	49,828	4,243	95,784	55,436	....	200	55,236	5,686
Rutland	468	157,950	92,895	275,560	38,328	37,229	6,487	112,657	6,317	201,018	74,542	....	11,993	62,549	‡12,476
St. Joseph & Grand Island	319	117,990	35,196	165,173	23,500	14,232	5,045	49,970	4,091	96,838	68,335	2,168*	722	65,445	15,175
St. Louis Merchants' Bridge Term.	9	......	4,728	131,029	19,133	8,068	219	48,340	3,946	79,706	51,323	....	4,300	47,023	‡20,426
Terminal R. R. Ass'n of St. Louis	26	......	275	229,568	25,313	15,405	394	60,705	5,102	106,919	122,649	14,130	21,000	115,780	‡8,580
Texas Central	268	93,054	32,560	132,125	14,042	14,978	982	39,557	5,005	74,564	57,561	....	1,969	55,592	8,178
Trinity & Brazos Valley	455	218,841	18,008	240,105	33,371	25,910	5,179	94,807	12,925	172,192	67,913	....	2,000	65,913	57,623
Union R. R. (Pittsburgh)	31	......	......	305,149	34,220	40,180	100	90,400	2,697	167,597	137,552	520	3,500	134,572	33,513

FOUR MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$308,430	$152,250	$494,752	$83,200	$105,518	$12,718	$167,303	$19,175	$387,914	$106,838	$1,844	$14,400	$90,594	‡$19,231
Alabama Great Southern	309	710,217	349,577	1,199,071	153,234	241,031	29,846	394,585	35,285	853,981	345,090	1,904*	45,838	297,348	58,317
Belt Ry. Co. of Chicago	21	......	......	649,350	38,344	64,852	.....	233,559	24,518	361,273	288,077	....	23,000	265,077	‡57,508
Bessemer & Lake Erie	201	2,663,224	133,445	2,818,586	240,947	411,999	21,516	654,953	25,624	1,355,039	1,463,547	....	16,000	1,447,547	‡34,240
Central New England	294	609,846	133,517	788,496	162,131	86,997	6,828	258,678	11,173	525,807	262,689	....	22,400	240,289	162,706
Charleston & Wn. North Car.	340	318,628	91,782	442,163	87,504	60,982	9,353	161,431	13,154	332,124	109,739	....	16,400	93,339	59,008
Chicago, Peoria & St. Louis	255	397,347	132,827	556,410	80,058	127,118	24,012	208,613	17,987	457,788	98,622	....	18,400	80,222	‡2,917
Cincinnati, New Orleans & Tex. Pacific	337	1,992,134	492,373	2,617,649	312,070	560,986	64,520	773,794	68,405	1,779,775	837,874	9,016*	78,568	750,290	102,325
Cleveland, Akron & Columbus	210	462,701	170,349	684,290	91,723	113,866	9,680	208,670	12,149	436,088	248,202	....	26,000	222,202	‡10,168
Cleveland, Lorain & Wheeling	194	1,431,549	87,099	1,630,397	143,850	267,543	24,364	487,501	23,312	946,570	683,827	....	37,626	646,201	‡145,639
Colorado Midland	338	557,737	162,903	808,711	116,717	101,022	38,864	319,092	23,605	599,300	209,411	151*	33,600	175,660	42,378
Cumberland Valley	162	609,193	219,235	868,165	94,534	77,983	15,447	258,187	21,116	467,267	400,898	2,739	14,852	388,785	‡53,757
Detroit, Grand Haven & Milwaukee	191	333,782	227,794	646,471	113,297	56,083	18,858	239,431	20,358	448,027	198,444	66	10,846	187,664	57,599
Elgin, Joliet & Eastern	239	798,201	174	830,240	89,899	136,184	9,654	249,935	25,129	510,801	319,439	....	38,000	281,439	‡73,990
Evansville & Terre Haute	310	486,107	217,388	777,981	113,882	93,983	14,108	222,783	24,386	469,142	308,839	1,113*	36,140	271,586	16,234
Georgia	307	666,134	263,890	987,699	214,696	145,641	32,154	396,766	27,220	816,477	171,222	....	6,500	164,722	‡52,398
Georgia Southern & Florida	395	342,775	204,175	617,869	40,169	115,624	20,120	224,262	34,982	435,157	182,712	5,828	30,206	158,334	61,769
Grand Trunk Western in U. S.	336	1,197,069	674,355	1,975,510	173,175	290,098	87,703	688,249	55,291	1,294,516	680,994	1,843*	128,000	551,151	196,208
Gulf & Ship Island	307	134,373	122,213	590,677	130,650	100,207	5,818	206,566	28,284	471,525	119,152	....	14,740	104,412	‡89,424
Indiana Harbor Belt	103	168,141	......	481,069	103,566	48,114	5,947	266,557	20,195	444,379	36,690	9,490	11,498	34,682	‡15,810
Kanawha & Michigan	177	708,232	121,293	846,845	139,956	195,901	8,986	240,505	10,609	595,957	250,888	59*	25,779	225,049	142,010
Lehigh & Hudson River	97	336,626	20,540	367,176	70,610	39,096	3,839	133,152	12,181	258,878	108,298	....	10,000	98,298	15,047
Louisiana Western	198	411,085	168,736	609,598	58,124	82,597	18,518	178,304	25,416	362,959	246,639	2,126	19,700	229,066	‡1,601
New Orleans & North Eastern	196	688,288	180,148	926,209	98,982	176,999	29,773	310,007	37,771	653,532	272,678	736*	27,000	244,942	‡26,286
New York, Philadelphia & Norfolk	112	753,773	143,908	963,051	76,763	161,834	12,867	336,871	46,793	635,128	327,923	....	24,860	303,063	‡134,318
New York, Susquehanna & Western	151	519,589	219,498	828,669	110,176	85,555	5,727	290,711	15,710	507,879	320,790	8,901*	29,303	282,586	20,271
Peoria & Eastern	352	634,522	256,128	971,424	130,541	134,160	20,989	360,772	16,947	663,409	311,015	....	32,419	278,596	‡57,469
Pittsburgh & Lake Erie	191	3,826,881	452,973	4,401,318	502,148	375,537	50,225	942,771	87,197	1,958,178	2,446,140	1,133*	70,000	2,375,006	‡919,393
Richmond, Fredericksburg & Potomac	83	318,720	187,471	569,544	67,951	93,181	8,077	209,211	16,843	395,261	174,283	....	800	173,483	37,091
Rutland	468	535,716	431,261	1,072,062	151,527	126,867	25,590	385,514	23,112	712,611	359,451	....	36,107	323,344	27,071
St. Joseph & Grand Island	319	405,583	146,718	599,939	84,472	57,517	20,676	178,792	14,976	356,433	243,506	489	21,038	222,957	‡16,561
St. Louis Merchants' Bridge Term.	9	......	14,131	448,220	72,385	21,684	868	173,050	13,831	281,821	166,399	....	18,633	147,766	‡61,962
Terminal R. R. Ass'n of St. Louis	26		982	796,102	75,581	54,317	1,561	237,388	22,533	391,380	404,722	50,663	86,738	368,647	35,765
Texas Central	268	206,747	145,784	375,949	43,789	54,582	3,844	139,258	14,664	256,137	119,812	....	8,016	111,796	15,053
Trinity & Brazos Valley	455	489,213	57,755	558,216	118,504	93,777	16,965	281,224	10,714	551,184	7,032	....	8,000	968†	49,020
Union R. R. (Pittsburgh)	31	......	......	1,194,191	134,031	157,658	400	342,006	9,835	643,930	550,561	2,459*	14,000	534,102	16,182

*Deficit. †Loss. ‡Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. T. Carson has been appointed Auditor of the Chihuahua & Pacific, with office at Chihuahua, Mex., succeeding Philip Baber, resigned

C. B. Hibbard, formerly General Manager of the Quebec, Montreal & Southern, has been elected Second Vice-President of the Quebec Eastern.

W. F. Every, Chief Clerk in the Claim Department of the Northern Pacific, has been appointed General Claim Agent, succeeding J. F. Newton, resigned.

N. M. Osborne, General Agent of the Norfolk & Western, at Norfolk, Va., has been appointed Resident Assistant to the President, with office at Norfolk, Va.

B. L. Birkholz, Eastern Agent of the El Paso & Southwestern, at New York, has been appointed Assistant to the Secretary. The office of Eastern Agent has been abolished.

C. L. Addison, Vice-President of the New York & Long Island Traction Co. and the Long Island Electric Railway, has been elected President, succeeding F. L. Fuller, resigned. William O. Wood succeeds Mr. Addison as Vice-President and Mr. Fuller as a Director. Alfred A. Gardner has been appointed Counsel, succeeding Van Vechten Veeder, resigned.

J. T. Long has been elected President of the Williamsville, Greenville & St. Louis, succeeding D. H. Glass, elected Treasurer. James W. Van Dolah has been elected First Vice-President; D. N. Holladay, Second Vice-President; C. P. Scrogins, Secretary; W. H. Betts, Comptroller; Harris Kobey, Auditor, succeeding H. H. Rhodes, and James A. Plotner, General Counsel.

W. D. Herring, whose appointment as General Claim Agent of the Houston & Texas Central, the Houston, East & West Texas and the Houston & Shreveport, has been announced in these columns, was born in 1848, at Waco, Tex. He began railway work as personal injury Claim Agent for the Houston & Texas Central in October, 1896. In June, 1903, he was appointed General Claim Agent for the Galveston, Harrisburg & San Antonio and the Texas & New Orleans, which position he held until his recent appointment. Prior to the time Mr. Herring was connected with railway work, he was a clerk in his father's law office, and during that time studied law.

Operating Officers.

W. N. Mitchell has been appointed General Manager of the Williamsville, Greenville & St. Louis, succeeding C. A. Long.

H. P. Greenough, Superintendent of the Chicago, Rock Island & Pacific, at Dalhart, Tex., has been appointed Superintendent at Des Moines, Iowa, succeeding C. W. Jones.

R. Beeth, Chief Train Despatcher of the Atchison, Topeka & Santa Fe at Dodge City, Kan., has been appointed Trainmaster of the El Paso & Southwestern at Tucumcari, N. Mex.

E. M. Graham, Agent of the Norfolk & Western at Norfolk, Va., has been appointed General Agent and Superintendent of Terminals at Norfolk, succeeding N. M. Osborne, transferred to another department. E. O. Parkinson succeeds Mr. Graham

Ernest R. Bissell, Superintendent of the Lake Erie & Western at Muncie, Ind., has been appointed Superintendent of the Peoria division, with office at Lafayette, Ind., succeeding William J. Davis, resigned. J. W. O'Brien, Trainmaster at Lima, Ohio, succeeds Mr. Bissell.

G. C. McNally has been appointed Superintendent of Car Service of the Chicago, Lake Shore & Eastern and the Elgin, Joliet & Eastern, with office at Joliet, Ill. A. M. McClary, Car Accountant, has been assigned to other duties, and his office has been abolished. All reports formerly made to the Car Accountant will be made in the future to the Superintendent of Car Service, who will also have charge of car mileage accounts and settlements with other roads for car mileage.

H. J. Temple. Superintendent of the Cananea, Yaqui River & Pacific, has been appointed Superintendent of the Sonora Railway, with office at Nogales, Sonora, Mex., succeeding A. R. Oster, who will have jurisdiction over the operated lines of the Cananea, Yaqui River & Pacific and Southern Pacific in Mexico, from Empalme south. The line between Zorillo and del Rio has been placed in operation, and the entire line of the Cananea, Yaqui River & Pacific from Lomas Junction to del Rio has become a part of the Cananea division, and will be under the jurisdiction of Mr. Temple.

Arthur Hale is henceforth to devote all his time to the work of the American Railway Association, and he has resigned his position as General Superintendent of Transportation of the Baltimore & Ohio. He will have an office in New York and also one in Chicago. In addition to the duties Mr. Hale has heretofore performed as Chairman of the Committee on Car Efficiency, the Committee on Car Service and the Arbitration Committee, he has recently been representing the Executive Committee of the Association in various matters. His first work in this direction was in connection with the National Conservation Congress in Washington some weeks since. In thus employing Mr. Hale the Association takes the first step—foreshadowed in the special committee report on organization, made last April—in the policy of dealing with the public, and with all questions which immediately affect the public, in a broad, public spirited and impartial manner. And Mr. Hale is eminently fitted for such work. He will be independent of any single railway or group of railways and therefore will be able to deal with the public with all necessary freedom and frankness. He not only has clear conceptions of his work but knows how to clarify other people's ideas concerning railway problems. His reputation for independence of character and as a vigorous worker is already established.

Arthur Hale.

Mr. Hale is the son of Rev. Dr. Edward Everett Hale and was born in 1859. He graduated from Harvard University in 1880, and began railway work in 1882 as apprentice in the Altoona shops of the Pennsylvania. Two years later he became draftsman in the Motive Power department, and in 1885 was made a clerk in the Transportation department at Philadelphia. After two years he was promoted to assistant chief clerk in the Car Record office, and by 1889 had become chief clerk. In 1893 he was made special agent, Transportation department, and in 1898 was made Superintendent of Telegraph. In June, 1901, he left the Pennsylvania to become Assistant General Manager of the Baltimore & Ohio. and a year later was made General Superintendent of Transportation. He has been chairman of the Committee on Car Service of the American Railway Association since 1902, and when the committee on car efficiency was formed about two years ago he was elected chairman of that also.

Traffic Officers.

R. J. Tozer has been appointed Traveling Freight Agent of the Northern Pacific, with office at St. Louis, Mo.

W. L. Jacquith has been appointed Contracting Freight Agent of the Yazoo & Mississippi Valley at Vicksburg, Miss.

Philip A. Hutchins has been appointed General Freight and Passenger Agent of the Chihuahua & Pacific, with office at Chihuahua, Mex.

J. A. Chilton, Traveling Passenger Agent of the New Orleans & Northeastern, the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific, at Dallas, Tex., has been

appointed Traveling Passenger Agent of the Texas & Pacific. Irvin Keller succeeds Mr. Chilton.

A. P. Bryant has been appointed Assistant General Freight Agent of the Minneapolis & St. Louis and the Iowa Central, with office at Peoria, Ill.

R. H. Ingle has been elected a Commissioner of the Montana Demurrage Bureau, succeeding J. D. Mendenhall, resigned on account of ill health.

The jurisdiction of F. C. Lang, Traveling Agent of the Chicago, St. Paul, Minneapolis & Omaha, at Grand Forks, N. Dak., has been extended to include Rainy River, Ont.

The office of Eastern Agent of the El Paso & Southwestern has been abolished and B. L. Birkholtz, heretofore Eastern Agent, has been transferred to another department.

Frank E. Batturs, General Passenger Agent of the Morgan's Louisiana & Texas, has been appointed Assistant General Passenger Agent of the Southern Pacific at San Francisco, Cal., succeeding Paul Shoup, resigned.

J. G. Van Norsdall has been appointed Traveling Passenger Agent of the Pere Marquette at Chicago, succeeding John A. Russell, resigned, and George G. Haight has been appointed Traveling Passenger Agent at Chicago, succeeding John J. Forster, resigned.

E. W. De Hoe has been appointed General Freight and Passenger Agent of the Williamsville, Greenville & St. Louis. H. B. Montgomery, Vice-President, has been given charge of the Land Department and B. F. Funk has been appointed Industrial Agent.

Engineering and Rolling Stock Officers.

O. D. Greenwalt has been appointed Master Mechanic of the Williamsville, Greenville & St. Louis.

James McBrian has been appointed District Car Inspector, Choctaw district, of the Chicago, Rock Island & Pacific, with office at Argenta, Ark.

W. A. Bennett is now Road Foreman of Engines of the Chicago, Burlington & Quincy at Edgemont, S. Dak., with jurisdiction over the line from Alliance, S. Dak., to Deadwood, and over all branches in the Black Hills.

J. F. Bowden, Master Mechanic of the Baltimore & Ohio, at Parkersburg, W. Va., has been appointed Master Mechanic of the Chicago division, with office at Garrett, Ind., succeeding D. Gallaudet, resigned to take service with another road.

Lincoln Bush, whose resignation as Chief Engineer of the Delaware, Lackawanna & Western we have announced, will, on January 1, engage in private practice as Consulting Engineer, with office in the Metropolitan Life building, New York.

D. Gallaudet, Master Mechanic of the Chicago division of the Baltimore & Ohio, has been appointed Master Mechanic of the Grand Junction Terminal of the Denver & Rio Grande, with jurisdiction over the Second district, Second division; also that portion of the Second district of the Third division between Grand Junction, Somerset and Montrose, with office at Grand Junction, Colo.

Purchasing Officers.

V. T. Bartram, Purchasing Agent of the Temiskaming & Northern Ontario, has resigned.

Vandyke Pearson has been appointed Purchasing Agent of the Williamsville, Greenville & St. Louis, succeeding D. S. Newhall.

OBITUARY.

George W. Fletcher, District Freight Agent of the Southern Pacific at San Francisco, Cal., died on December 18.

F. H. Janvier, until six months ago Assistant General Solicitor of the Lehigh Valley, died on December 24 at his home in South Orange, N. J.

Theodore Meyer, Assistant to the Vice-President and General Manager of the Tehuantepec National, died at his home in Mexico City on November 8. He was for many years connected with various industrial enterprises in Mexico.

George W. West, Superintendent of Motive Power of the New York, Ontario & Western, died December 24 at his home in Middletown, N. Y. He was born in 1847 at Troy, N. Y. After a public school education he began railway work in 1865 as machinist on the New York Central & Hudson River at Schenectady, and two years later was made a gang foreman, and by 1873 had become Master Mechanic of the Chenango Valley, now part of the New York Central & Hudson River. A year later he was made Master Mechanic of the Buffalo division of the West Shore. In 1886 he became Master Mechanic of the Mahoning division of the New York, Lake Erie & Western, now the Erie, and a year later was transferred, as Master Mechanic, to the Middle division. In 1888 he was made Master Mechanic of the Eastern division, with office at Jersey City. In 1890 he was appointed Superintendent of Motive Power of the New York, Ontario & Western, the position he held up to his death. Mr. West was prominent and active in the affairs of railway mechanical organizations, and to such an extent that he was well and favorably known in all parts of the country. He was President of the American Railway Master Mechanics' Association in 1894 and contributed much to the advancement and usefulness of the organization. In 1889 he became a member of the New York Railroad Club, was elected an executive member in 1892, and president of the club in 1894 and 1895. For the last seven years he had been chairman of the executive committee. He was re-elected for an eighth term on December 18. During this time he was also a member of the Central Railway Club, of which he was president in 1901 and 1903, and for several years was also a member of the executive committee. All who came in touch with Mr. West knew him as a man to be relied on to the fullest extent. No one ever heard him speak ill of another, as he had the broadest charity for his fellow men.

G. W. West.

Railroad Construction.

New Incorporations, Surveys, Etc.

ALBERTA, MOBILE & PENSACOLA.—Incorporated in Alabama, with $50,000 capital stock, to build from Alberta, Ala., south to Pensacola, Fla. The incorporators include H. C. Bartling, W. J. Lavoery and C. M. Staigen.

ALLEGHENY & NORTHWESTERN.—A charter has been granted this company in Pennsylvania, with $70,000 capital, to build a line from Mars, Pa., to Evans City, in Butler county, seven miles. John G. McPherson is President. David Dillinger, W. E. Heller, J. L. Killip and C. S. Javos, all of Philadelphia, are interested.

ATCHISON, TOPEKA & SANTA FE.—An officer writes that this company will do a reasonable amount of ballast work on the extension between Point Richmond, Cal., and Bakersfield during the present year.

CANADIAN NORTHERN ONTARIO.—Application will be made at the next session of the Canadian Parliament for authority to build lines of railway from Nipigon bay to the National Transcontinental Railway, with branch lines to the northern and southern ends of Lake Nipigon; from Vermilion bay to the point where the National Transcontinental Railway crosses the Abitibi river, and thence to the south end of Lake Temiskaming. Application will also be made for an extension of time for the commencement and completion of several of the company's authorized lines in Ontario as follows: from

Washago to Kincardine; Arnprior to Gananoque; Pembroke to Cobourg; Pickering to Owen Sound; Niagara to Goderich; Port Dover to Owen Sound; Hawkesbury to Toronto; Parry Sound to North Bay; French River to Batchewana, and Toronto to Ottawa.

Canadian Pacific.—Application will be made at the next session of the Canadian Parliament for an extension of the time for building the Ontario, Northern & Western, from Wright, Que., north to Maniwaki, and thence to James Bay; also from a point on the company's main line to Lake Temiskaming and also such branch lines as may be necessary, provided that they do not exceed 30 miles in length, excepting for the purpose of connecting with other railways.

Application will be made at the next session of the Canadian Parliament for an act extending the time for building the Tilsonburg, Lake Erie & Pacific from Ingersoll, Ont., passing through the counties of Oxford, Perth, Waterloo, Wellington, Dufferin, Grey and Simcoe, or any of them, to Collingwood, Ont.

Delaware & Eastern.—An officer writes that no work was done during the past year on the proposed extension to be built under the name of the Schenectady & Margaretville, from Margaretville, N. Y., northeast to Schenectady, 81 miles. (Oct. 2, p. 1075.)

Denver, Northwestern & Pacific.—Press reports from Denver, Colo., indicate that track laying on the line from Yampa to Steamboat Springs, about 27 miles, has been finished, and that this section will be put into operation in the early part of January; also that track laying on the division between Steamboat Springs and the Utah state line, about 145 miles, will be begun as soon as weather conditions permit. (Oct. 16, p. 1176.)

Grand Trunk Pacific.—According to a report from Toronto, Can., a statement showing progress of present condition on the western portion of this line has been issued, according to which steel has been laid for 865 miles, 1,132 miles being under construction, and 609 miles of the main line under survey, as are 130 miles of branch lines. This portion under survey lies chiefly in the mountain section between Wolf Creek and Prince Rupert. Progress on the remaining portion of the prairie section will be considerably hastened by the completion of the big Battle river bridge, which is a steel viaduct 770 ft. long and 184 ft. high, consisting of 54 spans. Work and track laying on the section between Battle river and Edmonton is now proceeding rapidly and it is expected that the line will be completed from Edmundton to Winnipeg in the early part of January.

Holston River Railway.—See Virginia & Southwestern.

Ilwaco Railroad.—See Union Pacific.

Indianapolis, Cloverdale & Terre Haute Traction.—This company has announced that bids will soon be asked for building the first division of the line from Mooresville, Ind., northwest to Roachdale, about 26 miles. E. M. Bauman, Indianapolis, Ind., may be addressed. (June 19, p. 209.)

Kansas, Southern & Gulf.—The following have been elected officers of this company, which was recently sold to Chicago capitalists: President, P. E. Stanley, Chicago; Vice-President, John A. Fletcher, Chicago; General Manager, William C. Ross, Westmoreland, Kan.; Chief Engineer, E. C. Simmons, Westmoreland, Kan. It is officially announced that the reorganized company expects to construct at once an extension of 22 miles from Westmoreland, Kan., to Manhattan, and bonds to the amount of $22,000 were voted by the people of Pottawatomie township, in which Manhattan is located, on December 15. Nearly all the right-of-way has been secured and surveys made. The residents along the route have subscribed for a large part of the first mortgage 5 per cent. bonds issued for construction, and such subscriptions from present indications will be over $200,000. (Dec. 4, p. 1500.)

Kootenay Central.—Application will be made at the next session of the Canadian Parliament for an act extending the time for the completion of the authorized lines from Fort Steele, B. C., to the international boundary, via Elko, and from Fort Steele to Golden, via Windermere.

Marshall & East Texas.—According to reports from Marshall, Tex., residents of that place have been asked by the M. & E. T. to give the railway company a site for its terminal grounds and stations, in the southern portion of the city; also right of way from Marshall to the Panola county line, and right of way south from that point in Panola county; also to grant the company a bonus. As soon as the negotiations are completed work is to be started on the proposed extension south from Marshall. (Dec. 11, p. 1560.)

Minidoka & Southwestern.—See Oregon Short Line.

Northwestern Railroad.—See Union Pacific.

Ohio Roads (Electric).—Surveys are said to be under way on the last link between Grove City, Ohio, and Columbus, for a new interurban line projected from Cincinnati, Ohio, northwest to Columbus, about 125 miles. From Cincinnati north the line is finished to Lebanon, from which place the route passes east through Wilmington to Washington Court House, thence over a private right of way north to Mt. Sterling, thence via Harrisburg and Grove City to Columbus. B. F. Kroger, of Cincinnati, is said to be the principal promoter.

Oregon Railroad & Navigation.—See Union Pacific.

Oregon Short Line.—An officer writes that surveys are now under way for a line of about 120 miles from Twin Falls, Idaho, south to a connection with the Southern Pacific, about 20 miles east of Wells, Nev. Articles of incorporation of the Minidoka & Southwestern have been amended and extended to cover this survey. The survey passes through Hollister. Construction has not yet been authorized. The line, if built, will serve as the western and southern outlet for the agricultural country around Twin Falls, giving that section access to the mining camps of Nevada, as well as a shorter line to the Pacific coast.

Surveys were made some time ago for a line from Rupert, Idaho, northwest to Fuller, but construction has not yet been authorized. The line passes through what is expected to become a very productive section when placed under irrigation.

St. Mary's & Western Ontario.—The Canadian Government has entered into a supplemental agreement regarding the subsidy contract for building a line between Woodstock, Ont., and Exeter, 45 miles. The original contract provided for a subsidy at the rate of $3,200 a mile. The act, in which aid for the building of railways is voted, provides that subsidies may be granted at that rate, where the cost of construction does not exceed $15,000 a mile, and may be increased to $6,400 a mile as cost of construction increases. (Dec. 25, p. 1664.)

Schenectady & Margaretville.—See Delaware & Eastern.

South Omaha & Western.—See Union Pacific.

Texas Roads.—Surveys are being made for a line from Pecos, Tex., southwest to Ballmorhea, about 35 miles, and it is probable that the line will be built at once. It is understood that residents of Pecos and Ballmorhea, associated with M. L. Swernhart, of Chicago, are back of the project.

Texas Roads (Electric).—The construction of a number of interurban electric lines in Texas will be started within the next few months, it is said. Projects are on foot for building several electric lines between Dallas and towns within a radius of 75 miles.

A line is to be built from Fort Worth west to Mineral Wells, about 50 miles. John Scullin, of St. Louis, Mo., and associates are interested.

It is expected that an interurban electric line from Houston, Tex., southeast to Galveston, 50 miles, will be built within the next 18 months. The Stone & Webster interests are understood to be back of this project. The preliminary plans for this line were made some time ago but actual construction has been delayed by the several steam railways which enter Galveston in agreeing to the plans for the proposed causeway across Galveston bay. The construction work on the causeway is to be started soon.

Surveys made for an electric line from Beaumont, Tex., southeast to Port Arthur, about 20 miles. John W. Gates, of New York and Port Arthur, Tex., is said to be back of the project.

Colonel S. W. Fordyce, of St. Louis, Mo., and associates, who own the Rio Grande Railway, which runs from Brownsville, Tex., northeast to Point Isabel, 22 miles, will soon begin the work of electrifying the line for electric traction.

Lon Hill, of Harlingen, Tex., is promoting the building of an electric line from Harlingen, Tex., south to Brownsville. New towns have sprung up along the route and land is being

rapidly divided into small farms and placed under cultivation.

The proposition to build an interurban electric line from San Antonio, Tex., north to New Braunfels, 30 miles, is said to be under consideration by the Stone & Webster interests.

UNION PACIFIC.—The report of this company for the year ended June 30, 1908, shows that the construction of the double-track railway of the South Omaha & Western, from South Omaha, Neb., to Lane, 11.60 miles, was completed during the year. This line shortens the distance between South Omaha and points west of Lane by 8.94 miles. Construction work temporarily suspended during the business depression is progressing on the lines of the following companies or of companies organized in their interest as follows:

Union Pacific.—On the remaining 52.63 miles of the projected line from Hershey, Neb., to Northport, 51.17 miles were graded and ready for track. Grading on the extension of the Topeka & Northwestern branch, from Onaga, Kan., to Marysville, was completed on 13.13 miles, and is in progress on the remaining 19.18 miles.

Northwestern Railroad.—On this line from Blake's Spur, Ore., to Homestead, 58 miles, grading was completed on 28 miles and partly completed on five additional miles.

Oregon Railroad & Navigation.—The line of this company between Lewiston Junction, Wash., and Lewiston, Idaho, 72.30 miles, was completed and open for traffic on July 7, 1908.

Ilwaco Railroad.—An extension from Holmans, Wash., to Meglers, 13.39 miles, was completed and open for traffic on June 1, 1908.

VIRGINIA & SOUTHWESTERN.—Announcement is made that this company will resume work, which was suspended early in 1907, on the Holston River Railway, and which had part of the 38 miles finished at the time of the suspension of work. It is expected to have the line finished and in operation in six months from Persia, in Hawkins county, Tenn., northeast into the coal fields of southwest Virginia. Connection is to be made with the Virginia & Southwestern at Moccasin gap, Va. (R. R. G., May 15, p. 688.)

WISCONSIN CENTRAL.—An officer writes that the extension of this road from Ladysmith, Wis., north to Superior, 108.5 miles, is to be opened for operation January 4.

Railroad Financial News.

BOSTON & MAINE.—Debenture 4½ per cent. 20-year bonds, amounting to $11,700,000, have been sold to William A. Read & Co., New York. It is said that the bonds were sold at about 103.

CHICAGO & NORTH WESTERN.—Directors, it is said, are to vote early in January to issue $10,000,000 new bonds to fund outstanding obligations, amounting to about $8,000,000, maturing in 1909.

CHICAGO TERMINAL TRANSFER.—The minority stockholders' protective committee, George I. Malcom, chairman, representing about 80,000 shares of preferred stock, has sold between 65,000 and 70,000 shares of the preferred stock to a purchaser, understood to be the Baltimore & Ohio. This sale is in accord with the offer made some time ago. (Dec. 4, p. 1501.)

INDIANAPOLIS TRACTION & TERMINAL.—An initial dividend of 1 per cent. has been declared on the $5,000,000 stock. The dividend is payable December 31. The company operates the 136 miles of trolley line of the Indianapolis Street Railway and has completed 11 miles of double-track interurban line.

KANSAS, SOUTHERN & GULF.—This road recently was sold to Chicago parties, including P. E. Stanley and John A. Fletcher. See Railroad Construction.

LITTLE ROCK RAILWAY & ELECTRIC.—A semi-annual dividend of 2½ per cent. has been declared on the $1,500,000 common stock. This increases the annual rate from 4 per cent., paid since June, 1906, to 5 per cent. The company operates about 32 miles of street railway in Little Rock, Ark.

NEW YORK, NEW HAVEN & HARTFORD.—Control of the Tarrytown, White Plains & Mamaroneck is said to have been acquired by the New Haven company. The Tarrytown, White Plains & Mamaroneck, which is in the hands of a receiver, operates a road extending from Tarrytown station, on the New York Central & Hudson River, to Mamaroneck on the sound, and from White Plains station, on the Harlem branch of the New York Central & Hudson River, to Silver Lake Park, a total of a little over 23 miles.

NORFOLK & SOUTHERN.—The receivers have been authorized to issue $1,000,000 one-year 6 per cent. certificates, the proceeds to be used for repairs and maintenance. The certificates are not to be sold for less than 98, and no other issue of certificates to a greater amount than $500,000 is to be placed on a parity with this issue.

NORTHERN SECURITIES CO.—A dividend of 4 per cent. has been declared on the $3,954,000 stock payable January 11. This compares with 5 per cent. paid from January, 1906, to January, 1908, inclusive.

RUTLAND.—No dividend was declared on the preferred stock by the directors at their meeting held on December 23. This stock is a 7 per cent. cumulative preferred, but 4 per cent. annually is the most that has ever been paid on it; since 1906 only 1½ per cent. a year has been paid.

TARRYTOWN, WHITE PLAINS & MAMARONECK.—See New York, New Haven & Hartford.

UNDERGROUND ELECTRIC OF LONDON.—William Barclay Parsons and Colonel Millard Hunsiker have been elected directors.

WESTERN MARYLAND.—The receiver has been authorized to sell $536,000 5 per cent. receivers' equipment certificates, to be dated January 1, 1909.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Wabash-Pittsburgh Terminal Co., reported in the *Railroad Age Gazette* of November 27 and December 25 as being in the market for 12 consolidation locomotives, has ordered these locomotives from the American Locomotive Co.

The Mississippi Central, as reported in the *Railroad Age Gazette* of December 25, has ordered two passenger locomotives from the American Locomotive Co. These will have cylinders 19 in. x 26 in., 69-in. driving wheels, and will be equipped with Otis steel firebox crown sheets, Chicago lubricators and Ohio injectors.

The Harriman Lines, as reported in the *Railroad Age Gazette* of December 11, have ordered two Mallet (2-8-8-2) compound locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight on drivers	390,000 lbs.
Total weight, engine	430,000 "
Cylinders	26 in. and 40 in. x 30 in.
Diameter of drivers	57 in.
Boiler, type	Straight top
Boiler, working steam pressure	200 lbs.
Heating surface, water-heater tubes	1,046 sq. ft.
" " boiler tubes	4,927 "
" " firebox	199 "
" " total	6,172 "
Tubes, number, water-heater, about	400
" number, boiler, about	400
" outside diameter	2¼ in.
" length, water-heater	5 ft. 3 in.
" length, boiler	21 ft
" material	Shelby steel; Nat. Tube Co
Firebox, type	Oil burning
" length	126 in.
" width	78¼ in.
" material and maker	Otis steel
Grate area	68 sq. ft.
Water capacity	9,000 gals
Oil capacity	2,850 gals.
Tractive effort	94,640 lbs.

Special Equipment.

Bell ringer	U. S. Metallic
Brakes	Westinghouse
Brakes, foundation rigging	American Brake Co
Brake-beams	Damascus
Brake-shoes	Am. Brake Shoe & Fdry Co.
Couplers	National Malleable Castings Co.
Headlight	Acetylene Handlan-Buck
Injector	Nathan
Journal bearings	Hewitt
Sanding devices	Am. Locomotive Sander Co.
Sight-feed lubricators	Nathan
Superheater	Baldwin
Valve gear	Walschaerts

CAR BUILDING.

The Escanaba & Lake Superior is in the market for 50 forty-ton flat cars.

The New Mexico Central expects soon to be in the market for a number of mail and passenger cars.

The Toledo, Ann Arbor & Detroit has ordered one all-steel gasolene motor car from the McKeen Motor Car Co.

The Birmingham Southern, reported in the *Railroad Age Gazette* of December 4 as having ordered 175 fifty-ton all-steel hopper bottom coal cars from the Pressed Steel Car Co., has ordered but 160. These cars will weigh 43,000 lbs. and will be 32 ft. 7 in. long and 9 ft. 6 in. wide and 8 ft. 4 in. high, inside measurements, and 35 ft. 1 in. long and 10 ft. 1⅜ in. wide and 10 ft. 8 in. high over all. The bodies and underframes will be of steel. The special equipment includes:

Bolsters, body	Pressed steel diaphragms
Truck	Arch bar
Brakes	Westinghouse
Brake beams	Pressed steel
Couplers	Climax
Draft gear	Westinghouse
Dust guards	Wood
Journal boxes	Kensington
Wheels	Schoen

The Virginian Railway was reported in the *Railroad Age Gazette* of December 18 as having ordered 1,500 fifty-ton all-steel gondola cars from the Pressed Steel Car Co. These cars will weigh 43,800 lbs. and will be 40 ft. long, 9 ft. 4 in. wide and 4 ft. 6 in. high, inside measurements. Cars of this same design were illustrated and described in the *Railroad Age Gazette* June 12, 1908. The special equipment includes:

Axles	Open-hearth steel
Bolsters, body truck	Pressed steel
Brakes	Westinghouse
Brake-beams	I-beams. 14.75 lbs.
Brake-shoes	Streetor
Brasses	Lead lined
Draft gear	Westinghouse friction, Farlow attachments
Dust guards	Wood
Journal boxes	Malleable iron
Side bearings	Malleable iron, chilled cast-iron
Trucks	Arch bar
Wheels	Cast iron, 725 lbs.
Center plate, top	Cast steel
Center plate, bottom	Drop forged

The Virginian Railway, as reported in the *Railroad Age Gazette* of December 25, has ordered eight coaches, four parlor cafe cars, four mail and baggage and two baggage cars from the Barney & Smith Car Co., for delivery within 90 days. These cars will be 61 ft. long over end sills. The special equipment includes:

Brakes	Westinghouse quick action
Couplers	Tower
Curtain material	Pantasote
Draft gear	Westinghouse
Dust guards	Wood
Heating system	Direct steam
Journal boxes	Malleable iron
Lighting system	Oil lamps
Paint	Virginian Ry. standard
Seats	Pressed steel underframes
Seat covering	Pantasote
Side bearings	Malleable iron, Wood's rollers
Trucks	4-wheel
Vestibules	Wide, with steel trap doors
Vestibule diaphragms	Canvas
Wheels	Rolled steel
Window fixtures	National

IRON AND STEEL.

The Canadian Pacific is said to have given a contract to the Algoma Steel Co. for 20,000 tons of rails.

The Pittsburgh & Lake Erie will soon place a contract for 10,000 tons of rails for delivery early in 1909.

The Philadelphia & Reading has placed an additional order for 15,000 tons of rails with the Pennsylvania Steel Co.

Rail Production in 1908.

Railway construction during 1908 is estimated to have been but little under 3,215 miles, calling for between 500,000 and 600,000 tons of steel rails, a very small tonnage. Renewals alone under normal conditions call for about 1,000,000 tons. This year replacements have been kept down to the minimum. The year began with many suspended rail orders, the held over contracts aggregating about 700,000 tons. New contracts have been very meagre throughout the year, so that probably the entire rolling of all mills has not been over 1,500,000 tons; but recently orders for about 250,000 tons have been placed for 1909 delivery, and probably as much more is under negotiation, and it is hoped that some of these contracts will be placed this week.—*Journal of Commerce.*

RAILROAD STRUCTURES.

ERWIN, TENN.—The Carolina, Clinchfield & Ohio has given contract to J. P. Pettyjohn & Co., Lynchburg, Va., for the shops to be built here.

HAMMOND, IND.—The Chicago, Indianapolis & Louisville has contracted for a bridge over the Grand Calumet river at Hammond. The bridge is to have one 108-ft. single leaf bascule span, Page type, with a 40-ft. girder approach, and one 108-ft. through truss span, so designed that it can be converted into a bascule span when required. The bridge is to be wider than the ordinary single-track bridge, as it is intended to lay a gauntlet track over the structure. Both spans rest upon a pier in the center of the river. The piers are built of concrete. The American Bridge Co. has the contract for the superstructure, the Ferro Construction Co. for the erection, and the Great Lake Dredge & Dock Co. for the substructure. W. H. Hughes, Chicago, is the Designing Engineer and Robert W. Hunt & Co., Chicago, are the Consulting Engineers.

HILLYARD, WASH.—The Great Northern has plans ready for enlarging its shops at Hillyard, at a cost of about $200,000. The machine shop is to be changed from a seven-pit to a 20-pit shop, giving increased facilities for repairing locomotives. The floor space of the coach shop is to be doubled and several stalls will be added to the roundhouse.

HUNTINGTON, TEX.—The Texas & New Orleans has bought a ten-acre tract of land as a site for a roundhouse, machine shop and additional track facilities. Work will be commenced soon.

MARSHALL, TEX.—See Marshall & East Texas under Railroad Construction.

RENOVO, PA.—The division officers of the Pennsylvania Railroad have made an estimate of cost of building a boiler shop at this place, but this work has not yet been authorized.

ST. PAUL, MINN.—The St. Paul Bridge & Terminal Railway, as reported in our issue of December 4, has given the contract for the superstructure of a bridge across the Mississippi river, including 950 tons of steel, to the American Bridge Co. The approaches and the substructure will be built by W. J. Hoy, of St. Paul. The bridge will consist of a 450-ft. draw span, having a clear opening of 180 ft. on each side of the central pier with a 190-ft. fixed span and a short girder span on each side. The approaches will be pile and lumber trestles. The piers will be concrete construction on a pile foundation. The work will necessitate the use of 950 tons of steel and the construction of 1,500 cu. yds. of concrete and 12,000 lineal ft. of piling. The plans for the main structure were made by L. P. Wolff, Consulting Engineer, St. Paul, and construction will be supervised by Alfred Jackson, Chief Engineer of the Terminal Railway.

SEATTLE, WASH.—Press reports indicate that the Union Pacific has given a contract to Chase Bros. for building the Georgetown viaduct. The cost of this structure is said to be about $20,000.

TACOMA, WASH.—Local reports indicate that a contract has just been given to Hudson & Rydstrom, of Tacoma, for building the Union Pacific tunnel in Tacoma. The bid is said to have been $800,000.

It is reported in Tacoma that Cornell Bros., of that city, have been awarded contract for the local warehouse of the Great Northern. (Dec. 18, p. 1612.)

WENACHTEE, WASH.—Local reports indicate that the Great Northern will enlarge its yards.

Concrete Telegraph Poles on the Pennsylvania.

Concrete Telegraph Pole.

The Pennsylvania Lines West have just completed and placed in experimental service a number of concrete telegraph poles through New Brighton, Pa. This construction followed a series of experiments which have been carried on during the past two years. In 1906 concrete poles, as a substitute for wood, were first tested. Fifty-three reinforced concrete poles were placed in line on the Pittsburgh, Fort Wayne & Chicago near Maples, Ind. One year later these were giving entire satisfaction and showed no evidences of disintegration. Much importance is also attached to the increased strength of these poles, which are said to hold the strain of the line, even on curves, without any bracing. The poles at New Brighton are about 30 ft. long, 14 in. in diameter at the base and 6 in. at the top. The accompanying illustration shows the general appearance of one of these concrete telegraph poles.

SIGNALING.

The Chicago, Rock Island & Gulf has recently completed and turned over to the Missouri, Kansas & Texas for operation a 28-lever interlocking plant at Carrollton, Tex. This is a mechanical plant, Saxby & Farmer machine with 23 working levers. It is at the crossing of the C., R. I. & G., the M., K. & T., and the St. Louis South Western.

The St. Louis & San Francisco signaling, to be put in by the Union Switch & Signal Company, includes 700 miles of single track and 25 miles of double track. The sections to be covered are the Eastern division from St. Louis to Monett, Mo.; the Northern division from Kansas City, Mo., to Springfield, Mo.; the Ozark division from Springfield, Mo., to Thayer, Mo., and the Southeastern division from Amory, Miss., to Birmingham, Ala. The signals are to be located so as to make the blocks approximately two miles long. It will require 1,200 signals. On the double track the "wireless" system is to be used. The signals are to be of electric motor, three position normal clear, and are to give the indications in the upper right-hand quadrant. The night indications are to be red for stop; yellow for distant, and green for proceed. The lamps are to have long-time burners. Gravity battery is to be used for track circuits and a caustic soda primary battery will provide the motive power for the signals. The Signal Company expects to have the signals in operation by January 1, 1910.

The Stiegelmeyer Automatic Train Stop.

This device, made by the Stiegelmeyer Automatic Train Control Company, 1028 Nelson street, Indianapolis, was tested on the Cleveland, Cincinnati, Chicago & St. Louis near Beech Grove, 12 miles southeast of Indianapolis, on December 16. About 100 railway men were present. The tests were made with a locomotive and five coaches. Two were made at a speed of 40 miles an hour and one at 12 miles an hour. In each of the tests at the higher rate of speed the train was brought to a stop within a little less than 800 ft., while at the lower rate the stop was effected within 100 ft. In this device a revolving disk is attached beneath the engine and connected with the air line. The disk comes in contact with a third T rail 30 ft. long on the outside of the track. The T rail is put in position by the signalman so that it will impinge on the revolving disk and thereby open an air valve on the train and set the brakes; also it shuts off the steam. H. F. Houghton, a member of the American Railway Association Committee on Safety Appliances, was present, as was also Alexander Shane, chief inspector for the Indiana State Railroad Commission.

Supply Trade News.

The Westinghouse Air Brake Co., Pittsburgh, Pa., expects to resume work on full time at its Wilmerding plant at the beginning of the year.

The General Railway Supply Co., Chicago, will move its offices on January 1, from the ninth floor of the Marquette building to room 531 of the same building, where larger quarters have been secured.

The Commercial Dump Car Co., Chicago, has been incorporated with $100,000 capital by George W. Holmes, S. L. Page, Jesse B. Hawkins, Backburn Esterline and Edward W. Everett, all of Chicago.

J. S. Coffin, who has been for a number of years in the mechanical department of the Galena Signal Oil Co., Franklin, Pa., has been elected Vice-President of the American Brake Shoe & Foundry Co., Mahwah, N. J., effective January 1, with office at New York.

W. White, President of the National Boiler Washing Co., Chicago, who sailed on November 25 for England and the continent in connection with business relating to boiler washing systems, returned to Chicago on December 27. He reports a pleasant and successful trip.

The Parkesburg Iron Company, Parkesburg, Pa., have placed a contract for the immediate erection of a steel building 85 ft. x 150 ft. as an addition to its tube mill. This new building will be at the finishing end of the mill, and will be served throughout by a traveling crane.

The Acme White Lead & Color Works, Detroit, Mich., has increased its capital stock from $1,250,000 to $2,000,000. This was made necessary by the steady growth of the company and to provide capital for the further development of the new white lead corroding department.

The Whiting Foundry Equipment Co., Harvey, Ill., has supplied the wheel pits, pitting trolleys, electric puller machines, transfer car for core oven, floor cranes, reservoir ladles and teapot spout wheel pouring ladles for the new St. Louis, Mo., plant of the American Car & Foundry Co.

Frank C. Osborn, President of the Osborn Engineering Co., Consulting Engineers, Cleveland, Ohio, was recently appointed one of the Commissioners of the Cuyahoga County Court House Commission, which has charge of building the new county court house and other county buildings.

The Ritter Folding Door Co., Cincinnati, Ohio, has been awarded the contract for equipping the shops of the Carolina, Clinchfield & Ohio at Erwin, Tenn., with Ritter folding doors, constructed of wood and glass. The contractors for these shops are John P. Pettyjohn & Co., Lynchburg, Va.

The American Blower Co., Detroit, Mich., gave each of its employees this Christmas one dollar and one additional dollar for each year of continuous employment. This was the same distribution that was made two years ago. Last year, owing to the business depression, nothing of this nature was done.

The Chicago, Indianapolis & Louisville has contracted with the American Bridge Co. for the erection of a new bridge across the Grand Calumet river, Hammond, Ind. Robert W. Hunt & Co., Chicago, are the Consulting Engineers for the railway. More complete details regarding this work may be found under Hammond, Ind., in Railroad Structures.

William B. Dickson, Second Vice-President of the United States Steel Corporation, has been elected First Vice-President, succeeding James Gayley, who resigned several weeks ago to look after his private business affairs. David G. Kerr, of Pittsburgh, Pa., who has been largely identified with the

raw material department of the Steel Corporation, succeeds Mr. Dickson.

The Whiting Foundry Equipment Co., Harvey, Ill., has appointed the United Steel & Equipment Co., Seattle, Wash., its representative for Vancouver, B. C., Portland, Ore., and the state of Washington. It has also appointed Gorman, Clancey & Grindley, Ltd., Calgary, Alb., its representatives for Alberta and the southeastern corner of British Columbia. These agencies will have charge in their respective territories of the sale of the electric traveling and other types of cranes, foundry equipment, cupola furnaces, air hoists and steel and malleable foundry equipment made by the Whiting company.

The fifth annual convention of the National Association of Cement Users will be held at Cleveland, Ohio, on January 11-16. Among the papers to be read that will be of interest to railway men are the following: "Cost of Reinforced Construction as Applied to Bridges," by E. H. Guimby, Engineer of Bridges, Philadelphia, Pa., and E. P. Goodrich, Consulting Engineer, New York City; "Advantages of Reinforced Concrete for Railroad Construction," by B. H. Davis, Assistant Engineer D., L. & W., Hoboken, N. J.; also a paper on "Cost of Concrete Telegraph Poles."

The American Automatic Stoker Co., which has recently been organized to manufacture a new type of automatic stoker, has arranged to open offices in Chicago and New York. John J. Hannahan, heretofore Grand Master of the Brotherhood of Locomotive Firemen and Engineers, has resigned, effective January 1, to become First Vice-President of the new company, in charge of the Chicago office. The building of a new plant is under consideration. D. W. Ross, T. P. Shonts and Edwin Hawley are interested.

Lincoln Bush, heretofore Chief Engineer of the Delaware, Lackawanna & Western, has resigned to engage in private practice, January 1, as Consulting Engineer, with office at 1 Madison avenue, New York. He expects to devote a part of his time to the development of the Bush train shed. This train shed is now in use in the Lackawanna's stations at Hoboken, N. J., and Scranton, Pa., and Mr. Bush has recently closed a contract for its use in the new Chicago & North Western passenger terminal at Chicago. He has also been made Consulting Engineer of the Bradley, Gafney, Steers Co., a new contracting firm composed of well-known New York contractors. The office of this company will also be at 1 Madison avenue. Mr. Bush was born in 1861 in Illinois. He graduated from the University of Illinois in 1888, having taken the civil engineering course. He received the degree of Doctor of Engineering from this university in 1904. He began railway service in 1888 as assistant engineer of maintenance of way on the Wyoming division of the Union Pacific. A year later he was made assistant engineer on location of the Pacific Short Line at Ogden, Utah. For a few months in 1890 he was an assistant instructor at the University of Illinois, and then went with E. L. Corthell as assistant engineer on bridge work at Chicago. At the end of 1891 he went to the Pittsburgh Bridge Company as chief draftsman at its Chicago office. Five years later he went to the bridge department of the Chicago Drainage Canal, but after a few months resumed railway work as assistant to the Bridge Engineer of the Chicago & North-Western at Chicago. Three years later he was made Acting Division Engineer of the same road at Boone, Iowa, and at the end of 1899 went to the Delaware, Lackawanna & Western as Bridge Engineer. He was made Principal Assistant Engineer of this road in 1900 and Chief Engineer in 1903.

Lincoln Bush.

TRADE PUBLICATIONS.

Air Compressors.—Catalogue No. 100, issued by the Thos. H. Dallett Co., Philadelphia, Pa., partially illustrates and describes the air compressing machinery which it manufactures. It has 24 pages, 6 in. x 9 in.

Side Crank Engine.—Bulletin No. 20, issued by the Ridgway Dynamo & Engine Co., Ridgway, Pa., illustrates and describes the Ridgway single-valve side-crank engine. A general description of this engine appeared in the *Railroad Age Gazette* of December 4.

Brill's Magazine.—The issue for December 15 of this periodical, published by the J. G. Brill Co., Philadelphia, Pa., contains a number of articles regarding cars recently built for various street and interurban railways. This issue also contains the index of Volume II.

Ruberoid.—The December issue of *The Exchange*, published by the Standard Paint Co., New York, shows, on its outside cover, a half-tone illustration of the Greek Temple on Young's Million Dollar Pier at Atlantic City, N. J., which building is covered with Ruberoid roofing.

Thermit.—The issue of *Reactions*, published by the Goldschmidt Thermit Co., New York, for the fourth quarter of 1908, contains an article entitled "Welding Mud Rings on Locomotives," also an article entitled "The Use of Thermit Steel," which deals with thermit as used in welding massive machinery.

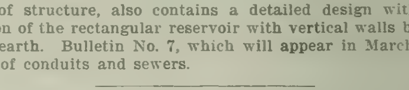
Switch Point Lock.—A 36-page note book being distributed by the W. K. Kenly Co., Chicago, has two pages in the middle of the publication suggesting the use of the Latimer switch point lock for safety. The book is bound in brown suede and the paper is of good quality bond. This lock was described in the *Railroad Age Gazette* of December 25.

Metal Protective Paint.—A descriptive catalogue issued by the Arkon Carbon Co., First National Bank building, Chicago, sets forth the qualities to be found in Arkon carbon paint for the protection of metal. The publication is accompanied by a fac-simile letter from Robert W. Hunt & Co., who made a series of severe tests of this paint and found it suitable as a protective coating for metal.

Reinforced Concrete.—The December issue of Designing Methods of Reinforced Concrete Construction, published by the Corrugated Bar Co., St. Louis, formerly the Expanded Metal & Corrugated Bar Co., treats of the special problems met in the design of reservoirs, with some remarks on this type of structure, also contains a detailed design with discussion of the rectangular reservoir with vertical walls backed with earth. Bulletin No. 7, which will appear in March, will treat of conduits and sewers.

Stayin Drill Socket.

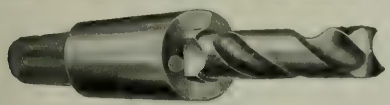
The accompanying cuts show two applications of the Stayin drill socket, made in various sizes by the G. R. Lang Co., Meadville, Pa. This drill socket holds drills with or without tangs, just as other sockets made for this purpose. The particular advantage claimed for it, however, is that the socket will stay in the drill press spindle. This is assured by making a groove in the shank of the socket to fit the round key in the drill press spindle. This groove is not shown in the accompanying cuts, but the key is applied to the spindle of the drill press just as the drill proper is keyed to the socket as shown herewith. To do this a drilling jig is used, which is loaned by the makers to their customers.



Lang Socket With New Drill.

On old drills, whose tangs have been broken, a flat is ground instead of a groove. The drift slot in the socket is made extra long,

so that the drill can be easily knocked out with the drift. Unbroken drills have a V groove milled in the shank, as shown. This takes a few minutes longer than grinding a flat, but it insures a good bearing the whole length of the key. The hardened steel keys are pressed in the sockets, truly parallel with the bore and central with the tang slot. The key projects into the interior of the socket only one-third

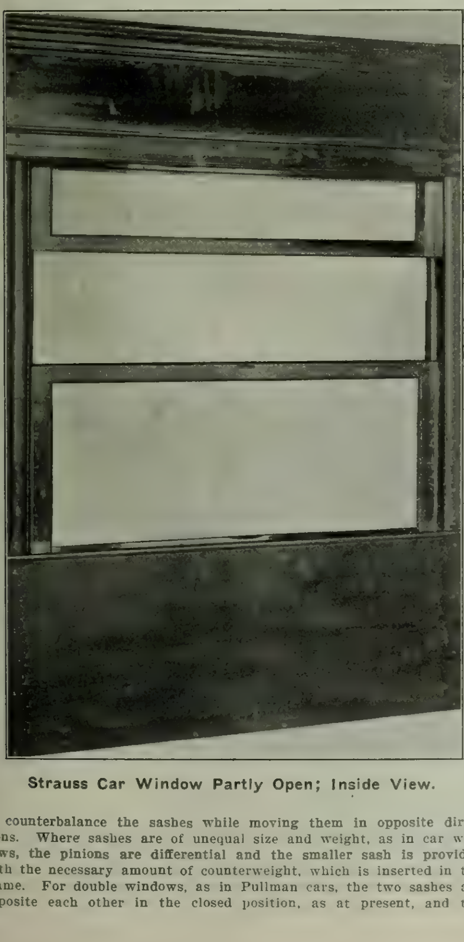


Lang Socket With Old Drill.

of its diameter. The walls of the sockets are made larger than standard sockets, so that they are not weakened by the insertion of the key; otherwise the sockets are standard, so that any combination can be made just as with ordinary drill sockets.

New Type of Window for Cars and Buildings.

The Board of Supervising Engineers, of the Chicago traction systems, is considering a new type of window, called the self-balancing, which is quite a novel and ingenious departure from present practice. The construction and operation of the device are illustrated by the accompanying drawing and photograph. Each sash is provided with a pair of vertical racks. The racks of the upper and lower sash on each side mesh with a pinion supported in the window frame. This pinion transmits the load and motion of one rack to the other so as



Strauss Car Window Partly Open; Inside View.

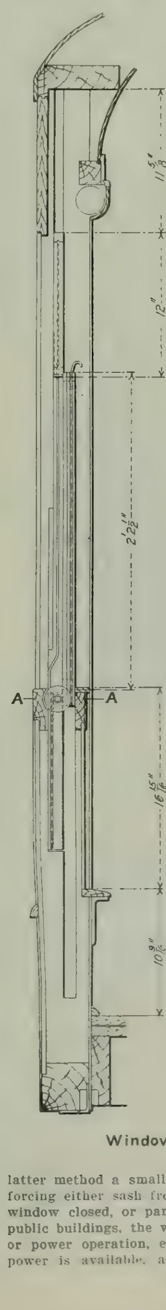
to counterbalance the sashes while moving them in opposite directions. Where sashes are of unequal size and weight, as in car windows, the pinions are differential and the smaller sash is provided with the necessary amount of counterweight, which is inserted in the frame. For double windows, as in Pullman cars, the two sashes are opposite each other in the closed position, as at present, and the opening and closing of the inner sash simultaneously opens and closes the outer one. The receding sashes disappear in enclosures or pockets above and below the window, so that when the window is fully open the whole area of the frame is available for ventilation.

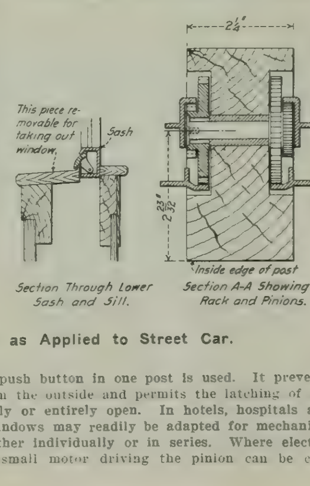
To prevent rain and moisture from finding their way into the lower pocket when the window is closed, the lower sash is provided with a water shedding device which is shown in detail in the drawings. This device consists of a metal piece which drops over a lip on the window frame when the sash is closed and is drawn down with it as it is lowered. It acts automatically by its own weight and has no springs. Springs are also absent from the sash guides, which are sealed by the metal racks. There is no latch on the car window, but merely a central handle, the idea being to eliminate all locking and unlocking devices and make one and the same operation sufficient either to fully close or fully open the window. If desired, all the windows on one side of the car can be controlled from the platform.

The advantages of the window in car service are summed up as follows:

1. It opens and closes instantly with slight exertion.
2. It is opened and closed fully or in part at one operation.
3. It opens the full height of the frame, or a fraction of the same, at will.
4. It stops instantly at any point of opening and remains there.
5. When partly open, the aperture is above the passenger's head, so that draft, smoke and dust do not strike him.
6. It cannot rattle or shake loose or drop accidentally.
7. It cannot bind or stick.
8. It is air-tight, and dust and waterproof.
9. It cannot be injured by rough usage and requires no maintenance or repairs.
10. It makes unnecessary open summer and convertible cars, since with the window is applicable to every variety of tained together with the additional advantage due to instant closing.

The principle embodied in this car window is applicable to every variety of window. In buildings, for example, the space below the window sill on each floor forms the pocket for the lower sash of the window on that floor and the upper sash of the window on the floor below. The usual construction of lintels permits this; but where this cannot be done the sashes are so designed as to move entirely within the limits of the floor height. The window is locked at the meeting sashes or at a point below the lower sill. For the latter method a small push button in one post is used. It prevents forcing either sash from the outside and permits the latching of the window closed, or partly or entirely open. In hotels, hospitals and public buildings, the windows may readily be adapted for mechanical or power operation, either individually or in series. Where electric power is available, a small motor driving the pinion can be con-





Section Through Lower Sash and Sill.

Section A-A Showing Rack and Pinions.

Window as Applied to Street Car.

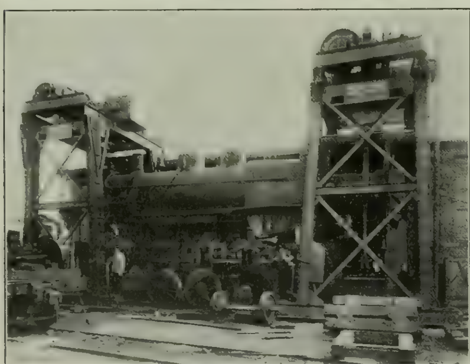
trolled from a switch, enabling an invalid, for instance, to open or close the window without leaving his bed. In buildings having automatic temperature regulators, the operation of the windows in each room can be controlled by these regulators if desired.

This window is also considered to be well adapted for storm sashes and screens. The pockets can be designed to house jointly the regular window sash, the storm sash and the screen, the last two remaining in the pockets out of season, and being brought into use only when needed. In this form the storm sashes could be provided with wire glasses and used for both fire and burglar protection.

The cost of windows of this type compares favorably with that of present types. Vertically moving doors and shutters for freight houses, roundhouses, warehouses, shops, etc., are also included in the application of this principle. The patents are owned and the devices are being put on the market by the Strauss Self Balancing Window Co., Fort Dearborn building, Chicago.

Whiting Electric Gantry Cranes for the Great Northern.

The photograph reproduced herewith shows two electric gantry cranes furnished the Great Northern Ry. by the Whiting Foundry Equipment Co., Harvey, Ill. The crane is a one-motor type, the capacity being 100 tons. The power is both hand and electric. The span, center to center of runway rails, is 14 ft. 6 in.; clearance inside of legs, 13 ft.; height from top of rail to under side of girder, 20 ft.; distance between hook centers, 11 ft.; lift (travel of hook), 14 ft. 6 in. The bottom member of the frame has bearings to which are fitted double-flanged cast iron wheels. The load is lifted by means of steel wire rope winding on hoisting drums, all of the hoisting gearing being supported on the bridge girders by means of



Whiting Electric Gantry Cranes Handling a Locomotive.

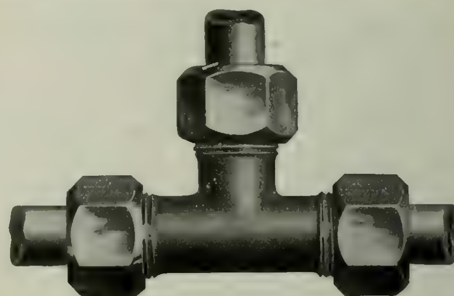
structural steel framing. The drums are designed to insure an equal distribution of the load upon the girders. The hoisting motor is comparatively small, as only slow speeds are required. The motor is fitted with the builders' automatic electric brake. This brake is operated by a solenoid in circuit with the motor so arranged that it acts automatically when the current is cut off from the motor. All parts are easily accessible for oiling and repairs. A factor of safety of five was used in designing the cranes. Six of them were sold to the Great Northern. As the photograph shows, they are especially adapted for lifting and unwheeling locomotives.

Union-Cinch Pipe Fittings.

The Union-Cinch pipe fittings illustrated herewith are designed for use with small piping to enable neat, mechanical looking jobs to be made, and to prevent the difficulties encountered with the usual threaded pipe and tapped fittings. The joint is made by screwing down the outside nut, which presses a thin tapered shell into the annular cavity between the pipe and the fitting, as shown in the sectional view. The nut may be pulled up hard, causing the soft cone shell to make a perfectly tight joint around the tubing that will stand any pressure the tubing will stand.

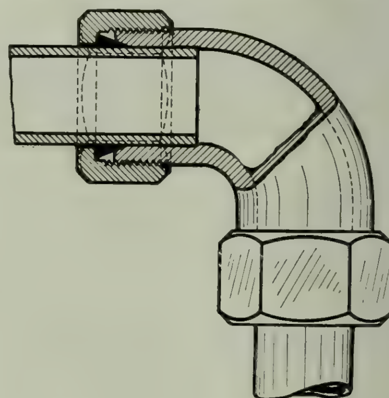
These fittings are made in sizes corresponding to standard iron pipe up to 1 in. Ordinary rough pipe may be used with them if the ends of the pipe are filed round and smooth, but the maker of the fittings is prepared to furnish smooth drawn steel tubing corresponding to iron pipe sizes on the outside diameter. This tubing has a 16 gage wall in the ¾-in. and 1 in. size, and an 18 gage wall in smaller sizes, and has, therefore, a very much larger carrying capacity than ordinary pipe. This steel tubing is cheap, is thoroughly annealed and readily bent. A hack-saw and monkey wrench are all the tools that are needed, except where special work has to be done, in which case a bending rig of some sort is convenient. Each fitting is a union, and the piping may be taken down at any point where a fitting is inserted.

Where a nice looking job is desired, brass pipe may be used; although where nickel-plating is done, the steel tubing will nickel-



Union-Cinch Tee.

plate just as nicely as brass pipe and is much cheaper. These joints may be taken down and made up again any number of times without trouble. They are recommended by the maker, the Sight Feed Oil Pump Co., Milwaukee, Wis., for oil pump piping, gravity oiling devices, gages, drop pipes, etc., and particularly around ammonia



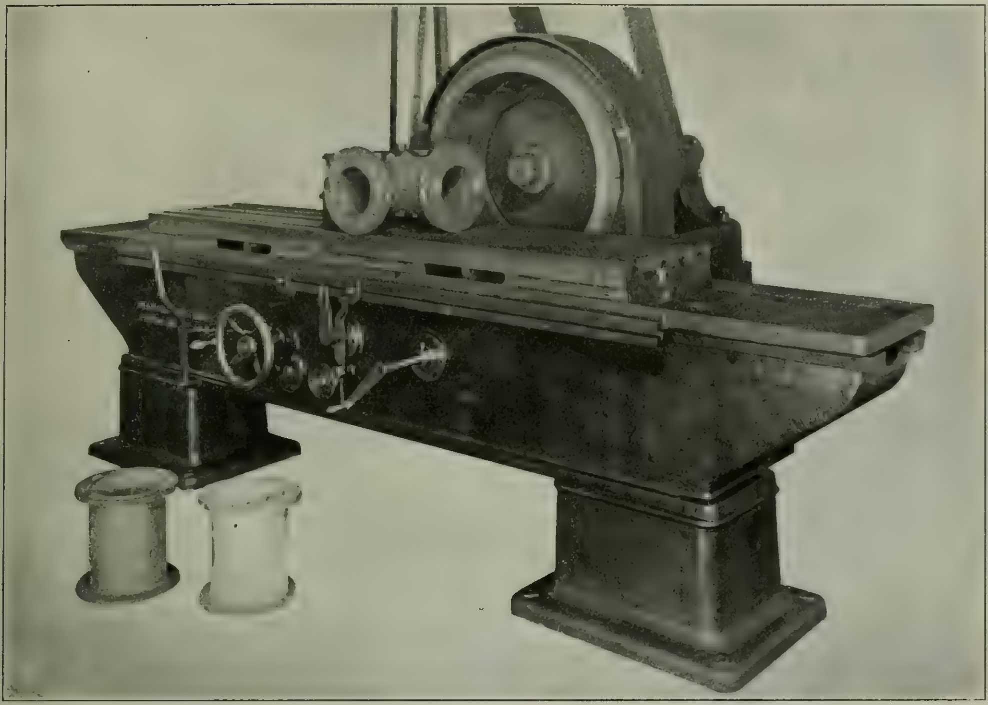
Sectional View of Union-Cinch Elbow.

handling machinery, the steel tubing and steel fittings being considered especially desirable because of the readiness with which they may be made tight against the escape of ammonia gas.

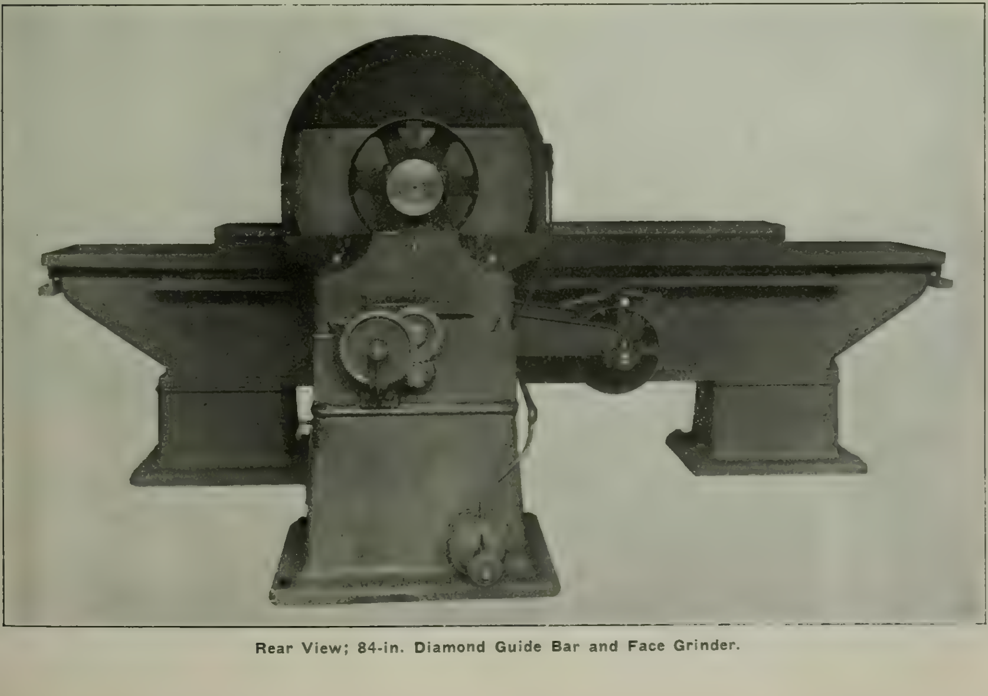
Guide Bar and General Face Grinder.

The Diamond Machine Co., Providence, R. I., has put on the market a large face grinder for general railway shop use. The machine is especially designed for grinding locomotive guide bars. It has also proved efficient in working on grinder columns, water meter cases, water pipe flanges, lathe legs and floor plates.

This machine has a number of advantages which give it special merit. Its operation is not hindered by hard iron or any other material. The work need not be as rigidly fastened as on a planer or milling machine. The movements of the mechanism are much the same as those of other machines doing this class of work. The wheel grinds cast iron with suitable speed. The emery ring is held in a steel-bound adjustable chuck, as machines of this nature require that the wheel should not run unsupported. The bearings are of ample size, made with babbitt, ring oiling, well protected from dust with the end thrust taken by a ball thrust bearing. The longitudinal table feed is obtained by open and cross belts which are connected to a rack and heavy gearing. Automatic reversing mechanism is provided for any length of stroke and is shifted by adjustable dogs. When hand feed is desired, a clutch is thrown in mesh with the hand wheel shown in the illustration. The cross feed may be either hand



84-in. Diamond Guide Bar and Face Grinder.



Rear View; 84-in. Diamond Guide Bar and Face Grinder.

or automatic, and is capable of fine adjustment. All machines are supplied with automatic pumps with the necessary adjustments for wet grinding.

The machines have been built in 84-in. and 114-in. lengths for belt or motor drive. Longer machines can be made if desired. The following dimensions apply to the 84 in. machine, which is shown herewith:

Length of bed	134 in.
Length of table	130 "
Width of table	19½ "
Length of platen (four 13/16 in. slots)	84 "
Width of platen	17½ "
Table travel per min., in lin. ft.	20
Total length, including table travel	18 ft. 4 in.
Total floor space required	7 ft. x 18 ft. 4 in.
Wheel diameter	30 in.
Wheel revolution per min.	350 to 700
Wheel spindle	3½ in.
Wheel spindle bearing	3½ in. x 10 in.
Weight, complete with countershafts	about 8,000 lbs.
Weight, with motor drive	about 10,000 lbs.

Armorclad Headlight.

The Star Headlight Co., Rochester, N. Y., is putting out a new all-steel headlight, shown in the accompanying cut. The claims for it include perfect ventilation, absolute focus, strength and rigidity of the case, and, particularly, careful workmanship on the case and reflector. It is made in two sizes, 16 in. and 18 in., the smaller weighing net 70 lbs. and the larger 80 lbs. The case is of No. 20-22 gage, pickled, cold rolled and reannealed, open hearth steel. The base of the case is of No. 14 gage steel, with the sides bent at two angles; this does away with riveting on angle irons.

The oil vessel is a "one piece" oil pot, the bottom and back being made of a single piece, while the rest is double seamed throughout. This oil pot has only two holes in it, one at the filler cap and the other where the oil enters the burner. The oil pot support is of

Star Armorclad Headlight.

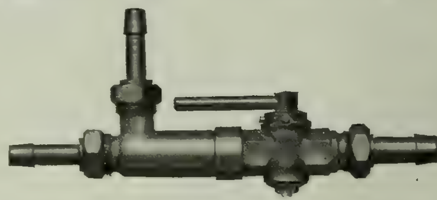
malleable iron. It is fastened with lock and wing nut and can be easily removed from the oil pot.

The burner is the Star Wilder patent stuffing box and brass oil pot connection. This is the same style as the regular Williams burner, with the exception of the Star patented arrangements. The reflector is made of aluminum or cold rolled and annealed lake copper, triple plated with silver. The box stand supporting the reflector can be raised or lowered so as to change the focus of the reflector if so desired.

A feature of the side number glass fastening is the device for holding the glass so that it can be removed from the outside. These glasses are 6½ x 10½ in. for either size of headlight. The goggle is held with the Wilder patent glass fastener. In this fastening no plaster of Paris is used, and the glass can be easily removed; also, allowance is made for expansion of the glass as it becomes heated.

Railway Vacuum Machine.

The accompanying illustration shows a device and method of its connection for use in cleaning railway coaches. It was designed to avoid the necessity for installing a special vacuum plant in car-cleaning yards. No special plant is required where this device is used, as sufficient air can be obtained from any ordinary line carrying compressed air, or it may even be connected to the air line of a locomotive. As seen in the accompanying cut, there are three connections, the top one being for the ¾-in. air supply hose. To the horizontal connection at the left is attached about 30 ft. of suction hose, on the end of which the sweeper is attached. The right hand end takes the exhaust line, about 6 ft. of 1-in. hose. The illustration of a car platform



Showing Method of Hose Connections.

shows these connections, and also the dust leaving the exhaust hose. By this arrangement it is not necessary to carry the heavier part of the apparatus about the car, but rather place it on the platform. A bag or vessel may be used to receive the sweepings or they may be allowed to blow into the air, as seen in the illustration.

The action within the device itself is the same as that of an injector. The air passes from the top out through the right hand end, causing a vacuum at the left hand end, to which is attached the suction hose and the sweeper. It is often necessary in cleaning a car to have a blast of air at the sweeper to blow dust out of corners, from behind piping, etc., and this condition is provided for through a cut-off valve placed between the intake and exhaust connections.

National Vacuum Car Cleaner.

By closing this valve, the air passes out through the suction instead of the exhaust end. After the dust is blown from the corners, it is then taken up by the suction, a simple opening of the cut-off valve being necessary.

The cost in air to operate this device is said to be about three cents per hour. A test showed that at 20 lbs. air pressure there were 9 1/5 cu. ft. of air used per minute; at 50 lbs. pressure, 17½ lbs. of air per minute and at 80 lbs. pressure, 25 lbs. of air per minute. These amounts are said to be about 20 per cent. less than that required for other devices made for this purpose. The National Vacuum Co., New York, maker of this device, also makes a portable one for house use, which may be used for car cleaning where electric power is available.

ELEVENTH ANNUAL REPORT OF THE UNION PACIFIC RAILROAD COMPANY.

Income for the Year.

The gross receipts and disbursements of the Union Pacific Railroad and Auxiliary Companies, after excluding all offsetting accounts between them, were as follows:

		1908.	1907.
Average miles of rail line operated during the year		5,781.41	5,644.55
TRANSPORTATION OPERATIONS.			
Gross operating revenues		$74,422,776.81	$74,656,152.11
Outside operations—revenues		1,616,448.10	1,652,446.39
Total revenue		$76,039,224.91	$76,308,598.50
Operating expenses		$40,177,515.62	$38,628,099.72
Outside operations—expenses		1,516,519.67	1,520,478.51
Taxes (rail lines and property dealt with as outside operations)		2,444,725.87	2,076,945.17
Total expenses and taxes		$44,138,761.16	$42,225,523.40
Revenue over expenses and taxes		$31,900,463.75	$34,083,075.10
Fixed Charges.			
Interest on funded debt outstanding in the hands of the public		$11,245,899.39	$8,640,608.34
Sinking fund, Utah & Northern Ry. Co. Consolidated Mortgage		12,013.33	12,013.33
Hire of equipment—Balance		1,487,123.40	1,357,780.80
Total		$12,745,036.12	$10,010,402.47
Less—Rentals for lease of road, for joint tracks, yards and other facilities, viz.:			
Collections	$671,106.22		
Payments	126,825.63		
		544,280.59	634,117.49
		$12,200,755.53	$9,376,284.98
Surplus after payment of fixed charges		$19,699,708.22	$24,706,790.12
Application of Surplus.			
Dividends on stocks of Union Pacific Railroad Co.:			
4 per cent. on preferred stock		$3,981,764.00	$3,981,764.00
6 per cent. on common stock		11,729,274.00	11,728,824.00
Dividends on stocks of the Oregon Railroad and Navigation Co. in the hands of the public:			
4 per cent. on preferred stock		94.00	232.00
		$15,711,132.00	$15,710,820.00
Surplus after payment of dividends		$3,988,576.22	$8,995,970.12
INCOME OTHER THAN FROM TRANSPORTATION OPERATIONS.			
Interest on bonds owned of companies other than Oregon Short Line Railroad and Oregon Railroad and Navigation Cos.		$1,143,063.81	$258,844.28
Dividends on stocks owned of companies other than Oregon Short Line Railroad and Oregon Railroad and Navigation Cos.		15,370,873.50	11,563,105.25
Rentals from steamships		249,131.60	136,231.40
Sales of unpledged lands and town sites		505.70	14,925.81
Total		$16,763,574.61	$11,973,106.74
Less—Balance of interest on loans and on open accounts other than with Auxiliary Companies		$540,225.73	$477,389.45
Miscellaneous expenses		203,657.33	25,586.53
		$743,883.06	$502,975.98
Balance		$16,019,691.55	$11,470,130.76
Deductions:			
Dividends on stocks of Union Pacific Railroad Co.:			
4 per cent. on common stock		7,819,516.00	7,819,216.00
Surplus		$8,200,175.55	$3,650,914.76
Total surplus from transportations and other income after payment of dividends		$12,188,751.77	$12,646,884.88
Applied as follows:			
Appropriated for betterments made during the year			$1,959,002.03
Net surplus		$12,188,751.77	$10,687,882.85

The difference in the distribution of revenues and expenses as provided for in the classification of "Operating Revenues" and of "Operating Expenses," promulgated by the Interstate Commerce Commission and made effective on July 1, 1907, and in the classification of the Commission in respect of operating expenses in effect prior thereto and observed by the Company, are such that the income for the year could not be understandingly compared with that of last year except by a restatement of last year's transportation operations under the classification observed this year. Thus restated, the results of the year's operations, compared with those of last year, are as follows:

	Increase.	Decrease.
Average miles of rail lines operated	136.86	....
Gross operating revenues and revenues from outside operations	....	$269,373.59
Operating expenses and expenses of outside operations	$1,545,457.06	....
Taxes	367,780.70	....
Revenue over expenses and taxes	....	2,182,611.35
Income other than from transportation operations	4,549,560.79	....
Total surplus	2,366,949.44	....
Fixed charges	2,824,470.55	....
Surplus over fixed charges	....	457,521.11

Assets and Liabilities.

The assets and liabilities of the Union Pacific Railroad and Auxiliary Companies are shown in detail in Table No. 5. The securities of the Auxiliary Companies owned by the Union Pacific Railroad Co. and of the proprietary railways which are operated as an integral part of the system and are owned by the Union Pacific Railroad and Auxiliary Companies, as well as all offsetting accounts between the companies, are eliminated, thus dealing only with the securities in the hands of the public and the assets due from and the liabilities due to the public.

The increase or decrease in assets and liabilities since last report, briefly stated, is as follows:

Increase in Assets:			
Cost of railways, equipment, and appurtenances as shown in detail under "Capital Expenditures"			$12,542,757.89
Stocks and bonds owned; payment of the remaining 75 per cent. payable on subscription to $16,200,000 par value preferred stock of the Southern Pacific Company and for the purchase of stocks and bonds acquired during the year		$23,346,963.18	
Less: Proceeds from stocks and bonds sold		14,580,672.55	
			8,766,290.63
Loans to Southern Pacific Company		$42,376,389.27	
Loans to San Pedro, Los Angeles & Salt Lake R. R. Co.		2,575,308.33	
			44,951,697.60
Expenditures for construction of new lines and for terminal properties			6,600,530.13
Material and supplies			2,348,066.24
Current cash accounts			433,799.35
Unadjusted accounts			1,138,863.68
Due from Proprietary Companies			440,586.52
Total			$77,222,592.04
Deduction—			
Decrease in cash on hand		$3,124,914.24	
Rolling stock sold		4,245,304.97	
			7,370,219.21
Net increase in assets			$69,852,372.83
Increase in Liabilities:			
Funded debt		$97,043,567.94	
Reserve for depreciation and replacement of equipment		135,469.44	
		$97,179,037.38	
Deduction—			
Capital stock	$2,700.00		
Loans paid off	27,860,574.10		
Current cash accounts	1,011,186.32		
Reserve funds written off	9,452,961.32		
		38,327,421.74	
			58,851,615.64
Increase in assets in excess of increase in liabilities (gain in Profit and Loss)			$11,000,757.19

Under the classification of Operating Revenues and Operating Expenses promulgated by the Interstate Commerce Commission in effect since July 1, 1907, the reserve funds established in former years for maintenance and renewals are not available for the payment of extraordinary repairs and renewals growing out of damages by floods and other exceptional causes. The sum to the credit of this reserve fund, amounting to $4,774,610.39, therefore, was written off and credited to Profit and Loss. The reserve funds established in former years for betterments, additions and new equipment, amounting to $4,678,350.93, were likewise written off and credited to Profit and Loss.

The Southern Pacific Company is engaged in the construction of railways in the Republic of Mexico under concessions and subventions which made it important, notwithstanding the monetary stringency

which existed last fall and winter, that the work should be prosecuted without interruption. To provide the funds for this work and for other important work it was deemed expedient to aid said company in temporarily financing its expenditures. The sum thus advanced amounted to $45,376,389.27 on June 30, 1908.

The state of the account in respect of the cost of the stock of the Northern Securities Company and of the stocks of the Great Northern Railway and of the Northern Pacific Railway Companies received in the distribution of the assets of the Securities Company, also in respect of the transactions growing out of the stocks subsequently acquired under subscription rights and of the proceeds from the sales of these stocks to June 30, 1908, is as follows:

Cost of 824,918.71 shares Northern Securities Co. stock		$79,459,691.36
Paid for:		
73,589.60 shares Great Northern Railway Company stock	$7,358,960.00	
Great Northern Railway Company subscription receipts for 2,600 shares	281,837.50	
Northern Pacific Railway Company subscription receipts for 34,516 shares	2,065,712.50	
		9,706,510.00
Total cost		$89,166,201.36
Amounts realized from stocks sold:		
100,000. shares Northern Securities Company stock	$16,880,019.46	
.18 shares Northern Securities Company stubs.	56.13	
254,923.89 shares Great Northern Railway Company stock	60,594,950.13	
280,700.82 shares Northern Pacific Railway Company stock	54,822,614.97	
13,200. shares Great Northern Railway Company ore certificates	1,021,789.63	
Northern Pacific Railway Company subscription receipts for 16,500 shares.	1,177,613.50	
Great Northern Railway Company subscription receipts for 2,000.60 shares	255,940.98	
		$134,752,984.80
Amount realized from sales in excess of the total cost of stocks (besides 35,786 shares Great Northern Railway Company stock, 77,164 shares Great Northern Railway Company ore certificates, 1,128 shares Northern Pacific Railway Company stock, Northern Pacific Railway Company subscription receipts, 62½ per cent. paid for 18,016 shares, and 7,249 shares Northern Securities Company stubs still on hand unsold)		$45,586,783.44

The Union Pacific Railroad and Auxiliary Companies own bonds, unpledged, to the amount of $81,966,500 face value.

The stocks and bonds owned, other than stocks and bonds of the Union Pacific Railroad and Auxiliary Companies, stand charged at the close of the year with $218,173,102.44, an increase during the year of $8,766,290.63. The details of the stocks and bonds owned (pledged or unpledged) and the increase or the decrease during the year are shown in tables attached to this report.

Capital Expenditures.

The charges to capital account, other than for stocks and bonds in companies other than the Union Pacific Railroad and Auxiliary Companies, were as follows:

Expenditures for account of the construction of railways taken over into cost of railways, equipment and appurtenances				$38,013.87
Cost of railways purchased in excess of amount included in previous reports under cost of railways, equipment and appurtenances, viz.:				
Leavenworth, Kansas & Western Railway		$373,309.95		
Topeka & Northwestern Railroad		312,916.92		
				686,226.87
Expenditures for account of extensions and cost of extensions transferred from free assets, viz.:				
Union Pacific Railroad Company:				
Cedar Rapids to Spalding, Nebraska	$165,920.85			
O'Fallons to Northport, Nebraska	1,449,693.19			
St. Vrain's Junction to Grantine, Colorado	63,241.27			
Stromsburg to Central City, Nebraska	494,871.71			
Thayer to Horse Thief Canon, Wyoming	291,091.88			
		$2,464,818.90		
Expenditures Oregon Short Line R.R. Co.:				
Kemmerer to North Kemmerer, Wyoming		206,626.33		
Expenditures Oregon Railroad & Navigation Co:				
Elgin to Joseph, Oregon	$269,657.30			
Less Credits:				
St John's Extension, Oregon.... $103.17				
St. John's to Troutdale, Ore. . 1,333.48				
Lewiston to Grande Ronde River, Idaho.... 977.80				
	2,414.45			
		267,242.85		
				2,938,688.08
Expenditures for Additions and Betterments, viz.:				
Ballasting		$19,212.70		
Bridges, trestles and culverts		588,735.25		
Station buildings, terminal yards, shops and other buildings		884,979.73		
Real estate		233,225.42		
Fencing telegraph lines, and shop machinery		149,902.96		
Additional side and passing tracks		270,897.37		
Additional main track		1,800,644.72		
Changes in line, reducing grades and widening embankment		769,969.35		
Interlocking and block signals		$874,052.36		
Water supply and pipe lines		75,284.28		
Additional cost of equipment added during the preceding fiscal year		21,971.71		
				5,688,876.85
Equipment transferred from deferred assets, viz.:				
168 locomotives		$2,761,045.02		
45 passenger train cars		426,087.73		
3,457 freight train cars		3,923,658.00		
				7,110,790.55
Adjustment in amount deducted from cost of railways, equipment and appurtenances on account of the difference between the face value of stocks and bonds of auxiliary companies, and the price at which they were taken over				26,925.06
Improvements to Northern Pacific Terminal property and Pintsch Gas Plant, Portland, Oregon				29,376.42
Adjustment in accounts taken over under reorganization				100,152.85
Total charges				$16,619,050.55
Credits:				
Amount received from Trustee of Union Pacific Railroad Company First Mortgage Four Per Cent. Bonds in payment for expenditures for betterments, improvements, equipment, etc., not otherwise provided for		$4,075,000.00		
Proceeds from sales of property		1,292.66		
				4,076,292.66
Net expenditures for capital account				$12,542,757.89

Equipment.

The changes in the equipment during the year were as follows:

	Condemned, etc.‡	Added and charged to— Account Replacement.	Capital.	Free assets.	Un Pac. Equipment Association
Locomotives	16	4	175	*93	*33
Cars:					
Baggage	1	1	...	...	*1
Baggage & mail.	1	7	2	...	5
Bag. & passngr.	..	4	2	..	..
Bag.,mail & psgr	1	..	..	...	..
Business	..	..	..	1	..
Chair	..	..	..	..	5
Dining	..	.	3	..	*3
Instruction	..	..	3	..	*3
Motor	3	4	..	7	..
Observation	..	..	6	*5	..
Passenger	6	1	35	*19	15
Postal	2	2	6	*7	..
Box	696	36	2,943	*1,698	*227
Caboose	15	41	11	..	4
Flat	35	252	200	*250	100
Furniture	71	..	..	..	..
Gondola	249	..	..	..	..
Do., drop bottom	4	70	..	*70	..
Do., hop'r bot'm.	5	..	100	..	*100
Refrigerator	84	..	..	..	..
Stock	144	10	22	*30	..
Work equipment	166	522	403	*10	*100
Amount credited or charged	$606,093	$734,459	$7,329,880	*$3,755,635	*1,040,173[1]

*Credit.

[1] Grand total, credited or charged, $3,257,532.

‡Condemned, destroyed, sold or transferred and credited to replacement fund.

The locomotives added during the year averaged 97.40 tons total weight of engine without tender, and 84.29 tons upon drivers. The freight train cars added during the year averaged 50 tons capacity.

The locomotives and cars owned and their capacity at the close of the year were as follows:

	Year— This.	Last.	Increase.	Per cent.
Locomotives, standard gage.	1,087	1,050	37	3.52
Locomotives, narrow gage	1	1	..	.....
Total	1,088	1,051	37	3.52
Standard Gage.				
Total weight, excluding tender, tons	89,701	85,419	4,282	5.01
Average total weight, excl. tender, tons	82.52	81.35	1.17	1.44
Total weight on drivers, tons	73,980	70,109	3,871	5.52
Av. total weight on drivers, tons	68.06	66.77	1.29	1.93
Passenger train cars, standard gage	702	642	60	9.35
Passenger train cars, narrow gage	1	1	....	.....
Total	703	643	60	9.33
Freight train cars, standard gage	25,482	25,371	111	.44
Freight train cars, narrow gage	6	6	..	.....
Total	25,488	25,377	111	.44
Total capacity, stand. gage cars, tons	901,862	864,955	36,907	4.27
Av'ge capacity, stand. gage cars, tons	36.01	34.64	1.37	3.95
Work equipment	3,598	2,929	669	22.84

Transportation Operations.

For the purpose of comparison, the revenues and expenses of this year are restated in the following tables under the classification in effect last year, deducting, however, from the expenses of last year such expenses as were then included in the operating expenses but which are this year charged to income account, also adjusting last year's expenses to the primary accounts of this year's classification as far as practicable.

Thus restated the results of the year's transportation operations compared with those of the preceding year are as follows:

	Year ended — June 30, 1908.	June 30, 1907.	Increase or *decrease.*	Per cent.
Average miles of rail lines operated	5,781.41	5,644.55	136.86	2.42

Revenues.				
Passenger, including extra baggage	$16,641,467.67	$14,912,508.37	$1,728,959.30	11.59
Mail and express	3,956,151.20	4,143,581.72	*187,430.52*	4.52
Freight	52,899,157.66	54,809,073.72	*1,909,916.06*	3.48
Switching, rentals and all other sources	926,000.28	790,988.30	135,011.98	17.07
Total rail lines	$74,422,776.81	$74,656,152.11	*$233,375.30*	0.31
Outside operations—revenue	1,616,448.10	1,652,446.39	*35,998.29*	2.18
Total revenues	$76,039,224.91	$76,308,598.50	*$269,373.59*	0.35
Operating Expenses.				
Maintenance of way and structures	$8,898,300.54	$10,022,748.32	*$1,124,447.78*	11.22
Maintenance of equipment	7,991,447.19	7,867,080.64	124,366.55	1.58
Conducting transportation	21,214,178.96	18,780,079.56	2,434,099.40	12.96
General expenses	2,073,588.93	1,958,191.20	115,397.73	5.89
Total rail lines	$40,177,515.62	$38,628,099.72	$1,549,415.90	4.01
Outside operations—expenses	1,516,519.67	1,520,478.51	*3,958.84*	0.26
Total expenses	$41,694,035.29	$40,148,578.23	$1,545,457.06	3.85
Gross revenues over total expenses	$34,345,189.62	$36,160,020.27	*$1,814,830.65*	5.02
Passenger Traffic.				
Revenue passengers carried	6,450,286	5,663,828	786,458	13.89
Revenue passengers carried one mile	760,532,906	680,278,509	80,254,397	11.80
Revenue from passenger trains per mile of road	$3,562.73	$3,376.02	$186.71	5.53
Revenue from passenger trains per *revenue train* mile*	$1.71	$1.77	*$0.06*	3.39
Freight Traffic.				
(*Way-bill Tonnage.*)				
Tons of revenue freight carried	13,089,163	14,089,649	*1,000,486*	7.10
Tons of revenue freight carried one mile	5,271,939,813	5,704,061,535	*432,121,722*	7.58
Revenue per mile of road	$9,149.87	$9,710.09	*$560.22*	5.77
Revenue per *revenue train* mile†	$4.31	$3.89	$0.42	10.80

* Revenue passenger train and *all* mixed train miles.
† Revenue freight train and *all* mixed train miles.
Decreases in *italics*.

The following statement shows the increase in the Company's revenues and service during the first half year and the shrinkage caused by the general business depression in the second half year.

The increase for expenses for ties resulted from an increase in the average cost of ties from 66 cents to 75 cents per tie, an increase of 12.12 per cent., and from the greater number of ties put into the track.

The work done by the transportation department of the rail lines is shown in the following table:

		+ Increase. — Decrease.	Per cent.
Gross operating revenues	—	$233,375.30	0.31
Expenses conducting transportation	+	2,434,099.40	12.96
Revenue passengers carried one mile	+	80,254,397	11.80
Mileage of passenger cars	+	3,766,488	5.25
Locomotive mileage with passenger trains, including helping	+	570,554	5.32
Tons of revenue freight carried one mile	—	432,121,722	7.58
Tons of revenue and company freight carried one mile	—	408,721,492	6.11
Mileage of freight cars	—	36,502,841	8.63
Locomotive mileage with freight and mixed trains, including helping		2,187,013	13.87
Total locomotive mileage in service for which the attendant expenses are charged to "Conducting Transportation"	—	1,683,549	5.38

The cost of fuel for locomotives per locomotive mile in revenue service and in non-revenue service for which the expenses are charged to "Conducting Transportation" was 22.239 cents per mile run against 16.524 cents in the preceding year and for the entire expenses for conducting transportation 71.674 cents against 60.040 cents in the preceding year.

General Expenses.

	This year.	Last year.
Salaries and expenses of general officers	$302,543.10	$272,850.38
Salaries & expenses of clerks & attendants	930,005.03	775,740.18
Law expenses	238,102.24	268,657.10
General office expenses	103,852.44	99,226.89
Stationery and printing	139,649.81	94,224.19
Insurance	161,615.45	207,637.71
Other expenses	197,820.86	239,854.75
Total	$2,073,588.93	$1,958,191.20

General.

The delivery of the remaining 3,000 refrigerator cars for the "Pacific Fruit Express Company," referred to in the last annual report, was completed during the year, and the company now has 6,600 cars in service. The paid-up capital stock of the company is $10,800,000, paid for by the Union Pacific Railroad Company and the Southern Pacific Company, one-half each.

	Gross revenue.	Tons of revenue freight carried	Tons revenue freight 1 mile.	Loco. miles revenue freight service incldg. Mexico.	—No. of passengers— Carried.	One mile.	Loco. miles revenue passgr service incldg. Mexico.
Six months ending December 31, 1907	$42,919,295.84	7,751,263	3,065,584,431	8,237,359	3,470,230	431,603,877	6,511,477
" " " December 31, 1906	39,063,650.57	7,237,099	2,851,997,966	7,687,492	2,933,135	361,092,813	5,660,359
" " " June 30, 1908	33,119,929.07	5,337,900	2,206,355,382	5,348,964	2,980,056	328,929,029	6,103,849
" " " June 30, 1907	37,244,947.93	6,852,550	2,852,063,569	8,085,844	2,730,693	319,185,696	5,584,652

The rail lines were operated for 53.99 per cent. of their gross revenue against 51.74 per cent. in 1907. The average for both rail and water lines, including outside operations, was 54.83 per cent. against 52.61 per cent. in 1907. Expenses for "maintenance" were 22.69 per cent., and for "operations" 31.30 per cent. of the gross revenues of the rail lines.

The increase of $1,545,457.06 in the operating expenses resulted entirely from the increase in expenses during the six months ended December 31, 1907. In the six months ended June 30, 1908, there was a decrease in operating expenses of $3,452,584.35. The increase in the first half year resulted from the expenses incident to the greater amount of traffic moved, which, in the preceding year, had already reached proportions where it exceeded the limit of handling it economically, from the greater cost of fuel and other material, from the higher wage schedules, and from the expenses of rebuilding the bridges and restoring to its former standard the roadway damaged by the disastrous floods and heavy snow storms in the spring of 1907.

In the following statements the expenses have been combined under accounts which present them concisely and comparatively with last year.

Maintenance of Way and Structures.

	This year.	Last year.
Repairs of roadway and track	$3,720,408.51	$4,802,706.39
Bridges, trestles and culverts	499,316.77	670,020.60
Ties	2,192,853.63	1,856,416.87
Rails, frogs, switches and fastenings	716,315.55	982,674.62
Buildings, grounds and appurtenances	1,390,806.47	1,288,399.06
Snow and sand fences, & snow sheds	14,349.53	21,687.76
Superintendence	350,632.46	384,802.73
Stationery and printing	13,617.62	16,040.29
Total	$8,898,300.54	$10,022,748.32

Assets and Liabilities, June 30, 1908.

(Excluding stocks and bonds owned of auxiliary and proprietary railways and all offsetting accounts between them.)

Assets—Capital Assets.	June 30, 1908.	June 30, 1907.
Cost, railways, equip. & appurtenances*	$385,907,655.61	$373,774,563.64
Cost of extensions	1,700,355.17	1,290,689.25
Stocks and bonds owned.†	218,173,102.44	209,406,811.81
Trust funds	328,563.86	300,464.54
	$606,109,677.08	$584,772,520.24
Current Assets.		
Demand loans, Southern Pacific Co.	$45,376,389.27	$3,000,000.00
Loans to San Pedro, Los Angeles & Salt Lake R.R. Co.	2,625,308.33	50,000.00
Cash	4,395,934.40	7,520,848.64
Bills receivable	$8,929.90	$8,929.90
Agents and conductors	1,014,043.59	852,800.05
Traffic balances	....	212,334.90
Dividends and interest, to June 30th	4,849,453.25	3,738,932.50
Individuals and companies	2,536,319.86	3,170,186.43
U. S. Government transportation	1,049,592.42	1,069,455.21
Material, fuel and supplies	12,232,475.62	9,884,409.38
	$74,088,446.64	$29,507,897.01
Deferred Assets.		
Advances for the construction and acquisition of new lines	$33,013,620.92	$26,390,035.46
Ocean steamships "Manchuria" and "Mongolia"	5,126,796.58	5,126,796.58
Rolling stock	7,258,275.44	11,503,580.41
Land and miscellaneous property	6,771.43	6,935.43
Individuals and companies	9,824.27	32,715.60
Due from proprietary companies	790,487.19	884,659.15
	$46,205,775.83	$43,944,722.63
Contingent Assets.		
Unadjusted accounts	$1,457,894.52	$319,030.84
Land and town lot contracts	3,542,429.21	3,281,855.33
	$5,000,323.73	$3,600,886.17
Total assets	$731,404,223.28	$661,826,035.05

†As detailed in later tables.

*From year to year this cost has been written down by $11,327,036.56 received to date from the Improvement and Equipment Fund and by appropriations from "Income Account" amounting to $16,959,816.24—a total of $28,286,852.80.

Liabilities—Capital Liabilities.	June 30, 1908.	June 30, 1907.
Union Pacific Railroad Company:		
Common stock	$195,487,900.00	$195,477,900.00

Preferred stock	$99,544,100.00	$99,544,100.00
Stocks of Auxiliary Companies in hands of the public, viz.:		
Oregon Short Line Railroad Co.:		
Common stock	....	10,000.00
Oregon R.R. & Navigation Co.:		
Common stock	20,100.00	20,200.00
Preferred stock	3,410.00	6,010.00
Funded debt (excluding bonds of Auxiliary and Proprietary Cos. owned) Table No. 14.	298,109,067.94	201,065,500.00
	$593,164,577.94	$496,123,710.00
Current Liabilities.		
Traffic balances	$100,749.09	....
Coupons matured but not presented	149,145.15	$172,102.65
Coupons due July 1st	4,028,005.00	2,528,005.00
Interest accrued on bonds and loans to June 30.	1,392,039.38	1,878,815.74
Dividends due but uncalled for	38,836.00	33,660.50
Dividends payable July 1st and Oct. 1st	11,765,277.00	11,765,105.00
Bonds satisfied of mortgage	3,000.00	3,000.00
Loans and bills payable	41,189,645.90	69,050,220.00
Vouchers and pay rolls	4,112,357.27	6,221,595.98
	$62,779,054.79	$91,652,504.87
Deferred Liabilities.		
Taxes assessed but not due	$1,085,066.52	$983,212.64
Contingent Liabilities.		
Insurance fund (Table No. 23)	$416,506.41	$492,076.93
Trust accounts	54,027.45	81,918.78
Equipment replacement funds	97,683.39	204,329.31
Reserve for depreciation on steamships and rolling stock leased	1,353,769.60	1,111,654.24
Reserve fund for betterments, additions and new equipment.	....	4,678,350.93
Reserve fund for maintenance, renewals, etc.	....	4,774,610.39
Hospital fund	81,878.63	76,581.00
Union Pacific Coal Co.	1,736,885.11	2,848,829.45
Union Pacific Land Co	53,559.47	2,081,559.47
Due to proprietary companies	3,060,205.96	455,020.10
Principal of deferred payments on land and town lot contracts (Table No. 19)	3,542,429.21	3,281,855.33
	$10,396,945.23	$20,086,785.93
Balance to credit of profit and loss (Table No. 4)	$63,978,578.80	$52,977,821.61
Total liabilities.	$731,404,223.28	$661,826,035.05

EXPENDITURES.

Capital Expenditures.

Expenditures for construction and acquisition of new lines	$1,340,717.35	
Betterments and additions	5,688,876.75	
Equipment	7,110,790.65	
Cost of new lines transferred from deferred assets	2,351,587.89	
Adjustment in accounts taken over under reorganization	100,152.85	
Adjustment in other accounts	26,925.06	
Total	$16,619,050.55	
Deduct for:		
Received from improvement and equipment fund	$4,075,000.00	
Proceeds from sales of miscellaneous property	1,292.66	
Total	$4,076,292.66	
		$12,542,757.89
Increase in Assets.		
Loans to Southern Pacific Co	$42,376,389.27	
Loans to San Pedro, Los Angeles & Salt Lake R. R. Co	2,575,308.33	
Stocks and bonds owned	8,766,290.63	
Material, fuel and supplies	2,348,066.24	
Advances for construction of new lines	6,600,530.13	
Current cash accounts	$433,799.35	
Due from Proprietary Companies	440,586.52	
Unadjusted accounts	1,138,863.68	
Total	$64,679,834.15	
Deduct for:		
Decrease in cash on hand	$3,124,914.24	
Rolling stock transferred to capital expenditures	4,245,304.97	
Total	$7,370,219.21	
		57,309,614.94
Decrease in Liabilities.		
Loans paid off	$27,860,574.10	
Current cash accounts	1,011,186.32	
Reserve funds written off	9,452,961.32	
Total	$38,324,721.74	
Deduct for:		
Increase in reserve for depreciation and replacement of equipment	135,469.44	
		38,189,252.30
Total		$108,041,625.13

RECEIPTS.

Capital Liabilities.

U. P. R. R. Co. Twenty Year Four Per Cent. Convertible Bonds sold	$73,762,000.00		
U. P. R. R. Co. First Lien and Refunding Four Per Cent. Bonds sold	23,296,567.94		
U. P. R. R. Co. common stock issued in exchange for an equal amount of O. S. L. R. R. Co. capital stock	10,000.00		
	$97,068,567.94		
Deduct for:			
O. S. L. R. R. Co. Income "A" Bonds acquired	$14,000.00		
O. S. L. R. R. Co. Income "B" Bonds acquired	1,000.00		
O. S. L. R.R. Co. capital stock acquired.	10,000.00		
O. R. R. & N. Co. common stock acquired	100.00		
O. R. R. & N. Co. preferred stock acquired	2,600.00		
	$27,700.00		
			$97,040,867.94
Profit and Loss.			
Gross operating revenues and revenues from outside operations	$76,039,224.91		
Interest, dividends and other income	16,177,890.47		
Total receipts	$92,217,115.38		
Deduct for:			
Operating expenses and expenses of outside operations	$41,641,487.37		
Taxes	2,444,725.87		
Interest on funded debt and sinking fund requirements	11,257,912.72		
Dividends on preferred and common stocks	23,530,648.00		
Discount and commissions on bonds sold	10,979,721.71		
Miscellaneous expenses and charges	814,823.84		
Total charges	$90,669,319.51		
Less:			
Reserve fund for maintenance and renewals written off		$4,774,610.39	
Reserve fund for betterments, additions and new equipment written off		4,678,350.93	
	*9,452,961.32		
Balance	$81,216,358.19		
			11,000,757.19
Total			$108,041,625.13

* Under the classification of Operating Revenues and Operating Expenses promulgated by the Interstate Commerce Commission in effect since July 1, 1907, the reserve funds established in former years for maintenance and renewals are not available for the payment of extraordinary repairs and renewals growing out of damages by floods and other exceptional causes. The sum to the credit of this reserve fund, amounting to $4,774,610.39, therefore, was written off and credited to Profit and Loss. The reserve funds established in former years for betterments, additions and new equipment, amounting to $4,678,350.93, were likewise written off and credited to Profit and Loss.

PROFIT AND LOSS FOR THE YEAR ENDED JUNE 30, 1908.

Discount and commission on $73,762,000 face value 20-year 4 per cent. convertible bonds and $23,296,567.94 face value 1st lien and refunding 4 per cent. bonds sold and delivered during the year		$10,979,721.71
Balance of adjustment in charges for depreciation of equipment		33,569.65
Surveys charged off		19,711.31
Miscellaneous payments		6,770.00
Uncollectible accounts written off		10,889.82
Balance, June 30, 1908, viz.:		
Income account	$63,027,695.43	
Sinking fund	950,883.37	
		63,978,578.80
		$75,029,241.29

Balance, June 30, 1907		$52,977,821.61
Balance income from transportation operations	$3,988,576.22	
Balance income other than from transportation operations	8,200,175.55	
		12,188,751.77
Sinking fund contributions and income from sinking fund investments		21,795.89
Profit from sale of securities		167,773.09
Reserve fund for betterments, additions and new equipment written off		*4,678,350.93
Reserve fund for maintenance, renewals, etc., written off.		*4,774,610.39
Contingent liabilities written off		200,000.00
Miscellaneous collections		6,434.28
Adjustments in accounts.		8,029.84
Proceeds from sale of unpledged lands and town sites		5,673.49
		$75,029,241.29

*Under the classification of Operating Revenues and Operating Expenses promulgated by the Interstate Commerce Commission in effect since July 1, 1907 the reserve funds established in former years for maintenance and renewals are not available for the payment of extraordinary repairs and renewals growing out of damages by floods and other exceptional causes. The sum to the cerdit of this reserve fund, amounting to $4,774,610.39, therefore, was written off and credited to Profit and Loss. The reserve funds established in former years for betterments, additions and new equipment, amounting to $4,678,350.93, were likewise written off and credited to Profit and Loss.

GENERAL OPERATING RESULTS, YEAR ENDED JUNE 30, 1908.

	June 30,1908.	June 30, 1907.	Increase.	Decrease.	Per Ct.
Average miles of rail lines operated	5,781.41	5,644.55	136.86	....	2 42
REVENUE AND EXPENSES.					
(Rail lines and outside operations.)					
1. Gross revenues	$76,039,224.91	$76,308,598.50	....	$269,373.59	.35
2. Gross expenses	41,694,293.89	40,148,578.23	$1,545,715.66	....	3.85
3. Revenues over expenses	34,344,931.02	36,160,020.27	....	1,815,089.25	5.02
4. Ratio of expenses to gross revenues	54.83	52.61	2.22	....	4 22
(Rail Lines only.)					
5. Total operating revenues	$74,422,776.81	$74,656,152.11	....	$233,375.30	.31
6. Operating expenses	40,177,515.62	38,628,099.72	$1,549,415.90	....	4.01
7. Net operating revenue	34,245,261.19	36,028,052 39	....	1,782,791.20	4.95
8. Ratio of operating expenses to total operating revenues	53.99	1.74	2.25	....	4.34
9. Operating revenues per mile of road	12,872.77	13,226.24	....	353.47	2.67
10. Operating expenses per mile of road	6,949.43	6,843 43	106.00	....	1.55
11. Net operating revenue per mile of road	5,923.34	6,382.81	....	459.47	7.20
12. Operating revenues per *revenue train* mile (a)	3.23	3.07	16		5.21
13. Operating expenses per *revenue train* mile (a)	1.74	1.59	15	....	9.45
14. Net operating revenue per *revenue train* mile (a)	1.49	1.48	01	....	.68
TRAIN AND LOCOMOTIVE MILES.					
15. Revenue service—Total freight train miles	10,972,701	13,569,398	....	2,596,697	19.14
16. Revenue service—Passenger train miles	10,767,832	10,231,416	536,416	....	5.24
17. Revenue service—Mixed train miles	1,295,456	517,458	777,998	....	150.35
18. Revenue service—Special train miles	28,282	....	28,282		
19. Revenue service—*Total train miles* (a)	23,064,271	24,318,272	....	1,254,001	5.16
20. Revenue service freight—Light and helping locomotive miles	1,296,403	1,686,480	....	390,077	23.13
21. Revenue service passenger—Light and helping locomotive miles	530,275	496,137	34,138	....	6.88
22. Revenue service mixed—Light and helping locomotive miles	21,763	....	21,763		
23. Revenue service special—Light and helping locomotive miles	9,442	....	9,442		
24. Revenue service—*Total locomotive miles* excluding switching	24,922,154	26,500,889	....	1,578,735	5 96
25. Revenue service—Switching locomotive miles	4,179,542	4,414,733	....	235,191	5.33
26. Revenue service—*Total locomotive miles*	29,101,696	30,915,622	....	1,813,926	5.87
27. Non-revenue service—Locomotive miles included in Conducting "Transportation Expenses" (d)	496,575	366,198	130,377	....	35.60
28. Ratio of *light and helping* locomotive miles to *revenue service* total *train miles*	8.06	8.98	....	.92	10.24
29. Ratio of *helping miles* to *revenue service* total *train miles* excluding *running light*	3.27	4.06	....	.79	19.46
CAR MILES.					
30. Revenue service—Freight car miles—loaded	279,025,230	316,173,710	....	37,148,480	11.75
31. Revenue service—Freight car miles—empty	96,517,578	93,608,067	2,909,511	....	3 11
32. Revenue service freight—Caboose car miles	10,913,724	13,177,596	....	2,263,872	17.18
33. Revenue service—Total freight car miles	386,456,532	422,959,373	....	36,502,841	8.63
34. Non-revenue service—Total freight car and caboose miles	1,000,021	....	1,000,021		
35. Total freight car and caboose miles	387,456,553	422,959,373	....	35,502,820	8.39
36. Revenue service—Passenger car miles (b)	75,547,015	71,780,527	3,766,488	....	5.25
37. Non-revenue service—Passenger car miles	542,560	575,669	....	33,109	5,75
38. Revenue service—Special car miles—freight and caboose	370,952	....	370,952		
39. Revenue service—Special car miles—passenger	111,310	....	111,310		
40. Revenue service—Total special car miles	482,262	....	482,262		
41. Average number of cars in passenger trains	6.26	6.68	....	.42	6 29
42. Average number of loaded cars in freight trains—East or North.	22.17	21.91	.26		1.19
43. Average number of loaded cars in freight trains—West or South.	23.33	22.98	.35	....	1.52
44. Average number of loaded and empty freight cars in freight trains (excluding caboose)	30.61	29.09	1.52	....	5.23
45. Average number of loaded freight cars in freight trains	22.74	22.44	.30	....	1.34
46. Ratio of loaded freight car mileage to total freight car mileage (e)	74.30	77.16	....	2.86	3.71
47. Ratio of empty freight car mileage to total freight car mileage (e)	25.70	22.84	2.86	....	12.52
MISCELLANEOUS.					
48. Average cost of maintenance of way and structures per mile of first and second track	$1,450.71	$1,707.71	....	$257.00	15.05
49. Average cost of repairs and replacements per locomotive per annum (c)	3,068.90	2,932.92	$135.98	....	4.64
50. Average cost of repairs and replacements per passenger train car per annum (c)	1,036.64	1,092.31	....	55.67	5.10
51. Average cost of repairs and replacements per freight train car per annum (c)	113.22	126.87	....	13.65	10.76
52. Conducting transportation per revenue service total *train mile* (a)	91.98 cents	77.23 cents	14.75 cents	....	19.10
53. Conducting transportation per *locomotive mile* included in "Conducting Transportation Expenses" (d)	71.67 cents	60.04 cents	11.63 cents	....	19 37

(a) Includes revenue and *all* mixed train miles, but excludes mileage of locomotives helping, as prescribed by the Interstate Commerce Commission of the United States. (b) Includes mileage of passenger cars in revenue service passenger, freight and mixed trains. (c) Includes value of equipment condemned, destroyed or sold. (d) Includes mileage run with pay, inspection and other official trains, and mileage of material and supply trains, as the expenses incurred in hauling such trains are included in expenses for Conducting Transportation. (e) Excludes non-revenue and caboose mileage.

INVESTMENT STOCKS OWNED, JUNE 30, 1908.

	Owned by Union Pacific R.R. and Auxiliary Companies: Union Pacific R. R. Co.	Ore. Short Line R.R. Co.	Total.	Inc. (+), or dec. (−).	Of total owned there are: Pledged.	Unpledged.
Atchison, Topeka & Santa Fe Ry. Co., preferred stock	....	$10,000,000	$10,000,000	....	....	$10,000,000
Baltimore & Ohio R.R. Co., common stock	....	32,334,200	32,334,200	....	....	32,334,200
Preferred stock	....	7,206,400	7,206,400	....	....	7,206,400
Chicago & Alton R.R. Co., preferred stock	$10,343,100	....	10,343,100	....	....	10,343,100
Chicago & Northwestern Ry. Co. common stock	....	3,215,000	3,215,000	....	....	3,215,000
Chicago, Milwaukee & St. Paul Ry Co., common stock	....	1,340,000	1,340,000	—$2,350,000	....	1,340,000
Common stock (65 per cent paid)	....	3,272,500†	3,272,500†	+ 2,350,000†	....	†3,272,500
Preferred stock (65 per cent paid)	....	1,845,000†	1,845,000†	....	....	†1,845,000
Great Northern Ry. Co. preferred stock	....	3,578,600	3,578,600	—9,072,360	....	3,578,600
Iron Ore certificates, 77,164 shares.*	....	....	....	....	....	....
Illinois Central R.R. Co., capital stock	20,123,100	....	20,123,100	+ 1,500,000	....	20,123,100
N. Y. Central & Hudson River R.R. Co., capital stock	....	14,285,700	14,285,700	....	....	14,285,700
Northern Pacific Ry. Co., common stock	....	112,800	112,800	—4,040,000	....	112,800
Common stock 62½ per cent paid	....	1,801,600†	1,801,600†	—690,000†	....	†1,801,600
Northern Securities Co. stubs	....	724,900	724,900	....	....	724,900
Railroad Securities Co. common stock	3,482,900	....	3,482,900	+ 67,500	....	3,482,900
Preferred stock	1,935,900	....	1,935,900	+ 37,500	....	1,935,900
Southern Pacific Co. common stock	....	90,000,000	90,000,000	....	$90,000,000‡	....
Preferred stock	....	34,200,000	34,200,000	....	18,000,000‡	16,200,000
Total, 1908	$35,885,000	$203,916,700	$239,801,700	—$12,197,360	$108,000,000	$131,801,700
Total, 1907	34,280,000	217,719,060	251,999,060	....	108,000,000	143,999,060

*Par value of shares not stated in certificate. †Full par value of stocks. ‡Deposited as collateral under Oregon Short Line R. R. Co. 4 per cent. refunding mortgage. Of the total $100,000,000 outstanding bonds, $55,000,000 are a free asset in the treasury of the Union Pacific Railroad Co.

STOCKS OWNED OF OTHER COMPANIES, JUNE 30, 1908.

	Amount in hands of public, June 30, 1908.	Owned by Union Pacific R.R. and Auxiliary Companies. Union Pacific R. R. Co.	Oregon Short Line R.R. Co.	Total.	Inc. (+), or dec. (—).	Of total owned there are— Pledged.	Unpledged.
Caliente & Pioche R.R. Co.: Capital stock	$15,000.00	....	$15,000.00	$15,000.00	....	....	$15,000.00
Grays Harbor & Puget Sound R.R. Co.: Capital stock	....	$10,000.00	....	10,000.00	....	....	10,000.00
Greene River Water-Works Co.: Capital stock	....	225,000.00	....	225,000.00	....	....	225,000.00
Ilwaco Railroad Co.: Capital stock	....	152,500.00	....	152,500.00	....	....	152,500.00
Kansas City Terminal Railway Co.: Capital stock	100,000.00	100,000.00	....	100,000.00	....	....	100,000.00
Leavenworth, Kan. & Westn Ry. Co.: Capital stock	....	....	....	....	— $1,000,000.00	....	....
Leavenworth & Topeka Ry. Co.: Capital stock	25,000.00	25,000.00	....	25,000.00	....	....	25,000.00
Leavenworth Depot & R. R. Co.: Capital stock	100,000.00	50,000.00	....	50,000.00	....	....	50,000.00
Occidental & Oriental Steamship Co.: Capital stock	1,250,000.00	8,750,000.00	....	8,750,000.00	....	....	8,750,000.00
Ogden Union Ry. & Depot Co.: Capital stock	150,000.00	150,000.00	....	150,000.00	....	....	150,000.00
Oregon & Washington R.R. Co.: Capital stock	....	1,000,000.00	....	1,000,000.00	....	....	1,000,000.00
Pacific Express Co.: Capital stock	3,600,000.00	2,400,000.00	....	2,400,000.00	....	....	2,400,000.00
Pacific Fruit Express Co.: Capital stock	10,800,000.00	5,400,000,00	....	5,400,000.00	– 4,800,000.00	....	5,400,000.00
Rattlesnake Creek Water Co.: Capital stock	....	78,300.00	....	78,300.00	....	....	78,300.00
St. Joseph & Grand Isld R.R. Co.:							
Common stock	4,600,000.00	2,900,000.00	....	2,900,000.00	....	....	2,900,000.00
First preferred stock	5,498,500.00	932,200.00	....	932,200.00	....	....	932,200.00
Second preferred stock	3,500,000.00	1,250,000.00	....	1,250,000.00	....	....	1,250,000.00
San Pedro, Los Angeles & Salt Lake R. R. Co.: Capital stock	12,500,000.00	....	12,500,000.00	12,500,000.00	....	....	12,500,000.00
Short Line Land & Improvemt Co.: Capital stock	50,000.00	....	50,000.00	50,000.00	....	....	50,000.00
Spokane Union Depot Co.: Capital stock	....	125,000.00	....	125,000.00	....	....	125,000.00
Topeka Iron Co.: Capital stock	55,000.00	55,000.00	....	55,000.00	....	....	55,000.00
Union Depot & Ry. Co. (Denver): Capital stock	160,000.00	240,000.00	....	240,000.00	....	....	240,000.00
Union Depot Co. (Kansas City): Capital stock	450,000.00	45,000.00	....	45,000.00	....	....	45,000.00
Union Land Co.: Capital stock	....	10,000.00	....	10,000.00	....	....	10,000.00
Union Pacific Coal Co.: Capital stock	....	5,000,000.00	....	5,000,000.00	....	....	5,000,000.00
Un. Pac. Equipment Association: Capital stock	....	100,000.00	....	100,000.00	....	....	100,000.00
Union Pacific Land Co.: Capital stock	....	100,000.00	....	100,000.00	....	$99,400.00	600.00
Union Pacific Water Co.: Capital stock	....	500.00	....	500.00	....	....	500.00
Utah Light & Ry. Co.:							
Common stock	....	....	1,849,450.00	1,849,450.00	+ 1,849,450.00	....	1,849,450.00
Preferred stock	....	....	3,836,300.00	3,836,300.00	+ 3,836,300.00	....	3,836,300.00
Washington Union Coal Co.: Capital stock.*	....	....	....	....	—170,200.00	....	....
Total, 1908	....	$29,098,500.00	$18,250,750.00	$47,349,250.00	+ $10,485,750.00	$99,400.00	$47,249,850.00
Total, 1907	....	24,298,500.00	12,565,000.00	36,863,500.00	....	99,400.00	36,764,100.00

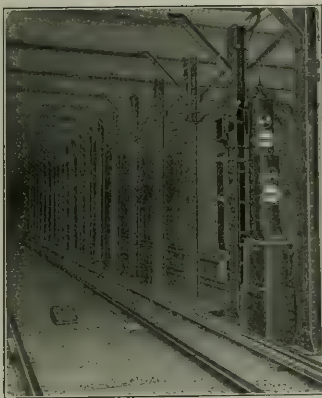
*Sold to Union Pacific Coal Company.

BONDS OWNED OF OTHER COMPANIES, JUNE 30, 1908.

	Amount in hands of public, June 30, 1908.	Owned by Union Pacific R.R. and Auxiliary Companies. Union Pacific R. R. Co.	Oregon Short Line R.R. Co.	Total.	Inc. (+), or dec. (—).	Of total owned there are— Pledged.	Unpledged.
Atchison Union Depot & R.R. Co.: Second mortgage, 5 per cent	$31,500.00	$4,500.00	....	$4,500.00	....	....	$4,500.00
Cheyenne County, Colo: Refunding 5 per cent	....	26,200.00	....	26,200.00	....	....	26,200.00
Chicago & Alton R. R. Co.: Debenture 5 per cent	....	147,000.00	....	147,000.00	+ $147,000.00	....	147,000.00
Green River Water-Works Co.: First moregage 6 per cent	....	198,000.00	....	198,000.00	—10,000.00	....	198,000.00
Idaho Northern R.R. Co.: First Mortgage 5 per cent	....	143,000,00	....	143,000.00	+ 143,000.00	....	143,000.00
Ilwaco Railroad Co.: First mortgage 6 per cent	....	305,000.00	....	305,000.00	....	....	305,000.00
Leavenworth & Topeka Ry. Co.: First mortgage 4 per cent	250,000.00	125,000.00	....	125,000.00	+ 22,500.00	....	125,000.00
Leavenworth Depot & R.R. Co.: First mortgage 5 per cent	87,000.00	63,000.00	....	63,000.00	....	....	63,000.00
Northern Pacific Terminal Co.: First mortgage 6 per cent	....	58,000.00	....	181,000.00	- 13,000.00	....	181,000.00
Ogden Union Ry. & Depot Co.: First mortgage 5 per cent	163,000.00	163,000.00	....	163,000.00	....	....	163,000.00
Payette Valley Ry. Co.: First mortgage 5 per cent	....	....	$44,000.00	44,000.00	....	....	44,000.00
Rattlesnake Creek Water Co.: First mortgage 6 per cent	....	146,000.00	....	146,000.00	....	....	146,000.00
San Pedro, Los Angeles & Salt Lake R.R. Co.: 1st mort. 4 per cent	....	....	20,000,000.00	20,000,000.00	....	....	20,000,000.00
Utah Light & Power Co.: Consolidated mortgage 4 per cent	....	....	1,500.00	1,500.00	+ 1,500.00	....	1,500.00
Utah Light & Ry. Co.:							
Consolidated mortgage 5 per cent	....	....	993,000.00	993,000.00	+ 993,000.00	....	993,000.00
Collateral trust 6 per cent	....	....	41,000.00	41,000.00	+ 41,000.00	....	41,000.00
Union Pacific Coal Co.: First mortgage 5 per cent	*1,158,000.00	3,842,000.00	....	3,842,000.00	—136,000.00	....	3,842,000.00
Union Pacific Land Co.: First mortgage 4 per cent	....	7,400,000.00	....	7,400,000.00	—2,600,000.00	$7,400,000.00	....
Total, 1908	....	$12,620,700.00	$21,079,500.00	$33,823,200.00	—$1,385,000.00	$7,400,000.00	$26,423,200.00
Total, 1907	....	15,039,200.00	20,044,000.00	35,208,200.00	....	10,000,000.00	25,208,200.00

*Held by Union Pacific Coal Co. sinking fund. NOTE.—The Oregon R. R. & Nav. Co., owns $123,000 Northern Pacific Terminal Co. first mortgage 6 per cent bonds, and owned in 1907, $125,000 of these bonds.

A. C. Block Signaling



Typical Block Signal, New York Subway, showing also Train Stop.

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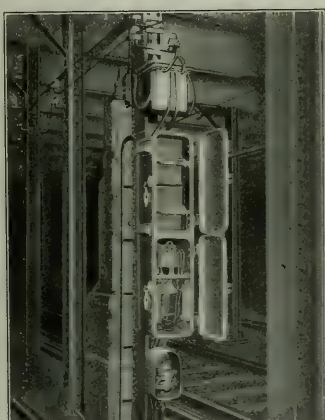
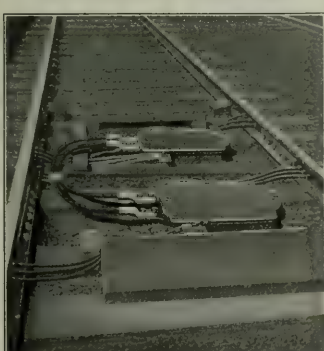
The first installation ever made of signals of this class was by the Union Company on the North Shore Railroad in California. This was quickly followed by installations in the New York Subway, on the Long Island Railroad, the West Jersey and Seashore, the Philadelphia Rapid Transit, and the New York, New Haven and Hartford. The subway installation was the boldest and the most original signaling project ever undertaken and it has been a brilliant success.

Solenoid Curve Signals, Interborough Rapid Transit.



Instrument Case in Advance of Block Signal, New York Subway.



Inductive Bonds in Place in Track.

The Union Switch & Signal Company

General Office and Works: Swissvale, Pa.

Monadnock Block CHICAGO	Frisco Bldg. ST. LOUIS	Sovereign Bank Bldg. MONTREAL	Central Bldg. NEW YORK

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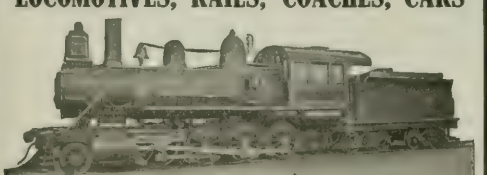

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R. S. CHISOLM, *Treasurer.*
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CONTENTS

THE HIGH CURVES OF RAILWAY RECEIVERSHIPS.

Some four years and a half ago (August 5, 1904) we pointed out in these columns certain features of the three preceding periods of high curves in railway receiverships. The first period, dating back to 1876, was incomplete as it did not include the panic year 1873 and the two years after for which no returns are available. But the returns did include five years of the "long drag" ending in 1880. The three intensive periods in condensed form are set forth below:

First Period.

Year.	Miles.	No of roads.	Stocks and bonds.
1876	6,662	42	$467,000,000
1877	3,637	38	220,294,000
1878	2,320	27	93,385,000
1879	1,102	12	39,367,000
1880	885	13	140,265,000
Total	14,606	132	$960,311,000

Second Period.

Year.	Miles.	No. of roads.	Stocks and bonds.
1883	1,990	11	$108,470,000
1884	11,038	37	714,755,000
1885	8,286	44	385,460,000
Total	21,314	92	$1,208,685,000

Third Period.

Year.	Miles.	No. of roads.	Stocks and bonds.
1892	10,508	36	$357,692,000
1893	29,340	74	1,781,046,000
1894	7,005	38	395,791,000
1895	4,089	31	369,075,000
1896	5,441	34	275,597,000
Total	56,383	213	$3,179,201,000

The fourth curve falls in the "panic year" just closed—only it is not, strictly speaking, a curve so much as a sharp upward angle whose inclosing lines fall thus far, or nearly so, within a single year, 1908, when the receivership mileage has been 8,009, the number of railways 24 and stocks and bonds $596,359,000. What the present year will bring forth is, of course, uncertain. But the outlook favors decidedly the close of a sudden and sharp but brief receivership period.

Comparison of the periods and their coefficients are interesting. In a rough way it will be noted that, taking the long panic aftermath following 1873 as a basic line, the high curves of receiverships come about ten years apart, with 1907 somewhat longer removed. This may have slight significance. But the coincidence would have been closer if the prophecies of woe in the height of speculation some three years ago had been fulfilled—and there was another time of doleful prophecy three or four years before that. Both those epochs of speculative expansion were survived without panic and when the panic year, now presumptively in its past tense, came it left relatively few wrecks upon the shoals. Compare, for example, the $596,359,000 of stocks and bonds in the receiverships of 1908 with the $467,000,000 of 1876, when the railway interest of the country was much smaller than now, or, under similar conditions, with the $714,755,000 of 1884, or the $1,781,046,000 of 1893. It was not many years ago when, under the evil auspices of "holding companies" and "high" finance with stock recapitalized into mortgage bonds it looked as though the next receivership period would be fraught with profound and widespread disaster. Inflated bonding, it was reasoned plausibly, spelled foreclosure when hard times reduced the railway earnings for the bonds which had once been stock without foreclosure power. Yet that prophecy has gone unfulfilled, too, though one or two of the big "high financed" systems have been badly jarred. So also with the street railways. Their enormous and often reckless over-capitalization in bonds as well as stock seemed a clear prognosis of foundering when the first financial tempest swept the fiscal sea. Yet if we exclude the notorious New York Interborough example—where wreck would doubtless have followed, panic or no panic—and one or two minor cases the survival of the street railways has been remarkable.

Looking back over the first three periods of high curve receiverships and allowing over-speculation as a general cause of each there appear only two or three elements of a special contributory character. There were the frenzy of railway building that brought on the panic of 1873—with the granger agitation as a minor component—and the silver question in 1893 and after. But in none of the three periods was there such an aggregation of new contributory causes as in the year just past. Add to abnormal speculation state railway baiting and to that federal interference and a presidential election to both and the revision of the tariff to the three one finds such a combination of sinister forces as challenged the most exalted mood of the optimist. Yet that optimist is still atop and promises to remain there, and his reasonings why acute conditions of railway calamity have been but sub-acute in the sequel are proving sound. When he tells us of solid underlying bases of American industry, of the massed capital that resists the harder impacts and onsets of panic, of the consolidated railway interests and organizations which protect their weaker lines we begin to believe him—even in the face of revived Wall street speculation—and to understand why the panic harvests of 1908 fell so far, in terms of railway receiverships, below the dismal reapings of the decades before.

THE NEW HAVEN ELECTRIFICATION.

The paper read by W. S. Murray before the Institute of Electrical Engineers and published a week ago in this paper was so remarkable in its presentation of the subject and so valuable in the matter which it contained that it was well within the bounds of expectation that it would call forth a full and vigorous discussion. This expectation was fulfilled, as will be seen from the abstract appearing in another column this week. When we remember the storm of criticism, amounting at times to prognostications of it-can't-be-done, when the proposition to electrify the New Haven line with the single-phase system was proposed, it would be strange if all interested engineers should have been willing to accept Mr. Murray's frank exposé of his troubles and of the means taken to meet them, coupled with the statement of current conditions, as a demonstration of the complete success of single-phase design and operation. Hence, differences of opinion still exist as to the relative electric and economic merits of the rival systems.

It was agreed universally, however, that the presentation of the subject was novel and of great importance and usefulness. As one speaker put it: "The ordinary man is usually so bent on having his work given the greatest amount of credit that his best endeavors are put forward in advertising the beauties of his work and concealing the blemishes thereof. It is, therefore, certainly most radical, not to say startling, to have an engineer feel so sure that the beauties of his work will be properly appreciated that he is content to pass them over with but scant mention, and by taking the directly opposite course at great pains, and even in minute detail, to exploit and expound upon the blemishes."

Nearly every speaker had something to say upon this point, and with their commendation was expressed the desire that some officer of the New York Central would go and do likewise. If this were to be done, the enginering world would be in a far better position to pass judgment and come to a decision as to the relative merits of the two systems than it is at present, or can be until enough time has elapsed to show by natural selection which is fitter to survive.

It is probable that each has its natural field of operation, in which the other will be unable to compete either economically or electrically. In reply to the criticisms of the New Haven failures attention was repeatedly drawn to the short haul on the New York Central, in that, up to the present, this company had been called upon to perform little more than a switching service, so that its work was not comparable with the longer and faster runs that are being made on the New Haven.

Much of the discussion swung around the cost of installation, and again and again the direct current men returned to the charge, but their figures were estimates based on other estimates that resolved the whole in a mass of uncertain guessing that proved nothing and convinced no one. But even had their hypothetical figures been based on certainties it would have to be borne in mind, as one speaker put it, that "the final test is not the cost of installation, but the ratio between the receipts and the coal pile."

In many respects the discussion partook of the character of arguments pro and con regarding the two types of motor by their respective adherents, especial emphasis being placed by the party of direct current on the greater tractive power per ton of weight of the New York Central locomotive, which was met by the claim of greater torque at high speeds of the single-phase motor.

Taking the discussion as a whole, and regarding it solely from the position of a disinterested outsider, it is evident that the paper has made a profound impression upon the electrical engineers to whom it was addressed. It has shown them that the possibilities of single-phase operation are much greater than many of them supposed to be possible a few years ago, and while the advocates of direct current operation are not yet willing to concede an equality to the alternating current machine, they are, at least, obliged to admit that great advances have been made, and that the end is not yet.

The outsider, too, who has come into close contact with the operating officers of the two roads, knows that while each expresses himself as satisfied with what has been done and feels that the period of worry has been passed, there is still a sense of much to be accomplished before all will be well. They know that the electric locomotive has developed track stresses of great magnitude at high speeds that are still imperfectly understood, and that these stresses must be guarded against by lowering the maximum speed limit and using a track construction that for strength is probably unrivaled, and for cost of maintenance undoubtedly outranks anything heretofore in use. Such things as these, however, the railway officer and the engineer expect, for each knows the infrequency with which first efforts are crowned with solid sucess. They know that all of these great undertakings reach their final triumph through a long series of trial and error, and that there is no other path leading to the goal. It is quite safe to say, therefore, that it is the consensus of opinion of all who took part in the discussion of Mr. Murray's paper that it was a bold step on the part of the New Haven management to brush aside the tremendous array of obstacles arising from the paucity of data regarding single-phase operation and requirements and launch at once into the unknown waters of trunk line operation on so large a scale, where failure would have been disastrous. By so doing, and by its display of courage in overcoming difficulties and placing operation on a satisfactory footing, the New Haven company has rendered a service of great value to electrical and to railway science in demonstrating at least some of the possibilities of single-phase traction. The New Haven officers chose the single-phase system because they believed that the direct-current locomotive is not suited for trunk line work. As Mr. Murray said in his closing remarks: "The electrification of the New Haven road was not taken up as a terminal proposition in any way whatever, but was intended to have its application to long-distance work."

COMMODITY VALUES AND FREIGHT RATES.

In its opinion in the case of the Stowe-Fuller Company *v.* Pennsylvania Company, *et al*, the Interstate Commerce Commission said that "classification must be based upon a real distinction from a transportation standpoint"—that "to hold otherwise would be to promote false billing on the part of shippers." It was assumed that the Commission meant to condemn the basing of rates on commercial as distinguished from transportation considerations. The later opinion in the case of Union Pacific Tea Company *v.* Pennsylvania Railroad, *et al*, indicates that this inference was incorrect. In the latter case the Commission said:

> "While we now decline to establish this rating upon the basis of value, it must not be understood that we have reached a final conclusion that such a principle might not with propriety be introduced into the classification of these articles. There is much to commend the idea. . . . If the carriers could suggest a workable plan which would accomplish this it would probably meet with the approval of the Commission. . . . The value contemplated by such a classification would not be a release value, but a declared value. The value as stated by the shipper would be a part of the description of the property."

There is nothing novel about basing rates on the value of commodities. The minimum and maximum between which rates must be fixed are the cost of the service and the value of the service. A railway cannot afford to haul a commodity for $50 if hauling it will add $51 to operating expenses. A shipper cannot afford to pay $50 for the transportation of a commodity if it will be worth only $49 more in the market than at the shipper's farm or factory; the cost will exceed the

value of the service. Now, the value of commodities is a most important factor in fixing both cost and value of service. The more valuable a commodity is, the larger are the claims the railway has to pay for loss of or damage to it, and the higher therefore is the average cost of hauling it. The less valuable a commodity is the less is its value per ton increased by moving it from one place to another; the less is the value of the service to the shipper; and the smaller is the maximum rate he can afford to pay. Conversely, the less valuable a commodity is the less a railway can afford to haul it for, and the more valuable it is the more a shipper can afford to pay for having it hauled.

The principles stated are so obviously true as to be axiomatic. They are tacitly recognized in every tariff or classification made by either railways or commissions. But railways do not, in practice, carry these principles to their logical conclusion; and when they try to approach nearer to doing so, commissions are apt to oppose them. Commissions are strongly prone to give preponderant weight to cost of service and to neglect value of service, although the latter is the more important factor, not only in scientific rate-making, but in fixing prices in every commercial business. The railway is analogous to a manufacturing concern, such as a packing house, that makes a number of articles. Theoretically, perhaps, the packer can tell how much it costs him to make fertilizer and porterhouse steaks. But in actual practice he buys a steer, horns, hair, hoofs and all, for a stipulated price per 100 lbs. By the manufacturing process, part of the steer is made into fertilizer and part of it into porterhouse steaks. The fertilizer is sold for a price a little above the cost that would not have been incurred if it had not been made, while the porterhouse steaks bring far more than the average amount per 100 lbs. it has cost to prepare the carcass for market. The value of the service of making fertilizer is less than the value of the service of making porterhouse steaks. If the packer tried to base his prices on cost he would have a big demand for steaks, but no demand for fertilizer. Similarly, if the railway tried to base its rates on average cost it would have a big demand for short hauls and for the transportation of such commodities as dry goods, but it would have no demand for long hauls and for the transportation of such commodities as coal and lumber.

If due weight were given to the value of commodities many articles in the classifications would carry very different rates from those they carry now. The average number of tons of coal per car shipped between Pittsburgh and Chicago by a certain large manufacturing concern in the year ended June 30, 1908, was 49.3. The average rate paid was $1.90 per net ton, making the average earnings per car $93.67. The average carload of merchandise between the same points was perhaps 15,000 lbs. and the first-class rate 45 cents per 100 lbs., making the earnings per car about $68. Earnings per car from one of the least valuable commodities were more than from one of the most valuable. We have heard shippers complain that class rates in eastern territory have stood unchanged for years. A fairer criticism probably is that in proportion to the value of the commodities and to earnings per car class rates are too low as compared with rates on many commodities outside the classifications.

Both the cost of the transportation service to the railway and the value of the service to the shipper are affected by changes in the value of commodities. A logical application of the principle of basing rates on the value of commodities would involve raises or reductions of rates as the value of commodities advanced or declined. No one would argue that rates should be changed with every slight fluctuation in the price of a commodity; but when changes in prices are not merely fluctuations, but are substantial and lasting, there should be also changes in railway charges. Inflexible schedules of rates are apt to be unduly burdensome to commerce in periods of low prices and unremunerative to the railways in periods of high prices.

It is not clear whether the Interstate Commission in its opinion in the Union Pacific Tea Company case meant to invite consideration of the entire question of the proper relation of the value of commodities to rates; but the question is one that highly merits more intelligent consideration and application than it has had.

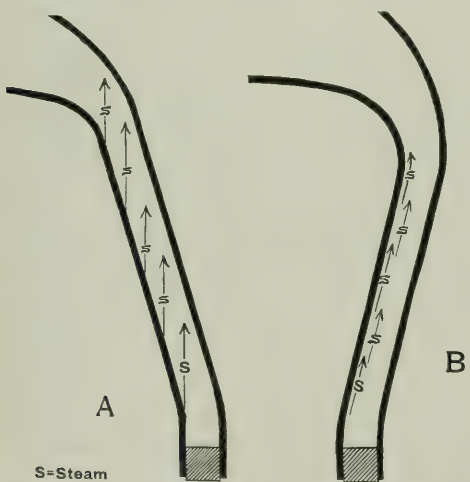
THE LIFE OF WIDE FIREBOXES.

The firebox, 60 to 70 inches wide, for bituminous coal burning locomotives, has been a continued source of trouble on most railways on account of broken and leaky staybolts, leaky tubes and cracked sheets. The repairs to side sheets in many of them have been so extensive that the boxes have been removed after a service of two or three years and in many instances this life has been only one year. While various theories have been advanced to explain these failures, the relation of the life of the side sheet to its shape has not been so definitely settled as to make much impression on firebox design and it does not appear to have been considered of much importance. The fact that the older fireboxes having O. G. shape, with the side sheet inclining out from the mudring, has suggested the possibility that the difference in the steam and water circulation in fireboxes having side sheets inclined in and those having them inclined out, may account for the large difference in the life of the side sheets in the two types of boxes, and this may have some important bearing on future firebox design. There appears to be no settled practice in this regard, but the majority of wide fireboxes incline inward following the general contour of the outside sheet but at a smaller angle. In modern practice, however, may be found side sheets inclined out to a moderate degree; some vertical, and many nearly vertical, inclined either out or in. Thus the Harriman common standard boiler for Atlantic and Pacific engines has the side sheet inclined in, that for the consolidations, inclined out, and for switchers the O. G. form. On the Canadian Pacific they incline in on the Pacific engines and out on the consolidation. The new boilers with combustion chambers for the Northern Pacific and those for the St. Paul have the side sheets inclined out.

The number of wide fireboxes which have been renewed in the United States during the past two or three years is so large that the old ones would cover many acres, and if all of them were collected on the open prairie they would make an impressive spectacle which should result in some serious investigation as to the cause and a modification in firebox design which would largely prolong their life. The expense connected with such an investigation would be but a small portion of the amount spent for new fireboxes every year. The determination of the best shape for a locomotive firebox to insure long life for the sheets is a question which involves a correct knowledge of the circulation of water in locomotive boilers, and locomotive builders and motive power officers are alike at sea in their ideas regarding this important phenomena. This was well illustrated in the discussion of Mr. C. A. Seley's paper on the "Life of Wide Fireboxes," at the recent meeting of the Western Railway Club, where there was such a difference of opinion as to how water circulates in a firebox that two speakers said without contradiction that "we know little or nothing about it."

The effect of the shape on the life of fireboxes was suggested in the discussion on "the proper size of water space in the sides of locomotive boilers," by Lawford Fry and others at the Master Mechanics' meeting in June, 1905, and as this involved theories in regard to the water and steam circulation we reproduce here the cut which illustrates the principle involved. Mr. Fry said "In diagram A the side sheet inclines inward from the mudring. The steam rises in vertical lines S S across the water leg and interferes with the descending current of water. If the evaporation is violent there is a tendency to blow all the water out of the water leg. In

diagram B the side sheets slope outward from the mudring and the steam rises along the inner sheet, as indicated by lines S S, giving the cold water a chance to descend along the outside sheet to take the place of the evaporated water. This is a definite statement which gives one theory of circulation and it assumes that there is an upward current of steam along the inner sheet and a downward current of water on the outside sheet. If this theory is correct the sheet in Fig. B would burn out first, as it would be covered with steam instead of water, the very condition favorable to overheating. It is more reasonable to think that there is a current of steam and water passing along the inner sheet in form B, and where the water leg is narrow, there is an upward current of water through the whole section and the supply is from below along the mudring. The velocity is greatest along the fire sheet and it draws water from the outer portion in a diagonal or curved upward line. If this explanation is correct then the shape B is the best as the steam bubbles are rapidly renewed by the constant inrush and scouring effect of the water current, as Mr. Seley suggests. His paper further implies that there may be some advantage in a narrow water



leg, as it would favor more active circulation, the higher velocity being due to a given volume of water passing through a restricted passage in a unit of time, while a larger passage would result in a more sluggish current.

This theory is based on the assumption that a definite volume of water must circulate past the side sheet, but it is not at all certain that it does; it is more likely that the restricted passage will retard the current and allow less water to pass. The sheets will be more effectually cooled when there is a large volume of water adjacent and ready for any circulation which the rise in temperature may induce. The Wootten boiler is a good illustration of this condition, as here the water legs are unduly enlarged and the circulation is good. For this reason we are inclined to differ with the author in his suggested advantage of a narrow water space. The benefit of a wide water leg in increasing the length of staybolts and largely reducing the number of broken ones is so great that one should hesitate to give it up for an uncertain theory as to circulation. In the Master Mechanics' discussion referred to, Mr. Fry said: "There are so many good reasons for the use of wide water spaces that it is strange that the width has not been increased more rapidly. It is obvious that a free circulation of the water will be insured by wide water legs and they will help the evaporative powers of the firebox." Professor Goss said: "We all agree that we are not likely to get the water space too wide at the mudring, as a matter of principle the wider the better. There should be no contraction of the water space above the mudring but it should widen out."

The above is only an introduction to the discussion, and an investigation should be made on the proper design of wide fireboxes to insure long life to the sheets. The records showing the life and mileage obtained from fireboxes of various shapes should be collected in connection with the drawings so that some definite conclusions can be drawn. This should be followed by an investigation which would give us some positive knowledge in regard to the direction of the currents of water and steam in the circulation of locomotive boilers. Without such knowledge firebox design is largely guesswork so far as durability is concerned, and the recent experience with wide fireboxes is not a creditable record for locomotive designers and builders.

NEW PUBLICATIONS.

The Plane Table. By W. H. Lovell. New York: McGraw Publishing Co. 49 pages, 4¾ by 7¼ in.; 9 illustrations. Cloth. Price, $1.

From the introduction it is to be inferred that the author, who is a topographer of the United States Geological survey, wishes to extend the use of the plane table in this country by citing its advantages and its adaptability to a wide range of work. The criticism to be made of this work is that it partakes too much of the character of a reprint from a technical society paper in that it assumes an amount of information on the part of the reader sufficient to make him familiar with all of the minor details of plane table work. In short it is an intermediate section of a complete work. It skips all of the detail description of the instrument, and the principles upon which it acts, and plunges at once into the solution of a few problems and then stops short without one hint as to the uses and the means of connecting the several points that have been located, and it is only in the chapter on land surveys that one gets an inkling as to what should be done and even then the familiarity of the reader with the work is needed to make the text clear. If the text were to have been presented as a discussion of a paper on the subject, it would be considered a valuable contribution, but standing alone its incompleteness makes it of no value to a man who is ignorant of the construction and uses of the plane table and wants to learn of both; while, for the expert, the problems given and the notes accompanying them in regard to location, signals, flags and such auxiliary matters, are of little value other than mere reminders of things of which he already knows. So, while the contained matter is good as far as it goes, it neither starts soon enough or goes far enough to be of any great value.

Manual of Reinforced Concrete and Concrete Block Construction. By Charles F. Marsh and William Dunn. New York: D. Van Nostrand Co. 290 pages, 4 in. by 6½ in.; 113 illustrations. Leather, semi-flexible. Price, $2.50.

This manual is a condensation of the larger volume on reinforced concrete by the same authors, and its object is to give in concise and handy form, the methods employed in the solution of common problems. It is an office pocket book and deals almost exclusively with the problems that arise in design. There are brief opening chapters on materials, construction and false work, water proofing and fine resistance. and then the book plunges directly into the calculations that are needed for the work in hand. It starts in computing loads on columns, piers and retaining walls, and broadens out to include such modifications as hoppers and bins with conical and spherical bottoms, and thus passes naturally to the consideration of the stresses in beams and girders, and then of floors and slabs. In the case of the latter it is frankly recognized that there is no accepted and satisfactory theory of the stresses in slabs supported on all edges. The generally accepted theory is that the maximum stress is to be found at

the center in two planes at right angles to each other. Beyond this the data depend on mathematical reasoning. The same confusion exists in the matter of the pressure upon retaining walls, and three theories are proposed: The first that the center of pressure always acts at one-third the height of the wall from the base, except where there is a surcharge; the second, put forward by J. C. Meem, and based on the well known fact that the pressure on the struts in a trench is always less towards the bottom than near the top and that the center of pressure is at a distance of one-third the height below the surface instead of the usually accepted position of one-third the height above the bottom, and the theory of E. G. Haines based on the assumption that slips of earth-works have always a plane of fracture forming a circular curve, and that the center of pressure is five-sixteenths the height of the wall above the bottom, a condition that does not differ materially from the first theory. These instances are cited merely to show the need of further investigation along the lines of determining stresses in concrete work.

There is a chapter on hollow concrete blocks that deals with the materials, methods of manufacture, the strength and cost. The final chapter contains tables and diagrams that will add to the general usefulness of the book for office work.

The Proper Distribution of Expense Burden. By A. Hamilton Church. New York. *The Engineering Magazine;* 116 pages, 5 in. x 7½ in. Cloth. Price, $1.00.

The chapters of this book are a series of articles reprinted from *The Engineering Magazine* on the subject of the proper distribution of the expenses of an establishment on the items of manufactured product. The fundamental principle upon which the method advocated by the author rests is that the averaging of the general expenses of the shop and the office and distributing them, *pro rata*, over the product on a percentage basis, is wrong, whether that percentage is based upon the wage or time cost of the article in question. He argues that the error lies in the fact that, in the case of the wage basis, it is quite possible that a low rate of wage may be paid for the running of a large and expensive machine so that the percentage borne would be out of all proportion to the investment. But, if the time rate be the basis, it may happen that on the same article a good and a poor workman may be consecutively employed, with the result that in one case the percentage would be high and in the other low for the same product.

The plan proposed is to consider a factory as composed of a number of small shops, and that each one of these is doing an independent business, and as such is obliged to pay interest on investment in machinery and rental for space occupied and for light, heat and power furnished. It is evident that if such a condition existed and each machine were to be owned and operated by a separate person, the fixed charges would go on without variation, whether the machine were to be idle or not. Why, then, should not the same condition be assumed in the case of the factory? Idle time represents a loss, and it is only the loss resulting from idleness that is to be distributed over all of the items of manufacture in the form of a supplementary charge, and this is done pro rata in proportion to the other charges of the article.

In the allocation of these charges a very sharp distinction is drawn between a job and work order, in that the works order may consist, and usually does consist, of a number of jobs. The job is defined "as the amount of time spent by any particular workman on any particular piece or similar set of pieces." And it is in connection with this idea of the job that the factory is considered as divided into a number of small shops that are doing an independent business, so far as costs are concerned, in everything except the individual bearing of losses accruing from idleness.

In making the first charges the rental of the building is divided among the several machines on the basis of the space occupied, and the cost of light and heat is likewise divided among them on the same basis, while the power charge is on the basis of the amount consumed, to which is added an interest and depreciation charge dependent on the value of the machine. Shop supervision is apportioned in accordance with the amount of attention required by the different machines, and general office and selling expenses are analyzed in the same way and allotted in accordance with the demands of the different products for the services of the advertising, correspondence and general management departments.

The system is naturally complex and its introduction could not be accomplished in a day; but it is evident that the information gained by the application of such a system would, after a time, more than repay for all of the expense and trouble involved in its application, and that when once in full swing the details would require but comparatively little time, if the evidence of those who have worked along similar lines is of any value. So the book may be regarded as a valuable contribution to the literature of cost accounts.

Geschwindigkeitsmesser für Motorfahrzeuge und Locomotiven. Fr. Plug, Regierungsbaumeister. Mit 312 Fig. im Text; 285 pp. Berlin, 1908. Julius Springer. Price, $2.85.

This book on speedometers was compiled at the instance of the "Mitteleuropäische Motorwagen-Verein" to serve as a reference for the present status of speed measures for motor-vehicles. The author has found it desirable to extend the scope so as to include speedometers for locomotives.

The arrangement of the book is systematic but it lacks an index, so that in looking for a particular item the reader must be content with the table of contents. The first chapters are concerned with the general requirements of speed indicators for automobile, for locomotive and for street railway service, a description of the different types of instruments and of the mechanical laws on which they depend. The component parts of the apparatus are treated separately, thus affording an opportunity for their critical discussion. Then follows a detailed description, accompanied by excellent illustrations, of the most noteworthy speedometers in use in Europe. A list of the prominent patents taken out in Germany (in each case the short description is illustrated by a diagram) completes the book.

The measurement of the speed of a stationary engine is a simple matter—it consists in counting the number of revolutions. Using the number of revolutions of a wheel whose diameter is known is the basal principle employed in speedometers to determine the length of the path described by the vehicle. The record of speed should be made to depend wherever it is feasible, not on the revolutions of a driving wheel but on those of a driven wheel. The former is at times subject to slipping which would be recorded as distance traveled although it is only circular motion that has in any way moved the vehicle, and to the extent that it takes place, the speed record would be too high. Even when properly connected there are inherent sources of inaccuracy in the wheels themselves, so that under favorable conditions a speedometer can only furnish approximately correct records or indications. In case of automobiles the diameter of the wheels will vary with the degree of inflation and the load, in vehicles with iron tires the wear of the tires will gradually diminish the diameter of the wheels. The author gives the limit of allowable error in a good instrument as plus or minus 4 per cent.

At different times prize competitions have been invited by various corporations and associations in Europe for speedometers to meet certain specified requirements. The author gives the specifications to be fulfilled in the competitions invited by the "Grosse Berliner Strassenbahn-Gesellschaft in 1901, by the Mitteleuropäische Motorwagen-Verein in 1905 and by the French Automobile Club in 1906. These specifications give a good conception of what should be required of a good speedometer.

C. F. E.

Letters to the Editor.

THE LAW AND THE RATE.

Tucson, Ariz., Dec. 1, 1908.

To the Editor of the Railroad Age Gazette:

The practice of making through rates by combinations of locals over junction points which has been followed by the railways of the United States since interline waybilling was first established is recognized by the Interstate Commerce Commission in Rule 5 of Tariff Circular 15A. The Commission adds that the practice is universal, and that rates thus made have the same binding effect as through published joint rates. It furthermore views with great favor the publication of proportional rates to and from important junction points and gateways, thus facilitating the more speedy adjustment of through rates to meet changing commercial and traffic conditions. While it is true that many of the utterances of the Commission have no more binding effect on the roads, from a legal point of view, than the utterances of any private individual until passed upon by the court of last resort, it behooves us to ask, "Is not this ruling essentially sound?"

In response to a request from the Accounting Department, one of the most eminent railway lawyers of the United States has recently expressed the opinion that through billing should be discontinued unless there is a through published rate. His opinion is based on the argument that the delivering line, in collecting charges on a through waybill, where the rate is based on a combination of locals, is making itself a party to tariffs of other lines in which it has never concurred and is assuming legal responsibility for the correctness of the rates of other lines, and that the Commission has never intended that one line shall thus assume responsibility for another line, or that it shall hold itself legally bound to collect any undercharges that may arise by reason of the errors of other lines and their agents. While the opinion does not explicitly so state, the only logical inference that can be made from it is that the delivering line not only cannot thus be held responsible, but that it cannot legally undertake to make collections in this way for account of other lines, even though it should be willing to do so.

As an abstract legal theory this opinion seems well-founded. In practical every-day railroading is it as sound as the Commission's recognition of the precedent of past years? Are we not in danger of losing ourselves in a maze of abstract legal theory? In our endeavors to adjust ourselves to the new regimé, are we not in danger of going to the extreme of considering the traffic of the country as created to conform to some legal theory instead of squarely facing the situation and making the law an aid in the development of commerce? Will the Accounting Department hue to the lines of this legal opinion?

The few that do well find themselves hugging the phantom of self-righteousness while their more practical competitors are handling the business.

As a concrete example, let us take the case of a small shipment moving from some remote New England point to destination on a small line in Nevada. The through rate is made by the combination of a local rate to some seaboard terminal, plus a through rate from that point to the junction of the little Nevada line, plus the local rate of the delivering line from that junction to destination. We will assume that the New England line has made an error in its rate to the seaboard terminal. After the shipment has been delivered and the charges paid as billed the error is discovered and the New England line issues correction. When the undercharge reaches the delivering line, if the theory of the Accounting Department is acted on, they can only say to the New England line: "We are not a party to your tariff and we cannot under the law undertake the collection of this undercharge for you." If the originating line complies with the law as interpreted by the Commission, it must collect the undercharge or lay itself liable to suffer the penalties prescribed by the law for deviating from published tariffs. It must send its own representative to collect the undercharge or maintain a representative for that purpose at the destination of the shipment, or it must file power of attorney with the delivering line to collect such undercharges as may arise.

Let us see whither we are tending. It means one of three things: Further consolidation of the railways of the country; an enormous increase of the publication of through rates over anything that is known now, or the demand on the part of a very strong minority for government ownership. The normal consolidation of existing lines is not likely to be greatly accelerated. We may lay aside for the present any discussion of government ownership, which could not fail to be, under our present form of government, the worst calamity that could befall the transportation industry and commerce of our country. It remains, therefore, to consider the extension of the publication of through rates.

The publication of any single rate by any individual line is a matter of not more than forty days at the outside. If another line is a party to it, the time is proportionately increased. When 75 or 100 lines are parties to it, the time consumed in getting any rate published and into effect can only be estimated from concrete instances of tariffs that are now going into effect which have been in course of compilation for the past two years. Governmental supervision and control of our transportation industry is a good thing up to a certain point, but it will break down under its own weight and defeat its own purposes beyond that point. Just as surely as we establish a system that is not sufficiently flexible to meet the changing commercial conditions of the country, just that surely will we stifle the commerce of the country. The only alternative will be the promulgation and protection of rates without compliance with all the provisions of the law. The injection of too much abstract legal theory into the arteries of our commerce can only mean the stifling of that commerce or the death of the law. The law should be made for our commerce and not our commerce for the law. Whither are we tending?

G. C. WHITE.

INTER-ROAD TICKET REPORTS.

Denver, Colo., December 28, 1908.

To the Editor of the Railroad Age Gazette:

It is generally conceded that the present system of a monthly exchange of inter-road ticket reports is unsatisfactory. This is due chiefly to the great bulk of such reports. The desired improvement could therefore be best obtained by dividing them into four "weekly" reports. The first three could be made to cover seven days each. The final report of the month to cover the balance of the month's tickets and the whole month's baggage, exchange and correction reports. As it obviously would be impracticable to make a weekly settlement the final report of each month could be accompanied by a recapitulation showing the amount of the four weekly reports to be used in making a monthly settlement of revenue.

Agents' monthly reports of interline tickets issued have been replaced in many instances by reports covering shorter periods, much to the advantage of both agents and accounting departments. In making up these smaller reports agents are able to send reports in promptly at the close of each period. It is also essential that tickets be reported in the period for which they are stamped

The weekly system could well be carried to the inter-road reports with little or no increase in the cost of the cheaper labor and a material saving in that which is more expensive. No small part of the work on interline accounts results from the unwieldy reports, necessarily rushed through with great regard for time and small regard for accuracy. The consequent result is an expensive mass of errors. Handling the smaller reports should reduce to the minimum the errors in

inter-road reports with the result of a decided saving of wasted time.

Nearly all of the expense incurred in handling passengers on foreign tickets is carried on under credit extended from 30 to 90 days. With the monthly report plan now in use this is done without definite knowledge as to the date and amount of payment to be made. Reducing the size of the reports as outlined would bring settlement at least two weeks nearer to the time that value is given. Estimates of earnings would be more accurate as the weekly reports would give prompt information not obtained under the present system. The time gained under the above suggested arrangement would obviously be of great value in the preparation of monthly and annual reports.

Companies desiring not to change the method of auditing the coupons could continue their present methods and at the same time have the benefit of the prompt information contained in the weekly reports and the earlier settlement of revenue balances. Many beneficial results not mentioned would accrue. HUGH C. EDMISTON.

MACHINE FOR TESTING FLY WHEELS.

Lafayette, Ind., November 30, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

I wish to acknowledge receipt of copy of your issue of November 27, containing my paper on machine for testing fly wheels. I notice in this same issue some editorial comment and criticism on the paper. I should like to offer further comments which may throw light on some points that are apparently not well understood.

In the first place, as stated in the paper, the mathematical solution of the problem was made by Professor Hancock and not by myself. I have taken the treatment directly from his paper with some minor changes. I only did this as an introduction to the real subject of the paper, which was a description of the proposed testing machine.

As regards the anvil support for the rail, I would say that there are two different problems to be solved in a test of this character:

First, to determine the relative energy of impact of different lengths of flat spot with different speeds and weights so as to arrive at some rational formula. This, I think, would be done best by the indentation of the metal on an anvil, as shown, since all effects due to the elasticity of the rail and ballast would be eliminated.

Another problem is to determine the effect upon the rail, and, as is mentioned in the last part of the paper alluded to, this can readily be accomplished with the same apparatus. The revolving rail may be guided by supports some distance apart to imitate the ties, or, what is perhaps better, for the soft metal underneath may be substituted another rail resting on ties and ballast.

For determining the wear and deterioration of the rail under continued blows, the apparatus devised by the Pennsylvania Steel Company is probably the most satisfactory apparatus yet built.

It seems to me that it is desirble to know by experiment just what is the energy of impact of flat spots of different shapes and lengths with different weights and speeds, the energy of elliptic wheels and of defective counterbalance. While these may be determined approximately by mathematical means, there are too many elements entering into the problem to allow of such solutions being conclusive.

Allusion is also made in your editorial to the standard drop test for rails. It was not intended that this should be used as a standard of comparison for experiments made on the testing machine. It was only introduced in the paper to show approximately the relative magnitude of the energy of impact of a flat spot compared with that used in the drop test. To most people, so many thousand foot-pounds does not mean much unless it is compared with some other quantity of energy more or less familiar.

C. H. BENJAMIN,
Dean of the Schools of Engineering, Purdue University.

A CAR RECORD CRITICISM.

Bellwood, Pa., Dec. 7, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

One of the weak points in present day railroading methods, especially on larger systems, is in the car record department. This department, while in reality one of the most important in view of the repeated inability of railways to supply sufficient equipment to take care of traffic offered, is seemingly not given the attention which it deserves. It is the consensus of those in position to know that this inability to handle traffic offered is due, not so much to their lack of sufficient equipment, as to their inability to get the equipment they have loaded, moved and released promptly.

If the railways were running a storage warehouse business, then the present method of car service association supervision to look after terminal delays might be all right; but this is not the case, and railways are depending for revenue upon the car only when it is moving, either under load or toward lading. Generally speaking, the less it stands still, the more revenue it will earn.

Most of the supervision in operating departments is now being directed toward looking after the car while moving, and it gets comparatively little supervision while standing still. From this it appears that the object is to get the car standing still just as quickly and safely as possible. If such supervision is necessary, and no doubt it is, would it not be well to have a department with the object of keeping the car moving, and have it work against the department which is trying to get it to some place where it will stand still?

At present, the department nearest in touch with car performance is the car record office. This office cannot tell what the cars are doing now but only what they did do. Knowing that the delays were bad last month, it is almost powerless to make any better showing this month. What is wanted is a system which can make two records grow where only one grew before, or make each record mean more mileage, which is the same thing in the end.

So much for the disease; now for the medicine. Could not the historical feature of car records in the general office be sacrificed a trifle, and a little more of the "hurry up" feature be substituted? The management entrusts the maintenance and operation of a division to a division superintendent; why not entrust the car to him, so far as record is concerned, and simply ask that he use it, keep a record of what it does, and return it promptly; then make it the business of the general car record office to see that he does this?

To go a little more into detail, my plan is this:

Let the general office records be kept in such a manner that only movements between divisions be shown, and let these records be worked from division interchange reports made by yard masters at interchange points and forwarded, one copy to the general car record office, one copy to the division car record office delivering car and one copy to the car record office of the division to which the car is delivered. These reports to be forwarded every six hours, or as often as train service will permit. Then let the general office keep a record of movements to and from foreign roads, as is now done, of per diem accounts, etc. In short, treat each division as though it were a siding or yard.

The division car record office would keep the receipt and delivery of car to connecting divisions or roads, siding movements while on the division worked from conductor's car reports and mileage made, when necessary. This division

record to be kept in such a manner that at all times the conditions at every siding on the division shall be shown clearly. To carry out this latter suggestion, I recommend that wherever practicable, especially on feeding divisions, the following plan be adopted.

A card 2 in. x 4 in. for each car received on the division colored as follows:

Home cars	White
Foreign cars	Green
Individual cars	Blue

Small red stickers to paste on bottom of cards for penalty and hurry cars.

A case containing a pigeonhole for each siding on the division.

A filing case for cards of cars which have left the division but which are still active for record purposes.

The card to be moved through the filing case as the car is moved over the division, the initial and number to be placed at top of card followed by a trace of its movements. When the car has left the division the card is taken out of the siding case, and any information necessary is taken off, such as mileage made on certain classes of cars for monthly report to general car record office. After this has been done card is filed in filing case, classified as to initials, terminal numbers, etc.

You will note that the object of this system, while the car is on the division, is to keep it moving, and the open pigeonholes, the color of the cards and the red stickers are all means to that end. The record of what the car has done, while complete, is given secondary place. After the car has left the division and the card becomes active as a record, then only it is filed, with the prime object of easy reference, or from a record standpoint.

It may be urged that with present conditions a change of this kind is not necessary and this article is ill timed, but the idea is more or less radical, and could be tried best when business is light, since certain changes and adjustments would have to be made to meet local conditions, and these changes would take time. ROY M. BAKER.

FLAT SPOTS ON CAR WHEELS.

New York, January 5, 1909.

To the Editor of the Railroad Age Gazette:

In your issue of November 27 there was a communication regarding the dynamic effect of a flat spot on a car wheel on the rail, in which the blow was measured by the mathematical analysis of the motion of the flat spot about the first edge of the same to come into contact with the rail. This was followed on Dec. 4 by another mathematical analysis showing that the drop of the leaving edge of the flat spot depended upon gravity, and that a sufficient interval of time did not elapse for this to act and bring the flat spot down on the rail, when the speed was much above 4½ miles per hour.

Now, every practical railway man knows that the flat spot does deliver a very substantial blow at speeds above five miles an hour if the evidence of the sense of hearing and an occasional bent rail is of any value. So it seems that there must be something wrong, not necessarily with the mathematics but with the premises on which the calculations are based.

A suggestion is offered to the effect that both writers of the articles referred to based their computations on gravity, as if this were the only thing to be taken into consideration, but there are others.

For example, the weight of the car is resting on the axle box through the intervention of a spring, and this spring is, therefore, under considerable compression and ready to expand with all the strength of its elasticity the moment it gets a chance. The axle is being drawn by its housing and the truck pedestal, in which there is considerable lost motion, and so is crowding back against the fixed parts of the truck, and there is always a possibility of its being thrown forward to the limit of the lost motion by any force tending to drive it to the front. So when the wheel starts to roll over the flat spot there is the quick action spring tending to push it down and forward. This spring has a compression due to the load above, which may be 18,000 or 19,000 lbs. Taking the lower figure and considering the wheel and half the axle to weigh 1,075 lbs., the rate of acceleration during the fall of the wheel will be about 17.7 times as fast as when gravity alone is at work. This would immediately raise the speed at which the train can be running, and the flat spot strike its full blow from 4.55 to something more than 79.5 miles an hour, modified by the decreasing tension of the spring as the wheel drops away from it, by which the rate of acceleration is correspondingly decreased. The problem is further complicated by the size of the spring, as the fall in spring pressure will be the more rapid as the stiffness of the spring and its consequent compression is increased, and the severity of the blow will be increased according to the downward velocity of the wheel at the moment of the impact of the flat place. Further complications are added, in practice, by the motion of the load at the moment. If the car body is rising in its vibrations the blow will be less than if it is falling.

It appears, then, that this spring action accounts for the fact that the severity of the blow apparently increases with the speed, because the spring has a chance to produce a rapid downward acceleration, and may account for the destructive effects produced both on track and rolling stock, while the complexity of the forces involved renders a mathematical analysis and solution of the problem no easy task and one that would not be conclusive when it were finished, simply because there would be no certainty that all of the factors in the case had been taken into consideration and given due importance. GEO. L. FOWLER.

Contributed Papers.

TRAIN ACCIDENTS IN NOVEMBER.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of November, 1908. The monthly records are intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. They are based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details of for confirmation.

Train Accidents in the United States in November, 1908.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
5.	Pennsylvania	Allegheny.	xc.	Ft. & Ft.	1	2
*10.	Union Pacific	Borie.	xc.	Ft. & Ft.	10	3
10.	N.Y., N. H. & H.	Deep River.	xc.	Ft. & Ft.	4	10
*†11.	N. O. & N. E.	Little Woods.	rc.	P. & P.	8	20
13.	Wabash	Iles Junc.	bc.	Ft. & Ft.	3	1
†14.	At. Coast Line	Cambon.	bc.	P. & P.	2	1
21	Ann Arbor	Lakeland.	bc.	Ft. & Ft.	3	1
21.	Illinois Cent.	Berwyn.	xc.	Ft. & Ft.	1	2
22.	At. Coast Line	Nansemond.	bc.	Ft. & Ft.	1	1
*†28.	N.Y., N.H. & H.	Boston	rc.	P. & P.	5	50
28.	Seabrd A. Line	Silver Springs.	bc.	Ft. & Ft.	5	2

[1] Abbreviations and marks used in Accident List:
rc. Rear collision——bc. Butting collision——xc, other collisions——b. Broken——d. Defective——unf, Unforeseen obstruction——unx. unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
11.	Pennsylvania ..	Pittsburgh.	unx.	Pass.	1	1
17.	Balt. & Ohio...	Cowan.	d. track.	Pass.	..	25
18.	St. L., B. & M..	Refugio.	ms.	Pass.	1	1
20.	Southern	Leighton.	unx.	Ft.	2	0
22.	St. L., B. & M..	Sinton.	d. wheel.	Pass.	0	13
30.	Balt. & Ohio...	Valencia.	acc. obst.	Pass.	1	5

The most notable accidents in the foregoing list are the collisions at Borie, Wy.; Deep River, Conn.; Little Woods, La.; South Boston, Mass., and Silver Springs, Fla.

The collision at Borie was the result of a heavy freight train getting beyond control on a steep grade. This train crashed into a work train, making a very bad wreck, which took fire and was mostly burned up. Ten men were killed; five trainmen and five Japanese laborers. Three employees were injured. The cause of this accident appears to have been mismanagement of the air brakes. A report of it was published in our issue of December 18, page 1,600. This incident is the first one of this character to happen on this grade (between Laramie and Cheyenne) in 30 years, though 10,000 trains are moved over it annually. The grades are from 43 ft. to 85 ft. to the mile. On the steepest parts frequent five-minute stops are required (with freight trains, descending) to allow the wheels to cool.

At Deep River a work-train backed into a freight train making a bad collision, which resulted in the death of four or more employees. The rear collision at Little Woods occurred in a fog. The foremost train, a passenger train of the New Orleans & North Eastern, was just leaving the station, where it had stopped, and was running about 10 miles an hour, when it was run into at the rear by a passenger train of the New Orleans Great Northern. Two passenger cars were demolished, and two other cars were damaged. The three rear cars were practically empty. Eight passengers were killed and about twenty passengers were injured. No train men were killed or seriously injured. The fault is attributed to the second train. At New Orleans, December 23, the grand jury, after inquiring into this collision, returned indictments for manslaughter against the general superintendent of the New Orleans Great Northern, the division superintendent of the New Orleans & Northeastern, the chief train despatcher of the New Orleans Great Northern, the conductor and engineman of the New Orleans and Northeastern, and the engineman of the New Orleans Great Northern. The indicted men were required to furnish bonds in the sum of $1,000 each.

The rear collision of passenger trains at South Boston on the 28th was only a mile from the starting point of the trains. The train, which left the terminal at 6.16, bound for Braintree, had stopped at the South Boston station. As it started to leave the station the 6.22 train, bound for Readville, came around a curve under Dover street bridge and crashed into the rear of the Braintree train. The locomotive ploughed into the rear car of the forward train, spreading the sides of the coach apart and driving seats and passengers and wreckage half way the length of the car. The passengers were thrown into a confused mass at the forward end of the car. How many were in the car is not stated; but the number reported injured is 21. Two employees were killed. While the accident was caused principally by the shifting of the Plymouth division train on to the Midland division, the exact cause of the accident could not be learned, the railroad officials refusing to make any statement. The yards are thoroughly equipped with the block signal system.

The accident at Silver Spring, Fla., was a butting collision of regular freight trains, causing the death of one engineman, two firemen and two brakemen. We have no details of the cause.

The collision at Cambon, Fla., was due to a meeting order being overlooked by the conductor and engineman of passenger train No. 39, which resulted in their train colliding with passenger train No. 10. Two mail clerks were killed. The collision at Lakeland, Mich., is reported to have been due to a misunderstanding which arose in connection with the substitution of one order for another. In the Nansemond collision an engineman misread the name of the station in a telegraphic order.

Of the 11 electric car accidents which were of enough consequence to receive prominent notice in the newspapers in the month of November two resulted in fatal injuries. Near Laporte, Ind., an electric car was struck by a passenger train, which was moving backward, and one passenger was killed and 12 injured. The other fatal accident was on the Sixth avenue elevated line in New York City. In this case two employees on a work train were killed and two injured in consequence of a derrick on a car having been left in a position where its boom projected too far upward and came in contact with the overhead structure of a station.

THE LOG OF THE NEW HAVEN ELECTRIFICATION.

DISCUSSION OF W. S. MURRAY'S PAPER.

The discussion on Mr. Murray's paper, which we published somewhat fully last week, was very complete and exceedingly interesting, not only from the standpoint of the engineers who have participated in the work of the New Haven installation, but also from those who are upon the outside and are more or less familiar with what has been done. In presenting this paper Mr. Murray said that this was not the place to indulge in hopes, or to bury facts, or to harbor prejudices, and that if we were to progress, we could not do it by guesswork, and hypothesis must give way to facts when we can possess ourselves of them. When a decision is to be made between one of two things, it is right that the burden of proof should be placed on one of them, and when the splendid record of achievement of the direct-current system for the past 20 years is taken into consideration, the burden of proof as to its value for adoption on such a system as the New Haven must necessarily rest upon any other system than that which had been so efficient. Therefore it remained for the single-phase work to show what it could do, and it must needs earn its spurs before it could be freed from this burden of proof. He thought that this had now been done, and that the burden of proof had been shifted to the shoulders of the direct-current system to show that it could render as efficient service on long-distance work as the single phase is now doing. This system had the advantage of offering a lower cost and equal reliability in service, and that was a point that no board of railway directors could afford to ignore.

Calvert Townley, Vice-President of the New Haven Lines: What the designing engineer wants to know and what the constructing and operating engineer wants to know, is, what troubles and difficulties is he likely to meet, and how they can be overcome. Such facts are given *in extenso* in Mr. Murray's paper. It is to be noted, however, that he has omitted the customary statement of conclusions usually drawn from the facts furnished in the paper, but these conclusions are none the less clearly indicated, though they may not be stated. Those which stand forth are that the system was put in without any previous similar installation to pattern after; that several of its fundamental features were either entirely new or had so new an application that their previous use was not much of a guide; that sundry defects developed as installation progressed, resulting in delays and interruptions to the service; that these defects have nearly all been remedied and certain other improvements have been made, and that now, five months after the complete substitution of electricity for steam, while some of the improvements have still to be completed, the system has been demonstrated to be successful and well adapted to the service for which it was designed. It is to be noted, also, as an interesting fact, that the electric service is at present less subject to delays and

interruptions than was the steam service which it replaced.

It may be well, possibly, to recall some of the pioneer features that were included in this installation. For example, it is the first installation of generate single-phase current in large units at a fairly high electro-motive force with a dead ground on one side of the generating system; it is the first installation to adopt—though not the first system to put into operation—the 11,000-volt a. c. trolley, with the rail return without any transformer, converter or other sub-station appliance whatever between the generator and the inductive itself; it is the first a. c. system to handle 800-ton trains at 60 miles an hour; it is the first to use an a. c. gearless 25.6-cycle motor, and also uses much the larger motors of this type. It is the first installation to adopt a locomotive unit designed to fit the great majority instead of the heavier train service, and to take advantage of the multiple unit feature of operating two or more locomotives together when heavier trains require it.

Now, the one radical thing that was done wrong in the New Haven electrification and which was really at the bottom of the major part of the difficulties that have been encountered, is that the electrification was not begun soon enough. It is undoubtedly true that had more time been allowed for attention to the minor details of equipment, and could work that had to be done under great pressure have taken its normal course, many of the minor troubles which can be traced to these facts would never have existed, and, furthermore, had there been time for a reasonable operating tryout, very many of the defects which have caused delays to service would have been detected and remedied during the trying-out period instead of in practical service.

Mr. Murray states that we are not proud of it. It does not seem that the system needs any apology whatever, and, except in respect to some power-house interruptions, the operation has had fewer checks than I anticipated it would have when it was first adopted.

I wish especially to indorse what Mr. Murray has said of the Westinghouse Company, who were the contractors. They are certainly entitled to high credit for the success of this project. Without them the work could not have been done. There was no one else who would undertake to construct a single-phase locomotive such as the service required. There was no one else who even then believed such a machine could be built. The contractors' tireless, resourceful, prompt and cheerful co-operation with the engineers throughout the entire progress of this installation has contributed the essential features of its successful development, and they are rightfully entitled to a full and frank acknowledgment thereof. Without the single-phase a. c. motor the whole plan would become impossible.

A study of the list of changes that were made in the locomotive originally furnished disclosed the interesting fact that while there were a number of electrical difficulties, a very large percentage of the changes made were mechanical. With the principal elements of the locomotive design, namely, the large, gearless, 25-cycle motors, there has been practically no trouble. Their performance as to torque, commutation and capacity has been most gratifying, and it has been demonstrated that the motors and transformers had a capacity for service in excess of that called for by their guarantees. The several changes made in the locomotive detail were not primarily to correct defects, but so to increase the capacity of the parts modified as to provide an excess of locomotive capacity. There is one point about the gearless motor that has caused no trouble and which has been a pronounced success, and that is the flexible drive by which it is wholly supported and through which it exerts its driving power to the wheels. Trackmen have frequently been appalled because electric locomotives are so much harder on track that steam locomotives of even greater weight, and it has now come to be a generally accepted conclusion that this is due to increased impact because the armature dead weight is supported without cushion rigidly on the axle. On the New Haven locomotives this weight is cushioned, and the results in track maintenance cannot fail to be of far-reaching consequence.

W. J. Wilgus. It is doubtful if an engineer is morally justified in seeking renown by a brilliant dash into untried ways at the expense of travelers who pay their fares, and to whom the delay involves not only inconvenience, but a direct monetary loss. There is no doubt that many would have been pleased if Mr. Murray could have seen his way clear to make public at this time detailed data substantiating his position regarding the cost of installation and operation. While his company has saved the cost of sub-station and battery, it would be interesting and instructive to know just how far that saving has been offset or exceeded by the increased annual costs incident to the use of overhead construction and alternating-current locomotives; the costs of rectifying errors; the expense of holding steam locomotives in readiness to haul disabled electric trains to and from the junction with the New York Central at Woodlawn; the loss of the many well-known benefits that accompanies the use of multiple unit cars in suburban territory, and the absence of those features which assure reliability in service so essential to trunk line operation. The value of reliability is illustrated by the never failing supply of power to New Haven trains on the New York Central tracks, while a loss of the same would have been most serious to the traffic of the three lines if interruptions had occurred like those within the experience north of the junction.

B. G. Lamme. It has been my part to give a great deal of personal attetntion in the design to the a. c. generators in the power-house and the main motors on the locomotive of the New Haven electrification system. It is usually supposed that the motor was by far the more difficult problem of the two, considering that it was the first large gearless single-phase motor constructed for commercial service. But from my point of view, and it has since been borne out in practice, the design of the motors was a comparatively simple problem alongside that of the generators. In the design of the motors there were two points which were generally looked upon as sources of weakness—the commutation and the use of preventive leads, or resistance leads, as some people call them, between the armature winding proper and the commutator. It was also assumed that there would be severe sparking in the commutators of these motors. The records of these motors show that the total of 164 have averaged slightly over 40,000 miles ever since being put into operation, the minimum miles for any one motor being approximately 28,000 miles; averages from 30,000 to 50,000 miles will cover the record of a great majority of these motors. Under these conditions, the commutators are all in first-class shape with a good polish and showing relatively little wear. All these motors have been dismantled for the causes mentioned in Mr. Murray's paper, but none of the commutators has been turned unless it had received some mechanical injury from causes external to itself.

As far as the commercial service is concerned, none has required any attention, and from the present rate of wear it appears that there is at least from 15 to 20 years' life in each of them. As there is relatively little sparking even when developing two or two and one-half times full load torque, there was no real reason why these commutators should not make such good records. Regarding motor injuries it will be found that the number of injuries to the armature represent only a small percentage of the total which have occurred, largely from external causes. In a few cases these damages have resulted from an actual burn-out of a section of the armature, necessitating partial rewinding. This work has given an opportunity to make a thorough examination and this has shown that there is no dangerous overheating from the heavy loads which have been carried, and also that the

preventive leads are showing no more evidence of heating than the main winding.

If any comparison could be drawn, I should say that the preventive leads were in the better condition of the two. In only two instances have they broken down, either directly or indirectly. In short, the record for these leads is better than that for the main coils themselves, which is partly due to the fact that they are below the latter, and thus better protected mechanically, and their record may be considered as simply marvelous. If the rest of the system had shown anything like as good a record there would have been no occasion for the greater part of Mr. Murray's paper to-night.

In the generator no defect has developed which was not foreseen and provided for, based on the limited data at hand. The most pronounced difficulty in the first machine was with the heat in the rotor structure, not the winding, due to the pulsating reaction of the armature winding when carrying a heavy load in single-phase current. This was known previously, but in smaller machines had not developed destructive tendencies.

In the first rotor the structure was laminated as completely as mechanical conditions would permit, but it is almost impossible to laminate everything, due to the fact that the mechanical requirements call for rigidity in some of the structural features. On testing this first machine it was found that there was some local heating, with a heavy load sufficient to create hot spots in the core, and these in turn damaged the insulation on the coils from the outside in a comparatively short time. It was shortly discovered in our efforts to eliminate these hot spots, that we were not applying the correct remedy, and it was decided to attempt to eliminate all pulsating reactions from the armature by putting a short-circuit winding on the rotor of such value that a very large current could flow in it with very little loss. The rotor had not been designed originally for this purpose, and it was therefore difficult to adopt the most suitable proportion in this winding, but what we did put on immediately showed in practice that we had applied a practical remedy for the trouble. Meanwhile, we were bringing through new motors designed for the application of heavy cage windings, and upon the installation of these the field or rotor trouble all disappeared, and on the fourth machine a solid steel core was used in the surface, of which the copper cage is embedded, and with it all pulsating armature reactions have been eliminated, so that there was no further occasion for laminating the fill.

This work on the generators was done before full electric service was established. With one generator running there was but little or no disturbance due to short circuits, and it only appeared when more generators were put into service. It then soon became evident that there was some serious condition existing in the system, as indicated by the extremely violent shock to everything in case of short circuit. This was particularly noticeable in the switching system. We had calculated that these machines would give possibly six or seven times full load current on the first rush, but the indications were that this was being greatly exceeded, so that a series of oscillograph tests were made to determine the current rush, and it was found that under certain conditions each machine could give at moment of short circuit 5,000 amperes on one phase, the full normal load current being 340.

With three machines in parallel this would therefore mean that approximately 15,000 amperes could be delivered momentarily. This enormous rush of current was sufficient to explain many of the difficulties. While this work was being done the generators in the power-house had been suffering from the tremendous shocks which accompanied short circuit on the line, and our experience with the windings on these machines indicated that they were being subjected to enormous forces in the end windings. As the machines could give about fifteen times full load current momentarily, the force acting on these end windings would be 225 times normal, so that it was a serious problem to devise a type of bracing on the end windings sufficient to withstand such a force. Further, it is probable that as many of these shocks were experienced in a day as would ordinarily be experienced in a year on an ordinary high-voltage power-house generator. Probably the most complete system of bracing ever applied was put on these generators, yet in spite of this there was evidence of movement at times, so that it was evident that some laminating method would have to be applied. This was done by an insulated shock coil on the trolley side of each machine. When these were installed the results on the power-house were evident. The shocks were very greatly reduced, so that no further trouble is feared from this source.

An interesting point in connection with the use of the cage windings on these machines is that the apparent regulation of the system has been improved. This was anticipated, but the actual result was more pronounced than was expected.

It must be borne in mind that in one way this New Haven installation was more difficult than anything undertaken heretofore, and that is in the use of a 11,000-volt generator, with one terminal connected directly to the ground. Taking this condition into account, together with the enormous current rushes with consequent shock on the winding, and the single-phase operation of units of such large capacity, it may reasonably be claimed that this is the most difficult case of a. c. installation ever undertaken.

L. B. Stillwell. In the case of the New Haven equipment it is apparent that investigations and tests preliminary to commercial operation were not carried out with that degree of care and thoroughness which a work of this importance would justify and which our German fellow-workers consider essential. Mr. Murray is just emerging from a long and most trying contest with difficulties upon a conspicuous stage. The installation for which he is thus largely responsible did not, during several months of initial operation, attain that degree of reliability which the traveling public has a right to expect, and naturally has been subjected to severe criticism.

The engineering world is fortunate in the fact that the New York Central railroad and the New Haven company have not adopted the same electric system. Such an opportunity to compare the possibilities and limitations of the direct-current system and the single-phase alternating current system is unprecedented, and, except in America, would be impossible. Whatever we may think of the waste of investing millions to learn from experience the answers to questions which by German methods, for example, might be answered at much less cost, we are in no position to complain of the lack of opportunity to subject our ideas to the test of practice. Unquestionably, each and every problem of electrification should be estimated primarily with reference to local conditions and requirements, and in any given case it is conceivable that each local condition and requirement may lead properly to the adoption of a system other than that which would be chosen to solve the main general problem of electrifying not only a terminal and limited suburban road, but a railway division or trunk line. This frank expression then of the result attained should assist in the proper evolution of that system which is fittest, and therefore destined to survive.

When R. J. Sprague installed the multiple unit system of train operation in Chicago, a most important advance in the art of railroading was made. The applicability of this system to trains requiring tractive efforts exceeding 60,000 lbs. was demonstrated first in the New York subway and the equipment of the New York Central has contributed to our demonstrated utilities an excellent third-rail construction, and has afforded the fact that within the limits of this zone electricity can do the work better than steam. The New Haven installation, with its substitution of 11,000 for 600 volts opens the door to possibilities of electrification of railways far beyond the reach of 600-volt direct-current. The weak point in the installation of the New Haven system was the failure to study,

in detail, every element of equipment involved and to subject every link essential to reliable operation to careful analysis and test before installation. This was not done, and it may be attributed in part to the fact that it is characteristic of American managers to consider matters for a long time before reaching any decision, and then, when that decision has been reached, to urge execution more rapidly than conditions will warrant, without allowing sufficient time for investigation.

The fact, then, that the New Haven road has experienced an unusual number of delays due to power-house troubles is due to errors in the design of the generators, and in the high-potential circuit breakers which, it would seem, could have been avoided by the exercises of that degree of care and forethought which the importance of the work warranted. So far as four months' operation may be taken as a safe guide, there is nothing in the record which is discouraging as real performance of the electrical equipment of the locomotives. If we accept the delays due to circuit-breaker failures, the record is a good one.

It would be of great value if Mr. Murray would supply, for purposes of comparison, the record of train delays in steam operation during the corresponding months of the preceding year, and it is to be hoped that the engineers of the New York Central will follow the example that has been set and make public a log of their own electrification, showing results obtained as compared with preceding steam practice, thus affording an opportunity for accurate comparison of the result obtained by two contrasted electric systems in the operation of these important properties. An incidental problem that has apparently been solved in a satisfactory manner is the protection of existing telegraph and telephone systems from the effects of induction due to power currents. It is too early yet to speak of the reliability and safety of the high-potential overhead trolley and feeders, when subjected to the conditions imposed by snow and sleet, and it is to be hoped that a further contribution to the log will be made showing what this effect has been during the coming winter months. I observed recently in Hamburg that the single-phase system in use in that city employs the same method of supporting the trolley wire that has been adopted on the New Haven line, by which the trolley wire is converted into a catenary construction with a secondary suspension cable.

A. H. Armstrong. It is my understanding that the a. c. single-phase system was adopted in the New Haven installation in order to afford opportunity to demonstrate the suitability of that system to the officers for the electrification of the road. It is my further understanding that preference was given the system for the reason that it was considered to be a cheaper system as to first cost than either the 600 or 1,200 volt d. c. systems, proposals upon which were also received. It is instructive to know how nearly the early claims advanced for the a. c. system have been fulfilled in the completed installation. In 1905 Westinghouse published an estimate of $18,436 per mile as sufficient to cover the cost of contact line on a four-track road between Woodlawn and Stamford. Presumably this figure covers the same labor and material estimated to cost nearly $55,000 by Mr. Wilgus. In view of the wide discrepancy between the trolley construction as proposed and as completed, it would be instructive to know which of the two figures is nearer the actual construction cost.

The locomotive changes have been extensive, and have been stated most frankly, and it is claimed that the machines have more than fulfilled their guarantee of a capacity to haul 200 tons trailing. A log of the run giving the time required to haul 200 tons trailing with 45 second stops, averaging 0.451 per mile, would have been most interesting. If the present locomotives fulfill the guarantees as to performance of a 26 m. p. h. schedule with 15 per cent. margin in time, it may account for the increase in locomotive weight from 68 tons total, as proposed, to 102 tons as now in operation. The fact that these locomotives have increased in weight is due either to the fact that the condition were misunderstood when the locomotive was first installed or else through development of the alternating current motor it has become necessary to increase the weight over the original estimate. It is reasonable to suppose that the cost of these locomotive units has increased at least in a like ratio, although it is my experience that it costs fully 25 per cent. more to construct an a. c. single-phase locomotive than one of equal weight equipped with d. c. motors. While preference may originally have been given the a. c. motors for this installation with the limited knowledge of its operation, it is difficult to find the present enthusiasm for the system that applies in many ways to the New Haven conditions. In this connection I will state that the weight of the locomotive as now installed approaches fairly nearly the estimated weight of the locomotive, which the company with which I am connected said would be required to perform the service. In time perhaps the two weights will coincide. The interruptions to traffic that have been outlined can only be tolerated if a far-reaching object is to be attained. In view of the fact that the a. c. trolley construction as installed on the New Haven apparently costs 80 per cent. more than a 600-volt third rail and the a. c. locomotive costs at least double for the same service performed, it is instructive to compare the operating results secured with the two systems:

Comparative data a. c. and d. c. locomotives.

	Central 600 volt d.c.	New Haven 11,000 volt a.c.—600 d.c.
Weight total	94.5 tons	102 tons
Weight on driver	68.5 "	77 "
Number of motors	4	4
Total h.-p., 1 hr. rating	2,200	1,000
Guaranteed trailing load	400 tons	200 tons

With the same total weight a single Central locomotive unit has a capacity equal to two of the New Haven. Attention has been called to the fact that the average weight of trains on the New Haven road is approximately 212 tons. A list including the majority of trains on the New York Central which completed the guarantee of the trailing load of 400 tons shows that their weights run from slightly over 400 tons to almost 700 tons, and each of these trains was handled by a New York Central unit weighing less than 100 tons, and that each of these would have required at least two of the New Haven locomotives. Inasmuch as these two locomotives weigh approximately the same, I am willing, for the sake of argument, to admit that the cost of each locomotive is the same, we then have the spectacle of about 60 trains a day hauling, on the New York Central, for a certain sum of money, which, if the system had adopted single-phase would have required double the locomotive cost for the same service. And in a list that has been drawn up it is to be noted that every train on the New York Central hauled by a single-unit would have required two on the New Haven. The reliability of the d. c. and a. c. system is clearly illustrated in the following table of total delays for the months of July to October inclusive. The a. c. figures are taken from Mr. Murray's paper and the d. c. figures form the simple operation.

Train Minute Delays. Central and New Haven. Four Months—July-October, 1908.

	New York Central.	New Haven.
July	41	2,281
August	53	1,611
September	18	893
October	48	910
Total	160 min.	5,695 min.

The New Haven figures make no note of delays of over 300 minutes. The Central figures include delays due to locomotives or operators only. During these four months there were no delays due to generating, transmission, substitution or third rail and feeder distributing systems, in spite of the alleged complication of such a system.

In using Mr. Murray's figures where every statement is made over "300 train minute delays" I have taken 300 train minutes only. The figures given on the New Haven include all delays due to electrical apparatus. On the New York

Central they include only operator troubles and locomotive troubles. The reason for this is that during the four months in question there were no delays due to the generating system, the translation system, step down transformers, rotary converters, third-rail, third-rail feeders, and all the complex paraphernalia which applies to the three-phase direct current system, where the generating station does not feed direct to the locomotive.

I am an enthusiastic believer in the future of the a. c. locomotive, but in view of the fact that the generating station does not cost less, that the transmission by overhead trolley construction costs 50 per cent. more than the New York Central third rail, that the locomotives cost double those used on the Central, it is hard to find a reason for the extravagant enthusiasm concerning the a. c. system as installed. I believe there is a place for the a. c. system, a large field to be covered by it, but I do not believe that the facts as presented have justified the selection of the alternating current system on the New Haven road.

E. B. Katte. There are two cases mentioned in Mr. Murray's paper when no power was available on the third rail—one on July 8. On that day, unfortunately, some signal-erecting man dropped a pole across the two tracks and broke down the third rail, and there was some delay in getting the third rail built up again. On the 10th there was another delay of 13 minutes on the New Haven train, due to no power on the third rail. The third rail was broken down because of a freight wreck, and the delay was in building up the rail. I think I can say at no time has there been a lack of direct-current to apply to the third rail when the third rail was there, and further, that when the third rail has been knocked down, due to a wreck, it has been my experience in most cases the third rail has been erected and ready for service as soon as the wreck had been cleared and the running rails were ready for service again.

C. L. De Muralt. It does not seem to me that for the sake of the single advantage of using high pressure in the contact line it is worth while to undergo all the serious disadvantages which single-phase involves; in other words, is it justifiable to use single-phase alternating currents in heavy trunk line work, under which the New Haven installation must be classified?

The most serious disadvantage of the single-phase locomotive, and the most important is its deficiency of power. The official figures are that the New York Central direct-current locomotive weighs 95 tons and produces a nominal output of 2,200 h.p.; the single-phase locomotive of the New Haven weighs 102 tons and produces a nominal output of 1,000 h.p.—23.2 h.p. per ton for the Central and 9.8 h.p. for the New Haven.

The overload capacities of the two locomotives show different figures, but they are in the same proportion.

Now, Mr. Murray stated that among the trains there are 27 per cent. of trains that require double-headers. Every one of these trains could be hauled by one single New York Central direct-current locomotive. If, therefore, direct-current had been chosen for the New Haven system there would be at least eight or ten locomotives saved out of forty-one; in other words, putting each one at a cost of $35,000, there would be a saving of, say, $300,000, simply in investment, which is now lost. Add to that the increase in current consumption and increase in the waste of useless and locomotive ten miles, and altogether I believe that many of you, even the greater percentage will agree with me that the New Haven has made a mistake in adopting the single-phase alternating current system in the present state of the art.

C. P. Steinmetz. It is especially gratifying to verify here from actual experience the statements which have been made by unbiased engineers from theoretical considerations, that heavy railway work can be handled by single-phase alternating current motors; obviously, not with the same high drawbar pull per ton of locomotive weight, possibly lower, at least for the present, not with the same reliability of service, though I believe this establishes the single-phase alternating current motor as one of the methods and one of the apparatus by which the future electrification of our country's railway systems will take place. I am especially gratified in that I may say that I am the oldest engineer on the floor who has designed railway motors as compensated single-phase direct current commutator motors, because the first of these motors was designed eighteen years ago, and looking over the design recently, I find that the relative proportions of armature commutating winding and field winding were almost entirely the same as embodied in our present motor, and even the frequency which was suggested was 30 cycles. I regret to say that none of these motors ever came into practical service, because this low frequency did not exist for years afterward.

While the drawbar pull per pound of motor weight of the alternating current may necessarily be lower than that of the direct current motor, because in the alternating current motor the magnetic field pulsates between zero and the maximum, and the same motor, therefore, when energized by direct current with the same magnetism, magnetic flux, would give 41 per cent. more commutation.

My conclusion, from the evidence and data now available, are the same as I expressed before, that those railway problems which cannot be handled by direct current must be solved by the alternating current motor, and, as we know now, can be solved by the alternating current single-phase motor, but where direct current as well as alternating current can be used, the higher weight efficiency, that is, the greater drawbar pull per pound of motor weight afforded by the direct current motor, necessarily makes this motor preferable from the electrical engineer's point of view. It is interesting, then, to note that in these railway problems which can be handled by alternating current motors as well as by direct current motors, the decision whether one or the other type of motor shall be used thereby has shifted from the electrical engineer to the railway engineer or the railway manager, and is determined by the economical question—whether higher weight efficiency, that is, higher drawbar pull per pound of motor weight, and at least, at present, a somewhat lower reliability of service, are sufficient compensation and should be sacrificed for the possibility at some time, when our electrification of railways extends further, of being able to extend the same system of operation over those parts of the road which cannot be operated by direct current, and such other roads where direct current cannot be used, or whether the higher weight efficiency of the direct current motor and the at present greater reliability of service, compensates for the possibility that at some future time, with the advance of the electrical industry and the extension of railway electrification, we may have to replace the locomotive equipment, or change locomotives at the end of the direct current zone and the beginning of the alternating current zone.

That, as I stated, now appears to me a question to be determined by economical reasons, by the railway manager and not by the electrical engineer, for whom, from my point of view and my experience, the question is decided that where direct current can be used it is preferable to alternating current, and alternating current can be used where direct current is not feasible any more.

Mail service from Western Europe to China by way of the Siberian Railway has been resumed. There is a mail three times a week; that leaving Berlin Monday and Friday goes over the Southern Manchuria Railway to Dalny (which the Japanese call Dairen), when a Japanese steamer line forwards it to Shanghai. The mail leaving Berlin Wednesday is taken to Vladivostok. By Dalny, if there is no delay on

the way, the time from Berlin to Shanghai is 16 days; by Vladivostok, 18 to 20 days. To Pekin and vicinity the carriage is all by rail. The Japanese have established a steamer line from Vladivostok to Tsuruga.

EXHIBITION CAR OF CHICAGO, MILWAUKEE & ST. PAUL.

The Chicago, Milwaukee & St. Paul is running a car through the middle western states for the purposes of advertising the resources of the country along its Pacific coast extension. The car is loaded with exhibits of the agricultural products of western South Dakota, Montana, Idaho and Washington. There are really four distinct exhibits, one for each of these states. Besides the agricultural products there are also a number of mineral products from along the line, especially coal. Exterior and interior views are shown in the accompanying illustrations.

Chicago, Milwaukee & St. Paul Exhibition Car.

The car is accompanied by one or more representatives of the road, who give free stereopticon lectures at points where stops are made. The pictures shown are intended to give an idea of the appearance of the country. They include views of the new towns that have sprung up and also of the scenery along the line.

Parts of Iowa and Illinois have been traversed, and the car until recently was at the Corn Exposition at Omaha, where it attracted much attention. It will later be taken through other parts of Illinois and Iowa, Indiana, Missouri, and probably into other states farther east. The exhibit was arranged and the car is being run under the direction of F. A. Miller, General Passenger Agent.

The St. Paul uses an original plan to make sure that the stereopticon lectures will be well attended. Before the car goes to a place as complete a directory as possible is secured of the townspeople and of the farmers in the surrounding country, and to every person whose name is on the list a card is mailed, telling when the car will arrive and when and where the lecture will be delivered. Large posters are also put up through the surrounding country giving the same information. Illustrated literature is distributed at the meeting. The lectures have everywhere been largely attended.

Interior of St. Paul Exhibition Car.

LABOR RELIEF IN PRUSSIA.

Inquiries having been made in the Prussian Parliament as to what the government was doing to relieve the suffering of those thrown out of employment by the depression in trade, the Minister of Public Works said that as early as January of last year the officials of his department had been instructed to give out work as far as possible, and that actually large bodies of men who had been dismissed by other industries had been employed in his department. The railways had never before done so much construction as in 1908; the year's expenditures on construction account will be about $84,000,000, against $73,000,000 in 1907, $48,000,000 in 1906, and smaller amounts in previous years. This does not include expenditures for rolling stock, which is contracted for, and which were $57,000,000 in 1908, slightly less than in 1907, but much more than in 1906. Only for track material the orders were materially less than in 1907, when they amounted to 849,000 tons, against 595,000 in 1906. In 1908 they were 746,000 tons. This year the department will furnish work for a very large number of men on two of the new deep-water canals.

The Minister has directed that the contracts for rails and other iron track materials for the coming fiscal year be awarded several months earlier than usual.

The indications are that the industrial depression in Germany, which, while marked, has been less severe than in this country, continues unabated. Freight earnings of the German railways in November were 7⅔ per cent. less than in 1907, which is a greater decrease than in previous months. It is noticeable, however, that not only in November, but for the whole year, there has been a slight increase in passenger earnings.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

IX.

The following table gives the number of sub-stations, and indicates the position of each sub-station for the different stages; it also gives the capacity of plant proposed to be installed.

*Sub-stations Required for the Different Stages.**

	Port Melbourne and St. Kilda Branches.		Stage I.		Stage II.		Stage III.	
	Names of sub-stations.	Capacity in kw.	Names of sub-stations.	Capacity in kw.	Names of sub-stations.	Capacity in kw.	Names of sub-stations.	Capacity in kw.
1	South Melbourne	4.500	South Melbourne	4.500	South Melbourne	4,500	South Melbourne	4.500
2			Pascoe Vale ..	1,500	Pascoe Vale....	1,500	Pascoe Vale....	1.500
3			North Melbourne	3.000	North Melbourne	4,500	North Melbourne	6,000
4			Richmond.	3.000	Richmond.	6,000	Richmond.	6.000
5			Balaclava.	3,000	Balaclava.	3,000	Balaclava.	4.500
6			Brighton Beach...	1.500	Brighton Beach...	1,500	Brighton Beach...	1.500
7					Newport..	3,000	Newport..	3.000
8					Camberw'l	3.000	Camberw'l	3.000
9					Blackburn	1,500	Blackburn	1.500
10							Caulfield..	4.500
11							Spring Vale....	1.500
12							Mentone..	1.500
13							Clifton Hill.....	4.500
14							Ivanhoe..	1.500
15							Bell......	1.500
16							Brunswick	1.500

*The sub-station capacities given in this table are on the two hour rating.

Generally, the sub-station equipment consists of:—

(1) High tension feeder panels, equipped with oil switches.

(2) High tension machine panels, equipped with oil switches.

(3) Rotary converter sets, each consisting of a 12,000/550 volt three-phase stationary transformer and a rotary converter specified to give 1,000 kw. continuously, and 1,500 kw. for two hours, with momentary outputs up to 3,000 kw.

(4) Direct-current switchboard for controlling rotary converters and feeders to conductor rail.

(5) Lighting equipment, air compressor for cleaning, ventilating fans, and all auxiliaries.

The three-phase electric energy generated at Yarraville will be transmitted to the sub-stations at 12,000 volts, and this may be done either by overhead wires or by underground cables, or partly by one method and partly by the other. As we do not require, with the 800 volt direct-current system chosen, any overhead wires for distributing the current from the sub-stations to the trains, we recommend that advantage be taken of this to avoid all overhead wires in the central area; that is, between the Power Station, on the west, and Richmond, on the east. The cost of four alternative arrangements, as between overhead wires and underground cables, is given in the following table:

Cost of Overhead Lines and Underground Cables.

	Port Melbourne and St. Kilda Branches.	Stage I.	Stage II.	Stage III.
1.—Underground cables throughout.	£27,301	£75.653	£119.472	£211.776
2.—Underground cables to Richmond, round the inner circle and to Camberwell, Caulfield and Balaclava—overhead lines elsewhere.......	27.301	67,562	102.996	176.238
3.—Underground cables to Richmond and round inner circle overhead lines elsewhere..	27,301	63.555	93.293	159.962
4.—Overhead lines throughout, with duplicate lines on steel poles in central area............	18,453	47.469	67.324	113.533

In my estimates I have included alternative 3 which I recommend as giving somewhat greater security of supply due to the absence of overhead wires from the center of the city. There is no reason, however, why overhead lines should not be adopted throughout if you do not consider the extra cost of underground cables justified for the reasons stated or for the sake of appearance and convenience. Conversely, there is no technical reason why you should not adopt underground cables throughout according to alternative 1 if you consider the greater expense justified. The arrangement of feeders, both for

*Capital Cost of Power Station, Sub-stations and High Tension Feeders.**

	Pt. Melbourne and St. Kilda branches.	Stages I.	II.	III.
Power Station:				
Foundations, quays, main circulating water pipes and sumps, and all brick and concrete wrk	£ 26,000	£ 33,600	£ 42,000	£ 52,500
Steel building and chimneys, boiler house equipment, pipe system, feed and sump pumps..	67,000	96,600	150,700	195,500
Main generating units, condensing plant, air and circulating pumps	59,000	78.500	118,000	157,000
Switchboard, wiring, auxiliary motors, etc.	13,000	19,000	26.000	36,500
Fitting shop and tools, stores, cranes, and sundry equipment.	6.300	7,300	8.400	9.500
Total capital cost power station	171.300	235,000	345,100	451,000
Sub stations:				
Buildings and equipment	18.732	78.059	132.294	225.984
High tension Feeders:				
High-tension feeders between power station and substations (on basis of Alternative 3, in preceding table)	27.301	63.555	93.293	159.962
Spares for power department...	4.000	9.743	9.743	9.743
Total	221.333	386.357	580,430	846.689

*Including freight, tariff, engineering and contingencies.

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

the whole scheme and to deal with the lines covered by the different stages. Where more than one underground cable is required they would be laid on both sides of the track, thus giving greater security of supply. With the underground cables, test wires would be laid for recording the drop in voltage in the track, and telephone wires for communicating with the different sub-stations.

OPERATING EXPENSES OF POWER DEPARTMENT.

	Port Melbourne and St. Kilda Branches.		Stage I.		Stage II.		Stage III.	
	No. of Men.	Cost per annum.	No. of Men.	Cost per annum.	No. of Men.	Cost per annum.	No. of Men.	Cost per annum.
Power Station –								
Operating Staff:								
Engineer in charge	3	£750	4	£1,000	4	£1,000	4	£1,000
Switchboard attendants	4	568	4	568	5	710	5	710
Telephone attendants	1	102	2	204	2	204	3	306
Head drivers	4	628	4	628	4	628	5	785
Assistant drivers	.	..	3	426	4	568	5	710
Head firemen	4	536	4	536	6	804	7	938
Under firemen	.	..	5	590	7	826	10	1,180
Water tenders	3	330	3	330	5	550	6	660
Cleaners	1	102	2	204	3	306	4	408
Coal and ash handling men	2	220	4	440	6	660	8	880
Total	22	£3,236	35	£4,926	46	£6,256	57	£7,577

Fixed Charges.	Cost. per annum.	Cost, per annum.	Cost, per annum.	Cost, per annum.
	£	£	£	£
Power station operating staff: Wages	3,236	4,926	6,256	7,577
Repairs: Labor	1,100	1,500	2,250	3,000
Material	750	1,000	1,500	2,000
General:				
Clerical staff	120	150	200	250
Stationery, etc.	90	120	160	200
Supervision	300	350	400	500
Insurance:				
Boilers & staff	90	150	210	280
Total fixed charges (power station).	£5,686	£8,196	£10,976	£13,807
Fixed charges: Sub-stations and high tension feeders:				
Operating wages, inc. insurance.	1,360	3,570	5,440	7,710
Stores, repairs & maintenance	1,269	2,123	3,495	5,080
T'l fixed charges: Substations	£2,629	£5,693	£8,935	£12,790
Power Dept.	£8,315	£13,889	£19,911	£26,597
Variable charges:				
Power Station – Coal, Oil, and stores.*	£9,210	£23,200	£41,450	£62,260
Total fixed and variable charges †	£17,525	£37,089	£61,361	£88,857

*Black coal at 12s. per ton. The price of black coal burned at Yarraville is taken at 12s. per ton as against 14s. per ton for that burned by steam locomotives, because the power station is especially designed to burn the poorest and smallest coal, which is obtainable at a low price, but which cannot be burned in locomotives. If anything, 12s. per ton is on the high side as compared with 14s.

†Power department.

I suggest that the overhead lines should be erected by your own staff, the underground cables being laid by contract, the labor being provided by the railway department.

The high tension feeder cables will consist of three-core paper insulated, lead covered cables laid solid in wood troughing, or armored, according to their location. They are specified to stand a test pressure of 24,000 volts after laying, but a sample tested in the factory is not to break down under a two-minute test of 60,000 volts. The contracts for cables are arranged on a schedule basis and it is proposed that the work should be paid for per yard laid.

One of the accompanying tables gives a summarized estimate of the capital cost of the power station equipment necessary to deliver power to the conductor rail, including the high tension feeders and sub-stations.

The estimates given in this table are based on the use of black coal as, although the power station is specially designed to burn either brown coal, or black coal, it is only the latter that can be bought to-day as a commercial article in sufficient quantities for the production of the electrical energy required for the railways; if, when the scheme starts, brown coal should be obtainable in sufficient quantities, the saving made will, of course, depend entirely on the prices at which it can be delivered into the power station bunkers. I should hope this saving will be considerable.

As some of the material will not be manufactured in Australia it would take some time to obtain new parts, and hence the question of what spare parts should be kept in stock is very important. I have considered this very carefully, and have included in all specifications, schedules, to be filled in by the tenderer, giving prices for spare parts, the total estimated cost of which, for the power department, is included in this table.

Another table gives my estimate of the cost of operation of the power department for the different stages, including not only the power station itself, but also the high tension feeders and sub-stations.

(*To be continued.*)

GARY CLASSIFICATION YARD OF THE CHICAGO, LAKE SHORE & EASTERN.

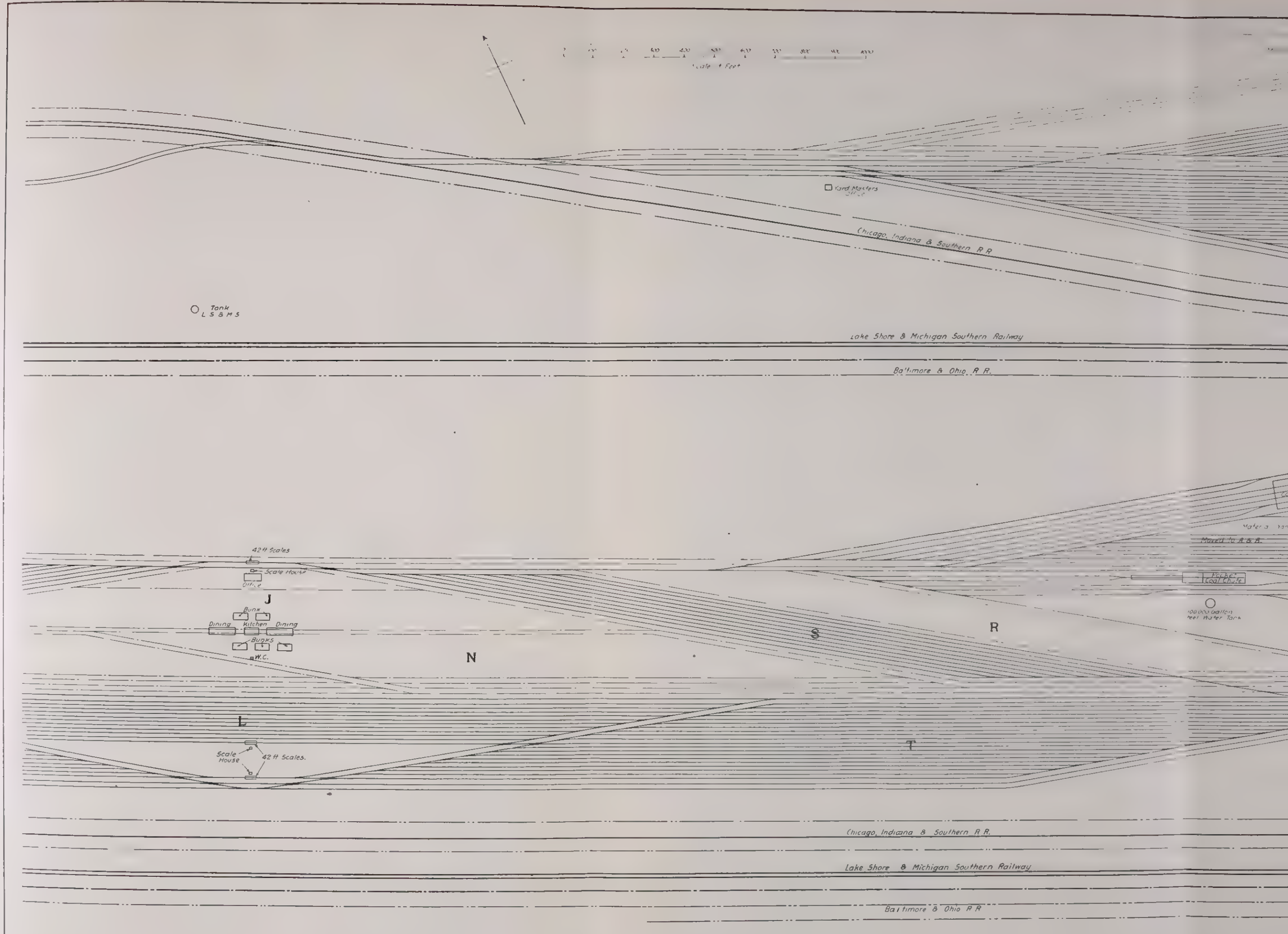
[WITH AN INSET.]

In preparation for handling the business of the Indiana Steel Company's plant—the new plant which the United States Steel Corporation is building at Gary, Ind.—the Chicago, Lake Shore & Eastern Ry., which is the connecting and switching road for the steel corporation's various plants in the Chicago vicinity, has made plans for a classification yard at Gary, having an ultimate capacity of 15,000 cars. One-third of this yard, or a capacity for 5,000 cars, has been built, a plan of this part being shown herewith.

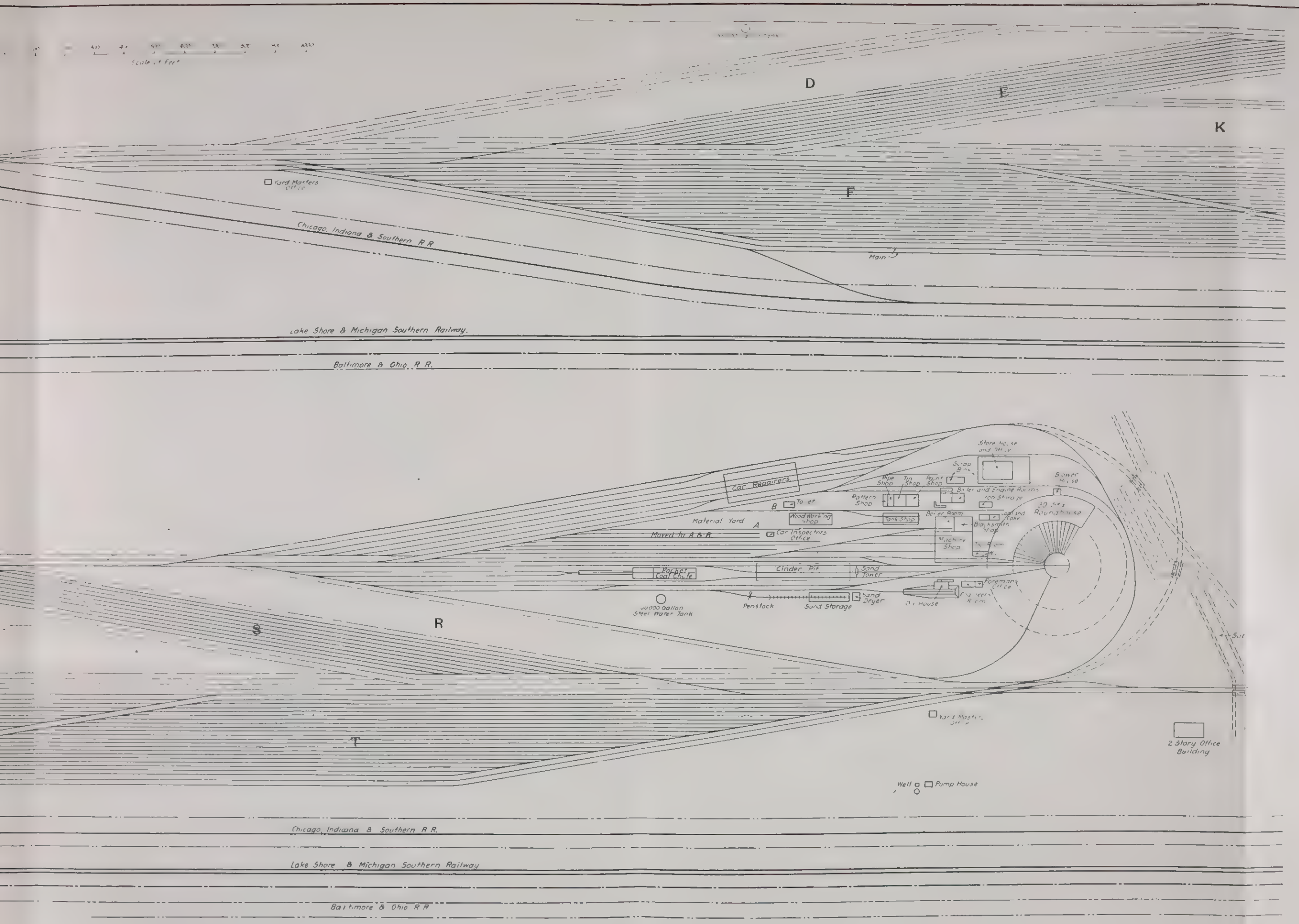
Two primary conditions governed the layout of the yard, one being the available length, which was limited by the location of the C., L. S. & E. on the west; and the other the fact that the larger part of the raw material and finished product will be handled through the yard in train lots. The tracks in yards F and T, the receiving yards respectively for incoming raw material and for finished product from the mills, are 2,600 ft. long, giving room for 52 cars. Trains of raw material coming into yard F are pushed by the yard engines over the scales at the throat between yards F and T, into the latter, where they stand until needed in the plant. Outgoing finished product is switched from the mills into yard T and thence across the scales into F, where the road engines take the trains. Less-than-train lots in either direction are handled similarly, being classified across the scales from one yard to the other. The scales in yard L can also be used in working between yards F and T.

Yards E and S supplement F and T, the movements through them being the same as for the larger yards. Empty cars awaiting finished product from the mills are passed over one of the three scales shown and stored in yards T and S. The construction of yards J, K and N, which are shown in outline above L, and of D and R, adjoining E and S respectively, will increase the capacity of the layout here shown to 7,500 cars. The ultimate plan provides for a duplication of this layout immediately north.

In connection with the yard, a new shop plant has been built. It is to be the general shops of the road, which has 125 locomotives and over 9,000 cars. The principal buildings are a machine, boiler and blacksmith shop under one roof; power house; engine house; car repair shop; woodworking shop; paint, pattern pipe and tin shop; tank shop; storehouse and



PLAN OF 15,000 CAR CLASSIFICATION YARD AT GARY, IND., FOR CHICAGO, LAKE SHORE & EASTERN RAILWAY.



PLAN OF 15,000 CAR CLASSIFICATION YARD AT GARY, IND., FOR CHICAGO, LAKE SHORE & EASTERN RAILWAY.

office building, and the usual locomotive terminal facilities. The principal shop buildings are brick and steel, with reinforced concrete tile roofing. In the case of the car shop, which will repair steel cars only, these roof tiles have inserted glass lights, there being 448 panes 12-in.x24-in., each set in the center of a tile. The roundhouse and machine shop are only 47 ft. apart, and as shown on the plan, are connected by a covered passageway which is wide enough to contain the tool room and a lavatory. The engine house, which has 20 stalls built, has a 70-ft. Pratt type turntable designed for Cooper's E—60 loading.

The plant will be electrically driven by power from the steel mills. This is 6,600-volt, 25-cycle, three-phase current, and the power station of the shops is really a sub-station for transforming this current down to 440 volts for the motors, 50 volts for the incandescent lights, and, by means of a frequency changer, supplying the 100 or more arc lights of the shops and yards with 2,200 volt, 60-cycle, three-phase current. The power station also contains air compressors, pumps, etc., and boilers to furnish steam thereto as well as for heating and for the steam hammers. There is also a hot water washout system.

The locomotive terminal facilities include a coal chute of 100 tons storage capacity, a 100,000 gal. steel water tank supplying three 10-in. penstocks, and an ash pit 155 feet long, 45 ft. 6 in. wide and 10 ft. deep. The pit has three tracks, the middle one being for cars, and the whole is spanned by a gantry crane, traveling the length of the pit, with a clamshell bucket to load the cars.

A car repair yard with seven tracks supplements the car shop on the west, and a number of storage tracks are provided just north of the coal chute. A track encircles the engine house and connects with the east end of the car repair yard so that cars may be moved into and out of it from either direction.

The plans for the yard and shops, and their construction, were in charge of A. Montzheimer, Chief Engineer of the road. The yards are laid with 85 lb. rails and about 50 miles of track already has been laid.

WORK OF ENGINEERING STAFF IN VALUATION OF WISCONSIN STEAM RAILWAYS.*

BY WM. D. PENCE, M.A.S.C.E. †

The engineering staff which jointly serves the Wisconsin Tax Commission and the Railroad Commission of Wisconsin was organized in June, 1903, under authority of the law providing for the assessment of the steam railway properties of the state on an *ad valorem* basis. The size of this staff ranged from a maximum of about 25 engineers and inspectors at the busiest portion of the first year's work, down to the minimum of two persons assisting the chief engineer after the completion of the initial valuation report. Upon this latter basis it was found to be practicable to carry forward the annual revaluations of the steam road properties. In February, 1906, the first incumbent in the position of engineer for the Tax Commission resigned, and his successor was appointed (July 1, 1906) to render joint service for the Tax Commission and the then recently created Railroad Commission of Wisconsin.

The 1905 law prescribing the *ad valorem* basis of assessment for street railway properties provided for the valuation work to begin on the initial inventory date of June 30, 1907, but the work was actually undertaken some six months earlier than that date because of a complaint lodged with the Railroad Commission respecting street car fares in the city of Milwaukee. To meet this emergency the staff was reorganized and greatly extended in January, 1907, and since that date a staff of from 20 to 30 members has been required continuously to meet the joint demands of the two commissions. Immediately upon the completion of the Milwaukee valuations in July, 1907, the field work for the valuation of the physical property of the remaining street railway and associated lighting companies of the state was undertaken, and before the completion of that work active service under the newly-enacted public utilities law was inaugurated. Numerous inspection duties have also arisen in connection with several other laws recently enacted or amended.

The staff engaged in the 1903 steam road valuation work was organized under three general heads or chiefs of departments, respectively responsible to the chief engineer for the valuation of the permanent way, the lands and the mechanical features. With the reorganization for the purpose of making the street railway valuations, there were still but three heads, the land valuations being associated with the "roadway" group, and an electrical department added. Under the still wider scope to the work of the staff arising under the administration of the public utilities law within the past year or so, the civil and mechanical engineering groups have been extended to cover water works plants, the electrical engineering group to include telephones, and two additional groups or departments have been established, viz., gas engineering and the department of gas and electric service inspections.

In its present form the working organization includes the following groups or subdivisions: (1) Administrative, (2) office staff, (3) civil engineering staff, (4) mechanical engineering staff, (5) electrical engineering staff, (6) gas engineering staff, (7) gas and electric service inspections, and (8) miscellaneous.

The basis of appointment of the staff is provided for in part by a formal rule of the Civil Service Commission, and in part by special authorizations given from time to time by the Railroad Commission for the employment of experts under the provisions of the public utilities and railroad commission laws.

Membership on the staff is based upon ascertained fitness for the special service for which the appointment is made. There is entire freedom from political or other influence both in the matter of appointment and in the tenure of position on the staff. The tenure of service has been steady, the roll, except for the additions, being much the same as that established early in 1907. The practice followed by the Railroad Commission in its other departments of service of requiring each employee to report daily the actual hours devoted to the state work is observed by the technical staff.

The present membership of the technical staff consists almost exclusively of graduates of engineering schools, and about 60 per cent. of the permanent staff are graduates of the University of Wisconsin. Seven members of the regular staff are also members of the faculty of the College of Engineering, University of Wisconsin, among this number being the engineer in charge, the chief mechanical inspector and the expert on light and heat. Five other members of the teaching force of the engineering college also render occasional service on the commissions' staff. It is proper to say in this connection that this is but one of many instances in Wisconsin of active participation by university men in professional service on behalf of the state. Such participation is encouraged by the board of regents and president of the university, both on account of a recognized obligation to the state which provides support, and because of the stimulus given to the work of the university through outside contact of this kind.

VALUATION WORK BY THE STAFF.

The valuations reported to the commissions by the engineering staff have been confined throughout to the physical property, without regard to intangible elements. For a given inventory covering the items of any particular property, a definite value is fixed upon a fair basis as to unit prices, etc., and the results are reported by the staff at a definite amount, irrespective of the uses to which the figures are to be applied.

*Extracts from a paper read before the Western Society of Engineers of Chicago, December 16, 1908.

† Engineer, Railroad Commission of Wisconsin and Wisconsin Tax Commission; Professor of Railway Engineering, University of Wisconsin.

These determinations are, by intention, entirely free from bias. Every reasonable effort is made to get at the exact truth in regard to local conditions. The figures are subject to revision upon finding evidence of defects of inventory, errors of judgment, or other element likely to vitiate results. After submitting the valuation reports to the commission opportunity is given for further conference and hearing upon any or all items of the physical valuation.

In certain public utilities cases the owners, and in a few cases the cities as well, have employed experts to give testimony on values before the Railroad Commission. In one or two such cases the state engineering staff has submitted to the representatives of the utilities company and the city an "informal" valuation report to serve as a basis for preliminary conference and discussion. This preliminary report, after due consideration in the light of added data and information, is succeeded by the "tentative" valuation report which is submitted to the Railroad Commission as a part of the formal record in the case to be considered with other evidence. Before making up a final decision in the case the commission gives the engineer an opportunity to review the record and submit a supplementary report, in which are presented revisions or comments bearing upon the original or "tentative" valuation report.

The valuation work performed by the engineering staff falls under four heads, viz.: (1) Valuations of the physical property of the steam railways of the state, (2) of the street railway and associated properties, (3) of the public utilities properties, and (4) of public service corporation properties in connection with stock and bond issues. The accompanying tabulation includes the total valuations for one year's work each for the steam railway and electric railway properties, and all of the physical valuation work thus far reported upon under the public utilities and bond issue laws, the last two classes covering a period of somewhat more than a year's time.

Summary of Recent Physical Valuations.

	Cost of reproduction— Property new.	Present. condition.
(a) *Steam Railway Properties:*		
Fifty-two (52) properties aggregating 7,090 miles; inventory date June 30, 1907; fourth annual revaluation under the 1903 ad valorem law	$244,128,868	$196,239,314
(b) *Street Railway Properties:*		
Twenty-four (24) street and interurban properties with ten (10) associated lighting and heating properties; inventory date, June 30, 1907; first valuation under 1905 ad valorem law	26,783,620	21,208,010
(c) *Public Utilities Properties:*		
Twenty-four (24) public utilities properties; varying inventory dates; valuations under 1907 law	6,405,521	5,440,605
(d) *For Stock and Bond Issues:*		
Five (5) properties valued and reports made under 1907 law	305,576	270,008
	$277,623,585	$223,157,937

VALUATIONS OF PHYSICAL PROPERTY OF WISCONSIN STEAM RAILWAYS.

The Tax Commission, by authority given in section 27 of the steam railway assessment law, on June 3, 1903, appointed as its expert engineer Prof. Wm. D. Taylor*, Professor of Railway Engineering, University of Wisconsin. Under instructions from the Commission, Mr. Taylor consulted with Prof. Mortimer E. Cooley, of the University of Michigan, under whose direction the Michigan railway appraisals of 1900-1901 had been made. Acting upon the information and valuable suggestions furnished by Mr. Cooley, the preliminary plans for the Wisconsin appraisals were developed in a comparatively short time, and certain features of the Michigan methods were improved upon. The most important difference in the basis employed in the two state appraisals related to the method of working out the inventories, and to the extent to which the state staff made actual detailed field inspections of the physical property. In the Michigan appraisals the state staff took the initiative in preparing the inventories and made extensive and independent field examinations of the railway property. This work was then largely duplicated by the companies themselves, so as to be able to check up the figures obtained by the state staff, and to an extent a third process was required in the final compilations in order to reconcile the two more or less independent appraisals.

* Professor Taylor served as engineer to the Wisconsin State Board of Assessment until February 1, 1906, when he resigned to become Chief Engineer of the Chicago & Alton Railway. His successor was appointed on July 1, 1906, to serve the two state commissions jointly.

With a view to eliminate this costly and seemingly unnecessary repetition of work the Wisconsin Tax Commission, upon the advice of its engineer, suggested to the representatives of the important lines of the state that the companies undertake to inventory and value their own properties for submission to the board. To this suggestion the companies readily assented, and in the plan of work subsequently adopted it was arranged that any portion or all of the inventoried property might be reviewed by the state staff, according to the judgment of the commission's engineer. Such reviews of the valuation when finally made fully confirmed the spirit of good faith with which the representatives of the roads responded to the open-minded attitude of the commission and its engineer toward the companies; and it may be added that the spirit of fairness inaugurated in the initial appraisals has prevailed throughout the successive annual revisions of the steam road valuations.

In view of the very complete presentation of the methods employed on these earlier steam road valuations heretofore published* it is deemed unnecessary to give space to a repetition of the same in this connection.

Mr. Taylor at the conclusion of his report to the State Board of Assessment above referred to, makes the following comment with regard to the matter of keeping the valuations up to date by annual revisions:

> It should not ever again be necessary to make as expensive an investigation as this has been to determine the value of the tangible railway property of the state. And if the future assessments for taxation are to be in any wise determined by the value of railway physical property, and if a rate-making railway commission is to be constituted in the state which shall give any weight whatever to the investment in physical property in deciding upon rates for freight and passenger traffic, it will be necessary to keep the appraisal of these properties reasonably well up to date. It has been said that no item of railway property, tangible or intangible, remains constant in value. Traffic and the value of land and terminals fluctuate with the tide of business prosperity. Rolling stock, rail and structures all depreciate and the roadbed appreciates with use. Thus it seems that with this appraisal as a basis it would be advantageous to work the appraisal of the roads over again annually. Counting upon the assistance of the railways this can be done with a comparatively small force and at comparatively small annual expense.

In line with the foregoing plan the engineer had previously supplied to each railway company a copy of the corrected detail summary sheets pertaining to its property, and early in 1905 also sent to each road two sets of blank report forms relating to the physical property in detail, stamped, respectively, with the words "Deductions from property, June 30, 1903, to June 30, 1904," and "Additions to property, June 30, 1903 to June 30, 1904." These blanks when filled out and returned to the engineer formed the basis of revisions of the original appraisals of 1903 whereby the valuations were brought up to the second inventory date of June 30, 1904.

With reference to the rate of progress on such work some interest attaches to the "lag" or interval of time elapsing from the nominal date of inventory for the steam road valuations to that of final completion of the valuation report. This interval for the several valuations has varied as follows:

1st	valuation,	inventory	of June	30, 1903,	16	months
2d	"	"	"	30, 1904,	14½	"
3d	"	"	"	30, 1905,	11½	"
4th	"	"	"	30, 1906,	14	"
5th	"	"	"	30, 1907,	17	"

In explanation of the above figures, it may be stated that

*See Report of Wisconsin Tax Commission, 1907, pp. 269-293.

in the initial or pioneer valuations as of inventory date June 30, 1903, there were the unavoidable delays incident to the organization of the staff, the formulation of plans for the work, and other elements entering into the earlier steps of any undertaking of large magnitude. In the annual revisions the chief cause of delay has been the time required by certain railway companies in the preparation of their reports of additions and deductions. The third report (second annual revision) was compiled under exceptionally favorable circumstances. The fourth required a longer time to complete, partly because of a delay in the receipt of reports of property changes on one or two of the larger roads, and in part by the fact that the engineering staff was engaged for the first time in the valuations of street railway properties. The increased time required to compile the fifth and most recent steam road report (as of date June 30, 1907) was due mainly to unusual demands upon the staff in connection with valuations and inspections uder the public utilities law late in 1907. By increasing the size of the staff somewhat in one department and assigning certain of the staff members exclusively to the valuations for taxation purposes, it appears that the steam and electric road valuation reports may hereafter be compiled within less than a year of the date of inventory.

PROPOSED REVISIONS OF METHODS.

The plan above described has been followed in each of the several successive annual revisions up to and including the fifth. In the 1903 plan the cost of reproduction was "assumed to be what it would cost to reproduce the road at the average prices prevailing for the period of five years ending June 30, 1902," that is, one year preceding the date of inventory. Through the excellent spirit of co-operation which pervaded the 1903 valuation work a series of unit prices based on the above assumption was worked out and adopted. While it has been practicable to make annual revisions in the unit prices for steel rail and a few similar materials subject to current market quotations, there have been no systematic revisions in the unit prices with respect to many kinds of the physical property involved in the inventories of these steam road properties. Five years have elapsed since these valuations were undertaken, and during this period there have been many radical changes in the cost of labor and materials involved in railway construction. Notwithstanding the temporary reaction in prices during the past year or so, it is certain that some important items, such as ties and structural timber, will never resume their former basis of cost.

Another matter which requires careful consideration in this same connection is the advance in land values throughout the state. No account has been taken of this factor in the annual revisions, the land values originally established having been used without change in the annual revaluations. There is also need to investigate further the matter of ratio of cost of acquiring rights-of-way as compared with the normal or average local land values for other than railway purposes, and these studies should be carried still further to cover the cost of acquiring lands for terminal purposes in the larger cities.

Recent conferences with railway officials touching the foregoing matters indicate that the railway companies are desirous of co-operating in any steps designed to maintain the valuations on the high standard established in the original valuation work of 1903-1904. As a result of these conferences and of discussions with the state commissions a critical study of the methods heretofore used in the various Wisconsin valuations and in those of other states is being made by the staff with a view to recommend improvements upon the present practice wherever practicable. It now appears that these revisions of method may be carried into effect, at least in part, in making the next (sixth) steam railway valuation report.

SERVICE INSPECTIONAL WORK BY THE ENGINEERING STAFF.

In exercising the broad powers conferred upon it with respect to service regulation of railway, express, telephone, and the municipal utilities companies, it has been the uniform policy of the Wisconsin Railroad Commission to insist upon adequate service, but without undue intrusion upon the routine of actual management. The inspections of service made by the technical staff under instructions from the commission are directed primarily to the actual results. When the results are found to be unsatisfactory, the commission frankly reports the facts to the company and also to the complainant, if any, with such recommendations or suggestions as may seem necessary or desirable. In the more important matters publicity is usually given through the daily press in order that the general public may be kept fully informed. Such publicity is often the only means of fixing in the public mind the responsibility for poor management or in establishing substantial justice where there have been false reports or wrong impressions as to the facts. As a general rule, the suggested improvement of service is made by the management without contest or delay. In the exceptional case the commission does not hesitate to use the mandatory powers conferred upon it by statute.

RAILWAY SERVICE INSPECTIONS.

The Railroad Commission of Wisconsin has not as yet adopted the plan of employing special inspectors to engage exclusively in investigations of railway service, although such inspectors may ultimately be required with reference to certain of the more technical phases of railway operation. Provision is made by the law for the employment of the requisite expert help when the need for the same arises. Such matters are at present investigated by the engineer personally or by special assignments from the technical staff, and reports submitted for the information of the commission.

An interesting experiment recently inaugurated by the commission is intended to bring together accurate information regarding the railway service of the state as seen by the ordinary or casual passenger. Under special instructions from the commission each member of the technical staff submits written trip reports covering his observations while en route about the state on valuation work or other commission business. The character and scope of these observations are indicated by the headings given below, taken from a blank form prepared with a view to secure some degree of uniformity in the facts thus reported to the commission.

TRIP INSPECTION REPORT.

ENGINEERING STAFF, RAILROAD COMMISSION OF WISCONSIN.

Report by .... Observations on Train No. .... Ry. Between .... (........M) and .... (........M) .... 190....

(Use additional sheet if more space is needed.)

1. *Train Service:* Running Schedule—On time or late; if late, actual amount and amount slated, causes, etc.; speeds, etc.

....

2. Train Equipment—Coaches; number and kind; crowded or otherwise; cleanliness, ventilation and sanitary condition (cars and toilets); sleepers.

....

3. Train Employees—Engineer; care in running, testing air, etc.; conductor, brakemen, flagmen, etc.; treatment of passengers, calling stations, guarding rear end, etc.; Pullman and dining-car service.

....

4. *Station Service:* Employees—Agent, baggageman, caller, etc.; conduct, attentiveness, intelligence, announcing trains, etc. (give names of stations).

....

5. Station—Waiting rooms and toilets; cleanliness, sanitary condition, ventilation, heating, etc.; platforms; grounds; waiting shelters, etc.

....

6. *Miscellaneous:* Track; bridges; crossings (obstruction or protection); safety appliances; train connections at junction points, etc.

....

7. *Passengers:* Department; demands on employees; hand baggage, etc.

....

(Date).................... (Sign)....................

It should be stated that the initial instructions regarding these trip reports were given in such manner as to make it

plain that the observer was not expected to engage in "detective" work and that, at least until further instructions were given, the observations and comments were to be only such as might reasonably be made by any ordinary traveler at any station or on any train. Many of the comments in these reports are of an entirely favorable character, as they obviously should be to represent the actual conditions in many instances. The intermingling of these favorable comments with the often pointed criticisms as to defects of service gives emphasis both to the good and the bad features and commands the attention and respect of the railroad management. A tabulated summary of the trip reports is prepared covering each month's observations and a copy of the monthly summary transmitted to the general manager or other responsible official of each road concerned with such report. The responses of the railway companies indicate entire readiness on their part to co-operate in this movement for the betterment of the railway service of the state.

However, these casual observations are not intended in any sense to do away with inspections of a more technical and rigid kind. It is found in practice that the need for the more searching inquiry is often revealed in the course of the routine investigations above described. Under the Wisconsin law and practice the members of the inspectional staff purchase tickets and travel like other passengers.

GETTING OVER HIGH GROUND.

BY J. A. MACDONALD, C.E.

The following somewhat novel method of getting a preliminary railroad line over high ground may be of interest. The care taken and the several traverses and numerous offsets in this work is partly explained by the nature of country and the fact that the line was practically what is termed a preliminary location.

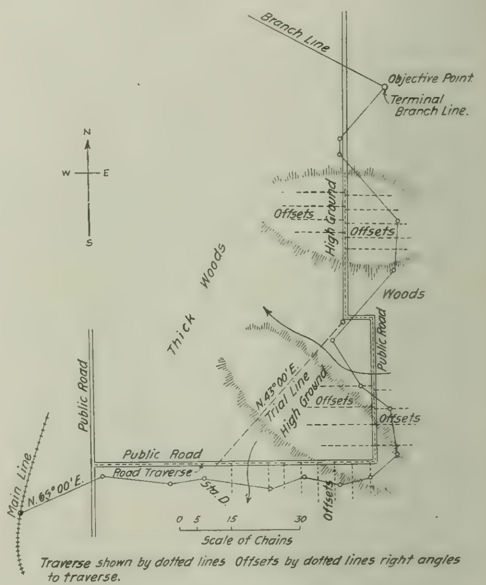
A reconnaisance was made by the chief engineer, driving along the public roads, shown in the plan, the only instruments being an aneroid and a prismatic compass. This was a simple matter so far as it went. Having a map of the country the chief engineer drew a line roughly about the way it is now shown on the accompanying sketch. This was a long way round to reach the objective point, which was the terminal of a branch as shown. The cross-country route, shown by the trial line, was the favored route if feasible, but owing to this route being covered with a dense forest of spruce the chief engineer had no data as to its feasibility for a railroad route, and so the instructions were to take this shorter and more direct route if at all possible.

The first done was to make a traverse of the public road. As will be seen, these roads ran parallel with the cardinal points. Levels were taken all along these traverses and a profile made. It was found in places, as shown on the sketch, the ground was very high, involving heavy and deep cuttings. The problem then was to get a line in which the cuttings would be as light as possible without unduly lengthening the line. It was also necessary to see that when the curves were run in that no deep cuts would be involved. For this reason the external secant was scaled frequently, and the degree of curve suitable to the ground was sketched and the line moved in or out to suit the curve. This line, therefore, was what may be called a preliminary location.

After the traverse was made along the roads offsets were taken at the high places, five or six chains apart, and extending well in on either side. Levels were taken on all of these offsets. In this way a topographical map of the country was soon made.

The line started from the main line, and when Station D was reached a bearing of N. 43 deg. E. was obtained from the plan in order to strike the corner of the road where there was an L. This was through a thick woods. It was found to be a very uncommon country. The ground was quite high about the middle and strangely of a marshy nature on the apex of the hill. Were the ground not of this nature it is probable that the line would go through here. But as it meant a long deep cut through marshy ground, it was decided that such was untenable, and so this line was abandoned and the round-about route was determined upon.

With the map of the country, and the topographical features and profiles, it was an easy matter to project a fairly



Getting Over High Ground.

good line on the map, which was placed on the ground. The curves and external secants were plotted on the plan previous to running the line so that the line, on the ground, as shown in the sketch, was in every way satisfactory.

FOREIGN RAILWAY NOTES.

Siam in its last fiscal year added 125 miles to its railway system, bringing up the total to 357 miles, and had 122 miles under way. In the last year the working expenses were but 34⅗ per cent. of the gross earnings, and the net earnings amounted to 5.7 on the capital invested.

The death at Paris is announced of Wm. Nordlinger, in his time one of the most distinguished of European railway engineers. Born and educated in Stuttgart, he completed his engineering education in the French School of Bridges and Highways. After a very short service in his native country, he entered the French corps, for which he had been trained, and after much railway building became chief engineer of the Orleans Railway, then the greatest in France. In 1870 he became consulting engineer, with Max von Weber, in the Austrian Ministry of Commerce, and later was chief manager of the State Railways. During the building of the Arlberg Railway he left the Austrian service, and finally retired in Paris, where he devoted himself largely to promoting the interests of the Protestant church in France. He wrote many pamphlets, notably one on the social position of engineers in Germany, which he contrasted very unfavorably with their position in France.

SOUTHERN PACIFIC DRAFT GEAR TESTS.

In connection with the elaborate tests of the improved Westinghouse air brake, on the Southern Pacific during the past summer, tests were also made on the Los Angeles division to show the advantage of the Westinghouse friction draft gear in freight service.

Comparative demonstrations were made with two trains of fifty 12,430 gal. oil cars and dynamometer car each. One train was found that there was not much difference in the slack in the trains with the different types of gear, but the difference in the amount of recoil was remarkable, the greatest recoil recorded with the Westinghouse friction gear being 5 ft. or 1.5 in. per car, while with tandem spring gear the highest recoil recorded was 24 ft. or 7.3 in. per car.

The slack and recoil were taken by applying rear hand brake and moving train back to gather loose slack, then stopping train and setting air brakes on 10 rear cars in emergency, the

Scale	Indicator spring
300000 lbs, 275000 lbs, 250000, 225000, 200000, 175000, 150000, 125000, 100000, 75000, 50000, 25000, 0	80 lb. Indicator Spring for all Jerks on runs 6 to 50 inc.
300000 lbs, 275000 lbs, 250000, 225000, 200000, 175000, 150000, 125000, 100000, 75000, 50000, 25000, 0	120 lb Indicator Spring for all Jerks on runs 51 to 81 inc.
600000 lbs, 550000, 500000, 450000, 400000, 350000, 300000, 250000, 200000, 150000, 100000, 50000, 0	200 lb Indicator Spring for all Buffs.

SHEET No. 0.

SOUTHERN PACIFIC Co's.

Comparative Draft Gear Tests With trains of 50 S.P.Co's 12430 Gals. Capacity Oil Cars equipped with

TANDEM SPRING AND WESTINGHOUSE FRICTION DRAFT GEARS.

Los Angeles Div.- June 1908.

Note:- On attached sheets the diagrams are taken from Indicators piped to a hydraulic chamber which is connected by levers to the Coupler of one end of the Dynamometer Car. (No gear used on this end of Car.) The Speeds are obtained by determining the number of revolutions per second of (33⅜ dia.) wheels of Dynamometer Car.

Table of Speeds MPH corresponding to rev per sec of Dyn Car wheels (33⅜ dia)

Rev per Sec	MPH	Rev per Sec	MPH
.168	1	2.69	16
.336	2	2.86	17
.504	3	3.02	18
.672	4	3.19	19
.840	5	3.36	20
1.00	6	3.51	21
1.176	7	3.70	22
1.34	8	3.86	23
1.51	9	4.03	24
1.68	10	4.20	25
1.85	11	4.37	26
2.00	12	4.54	27
2.184	13	4.70	28
2.35	14	4.87	29
2.52	15	5.04	30

Orders of Runs

Dates	Types of Gears	Dems	Runs	Dates	Types of Gears	Dems	Runs
6-11-08	Westinghouse Frict.	1	1●	6-3-08	Tandem Springs	6 A	38
"	" ●	A	2●	6-15-08	"	B	39
"	" ●	B	3●		"	C	40
"	"	C	4	"	"	7	41
"		D	5	"	"	A	42
"	" ●	2	1x	"	"	B	43
"	" ●	A	2x	"	"	C	44
"	" ●	B	3x	"	"	D	45
"	"	C	4x	"	"	E	46
"	"	D	5x	"	"	F	47
"	"	3	6	"	"	G	48
"	"	A	7	"	"	H	49
"	"	B	8	"	"	8	50
"	"	4	9	"	"	A	51
"	"	A	10	"	"	B	52
"	"	B	11	"	"	12	53
"		5	12	"	"	A	54
"	"	A	13	"	"	B	55
"	"	B	14	6-16-08	Westgh Frict.	7	56
6-12-08	"	6	15	"	"	A	57
"	"	A	16	"	"	B	58
"	"	B	17	"	"	C	59
"		C	18	"	"	8	60
6-13-08	Tandem Springs	1	19	"	"	A	61
"		A	20	"	"	B	62
"	"	B	21	"	"	[illegible]	63
		2	19x	"	"	A	64
	"	A	20x	"	"	B	65
	"	B	21x		"	12	66
"	"	3	22	"	"	A	67
	"	A	23	"	"	B	68
	"	B	24	"	1st 25 Cars Westg Frict.	13	69
"	"	[illegible]	25	"	2nd 25 Cars Tand Spr.●	A	70●
	"	A	26	"		B	71
	"	B	27	"		C	72
"	"	C	28	6-17-08	1st 25 Cars Tand Spr.	14	73
	" ●	9	29●	"	2nd 25 Cars Westg Frict.	A	74
	●	A	30●	"		B	75
"	"	B	31	"	"	16	76
	"	C	32	"	"	A	77
"	"	D	33	"		B	78
	"	5	34	"	1st 25 Cars Westg Frict.	15	79
	"	A	35	"	2nd 25 Cars Tand Spr.	A	80
	"	B	36	"		B	81
"	"	6	37	● Denotes Runs voided			

Index.

Sheet	Dems.	Runs.	Type of gears.	Tests:	Description.
1	3	6-8 22-24	Westingh Friction. Tandem Springs	Jerk	To determine value of Gear in destroying effects of a Jerk.
	4	9-11 25-28	Westingh Friction. Tandem springs	Buff	To determine value of Gear for destroying shocks produced by emergency applications made at, or near, head end of Train.
2	15	79-81	1st 25 Westingh Frict. 2nd 25 Tandem Spr.	"	" " " "
	16	76-78	& Vice versa.		
3	5	12-14 34-36	Westingh Friction. Tandem Springs.	Jerk.	To determine value of Gear in reducing shocks resulting from air hose bursting, or Train parting near rear end with Engine working.
	6	15-18 37-40	Westingh Friction. Tandem Springs.	"	To determine value of Gear in reducing shocks resulting from air hose bursting, or Train parting, near rear end with Engine shut off.
4	7	41-49 56-59	Tandem Springs Westingh Friction	"	Efficiency in dissipating shocks produced by rough handling when starting trains.
5	8	50-52 60-62	Tandem Springs Westingh Friction.	Release.	Release brakes at slow speeds and open throttle before rear brakes are released.
6	13	69-71-72	1st 25 Westingh Frict. 2nd 25 Tand. Sprgs.	"	" " " " "
	14	73-75	& Vice versa.		
7	9	31-33 63-65	Tandem Springs Westingh Friction	Buff.	Protection to cars and lading while switching &c.
8	—	—	Recapitulation of all Tests (large sheet)		

Southern Pacific Draft Gear Tests.

was equipped with Southern Pacific Company's standard tandem spring draft gear and type H quick action triple valves, and the other was equipped with Westinghouse friction draft gear and type K triple valves. Dynamometer car and slidometer were used for the purpose of obtaining records of shocks from buffs and jerks, also speed of train and were located in train as noted on following tables and diagram:

The first tests, 1 and 2, were to determine amount of slack and recoil in trains before and after the demonstrations. It

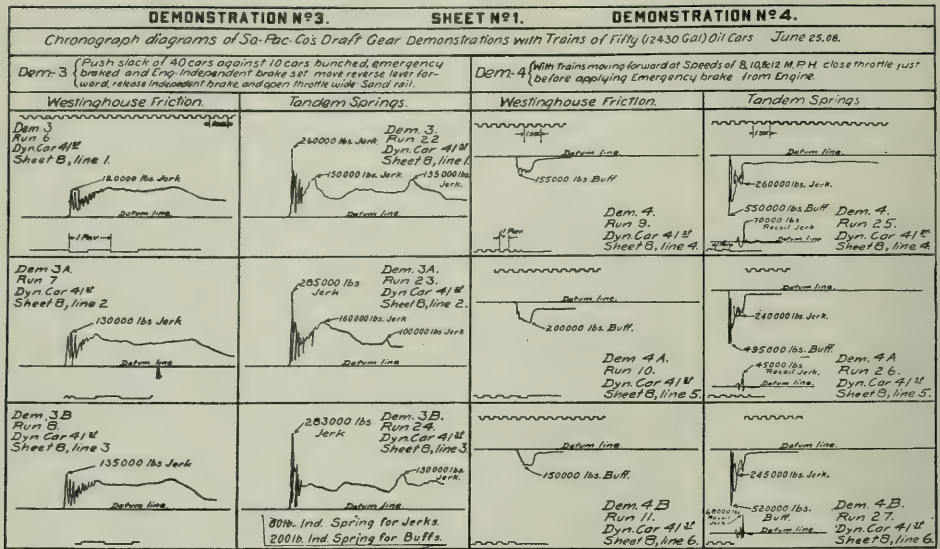
Line	SHEET 8a. Demonstrations	Slack: Westinghouse Friction, Total for 40 Cars	Per Car	Tandem Springs, Total for 40 Cars	Per Car	Recoil: Westinghouse Friction, Total for 40 Cars	Per Car	Tandem Springs, Total for 40 Cars	Per Car
1	1 & 2 Before Demonstrations	Void				Void			
2		"	on account of hump in yard interfering with slack			"	on account of hump in yard interfering with slack		
3		"		28'-3"	8.69"	"		21'-8"	6.67"
4		25'-5"	7.82"	28'-4"	8.72"	4'-1½"	1.27"	22'-9"	7.00"
5		27'-2"	8.36"	28'-6½"	8.78"	No Record		22'-9"	7.00"
6	1 & 2 After Demonstrations	22'-0"	6.68"	31'-3"	9.49"	4'-1⅝"	1.25"	23'-7"	7.16"
7		27'-0"	8.20"	31'-9"	9.64"	5'-0"	1.51"	21'-0"	6.37"
8		27'-11"	8.48"	31'-5½"	9.55"	2'-9½"	.85"	24'-1"	7.32"

Record of Tests 1 and 2.

engine then shoving the remaining 40 cars back into the 10 rear cars until stalled, using full throttle. The rail was marked at forward wheel of first car and at rear wheel of fortieth car, after which the engine was put into forward motion and with full throttle pulled train steadily until stalled. Points on rail were again marked under wheels of first and fortieth cars as previously mentioned and record taken of distance between the marks. The independent brake was then applied on engine to hold slack stretched until engine could be reversed, throttle closed, cylinder cocks opened, then independent brake was released and engine allowed to roll backward freely. The rail was again marked and measured for recoil.

Test 3 was made to determine and illustrate the value of both types of gear in destroying the effects of jerks such as regularly occur in service; an anchor was made of the 10 rear cars and engineer was instructed to take all the slack left in balance of the train by backing the 40 cars against the anchor, and trying, by using full throttle, to part the train. The dynamometer car was placed just ahead of the anchor (forty-first car), and photographic reproductions of the interesting data secured, illustrating that the friction gear softened the jerk to less than one-half that obtained with spring gear.

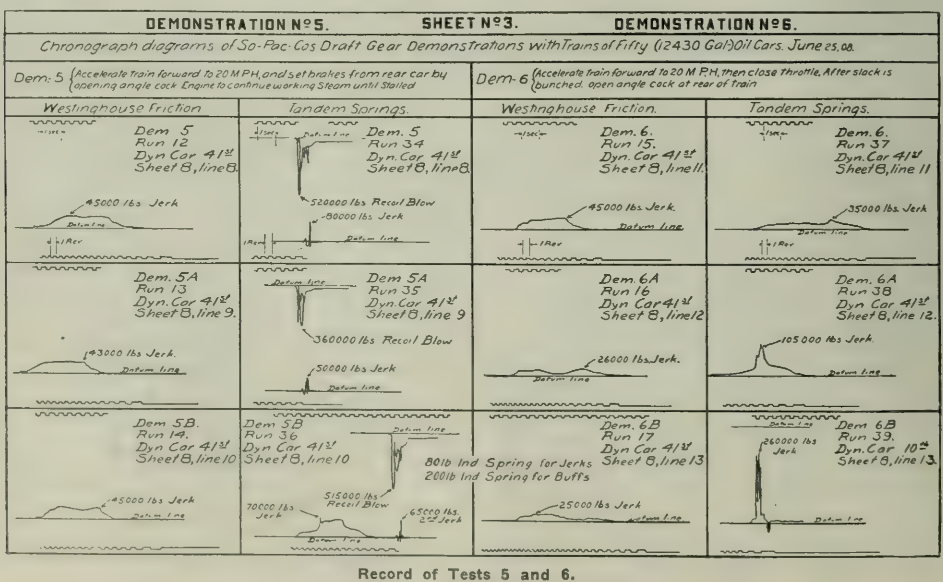
Test 4 was made to determine the comparative values of the gears for destroying shocks in the train produced by the en-



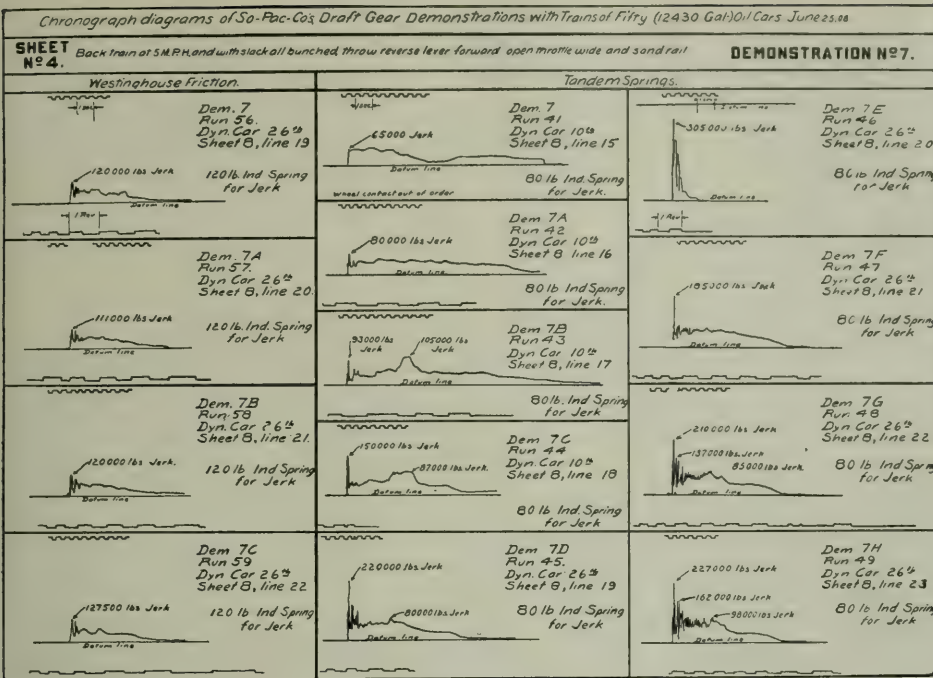
Record of Tests 3 and 4.

gineer making emergency application of brakes, which so frequently becomes necessary in service, or by hose parting at or near the head end of train (two engines, on head end pulling out of drawbar for instance) the trains were accelerated to approximately 10 miles per hour, the throttle closed just previous to movement of the brake valve to allow the train to drift, then an emergency application of the air brakes was made in the regular way with the brake valve. The friction gear diagrams show buffs from 150,000 to 200,000 lbs. and norecoil jerks, while the tandem spring gear shows buffs from 495,000 to 550,000 lbs. besides recoil jerks in every case from 45,000 to 70,000 lbs. The dynamometer car was placed in the back part of the train (forty-first car) to illustrate why lading is shifted and damaged en route, this particular demonstration representing an actual service condition.

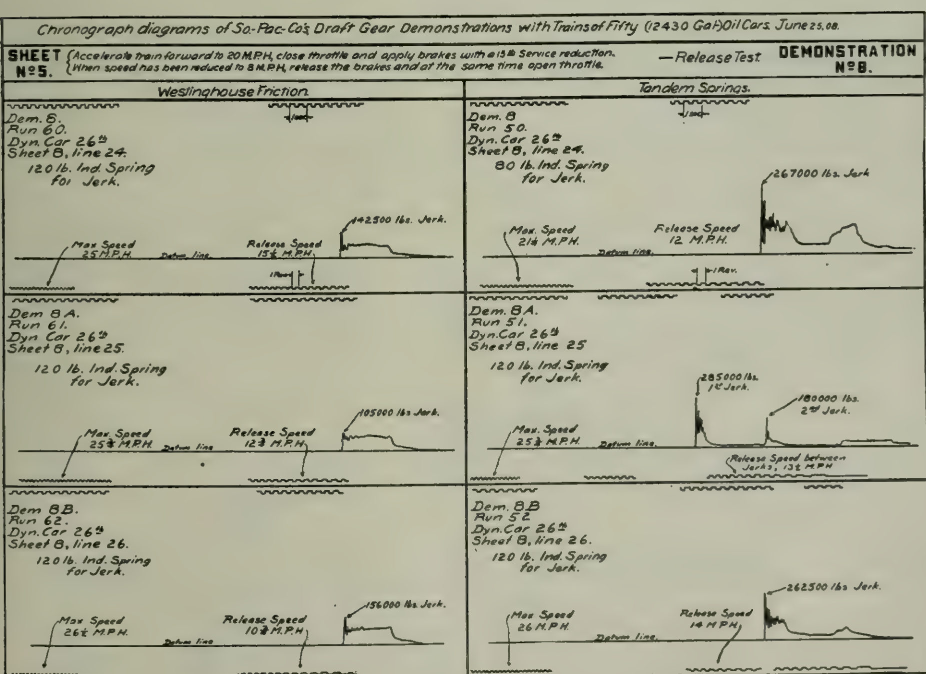
In test 5 an emergency application of the air brakes starting from the rear end of the train while en route and under full steam, such as occurs from hose bursting or train parting near rear end or by malicious or intentional use of conductor's valve in caboose, brings an entirely different condition than an emergency application made from the head end, and to determine the relative values of the draft gear under such conditions the trains were accelerated to a speed of about 20 miles per hour and the brake pipe was opened at rear end while the engine



Record of Tests 5 and 6.



Record of Test 7.



Record of Test 8.

...SPRINGS AND WESTINGHOUSE FRICTION DRAFT GEARS.

Tests made on Los Angeles Division, S. P. Co., June 11 to 18, 1908.

Line	Demonstration Nos.	Demonstration Description	Location of Dyn. car	Slideometer movements — Westinghouse friction — Dyn. car Forward	Westinghouse friction — Dyn. car Back	Westinghouse friction — Car	Westinghouse friction — Forward	Westinghouse friction — Back	Tandem springs — Dyn. car Forward	Tandem springs — Dyn. car Back	Tandem springs — Car	Tandem springs — Forw'rd	Tandem springs — Back	1st 25 cars West.-fric.; 2d 25 cars tandem springs — Dyn. car Forw'rd	1st 25 West.-fric.; 2d 25 tandem — Dyn. car B'k	1st 25 West.-fric.; 2d 25 tandem — Car	1st 25 West.-fric.; 2d 25 tandem — Forw'rd	1st 25 cars tandem springs; 2d 25 cars West.-friction — Dyn. car Forwrd	1st 25 tandem; 2d 25 West. — Dyn. car B'k	1st 25 tandem; 2d 25 West. — Car	1st 25 tandem; 2d 25 West. — Forwrd	Buffs and recoil blows — Westinghouse frict'n.	Buffs and recoil blows — Tandem springs	Buffs and recoil blows — 1st 25 West.-fr.; 2d 25 tndm	Buffs and recoil blows — 1st 25 tndm 2d 25 W.-fric.
1.			41st		2 3/16"	1st	No movement.			7 5/8"	1st	No movement.													
2.	3	Jerk	41st		3 11/16"	1st	No movement.			7 5/16"	1st	No movement.													
3.			41st		8 1/2"	1st	No movement.			8"	1st	No movement.													
4.			41st	10 3/16"		51st	5' 0 1/2"		1'—7 13/16"		51st	2'—6"		7 1/2"		51st	11"	5 13/16"		51st	5 3/4"	155,000	550,000	350,000	95,000
5.	4	Buff.	41st	1'—3 15/16"		51st	3' 0 1/4"		1'—1 5/8"		51st	4'- 2 1/4"		1' 4 1/4"		51st	3'—1"	1'—6 5/16"		51st	2' 9 1/2"	200,000	495,000	550,000	200,000
6.			41st	No record.		51st	3' 10 3/8"		7 7/8"	Remrks.	51st	3'—11"		1'—1"		51st	5'—2 1/2"	1'—8 15/16"		51st	4' 7 3/4"	150,000	520,000	490,000	240,000
7.			41st			51st			10 5/8"		51st	5'—6"											530,000		
8.			41st	7/8"		51st	3/8"		1'—4 7/8"		51st	1'- 8"										No recl.	Rec. blw 520,000		
9.	5	Jerk	41st	3 5/8"		51st	5 1/2"		11 3/8"		51st	1'—8 1/4"										No recl.	Rec. blw 360,000		
10.			41st	1 3/4"		51st	7 1/4"		1'—4 8/16"		51st	1'—8"										No recl.	Rec. blw 515,000		
11.			41st	1/16"		51st	3/4"		1/4"		51st	No movement.													
12.	6	Jerk	41st	1/8"		51st	No movement.		1 7/8"		51st		1/4"												
13.			41st W.F§	1 15/16"		51st	1" at stop	3/4"	1' 8 9/16"		51st	1/8"													
14.			10th	1'—0 1/16"		51st		5/8"	1'—4 15/16"		51st	1/4"													
15.			10th			51st				2 5/16"	51st		8"												
16.			10th			51st				2 5/16"	51st		8 1/4"												
17.			10th			51st			No record.		51st		2' 4 1/4"												
18.			10th			51st				3"	51st		2"												
19.	7	Jerk	26th		4 5/16"	51st		4"		8"	51st		1"												
20.			26th		3 3/4"	51st		7 1/4"		10 3/8"	51st		10"												
21.			26th		4 3/4"	51st		7 3/4"		6 5/8"	51st		1'- 0 1/4"												
22.			26th		4 1/4"	51st		7 1/4"		8 3/8"	51st		1'—7 1/2"												
23.			26th			51st				9 5/16"	51st		1'—3 1/2"												
24.			26th		1 13/16"	51st	No movement.			9"	51st	1 1/2"			4 3/8"	No record.			6 11/16"	1st	1 9/16"			130,000	
25.	8	Jerk	26th		2"	51st		1'—6"		9 3/4"	51st	No movement.		Void.					10"	1st	1 1/4"				
26.			26th		3 7/16"	51st		1'—11"		8 3/8"	51st	No movement.			5"	No record.		No movement.		1st	6 3/4"				
27.			26th			51st					51st				5"	No record.									
28.			11th			51st			Void.		51st												Void.		
29.			11th			51st			Void.		51st												Void.		
30.	9	Buff.	11th		1'—5 9/16"	3d.		2'—11"		5"	3d.		4"									k600000	250,000		
31.			11th		4 1/4"	3d.		5"		1'—1 7/8"	3d.		10"									k400000	450,000		
32.			11th		3 5/16"	3d		6"		11 1/2"	3d.		1'—1 1/2"									k500000	390,000		

§ 10th T. S.

Line	Jerks and recoil jerks — Westinghouse friction	Tandem springs 1st	Tandem springs 2d	1st 25 West.-friction; 2d 25 tandem spgs. 1st	1st 25 West.-fric.; 2d 25 tandem 2d	1st 25 tandem springs; 2d 25 West. frictn. 1st	1st 25 tandem; 2d 25 West. 2d	Speeds, miles per hour — West.-friction — Engine Max.	West.-friction — Engine At ret.	West.-friction — Dyn. car Max.	West.-friction — Dyn. car At ret.	Tandem springs — Engine Max.	Tandem springs — Engine At ret.	Tandem springs — Dyn. car Max.	Tandem springs — Dyn. car At ret.	1st 25 West. fric.; 2d 25 tandem spgs. — Engine Max.	Engine At ret.	Dyn. car Max.	Dyn. car At ret.	1st 25 tand. spgs; 2d 25 West. friction — Engine Max.	Engine At ret.	Dyn. car Max.	Dyn. car At ret.	Train damage — Westinghouse friction C	D	E	F	Tandem springs C	D	E	F	1st 25 West. fric.; 2d 25 tand. spr. C	D	E	F	1st 25 tand. springs; 2d 25 West. friction C	D	E	F
1.	120,000	260,000																																					
2.	130,000	285,000																																					
3.	135,000	283,000																																					
4.	No recoil	Recoil jerk 70,000		No recoil		No recoil		9 1/2		12		8 1/2		8		5		5 1/2		5		5 3/4																	
5.	No recoil	Recoil jerk 45,000		No recoil		No recoil		5 3/4		8 1/2		10		9 3/4		10		10 3/4		10		11																	
6.	No recoil	Recoil jerk 68,000		No recoil		No recoil		7 1/2		10 1/2		13		12		12		12 1/2		12		12																	
7.		Recoil jerk 55,000										13		12 1/2															1†										
8.	45,000	No jerk record'd	s, t. 80,000					17 1/2		19 3/4		21 1/2		16											1		*	1											
9.	43,000	No jerk record'd	s, w. 50,000					17 1/2		20 3/4		21		21										1	3			2	1										
10.	45,000	70,000	s65,000					17 3/4		21		21 1/2		22											1	1		1	1										
11.	45,000	35,000						19 1/2		21 1/2		19 3/4		21													*	g1	2										
12.	26,000	105,000						20 1/2		23		19 1/4		21 1/4														1	1										
13.	25,000	260,000						23		27		19 1/4		19 3/4														1											
14.	146,000	265,000						20		20 1/4		20 1/2		21														2	2	2	2								
15.		65,000										5 1/4		No record.																									
16.		80,000										4 3/4		5																									
17.		93,000	105,000									5		5 1/4																									
18.		150,000										5		5																									
19.	120,000	220,000						5		5 3/4		5		6 3/4														1											
20.	111,000	305,000						5 1/2		5		5		6																									
21.	120,000	185,000						6		6		5		6 1/4														1											
22.	127,500	210,000						5		5 1/4		4 3/4		6 1/2																									
23.		227,000										7 1/4		6 3/4																									
24.	142,500	267,000		135,000		225,000		24	17	25	15 1/2	21	13	21 1/4	12	23	13	24	9 3/4	24	16	24	14					3	4	4						c1			
25.	105,000	285,000	180,000	Void.		333,000	168,000	23 1/2	15	25 3/4	12 3/4	23	15	25 3/4	13 1/2	Void.				24 1/2	15	25	9 1/2					1	1			aVoid.				d1	1		
26.	156,000	262,500		157,500	96,000	30,000		25	13 1/2	26 1/2	10 3/4	24	15	26	14	23 1/2	13 1/2	24 1/2	10	24	15	24 1/2	10 1/4					2	3	2		h1				e3	2		
27.				127,500	127,500											24 1/2	16	24 1/2	14													b1		1	3				
28.		Void.										Void.																											
29.		Void.										Void.																											
30.	No recoil	Recoil jerk 30,000						5 3/4		5 3/4		3 1/2		3																									
31.	No recoil	Recoil jerk 65,000						4		3 3/4		5		5																									
32.	Recoil jerk 10,000	Recoil jerk 65,000						4		3 3/4		5 1/2		m No record.																									

REMARKS: Line 6—Slideometer weight jumped with tandem spring gear; line 7—After stop, with tandem spring gear, there was a very severe shock on locomotive; line 8—See notes s and t, also *(asterisk); line 9—See notes s and w; line 10—See note s, line 11—See note g and *(asterisk); line 24—See note c; line 25—See notes a and d; line 26—See note c and h; line 27—See note b; lines

DESCRIPTIONS OF LOCOMOTIVE AND CARS USED IN THE DEMONSTRATIONS RECORDED IN THE RECAPITULATION OF THESE TESTS.

LOCOMOTIVE.

Consolidation, Class C57 $^{22}/_{50}$ 187.
Number, S. P. 2765.
Total weight, loaded, 208,000 *lbs.*
Weight on Drivers, 187,000 *lbs.*
Tractive Power at 10 *M.P.H.,* 43,305 *lbs.*
Locomotive equipped with 9,000 *Gal. Rectangular Tender.*
Weight of Tender, loaded, 170,500 *lbs.*
Weight of Locomotive and Tender, loaded, 378,500 *lbs.*
Engine Speeds from Boyer Recorder.

CARS.

Oil Cars, Class O—50—2.
Capacity, 12,430 *Gals.*
Capacity, 100,000 *lbs.*
Light weight, 48,300 *lbs.*
Length over end sills, 41 *ft.* 10 *in.*
Length over couplers, 44 *ft.* 3¼ *in.*

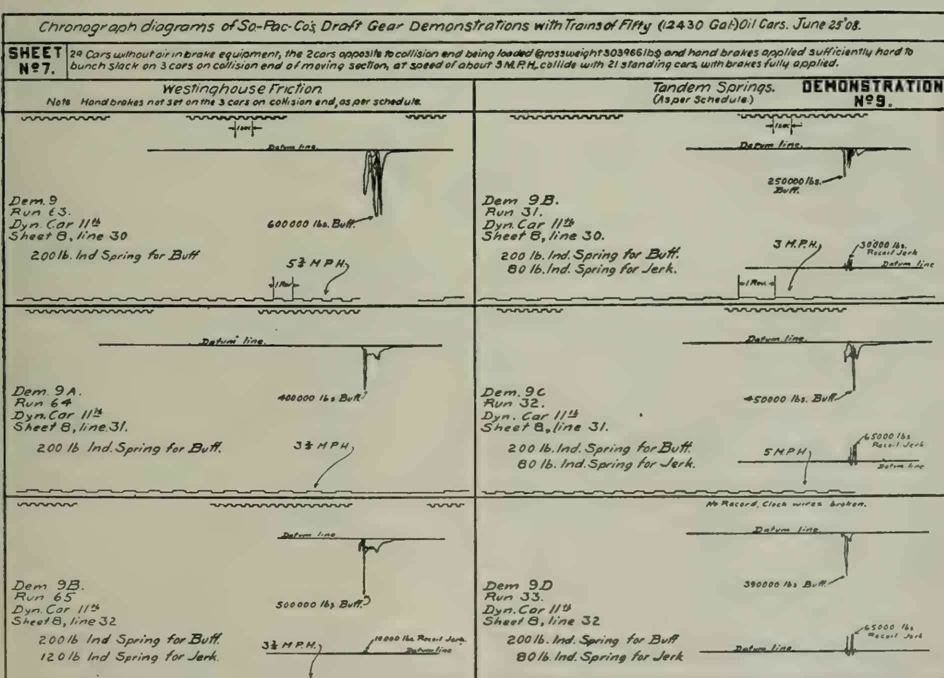
C—Denotes broken knuckles.
D— " damaged knuckle pins sheared in some cases.
E— " cracked or broken couplers.
F— " cars set out on account of coupler defects.
a—When approaching Demonstration knuckle slipped and train parted between thirty-ninth and fortieth cars.
b—Train parted between fiftieth and fifty-first cars.
c—Train parted between forty-fifth and forty-sixth cars.
d—Train parted between twenty-seventh and twenty-eighth cars.
e—Train parted between tender and first car, and between twenty-fourth and twenty-fifth cars, also renewed knuckle on second car.
f—Also three yoke rivets and one truck spring broken.
g—Also yoke rivets broken on tender coupler.
h—Train parted between thirty-sixth and thirty-seventh cars.
k—Slack not bunched with hand-brakes on three cars on collision end of moving section.
m—Clock wires broken.
s—Secondary jerk came after recoil blow. No first jerk recorded before train parted.
t—Train parted between sixth and seventh cars.
w—Train parted between tender and first car, and between twelfth and thirteenth cars.

* NOTE.—*On account of accident to train caused by brakes going into unexpected quick action while preparing for demonstrations* 5 *and* 6 *two knuckles were broken, four knuckle pins were damaged, one coupler was broken and three cars were set out on account of defective couplers.*

continued to work steam with full throttle until stalled. The dynamometer car was the forty-first car, in other words, where the jerk and recoil were most severe, and the indicator diagrams show that with Westinghouse friction gear the jerks were on the order of long, steady pulls of 43,000 to 45,000 lbs. with no recoil whatever, the train remaining intact, while with tandem spring gear there were severe jerks in quick succession from 50,000 to 80,000 lbs, which parted the train and recoil blows occurred ranging from 360,000 to 520,000 lbs. No ordinary equipment or lading could withstand such severe treatment.

Test 6 was made to determine the value of the gears in reducing shocks resulting from an emergency application of the brakes, which might be caused by hose bursting or train parting near the rear end of train similar to the condition above described, except with engine shut off and train drifting. The trains were accelerated to about 20 miles per hour and the throttle closed. After the slack was bunched an angle cock was opened at rear of train. The indicator diagrams show the jerks reduced to pulls with friction gear ranging from 45,000 to 146,000 lbs. while with tandem springs the jerks ranged from 35,000 to 265,000 lbs, the shape of the diagrams showing difference in the time element.

On sheet 4, test 7, will be seen the records of performance of the two types of draft gear under severe conditions produced by rough handling in starting heavy trains. The trains were backed at a speed of five miles per hour to represent attempting to gather slack and when the slack was all bunched the reverse lever was thrown into forward motion, throttle opened wide, and rail sanded. The dynamometer car was twenty-sixth car, except in part of the spring gear runs. It will be noted that the Westinghouse friction gear performance was almost identical in each run, showing jerks from 111,000 to 127,500 lbs., all well within its capacity, while the tandem springs show jerks from 185,000 to 305,000 lbs. under similar



Record of Test 9.

conditions, all many times the capacity of the springs and some spring gear diagrams show over 25 distinct jerks.

Probably more damage to equipment and lading has been caused by engineers running on short time attempting to release brakes on freight trains to save the time necessary to come to a full stop after slowing down than from any other one cause over which operating officials have control. To determine the value of the draft gears in such a case, in test 8 the trains were run at approximately 20 miles per hour, engine throttle closed, a 15-lb. service brake pipe reduction made (a heavy brake application), and when speed had been reduced to about eight miles per hour the brakes were released and engine throttle opened wide.

The indicator diagrams do not give all the data, since with the Westinghouse friction gear the jerks were from 105,000 to 156,000 lbs., all within its capacity, and with the tandem spring gear the jerks were from 262,500 to 285,000 lbs., all beyond their capacity, yet with the Westinghouse equipment the train remained intact and was again accelerated as intended, but in the attempts to accomplish this much desired result with the spring gear the train was parted, sometimes in several places, and in no case was the train again put under way.

It is absolutely impossible to permit engineers to make a practice of attempting to release brakes and applying steam with long freight trains under way which are equipped with spring draft gear and standard quick action triple valves.

The indicator diagrams of test 9 show performance of the gears under yard switching conditions. It will be noted that while the maximum blows recorded are very high, yet with the friction gear there was but a slight trace of recoil in one instance only, while with the tandem spring gears the recoil jerks reached 65,000 lbs.

The blows struck and recorded by the dynamometer car were for the purpose of illustrating the power of destructive shocks given cars and lading in switching, and while the moving part of the train was only going at from three to five miles per hour in these runs, yet much switching is done at higher rates of speed, and the explanation for lading and car damage in yards is not difficult to seek.

ELECTRIC RAILWAY ROLLING STOCK FOR URBAN AND SUBURBAN SERVICE.

BY H. M. HOBART, M. INST. C.E.

The weight of an electric passenger train may be divided into four parts:

I. The trucks, including truck frames, wheels and axles, brake rigging, etc.

II. Coach bodies with underframes, brake cylinders, etc.

III. Electrical equipment, including motors, rheostats, transformers, controllers, collectors, compressors, motors, cables, etc.

IV. Passengers.

For a given seating capacity, components I. and II. increase in weight slowly with increasing schedule speed and decreasing distance between stops; nevertheless representative weight and cost values may be readily assigned to these items.

Component III. increases rapidly in weight with increasing schedule speeds and with decreasing distance between stops. The weight of component III. is also very dependent upon the type of electrical equipment.

Component IV. is a very variable factor. While the number of passengers is often considerably in excess of the seating capacity, the *average* of the number of passengers carried by an urban or suburban train throughout all its journeys is rarely more than 40 per cent. of the seating capacity. In the following investigation, component IV. is not comprised in the "total train weight," which in this investigation is taken as the dead weight. This is justified by the greater simplicity with which the investigation may be carried through. The "total train weight" (TTW) is thus taken as the sum of the first three components, namely:

I. The trucks.

II. The car bodies.

III. The electrical equipment.

Let us take the case of a well built three-coach train providing 180 seats with the usual proportion of first class and third class seats, and to be operated at a schedule speed of 26 miles per hour with one stop per mile. Let the average duration of stop be 20 sec. Such a train will require an electrical equipment providing 12 rated h.p. (1 hr. 75 deg. C. basis of rating) per ton weight of train.

The following rough data of weights and costs will serve the purpose of this investigation:

Bogie trucks: Weight of each motor truck, including truck frames, wheels and axles, brake rigging, etc. .... = 5.5 tons.
Weight of each trailing truck .... = 4.0 "
Cost of trucks = £22($110) per ton.*
Car Bodies: Weight of each motor car body, complete with underframes, brake cylinders, etc. .... = 15 tons.
Weight of each trailer car body .... = 11 "
Cost of car bodies complete = £80 ($400) per ton.
Electrical Equipment: Weight of continuous current equipment .... = 16 kg. per rated h.p.
Weight of single phase equipment........ = 40 kg. per rated h.p.
Cost of electrical equipment = £125 ($625) per ton.

*For simplicity, pounds Sterling are converted at $5.

Let us work out the weights of: First, a continuous curren (cc) train, and, second, a single-phase (sp) train.

First.—Train with Continuous Current Equipment.—We may make the preliminary assumption that a suitable train for the required capacity and schedule will comprise two motor coaches and a trailer in between them, and that only one of the bogies on each motor coach will require to carry motors. Thus we have:

2 motor bogies	at 5.5 tons	=	11 tons.
4 trailing bogies	" 4.0 "	=	16 "
2 motor car bodies	" 15 "	=	30 "
1 trailer car body	" 11 "	=	11 "
Weight, exclusive of electrical equipment		=	68 tons.

Let us denote by W the weight of the electrical equipment. Then, since cc equipment weighs 0.016 ton per rated h.p., and since we require 12 rated h.p. per ton of total train weight ($= 68 + W$), we have

$$W = 12 \times 0.016 \ (68 + W) = 16 \text{ tons.}$$

$$TTW = 68 + 16 = 84 \text{ tons.}$$

Consequently rated capacity of electrical equipment $= 84 \times 12 = 1{,}000$ h.p. This may be provided by four 250-h.p. motors, and auxiliary apparatus. We may estimate the cost as follows:

Trucks	= 22 x 27 =	£595 ($2,975)
Car bodies	= 80 x 41 =	3,280 (16,400)
Electrical equipment	= 125 x 16 =	2,000 (10,000)
Labor in assembling at £6 ($30) per ton	=	505 (2,525)
Total cost of train		£6,380 ($31,900)
Total cost per ton		76 ($380)
Total cost per seat		35 ($175)

Second.—Train with Single-Phase Equipment.—We shall require to provide 12 motors, one for each axle. Thus we have:

6 motor bogies	at 5.5 tons	=	33 tons.
3 motor coaches	" 15 "	=	45 "
Weight, exclusive of electrical equipment		=	78 tons.

Denoting by W the weight of the electrical equipment, then since sp equipment weighs 0.040 ton per rated h.p., and since we require 12 rated h.p. per ton of TTW ($= 78 + W$), we have

$$W = 12 \times 0.040 \ (78 + W) = 72 \text{ tons.}$$

$$TTW = 78 + 72 = 150 \text{ tons.}$$

Consequently rated capacity of electrical equipment $= 150 \times 12 = 1{,}800$ h.p. This may be provided by twelve 150-h.p. motors and auxiliary apparatus.

The cost works out as follows:

Trucks	= 22 x 33 =	£725 ($3,625)
Car bodies	= 80 x 45 =	3,600 ($18,000)
Electrical equipment	= 125 x 72 =	9,000 ($45,000)
Labor in assembling at £4 per ton	=	600 ($3,000)
Total cost of train		£13,925 ($69,625)
Total cost per ton		93 ($465)
Total cost per seat		77 ($385)

Taking maintenance and depreciation of rolling stock and

interest on the capital outlay at 15 per cent. per annum, the annual costs are respectively:

	Per annum.
With continuous current ...... =	£5.3($26.50) per seat
With single phase .... =	11.5($57.50) per seat

In the next step we determine the miles traveled by each train per year. Each train should be in service for some

$$300 \times 15 = 4{,}500 \text{ hours per annum.}$$

During this time, at 26 m.p.h., it will cover

$$26 \times 4{,}500 = 117{,}000 \text{ miles.}$$

The input to the train will be 100 watt-hours per ton-mile. Taking the average efficiency from the generating station to the train as 80 per cent. for continuous current and 90 per cent. for single-phase, we have the output from the generating station per ton-mile:

With continuous current .... = 125 watt-hours.
With single phase .... = 111 watt-hours.

Or output per train-mile:

$$\text{With continuous current} = \frac{84 \times 125}{1{,}000} = 10.5 \text{ kw. hrs.}$$

$$\text{With single phase} = \frac{150 \times 111}{1{,}000} = 16.6 \text{ kw. hrs.}$$

Or output per train-year:

		Kw. hrs
With continuous current	= 10.5 x 117,000 =	1.23 million.
With single phase	= 16.6 x 117,000 =	1.94 million.

At a price of 0.33 penny (0.66c.) per k.w. hr. delivered from the generating station, the cost of electricity per train per annum is:

$$\text{With continuous current} = \frac{1{,}230{,}000 \times 0.33}{240} = £1{,}690(\$8{,}450)$$

$$\text{With single phase} = \frac{1{,}940{,}000}{240} = £2{,}690(\$13{,}450)$$

Annual cost for electricity per seat:

For continuous current................ = £9.4($47)
For single phase .... = 14.9($74.50)

Thus the annual cost for maintenance, depreciation, electricity and interest on capital are:

With continuous current....... 5.3 + 9.4 = £14.7($73.50) per seat.
With single phase ....11.5 + 14.9 = 26.4($132) per seat.

or

$$\text{with continuous current} = \frac{14.7 \times 240}{117{,}000} = 0.030\text{d.}(0.06\text{c.}) \text{ per seat mile;}$$

or

$$\text{with single phase} = \frac{26.4 \times 240}{117{,}000} = 0.054\text{d.}(0.108\text{c.}) \text{ per seat mile.}$$

As regards other charges the characteristics of the two systems fairly offset one another. With the heavy single-phase trains, the maintenance and depreciation charges for the permanent way will be much greater than with the relatively light continuous current trains. The cost of single phase overhead construction is greater than that of third-rail construction. These two items will offset the greater cost of the sub-station machinery in the continuous current system. Thus, for the schedule we are considering, we may assess to the single-phase system a cost of $(0.054 - 0.030 =)$ 0.024 penny (0.048c.) per seat-mile in excess of the cost incurred when continuous current is employed. For the 180-seat train in question, this represents $0.024 \times 180 = 4.3$d. (8.6c.) more per train-mile with a single-phase than with a continuous current train.

The average fare for urban and suburban railways is around 0.6d. (1.2c.) per mile. But since a seat is, on the average, occupied for—say—40 per cent. of its journey, the receipts per seat-mile are around

$$0.6 \times 0.40 = 0.24\text{d.} \ (0.48\text{c.})$$

corresponding to $180 \times 0.24 = 43$d. (86c.) per train-mile for the 180-seat train which we are considering.

Thus the 4.3d. (8.6c.) handicap of the single-phase system makes an inroad of 10 per cent. on the gross receipts, and in the case of most railways, is much more than sufficient to wipe out dividends were electrification introduced on an extensive scale. Or looking at the matter from the opposite standpoint, if, as Mr. Dawson and others have claimed, single-phase can, under these conditions, compete with steam, then the use of continuous current would render available for dividends a further 10 per cent. of the gross receipts. I have taken the high figure of an average fare of 0.6d. (1.2c.) per mile and 40 per cent. of the seats occupied, with the purpose of favoring the system in my comparison. As is well known, such favorable figures are the exception on urban and suburban railways, and in so far as lower figures are obtained, the 10 per cent. difference in favor of cc would be replaced by a higher percentage. At present none of the London Underground Railways are taking in as much as this (i.e., 0.24d., 0.48c.) per seat-mile.

It will be pointed out that the case I have taken, namely, a service in which, with one stop per mile, a schedule speed of 26 miles per hour is maintained, is rather a severe service. I am quite aware of this. But it is the very ability to provide such a service which is often a chief inducement to introduce electric operation. If still with one stop per mile, we come down to schedule speed of 22 m.p.h., while electrification is highly desirable there are not (except for mountain roads and for tunnels and elevated roads) so strong advantages in its favor as exist in the case I have taken for my example. While at the lower speed (with one stop per mile), the disparity between single-phase and continuous current is distinctly diminished, the advantage for continuous current is still far too great to be overlooked. At the slow schedule of 18 m.p.h. and one stop per mile or with any schedule equivalent to this, such as still lower speeds with more frequent stops, or higher speeds and less frequent stops (such as Heysham) we come to the range of work where, so far as relates to the rolling stock, it is more or less indifferent which system is employed. But for so unattractive a service there will rarely, with present developments, be found sufficient economic advantage to justify substituting electricity for steam.

A point which has not been sufficiently appreciated is the large percentage which the rolling stock constitutes of the total capital outlay of urban and suburban railways.

Thus take the case of 50 miles of double track, over which trains, each with a seating capacity for 450 passengers, are operated at a headway of 2½ minutes and at a speed of 14 miles per hour with two stops per mile. The distribution of the electrification and rolling stock costs is somewhat as follows:

Generating station	£800,000($4,000,000)
Transmission system.*	1,600,000(8,000,000)
Cc rolling stock	3,200,000(16,000,000)
Total	£5,600,000(28,000,000)

*Including sub-stations.

The rolling stock constitutes 57 per cent. of the total and the maintenance and depreciation thereon are enough greater than on the other items to raise the annual costs associated with the third item to some 75 per cent. of the annual costs associated with the total of the three items.

A group of calculations for 180-seat trains stopping once per mile and for various schedule speeds, yield results which I have brought together in the following table:

Schedule speed with one stop per mile.	Weight and cost — Total train — Weight, tons. C.c.	S.p.	Total cost C.c.	Total cost S.p.	Cost — Per ton C.c.	Per ton S.p.	Per seat C.c.	Per seat S.p.	Ratio.*
18 m. p. h..	73	85	£4,900	£6,400	£70	£75	£27	£35	1.29
			$24,500	$32,000	$350	$380	$135	$175	
22 " ..	77	103	5,400	8,200	72	80	30	45	1.50
			$27,000	$41,000	$360	$400	$150	$225	
26 " ..	84	150	6,400	13,900	76	93	35	77	2.20
			$32,000	$69,500	$380	$465	$175	$385	
30 " ..	103	...†	8,200	......†	80	...†	45	...†	....
			$41,000		$400		$225		

*Ratio of cost per seat for single phase train to cost per seat for continuous current train.
†Not possible with present developments.

From this table we see that the cost of a cc train for 30

m.p.h. is about equal to that of a sp train for 22 m.p.h., and that the cost of a cc train for 26 m.p.h. is about equal to that of a sp train only capable of 18 m.p.h. The table permits of realizing much more clearly the limitations and the legitimate field for single-phase traction. It is reasonable to suppose that in the course of a few years, a 20 per cent. handicap may be overcome as further experience with the single-phase system is obtained, although it must be remembered that improvements are still constantly occurring in cc equipments. But for the more severe schedules the disparity is of so great magnitude as to make it as unreasonable to delay railway electrification pending improvements in single-phase methods as it would be to stop building railways pending aviation developments.

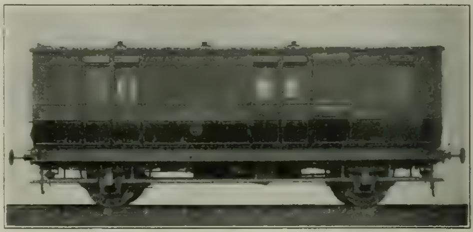
Referring again to the above table of weights and costs, it must be clearly realized that 18 m.p.h. with only one stop per mile is no longer an especially attractive service for suburban lines, and is easily performed by steam. So comparatively low a speed is only justified for runs averaging not much over one-half mile between stops. With only one stop per mile, 22 m.p.h. is the lowest schedule speed that can be considered distinctly attractive, and with our present experience the tendency will be strongly toward some 24 to 25 m.p.h., for cases where there is an average distance of one mile between stations.

INSTRUCTION CAR FOR LOCOMOTIVE MEN.

George Hughes, Chief Mechanical Engineer of the Lancashire & Yorkshire Railway, has recently equipped an instruction car as a portable lecture room. The intention is, that the car shall be sent to the various locomotive depots on the company's line, where mutual improvement classes have been formed, and lectures given by qualified persons, to the engine-drivers, firemen, mechanics, etc., with the object of thoroughly familiarizing them with all the various mechanisms they have to deal with when engaged on locomotives.

The interior of the car is fitted up with a number of seats for the audience, also lecture table, models, drawings and a small library of useful books having special reference to locomotives. The drawings are suspended from a roller fastened to the roof of the car when being used for purposes of explanation by the lecturer.

Ample facilities have been provided for having the lectures well illustrated, as will be seen by reference to the appended list of drawings, models, etc., and there is no doubt that the provision of such means of diffusing knowledge is bound to result in the members of the locomotive staff possessing a keener intellectual grip of the machine that is placed in their charge.



Lancashire & Yorkshire Instruction Car.

List of Drawings.

Sight feed lubricator.
Water pickup.
Slide valves
Motion.
Brake fittings.
Section of boiler and smokebox.
Radial axlebox.
Types of regulator heads.
Both types of big ends.
Sanding arrangement.
Pump ejector
Vacuum diaphragm cylinder and ball valve.
R. H. injector. L. H. injector.
Combination ejector.
Joy's Motion.

List of Models.

Joy's Motion.
Link motion.
Vacuum pump in two sections.
Section of ball valve.
Section of auxiliary valve.
Two sections of old type injector.
Section of combination injector.
Five sections of large combination injectors.
Three sections of pump type ejector.
Four sections of new type ejector.
Section of sight-feed lubricator.
Two sections vacuum brake rapid acting valve.
Vacuum brake diaphragm cylinder.
Hand vacuum pump.
One pair of weighing scales with weights.
One flash with shut-off cock.
Two bell jars.
One mercury barometer.
One glass bottle jar, and 6 flasks.

The car is also provided with a library of reference works and text books on locomotive practice.

Interior of Lancashire & Yorkshire Instruction Car.

General News Section.

The Atchison, Topeka & Santa Fe, which has for several years used telephones for block signaling, is now using them on two divisions for sending train orders; and they will soon be so used throughout the line from Chicago to Denver.

The Canadian Pacific has established an Industrial Department in the West with the object of supplying information to manufacturers, merchants and others desirous of locating in that section. The department will be under the direction of F. W. Peters, Winnipeg.

The Pennsylvania Company has asked the United States Court at Indianapolis for a restraining order to prevent the Lake Shore & South Bend Traction Company from laying a track across its right-of-way in Tolleston without first making arrangements for putting in suitable signals.

The Southern Pacific has discontinued the service of train agents (collectors of tickets and fares) on the line between El Paso and San Francisco. These collectors were dispensed with on the lines east of El Paso some time ago. Train agents have been in service on the Southern Pacific lines for the past five years.

William Vanamee, receiver of the Wallkill Transit Company, Middletown, N. Y., has issued an order that hot coffee shall be furnished free to motormen and conductors during the winter months between the hours of 6 and 9 o'clock in the morning and 6 and 12 o'clock at night; and motormen and conductors are expected to abstain entirely from the use of intoxicating liquors.

Under the profit sharing plan of the United States Steel Corporation for the year 1909 both the preferred and common stocks will be offered to employees for subscription. They can subscribe for preferred stock at 110 and common at 50. Recent market prices are about 113 for preferred and 52 for common. Heretofore, only preferred stock has been offered to employees. Last year it was offered at 87.50 and the highest previous price was 102, in 1907. Since the plan has been in force, about $12,000,000 in dividends, bonuses, etc., has been distributed to employees holding stock.

The Board of Mediation under the Erdman act, Messrs. Knapp and Neill, announces the signing in Washington of a compromise agreement between the Missouri, Kansas & Texas Railway and its employees. Enginemen, firemen, trainmen and conductors were involved. The most important point at issue concerned the computation of over-time under existing contracts as affected by the hours of service law. The Chicago tie-up agreement, so called, provides that where a crew is tied up after 14 hours it shall be deemed tied up in compliance with the law, and no overtime is allowed, but if tied up before 14 hours have expired, then time is allowed for the full time the crews are tied up. The settlement upon this point carries an agreement on the part of the company to put in force the Chicago tie-up rule on March 1, 1909. The settlement further carries the withdrawal of certain demands on the part of employees and a modification of the general principles of the Chicago agreement to suit local conditions on the M., K. & T.

E. E. Calvin, Vice-President and General Manager of the Southern Pacific, is quoted in the San Francisco papers as stating that the Dumbarton cut-off will be open for business on March 1, and about 90 per cent. of all the freight hauled to San Francisco by the Southern Pacific from the East and the interior valleys will then reach the city by rail around the south end of the bay, over this cut-off. The only freight sent across the bay from Oakland will be for the warehouses of the section near Lombard street pier. Eastern freight will be carried via Sacramento, Stockton, Niles and Dumbarton. Mr. Calvin said that some time ago the Southern Pacific was ferrying as many as 400 loaded freight cars to San Francisco daily, but that with the opening of the cut-off fully nine-tenths of these cars will be sent by the Dumbarton route. The freight boats from Oakland creek bridge to the foot of King street will be taken off. Mr. Calvin said that rumors about the Southern Pacific building tunnels under the city to deliver freight east of Telegraph Hill and in the neighborhood of Tenth and Market streets are baseless. He also said that a union passenger station is not under consideration.

Mayor J. N. Adam, of Buffalo, N. Y., in his annual message to the Common Council recommends that "every privilege granted to any railway for any purpose where the same does not directly serve as a switch to some Buffalo industry to whose prosperous continuance such switch is necessary, be revoked; that the roads be obliged to maintain flagmen night and day at every crossing at grade, that a commission of five be appointed to investigate assessment of railway property, that the state Public Service Commission be asked to compel the construction of improved stations; that at perilous crossings every train be stopped; that switching be forbidden at all crossings at grade, and that the legislature be asked to compel the roads to defray the entire cost of future grade crossing improvement, maintenance, consequential, and other damages." Mr. Adam's views should perhaps be accorded a standing somewhat different from that accorded the utterances of most mayors, for the reason that, as a member of special commissions, he has had many years' experience in dealing with railways and railway questions. The grade crossings of Buffalo have long been a hard problem; and the Buffalo papers have recently announced the failure of a long series of negotiations looking to the establishment of a new union passenger station.

New Cars and New Methods.

New York City is to have "pay-as-you-enter" street cars in large numbers and some of the cars are to have folding steps. The new type of cars, equipped with fare boxes on the rear platforms, will be put in operation on the Third Avenue Line on January 10. The conductors will give and receive transfers and will make change, but will not be allowed to touch the nickels, which must be deposited in the fare box by the passengers. Passengers may leave the cars at either the front or rear door. If they want transfers they must ask for them when they enter the car. The new cars will weigh seven tons less than the pay-as-you-enter cars at present in operation on the Madison avenue line of the Metropolitan. The steps fold up when the cars are in motion. The receiver for the Third Avenue Line has ordered 200 new pay-as-you-enter open cars, which also will be equipped with fare boxes. These cars will have an aisle in the center.

Change in Policy of Pennsylvania Promotions.

John S. Considine has been appointed Assistant Supervisor of the Pennsylvania at Columbia, Pa. In this appointment the Pennsylvania has broken a long-standing precedent, as Mr. Considine was a track foreman, which may be considered the highest rank of non-commissioned officers. An ordinary laborer could eventually become a track foreman, but it has not been the policy of the company to promote track foremen to a higher rank. The Pennsylvania has for years employed graduates of technical schools to be trained for promotion to the important engineering and mechanical positions. Realizing, however, that many employees who have not had the advantages of a college education, apply themselves so diligently to their work that they acquire a proficiency which should be recognized, the management has been carefully observing the work of all grades of men in the service, with a view to promoting those who showed exceptional ability, no matter what their start had been. Mr. Considine entered the service as a track laborer when but 15 years old. After five years he was assigned to duty in a supervisor's office.

There he acquired the rudiments of civil engineering. Later he was sent out on the road as track foreman, and his work in that capacity was of such a character that the title of general foreman of track laying was created for him. At this point Considine would have come to a sudden stop had it not been for the change in policy.

Our Country and Our Railroads.*

To successfully carry through important railway construction work, plans must be made years ahead; therefore, it is of paramount importance for the people and the railways to have a fixed governmental policy that can be relied upon. A policy that is changing, either through the Federal or state governments or railway commissions vested with power to arbitrarily regulate and restrict railways in their operation, prevents railways from successfully enlisting the support of bankers to enable them to plan future development, which this country must have to take care of its growing population, increasing demand for occupation, habitation, sustenance and transportation. We are beginning to live down the effects of last year's depressing conditions; but we are an advancing and forgetting people and before the recent panic has been forgotten, we should, as individuals and through co-operation, aid in influencing a governmental policy which will protect us from similar calamities in the future. The first essential factor in building a new country is the locomotive; the second, the plow; and when political agitation, unnecessary and restrictive regulations act as a bumping post to stop the headway of the locomotive, they stop the future progress and prosperity of the nation. If that vast domain west and southwest of Chicago, which is so rapidly turning its grazing lands of the past into farming lands of the future, is to have the same mileage of railway to an equal area as the country east of you, the present mileage will have to be increased by 100,000 miles of new railway. It was from that section of the country the packing houses received their grass-fattened cattle prior to the advent of the railway, while now many of the large pastures are owned by prosperous farmers who have so increased their productiveness, since the pasture days when ten acres were required to take care of one animal, that the same ten acres now produce 450 bushels of corn, 300 bushels of wheat or eight bales of cotton. This illustrates the change that is taking place and furnishes indisputable evidence that the country's transportation, unless pushed forward, will soon become inadequate, and the loss must fall upon the farmer, the merchant and the manufacturer alike. The country now needs a rest from further regulative laws until the railways can adjust themselves to a compliance with those which have been enacted.

All work necessary for the proper upbuilding of a country like ours cannot be accomplished alone through the railways. Our waterways must have the attention of the Federal government under as broad and comprehensive a plan as the policy pursued by our bankers in finding capital to build up our splendid railway systems. Compare the work of the government in furnishing water transportation where nature has provided the rivers and only awaits the work of contractors with what has been accomplished by our financiers and contractors in building our railways of 230,000 miles to an efficiency capable of moving the nation's traffic and its population. Consider what our property values and our transportation facilities would have been had the government kept pace with the country's progress with the waterways. To put it another way: If the 30,000 miles of railway of this country at the close of the war between the states had been under government ownership and control, the same as navigation or waterways, where would we have been to-day in the nation's growth if they had done no better for the public in furnishing rail transportation than they have in furnishing water transportation? Among the most important undertakings that should receive attention is the Chicago canal, which, through the Mississippi river, will connect the Great Lakes and the Gulf of Mexico. This canal completed to an efficiency to accommodate deep draught vessels will bring our cars laden with farm products of the west and manufactured goods of the east in direct connection with the ships to carry our commerce to all parts of the world. There is no reason why we should not have the work of both the Panama and the Chicago canal pushed to completion, but viewed from a cold business standpoint as a national investment the money expended within the boundaries of our own country would be worth dollars to dimes to the American people.

Railway pools should not be legalized; pools are secret understandings between the parties to them; but railways should be permitted to enter into open traffic alliances, subject to the approval of the Interstate Commerce Commission, which would safegard the interests of the public. The same Federal authority should authorize the issuance of railway securities, thereby protecting the investor against over-capitalization. The Capitol at Washington will then become the "Hague" of the nation's railways and its commerce, where peace conferences will be held to settle the questions arising between the public and the railways fair to both, and without political influence or favoritism to either.

*From an address by B. F. Yoakum before the Chicago Association of Commerce at Chicago, December 9.

Twenty-Nine Million Dollar Fine Has Evaporated.

The United States Supreme Court on Monday last announced that it would not review the case of the Standard Oil Company, in which a fine of $29,240,000 was imposed. The decision was announced by Chief Justice Fuller very briefly, no reason being given. The government had asked for a writ of certiorari to review the decision of the United States Circuit Court of Appeals for the Seventh Circuit, by which Judge Landis' decision imposing the fine for accepting rebates from the Chicago & Alton had been reversed. In the Supreme Court the case turned largely upon the right of the court to interfere in view of the fact that the case had been passed upon by the Court of Appeals, the government contending for such privilege as a right, while it was urged in behalf of the oil company that precedents were all against such a proceeding. Under this ruling the case will now go back to Judge Landis' court for a new trial, in accordance with the decision of the Court of Appeals. This decision, by Judge Grosscup July 22, 1908, held that the trial court had erred in its rulings on the admission and exclusion of evidence and in its charge to the jury; that the offence of accepting a concession is the "transaction" that the given rate consummates, whereby the shipper, for the thing shipped, no matter how great or how little its quantity, receives a rate different from the established rate; and that the trial court abused its discretion in imposing an excessive fine.

It is expected that the United States Attorney will take action within the next few weeks. On a new trial the fine to be imposed upon the Standard Oil Company of Indiana, if it should be adjudged guilty, probably would not exceed $1,000,000.

The trial of this case was begun in May, 1906 (*Railroad Gazette* Aug. 9, 1907, page 153; *Railroad Age Gazette* July 24, 1908, page 594).

Industrial Accidents.

Between 30,000 and 35,000 workmen lose their lives in accidents in the course of their employment in this country during a year. Census reports covering the years 1900 to 1906 show that out of over 1,000,000 deaths of males, more than 9 per cent. were due to accident. A large proportion of these deaths are due to causes more or less related to the occupations of the injured persons. Accidents fall into five general groups, viz., factories and workshops, electrical industries, mines and quarries, transportation by rail, and transportation by water. Among nut and bolt workers in Pennsylvania the returns of the chief factory inspector show the fatal accident rate during ten years to have been 5.4 per 1,000, and in miscellaneous steel and iron work 4.3 per 1,000. According to the industrial insurance experience the fatal accident rate of electricians and of electric linemen is excessive. Of 645 deaths of electricians 14.7 per cent., and of 240 deaths of linemen 46.7 per cent. were due to accidents.

In the anthracite mines of Pennsylvania the state inspectors have found that during ten years there have averaged annually 3.18 fatal accidents for every 1,000 men employed,

and the rate is even higher than this for certain specific occupations in the mines. That this is excessive is shown by comparison with the death rate from accident of 1.29 per 1,000 in the British coal mines. The reports of the Interstate Commerce Commission have shown that during ten years 16,363 railway trainmen lost their lives in accidents. This is equivalent to 7.46 deaths per 1,000 employees. Of 505 deaths of sailors occurring in the experience of an industrial insurance company 17.6 per cent. were due to accidents.

The possibilities for successful accident prevention have been clearly demonstrated in the experience of foreign countries. Granting that the underlying conditions in European countries are often quite different, and that many of our industrial accidents may be the result of ignorance, reckless indifference or carelessness, the fact remains that an immense amount of human life is wasted. If the accident liability of employees in coal mines in the United States were reduced from 3.10 per 1,000 to 1.29 per 1,000, the annual saving in human life would be 915. If the rate of casualties of railway employees in this country were reduced from 2.50 per 1,000, which was the average annual rate for 1897-1906, to 0.98 per 1,000, the average for the German Empire for the same period, the annual saving would be 1,735 valuable human lives.—*Bulletin 78, Department of Commerce and Labor.*

Catskill Water Supply Plans.

John A. Bensel, head of the New York City Board of Water Supply, says that the work of locating a tunnel for the Catskill water project under the Hudson river has been suspended, and that he is becoming more and more favorably inclined toward the bridging of the river instead. Such a bridge would do for automobiles and trolley cars, as well as the aqueduct, and the tolls collected might be sufficient to pay the interest charges on the additional expenditure. In any event, he said, the tunnel might take from four to five years to build, and it would not be known definitely until the last six months whether it was likely to prove a success.

The Age of Enterprise.

—*From Puck.*

The Imaginary Dangers of Color Blindness.

The practical application of the results of investigations in this field has come up for discussion in recent years. The æsthetician and the painter have interested themselves in these as in other visual problems. But the most natural direction in which to turn to find a practical application has proved to be toward the field of railroad signaling. In developing means of control over railroad trains, a complex system of signaling has been evolved. Here, as in the marine service, colored lights are employed for night signaling. A superficial consideration of certain defects of color vision has inspired the fear that this method of signaling is a menace to public safety. It is to be noted, however, that the objector has brought forward no evidence to show that his objection has any other than a purely fictitious foundation. Nor is it difficult to determine that the alarming conditions which he has conjured up have no counterpart in the practical affairs of railroad operation. Railroads, the world over, make use of colored signals; and the governments of several countries publish statistical reports of the numbers, the fatalities and the causes of wrecks. Now, such a country as England furnishes ideal conditions for a crucial test of the efficiency of the present system of signaling, because the English railroads have to cope with an unusual combination of adverse conditions of operation—congestion of traffic, high speed of trains, and the prevalence of fogs. Yet the English roads are noted for the infrequency of their accidents. . Their fatalities have averaged so low as one per 169,000,000 of passengers carried; and a full year has elapsed without a single fatality [to passengers from train accidents]. These data refer to accidents from all causes; and a commission recently appointed by the Royal Society reports that no accident, railroad or marine, can be traced to anomalous conditions of color vision. Practical experience then shows that colored lights constitute a safe means of signaling, and that their results are in the highest degree successful even when the conditions of operation are relatively unfavorable. Is it not clear that if railroad disasters are more frequent in America the cause is to be sought elsewhere than in a defective system of signaling? —From a paper on Color Blindness, by Prof. J. W. Baird, University of Illinois, in the *Psychological Bulletin.*

The Strang Motor Car on the Alton.

The Chicago & Alton and the Clover Leaf have been conducting a series of tests with the all-steel Strang gas-electric car "Irene" with a view to determining its efficiency for branch line service. This car was described in detail in The *Railway Age* of April 17, 1908, page 568.

On January 3, a party of railway officers, including General Traffic Manager Ross of the Alton-Clover Leaf; General Passenger Agent J. Charlton, and others made a trial run from Chicago to Bloomington, 127 miles. No attempt was made to make a speed record during the trip, and including the time consumed in stops, an average speed of 32 miles an hour was made. During the several test trips thus far made by the Alton the operation of the car has been satisfactory, but in order to further test its efficiency the "Irene" has been put in service between Bloomington and Dwight, Ill., a distance of 53 miles, where it will make two round trips daily. If after a service of 30 days it is found satisfactory for short runs and economical enough to compete with electric interurban lines, it is probable that a number of these cars will be ordered.

Why Not?

The Tree Planting Association of New York City, Charles R. Lamb, Secretary, suggests planting trees on either side of a railway track throughout an entire right of way; this to provide the timber needed for ties and for the beautification of the railway. The suggestion is being offered to the Pennsylvania, the New York Central, the Erie and other railways. Mr. Lamb makes additional suggestions as to the co-operation of the Tree Planting Association with the local authorities of each city and town, and with the civic associations interested in the beautification of their cities or towns, so that the tree planting would be developed from the railway tracks

around the stations and on the main streets or the roads leading to the stations. The inevitable result, in Mr. Lamb's judgment, would be that the principle of tree planting would be developed in each community as its beauty, practicability and economy of administration became appreciated.

Railways and Public Opinion.

The railway, as a corporation, has no voice in the selection of those who frame and administer the laws for its regulation. Its physical property—extending in part through sparsely settled sections and through wildernesses, perhaps—is the most defenseless property that exists. In the very nature of its existence, therefore, it can find safety only when, in the darkness of the night watches, in times of stress and peril, and in the enactment of laws for its regulation, the invisible sentinel of public opinion stands guard over its rights and property.—*W. W. Finley.*

President Butler on the Sherman Law.

"It is within the truth and not too harsh to say that the Sherman anti-trust act was passed partly in ignorance and partly in a spirit of flippancy for the purpose of satisfying, or at least quieting, the demand that something be done to curb the trusts. So long as it stands upon the statute books in its present form this law is a menace to the business of the country, and it does not serve any supreme public interest which justifies it in being such a menace. It unduly exalts the principle of competition, and it fails to lay proper emphasis upon the public benefits which may follow from properly regulated and supervised co-operation.

"The public interest now urgently demands the amendment of this act in order to relieve not the corporations but the people themselves from the limitations upon their business activity which this act imposes unnecessarily and unwisely." —*Nicholas Murray Butler.*

Railway Business Association.

The work toward creating conservative railway legislation, as undertaken by the Railway Business Association, is finding its reflex in the actions of commercial bodies. The resolutions passed by the Southern Commercial Congress on December 8 are noteworthy; also those of the New York Board of Trade and Transportation on December 9, and a resolution which was adopted on December 21 by the executive committee of the Merchants' Association of New York. This association has a resident membership of 1,200 and a non-resident membership of 35,000. The Railway Business Association has requested business organizations throughout the country to take similar action, and urges manufacturers of railway materials and equipment to second actively the passage of such resolutions in communities where their manufacturing plants are located. The Merchants' Association of New York points out that the railways of the United States constitute, collectively, the largest purchasing and consuming interest in the country, and as such they have exercised a corresponding influence on all industries upon which they rely for the vast volume of material and supplies, for construction, maintenance and operation, and since the purchasing ability of the railways, especially when relating to new construction, is largely contingent upon their ability to make such new issues of security as may properly be needed to cover their financial requirements, and since the ability to do this is directly dependent, in turn, upon public confidence in the stability of the conditions which determine the earning power of the railways, these resolutions urge all members of Congress and of the legislatures of New York and other states and of railway commissions, to encourage the return of railway business to normal conditions by ceasing and discountenancing ill-considered or unjustified censure of existing railway management, and by limiting the proposed legislation to such measures as have been so carefully investigated, as to determine not only the necessity for their enactment, but also their proper form and their effect. It was also resolved that copies of these resolutions be sent to Senators and Representatives in Congress and to Senators and Assemblymen in the New York state legislature.

On December 29, the directors of the Detroit Board of Commerce adopted a resolution expressing the attitude of that organization toward railway legislation as follows: That it is the sense of this board that state and national legislatures, in view of the immediate necessity for stable conditions of finance and business, should exercise moderation and calmness in legislation affecting public service and other business corporations. The action on the part of the Detroit Board of Commerce is especially noteworahy, since it was the result of a written communication from the Railway Business Association and was not influenced in any way by personal action or contact of any member of the association, as has been the case with other resolutions which have been passed.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York; Jan. 12, 1909; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Central Railway Club.

The annual meeting, followed by a banquet, will be held at the Hotel Iroquois, Buffalo, N. Y., on January 8.

Cecil Lightfoot, Chief Engineer and Manager of the Linde Air Process Co., will present a paper and give a practical demonstration of what is done with the company's process. At the banquet O. P. Letchworth, President of the Pratt & Letchworth Co., will be toastmaster. The speakers will include W. J. Harahan, Assistant to the President of the Erie; C. F. Moore, of the West Virginia Pulp & Paper Co.; Herbert P. Bissell, Vice-President of the Great Gorge Railway; George Ham, of the Canadian Pacific, and Eugene Chamberlin, Chairman Freight Car Equipment Pool, New York Central Lines.

American Society of Civil Engineers.

The fifty-sixth annual meeting will be held on January 20 and 21, 1909, in New York. At the first morning session, annual reports and an amendment to the constitution will be presented, officers elected and committees will report on the status of the metric system in the United States, and other matters. In the afternoon, the Blackwell's Island and the Williamsburg bridges will be visited, and in the evening the President will hold a reception. On the following day, the members of the association will visit the Ashokan reservoir, a special train having been chartered on the West Shore. In the evening there will be an informal smoker.

At the regular meeting on January 6 a paper entitled "Electric Railways in the Ohio Valley between Steubenville, Ohio, and Vanport, Pa.," by George B. Francis, M. Am. Soc. C. E., was presented for discussion, and illustrated with lantern slides. This paper was printed in "Proceedings" for November, 1908.

Traffic News.

The United Fruit Co. announces that henceforth steamers will leave New York for Central American ports every two weeks (Saturdays, January 9 and 23, and February 6 and 20).

The Wabash has given notice that shippers will be allowed to use indefinitely, in connection with the new uniform bill of lading, the drayage tickets which they now have on hand.

The Chairman of the Trunk Line Association has announced that old forms of bills of lading may be used until the end of February, if stamped with the proper notations. The Southern Railway has announced that owing to unavoidable delays, the new uniform bill of lading will not be put in use on that road until February 1.

The Illinois Central and the Nashville, Chattanooga & St. Louis have established a fast freight service that will enable shipments from Chicago to reach Atlanta in about 50 hours. The time heretofore taken has been 58 to 60 hours. A proportionate saving in time will also be made to Macon, Augusta and other points beyond Atlanta. The average time made by the trains in the new service is 17 miles an hour, including stops.

The State Corporation Commission of Oklahoma proposes to adopt a uniform bill of lading, and a meeting was held on January 5 to hear any railway which might wish to remonstrate. With the notice of the meeting there was a proposed form of a bill of lading which contained none of the usual conditions, but with a clause on the face of the bill to the effect that the carrier is "subject to such liability as is imposed by law."

A federal grand jury at Chicago continued this week to investigate the relations between shippers and the claim departments of railways for evidence that the roads have been paying rebates in the form of damage claims. Representatives of the claim departments of the Burlington, the Lake Shore, the Central of New Jersey, and other roads have been before the jury, but everybody except the government lawyers continues in the dark as to just whom and what the government is aiming at.

A correspondent of the New York *Evening Post*, writing from San Francisco concerning the complaints of the merchants of California against the railways on account of their proposed increase in trans-continental freight rates, says that the steamships running in connection with the railway across the Isthmus of Tehuantepec now deliver freight in San Francisco in 27 days from New York, and sometimes in 23 days, or in practically as good time as that given by the railways; and at lower rates. Business by the Tehuantepec route is increasing; freight is delivered in good condition. The ships of the fleet are from 10,000 to 12,000 tons each, and the service is quicker and better than by the Panama route. The volume of traffic coming by way of Panama has dwindled greatly. It seems that the rates by the Tehuantepec route are adjusted so as to compete with the railways on shipments to points some distance inland from the coast in California. As the Tehuantepec route is considerably shorter than that by way of Panama, its proprietors hope to retain a good share of the business, even after the Panama canal shall have been opened.

Statistics compiled by the secretary of the Chicago Board of Trade show that the railways entering Chicago hauled to that city from the West during 1908, 9,496,037 bbls. of flour; 21,168,442 bush. of wheat; 91,169,147 bush. of corn; 92,522,017 bush. of oats, and 23,696,615 bush. of barley. The largest amount of flour, 2,170,000 bbls., was hauled by the St. Paul, and the Burlington was second with 1,500,000 bbls. The Burlington hauled 4,200,000 bush. of wheat and the St. Paul was second with 2,893,000 bush. The Illinois Central hauled 21,700,000 bush. of corn, the Burlington was second with 14,482,000 bush., and the North Western was third with 10,630,000 bush. The North Western hauled 19,887,000 bush. of oats, the St. Paul 18,133,000 bush., and the Santa Fe 15,585,000 bush. The St. Paul hauled 665,000 bush. of rye and the North Western was second with 405,000 bush. The St. Paul hauled 10,213,000 bush. of barley and the North Western was second with 7,200,000 bush.

Court and counsel in the cases involving the validity of the Missouri maximum freight and 2-cent passenger fare laws made an arrangement under which the taking of testimony was finished on December 30. By stipulation the Chicago, Milwaukee & St. Paul, the St. Louis Southwestern, the Missouri Pacific and the Iron Mountain, will abide by the decision in the St. Louis & San Francisco case; the Wabash and the Chicago & Alton will abide by the decision in the Chicago, Burlington & Quincy case; and the Chicago Great Western will abide by the decision in the St. Joseph & Grand Island case. The case of the St. Louis & San Francisco was tried in the most detail. The railways presented facts as to expenses and earnings, tending to show that the Frisco, the Santa Fe, the Rock Island, the Kansas City Southern, the St. Louis & Hannibal, the Missouri, Kansas & Texas, the Chicago & Alton, the Chicago Great Western and the Burlington, lost money on intrastate business.

Judge McPherson announced that January 13 had been agreed upon as the date for arguments to begin. Herbert S. Hadley, Attorney-General of the state, will be inaugurated governor of Missouri on January 11, and will therefore be governor when he makes the principal argument for the state in this case.

The Staten Island Rapid Transit Company, which hitherto has carried school children short distances to and from St. George at $2 a month, has announced that the rate will be raised to $6.25 a month. Over 200 pupils are affected, and on the allegation that many of these will be deprived of high school privileges because of inability to pay the high rate and at the request of the New York State Public Service Commission, First District, the road has postponed the change for a month. The Interstate Commerce Commission has decided that the granting of reduced rates to pupils of schools is illegal, as being a discrimination against other persons who do not attend school; while the Public Service Commission of the state of New York, Second District, has decided that reductions made specially for pupils of schools are eminently just and proper. According to the newspapers, the reason given by the Staten Island Rapid Transit Co. for the increase which is now announced is that the rule prescribed by the Interstate Commerce Commission must govern, though it seems that the pupils who go to St. George begin and end their journeys wholly within the state of New York.

Commenting on the agitation against higher freight rates from California, E. P. Ripley, President of the Atchison, Topeka & Santa Fe, says that the present rates between the Pacific coast and the East are the lowest freight rates in the world. The coast shippers are a favored class who get abnormally low rates because of their location, and they would not have a leg to stand on, before any tribunal, either for lower rates or to prevent an advance. Referring to the statement that the increases would add $10,000,000 a year to the earnings of the railways, Mr. Ripley said he would venture the assertion that the advances would not come to one-fourth of that sum. Mr. Ripley is quoted further as saying:

"If any people of the universe should have no complaints to

make about freight rates, it is the people of the Pacific coast. I would certainly favor equalizations in favor of the interior if the coast cities are going to raise objections to these advances. What reason exists for insisting that of all industries railways should always be held to the commercial or political grindstone? What merchant or manufacturer would be content with as little a margin of profit as the railways now get?"

The Supreme Court of the United States on January 4 affirmed the decision of the United States Circuit Court for the northern district of Illinois in the case in which the Chicago & Alton was fined $40,000 and John N. Faithorn, then Vice-President of this road, and Fred A. Wann, then its General Freight Agent, were fined $10,000 each for giving rebates to the Schwarzschild & Sulzberger Company, packers, at Kansas City. Four members of the Supreme Court voted to affirm the decision of the lower court, four voted to reverse, and Justice Moody, who started the prosecution of the case when Attorney-General, did not take part. Under the rules of the court, those voting to sustain the lower court prevailed. The Schwarzschild & Sulzberger Company has a private track to its plant at Kansas City. The Alton gave it an allowance of $1 a car on shipments of packing house products over that road to eastern points. It was contended that this was not a rebate, but a fair payment for the use by the railway of the packing company's track. The decision seems to establish that in law the payment was a rebate, but owing to the peculiar decision of the Court there is some doubt as to what the result might be if another case involving the legality of payments for the use of industrial tracks were to come before it. While the Alton claimed that in this case the transaction was legitimate, the jury found that the private tracks were mere facilities of the packing plant, and not subject to the use of the railway in discharging its duties to the general public. The company and its officers were, therefore, found guilty of granting illegal rebates. The Circuit Court of Appeals for the Seventh Circuit sustained that verdict and the Supreme Court has now in turn affirmed it.

STATE COMMISSIONS.

The Iowa Railroad Commission on December 30 rendered a decision that when freight is shipped from a point outside of Iowa to a point in Iowa and is then rebilled and reshipped to another point within the state the full state rate must be paid on the intrastate part of the transaction. The Commission had always previously ruled that in such a case the interstate through rate would apply on the entire transaction. It changed its view to conform to the decision rendered by the Supreme Court of the United States in the case of the Gulf, Colorado & Santa Fe v. Texas.

I. C. C. Answer on Northwestern Lumber Rates.

Luther M. Walter, Attorney for the Interstate Commerce Commission, has filed in the United States Circuit Court at St. Paul a demurrer and answer to the complaint of the railways attacking the decisions of the Commission in the northwestern lumber rate cases. It is denied that the rates fixed by the Commission are unreasonable within the meaning of the fifth amendment to the Federal constitution, and it is contended that the court cannot inquire as to whether said rates are just and reasonable within any other meaning; which raises directly the question whether the courts may set aside orders of the Commission upon any ground except that they are confiscatory.

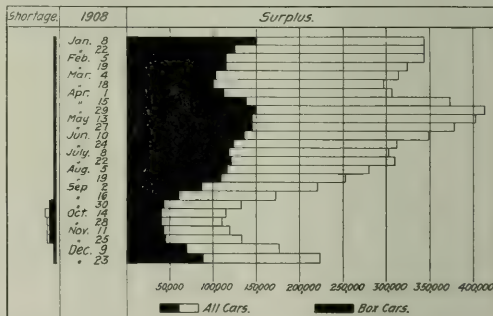
Continuing, the answer sets up that "the Commission is vested with the exclusive right and power of determining what are just and reasonable maximum rates, and that the reasonableness of such rates is not open to judicial inquiry upon original evidence leading to an independent conclusion; that in determining what are just and reasonable maximum rates to be charged in the future, the Commission must and does exercise discretion; that this court ought not and cannot substitute its judgment and discretion for the judgment and discretion of this defendant; that this court will only determine whether the rates prescribed by the Commission are just and reasonable within the meaning of the Constitutional guaranty which compels the establishment of rates with reasonable regard for the cost to the carrier of the service rendered and for the value of the property employed therein and also with reasonable regard for the value of the service to the public.

"In hearing the lumber rate cases each and every member of the Commission fully realized the great importance of the issues involved and each gave personal attention to all the testimony offered upon either side; and afterwards heard all parties at great length in oral argument; and the orders complained of are the result of the most painstaking consideration and care on the part of each commissioner."

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 37-A, giving a summary of car surpluses and shortages by groups from December 24, 1907, to December 23, 1908, says.

"There has been a further increase of 46,434 in the number of surplus available cars, bringing the total up to 222,077 for



Car Surpluses and Shortages in 1908.

the date of this report. Of this increase, 19,800 are box and 20,779 coal and gondola cars. The number of bad order cars continues to grow less, the decrease for this period being 2,500 cars."

The accompanying table shows the surpluses and shortages for the period covered by the report and the chart shows the surpluses and shortages in 1908.

CAR SURPLUSES AND SHORTAGES, FROM DECEMBER 24, 1907, TO DECEMBER 23, 1908, INCLUSIVE.

		Surpluses.					Shortages				
Date.	Number of roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
December 23, 1908	158	87,350	16.247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39.383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42.593	10.365	49.795	31,039	133.792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13.494	92.500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14.401	125.739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123.112	18,042	130,149	41.995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20.075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147.971	24.350	186.742	59.542	413.605	145	42	16	64	267
March 18, 1908	160	103.509	25,122	119.205	49.206	297,042	533	151	250	73	1,007
February 19, 1908	161	113.776	30.088	134.217	44.432	322,513	697	141	249	162	1.249
January 22, 1908	161	124.622	27.328	142.388	48.292	342.580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64.556	42.300	209,310	187	81	191	265	724

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1908.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,459	$4,699,834	$1,446,272	$6,638,401	$757,867	$1,204,634	$133,528	$1,780,867	$124,854	$4,001,750	$2,636,651	......	$42,328	$2,594,323	$1,001,757
Atlanta, Birmingham & Atlantic	642	130,551	36,731	180,803	24,542	32,755	8,899	74,353	7,824	148,373	32,430	......	7,500	24,930	12,167
Atlantic Coast Line	4,407	1,652,626	438,759	2,247,222	299,971	284,296	35,622	719,524	56,659	1,396,072	851,150	......	90,000	761,150	150,002
Bessemer & Lake Erie	201	457,914	21,063	484,066	45,570	87,947	5,056	141,981	7,343	287,897	196,169	......	4,000	192,169	†36,691
Buffalo & Susquehanna	373	169,654	15,128	191,278	33,763	48,707	2,268	77,028	6,360	168,126	23,152	$154*	4,000	18,998	†20,750
Central New England	294	219,361	24,888	256,523	32,190	19,421	1,618	80,659	2,827	136,715	119,808	.....	5,600	114,208	34,003
Central of Georgia	1,916	688,554	226,955	1,008,064	133,229	177,465	27,232	301,817	38,329	678,072	329,993	5,646	36,300	299,339	25,153
Chesapeake & Ohio	1,896	1,699,198	338,276	2,118,133	246,073	398,676	36,054	622,336	39,683	1,342,822	775,311	2,986*	67,100	705,225	†25,656
Chicago & Alton	998	661,374	292,261	1,036,841	111,303	129,213	33,395	357,361	28,293	660,065	376,776	1,900	30,000	348,676	103,029
Chicago & East. Illinois	566	725,996	137,808	920,783	99,857	176,295	16,952	318,698	35,518	647,320	273,464	1,617*	2,557	269,290	†41,227
Chicago & Erie	270	255,620	57,590	340,660	34,217	86,132	11,973	175,761	7,833	315,916	24,744	27	11,083	13,688	57,609
Chicago & North Western	7,635	3,910,840	1,304,837	5,654,874	610,362	621,820	88,466	2,143,475	85,924	3,550,047	2,104,827	2,497*	230,000	1,872,330	340,990
Chicago, Lake Shore & Eastern	580	305,269	......	338,605	26,509	70,257	1,325	105,883	5,596	209,570	129,035	.....	3,000	126,035	21,963
Chicago, Rock Island & Pacific	7,423	3,195,510	1,268,912	4,754,024	780,506	621,613	111,727	1,872,021	127,527	3,513,394	1,240,630	14,796*	198,154	1,027,680	†14,453
Chicago, St. Paul, Minn. & Omaha	1,730	762,603	357,997	1,202,969	99,357	118,974	24,119	428,154	24,744	695,348	507,621	1,484*	52,970	453,167	73,347
Delaware, Lackawanna & Western	893	2,362,280	500,602	3,058,999	238,833	358,815	47,812	796,061	70,731	1,512,252	1,546,747	52,164	82,800	1,516,111	413,123
Duluth, Missabe & Northern	273	656,783	31,456	693,033	110,541	74,572	1,401	125,199	7,040	318,754	374,279	8,189	28,870	353,599	†398,848
Elgin, Joliet & Eastern	239	198,815	80	205,086	24,269	33,218	2,500	66,015	6,627	132,629	72,457	.....	9,500	62,957	†18,101
El Paso & Southwestern	867	519,979	79,630	626,122	64,805	76,814	8,526	163,170	19,258	332,573	293,549	.....	11,186	282,363	159,195
Erie	1,902	2,822,013	599,385	3,684,317	387,237	814,531	78,696	1,314,612	73,397	2,668,473	1,015,844	37,239	105,994	947,089	451,229
Grand Rapids & Indiana	590	242,245	110,410	384,909	38,558	51,669	9,462	158,227	13,057	270,973	113,936	38*	21,832	92,066	†2,430
Great Northern	6,851	4,465,808	910,638	5,673,562	518,060	569,980	53,086	1,300,253	92,397	2,533,776	3,139,786	9,208	214,463	2,934,531	679,803
Gulf, Colorado & Santa Fe	1,518	1,032,076	272,262	1,354,397	184,266	208,912	19,415	417,293	31,803	861,689	492,708	.....	15,744	476,964	326,189
Illinois Central	4,519	3,315,179	865,766	4,773,431	537,202	850,073	99,615	1,574,347	123,853	3,185,090	1,588,341	6,707*	189,716	1,391,918	112,173
Kansas City Southern	827	595,803	107,745	752,720	75,968	89,420	21,996	236,961	26,779	451,124	301,596	.....	28,330	273,266	51,168
Louisville & Nashville	4,365	2,819,985	789,221	3,863,382	447,973	692,543	79,946	1,257,228	72,853	2,550,543	1,312,839	15,815*	112,337	1,184,687	563,241
Maine Central	931	415,835	193,475	654,307	97,226	100,011	6,098	239,626	19,949	462,910	191,397	2,333	30,075	163,655	†62,766
Mobile, Jackson & Kansas City	402	120,563	25,916	155,016	20,974	16,298	1,733	44,022	8,511	91,537	63,479	.....	3,087	60,392	34,354
New York, New Haven & Hartford	2,004	2,288,352	1,885,188	4,611,179	550,009	605,852	26,130	1,922,284	85,471	3,189,746	1,421,433	118,111	284,454	1,255,091	†210,604
Norfolk & Western	1,921	2,065,087	261,404	2,411,207	239,348	386,254	40,649	720,646	54,073	1,440,970	970,237	403*	82,300	887,534	59,649
Northern Pacific	5,649	4,707,996	1,368,163	6,418,352	511,452	683,842	59,904	1,777,085	82,188	3,114,471	3,303,881	19,189	288,826	3,034,244	48,721
St. Louis & San Francisco	4,727	2,112,606	731,192	3,080,091	545,104	463,429	63,443	1,056,916	103,071	2,231,963	848,128	.....	148,427	699,701	†83,288
St. Louis, Brownsville & Mexico	456	66,508	28,425	101,822	17,884	11,151	2,670	39,122	6,844	77,671	24,151	1*	3,000	21,150	4,966
Toledo, St. Louis & Western	451	244,574	36,666	301,898	35,696	34,921	6,954	99,092	7,742	184,405	117,493	.....	11,500	105,993	†30,829
Wisconsin Central	1,023	424,679	124,755	590,459	65,282	74,073	24,413	226,728	19,597	410,093	180,366	92	29,638	150,820	†3,564
Yazoo & Mississippi Valley	1,371	853,331	194,863	1,117,396	151,002	128,177	15,735	351,337	28,009	674,260	443,136	2,137	34,590	410,683	161,543

FIVE MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,459	21,373,875	$7,605,627	$31,376,370	$3,965,370	$5,613,447	$616,360	$8,320,186	$638,635	$19,153,998	$12,222,372	.....	$1,104,737	$11,117,635	$1,203,707
Atlanta, Birmingham & Atlantic	642	560,878	200,675	806,571	95,575	136,132	40,276	285,497	28,931	586,411	220,160	.....	31,500	188,660	40,115
Atlantic Coast Line	4,407	6,834,938	2,154,088	9,690,508	1,461,546	1,473,472	165,438	3,348,181	284,605	6,733,242	2,957,266	.....	450,000	2,507,266	346,058
Bessemer & Lake Erie	201	3,121,139	154,508	3,302,652	286,517	499,946	26,573	796,934	32,966	1,642,936	1,659,716	.....	20,000	1,639,716	†70,931
Buffalo & Susquehanna	373	839,284	94,237	964,454	175,824	207,104	12,795	334,840	32,844	763,407	201,047	$626	20,000	180,421	46,819
Central New England	294	829,208	158,405	1,045,019	194,321	106,418	8,446	339,337	14,000	662,522	382,497	.....	28,000	354,497	196,709
Central of Georgia	1,916	3,240,141	1,249,098	4,899,432	640,111	891,303	132,213	1,515,721	184,947	3,364,295	1,535,137	26,465	186,232	1,375,370	66,759
Chesapeake & Ohio	1,896	8,676,570	2,029,631	11,147,327	1,342,512	2,047,561	181,359	2,933,327	203,575	6,708,334	4,438,993	12,433*	331,900	4,094,660	†249,290
Chicago & Alton	998	3,419,741	1,764,259	5,620,801	523,016	592,456	177,114	1,655,846	139,313	3,087,745	2,533,056	5,643*	150,000	2,377,413	593,603
Chicago & East. Illinois	936	3,376,441	751,287	4,377,128	518,934	811,391	80,443	1,488,893	173,829	3,073,490	1,303,638	7,185*	112,557	1,183,896	†181,193
Chicago & Erie	270	1,308,633	345,081	1,792,627	200,153	422,712	55,609	818,012	37,098	1,533,584	259,043	1,491	56,997	203,537	37,496
Chicago & North Western	7,635	19,833,157	8,029,947	30,098,782	3,781,899	3,170,952	470,603	10,336,258	456,294	18,216,006	11,882,776	23,720	1,150,000	10,756,496	933,252
Chicago, Lake Shore & Eastern	580	1,598,605	......	1,737,339	146,142	385,329	5,448	529,648	26,726	1,093,293	644,046	.....	15,000	629,046	†172,069
Chicago, Rock Island & Pacific	7,423	15,753,733	7,721,442	24,962,903	3,914,709	3,173,321	548,557	8,874,310	620,622	17,131,519	7,831,384	49,906*	909,446	6,872,032	29,754
Chicago, St. Paul, Minn. & Omaha	1,730	3,730,401	1,867,259	5,987,388	826,048	591,944	107,085	2,037,841	126,657	3,689,575	2,297,813	4,563	264,848	2,037,528	262,088
Delaware, Lackawanna & Western	893	10,515,938	3,046,236	14,442,805	1,659,688	1,803,009	244,609	3,849,035	277,217	7,833,558	6,609,247	111,935	504,000	6,217,182	†99,674
Duluth, Missabe & Northern	273	6,402,128	148,924	6,577,617	428,032	445,060	5,857	744,043	53,117	1,676,109	4,901,508	46,864	265,404	4,682,968	†600,538
Elgin, Joliet & Eastern	239	997,017	254	1,035,326	114,168	169,403	12,154	315,949	31,756	643,430	391,896	.....	47,500	344,396	†92,092
El Paso & Southwestern	867	2,261,737	388,693	2,784,206	340,842	398,769	44,691	742,240	101,341	1,627,883	1,156,323	.....	55,933	1,100,390	†60,409
Erie	1,902	13,888,354	3,745,090	18,887,889	2,120,095	3,873,862	380,787	6,138,617	374,823	12,888,184	5,999,705	238,482	482,616	5,755,571	827,171
Grand Rapids & Indiana	590	1,105,498	792,250	2,048,141	212,031	265,682	52,104	742,037	66,400	1,338,254	709,887	1,281	105,945	605,223	14,856
Great Northern	6,851	20,166,435	5,134,157	26,669,911	4,726,427	2,800,299	291,292	6,389,128	427,878	14,635,024	12,034,887	136,648	1,027,235	11,144,300	†260,262
Gulf, Colorado & Santa Fe	1,518	4,217,787	1,283,220	5,767,847	866,090	942,438	97,386	1,882,644	166,285	3,954,843	1,813,004	.....	145,462	1,667,542	921,083
Illinois Central	4,519	15,120,783	4,803,880	22,660,165	3,013,828	5,359,861	492,675	7,633,398	487,739	16,987,501	5,672,664	14,090*	943,074	4,715,500	†553,841
Kansas City Southern	827	2,804,609	564,449	3,692,806	413,018	432,882	106,976	1,156,089	128,912	2,237,877	1,454,929	.....	141,649	1,313,280	†138,097
Louisville & Nashville	4,365	13,903,564	4,400,873	19,471,616	2,236,517	3,320,804	405,058	6,135,783	384,999	12,483,161	6,988,456	50,484*	561,688	6,376,284	1,287,435
Maine Central	931	2,032,802	1,451,905	3,722,982	647,885	470,679	38,792	1,239,687	104,582	2,501,625	1,221,357	15,474	155,017	1,081,814	†315,249
Mobile, Jackson & Kansas City	402	453,915	127,260	621,852	97,105	74,456	7,891	202,475	42,046	423,973	197,880	.....	14,468	183,412	73,471
New York, New Haven & Hartford	2,004	11,067,416	10,222,776	23,295,704	2,920,414	2,703,903	122,250	9,316,955	450,305	15,513,827	7,781,877	568,734	1,417,000	6,933,612	†445,040
Norfolk & Western	1,921	10,359,607	1,554,647	12,323,596	1,329,037	2,037,273	191,491	3,494,914	260,444	7,313,159	5,010,437	1,021*	432,700	4,576,716	†230,175
Northern Pacific	5,649	22,164,016	8,126,603	32,004,574	3,605,125	3,437,662	353,016	8,443,757	421,203	16,260,763	15,743,811	215,765	1,348,620	14,610,956	154,793
St. Louis & San Francisco	4,727	10,071,368	3,981,249	15,205,771	2,507,776	2,118,437	310,698	5,161,696	473,773	10,572,380	4,633,392	.....	628,378	4,005,014	†387,312
St. Louis, Brownsville & Mexico	456	288,507	134,685	455,920	83,636	60,121	13,607	167,952	24,979	350,295	105,625	72	15,000	90,697	101
Toledo, St. Louis & Western	451	1,186,135	224,420	1,514,807	173,607	206,788	43,816	485,488	45,636	955,335	559,472	.....	57,500	501,972	†117,388
Wisconsin Central	1,023	2,360,128	756,346	3,308,816	383,976	366,247	120,644	1,103,351	101,243	2,075,461	1,233,355	3,606	146,543	1,090,418	†50,001
Yazoo & Mississippi Valley	1,371	2,868,238	878,461	4,001,601	925,761	772,131	81,248	1,585,357	119,329	3,483,826	517,775	16,107	172,950	360,932	†121,481

*Deficit †Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

E. T. Kennan has been appointed Auditor of the Indianapolis Union.

H. M. Atkinson, President, and P. S. Arkwright, Vice-President, of the Atlanta, Birmingham & Atlantic, have been appointed receivers.

Mr. W. H. Ardley has been appointed General Auditor of the Grand Trunk Pacific, with headquarters at Montreal, succeeding N. J. Power.

C. H. Booth has been appointed Assistant Treasurer and Cashier of the Delaware & Hudson, with office at New York. This is a new office.

W. C. Brown, Senior Vice-President of the New York Central Lines, has been elected President, effective February 1, succeeding W. H. Newman, resigned.

J. W. Coon, Chief Clerk to the Third Vice-President of the Baltimore & Ohio. has been appointed Assistant to the Third Vice-President, succeeding J. G. Walber.

Paul Shoup, Assistant General Passenger Agent of the Southern Pacific, at San Francisco, Cal., has been appointed Assistant to W. F. Herrin, Chief Counsel.

K. T. Taylor, district claim agent of the Northern Pacific at Fargo, N. Dak., has been appointed Chief Clerk in the Claim Department, succeeding W. F. Ever, promoted.

W. S. Roney, Auditor of the Vandalia, has been appointed Assistant Comptroller. J. E. Merion succeeds Mr. Roney. John Theobald has been appointed General Accountant.

A. E. Sweet, Superintendent of the Southwestern district of the Chicago, Rock Island & Pacific, at Topeka, Kan., has been appointed Assistant to the Second Vice-President, with office at Chicago.

Operating Officers.

A. M. Keppel has been appointed Superintendent of the Washington Terminal Co., succeeding George W. Martin, resigned.

H. Hatcher, Assistant Superintendent of the Southern Railway at Columbus, Miss., has been appointed Superintendent at Columbus.

George E. Cooledge has been appointed Superintendent of Dining Car Service of the Lehigh Valley, with office at Easton, Pa., succeeding J. Howard Seal.

C. E. Meyer has been appointed Trainmaster of the Lake Erie & Western and the Northern Ohio, with office at Sandusky, Ohio, succeeding J. W. O'Brien, promoted.

M. M. Vincent, Assistant General Manager of the National Car Line Co., Chicago, has been appointed General Manager, succeeding Frank A. Spink, resigned to go with another road.

E. I. Ford, Trainmaster of Terminals of the Chesapeake & Ohio at Newport News, Va., has been appointed Superintendent of Terminals, in charge of all operation except that assigned to the General Agent.

E. S. Van Tassel, the announcement of whose resignation as Trainmaster of the Colorado division of the Union Pacific appeared in our issue of October 9, has associated himself with the New York office of Manning, Maxwell & Moore, New York.

John G. Walber, Assistant to the Third Vice-President of the Baltimore & Ohio, has been appointed General Superintendent of Transportation, with office at Baltimore, Md., succeeding Arthur Hale, whose resignation we have previously announced.

Judge T. J. Freeman, Receiver of the International & Great Northern, has assumed the title of General Manager. Horace W. Clarke, General Superintendent, has been appointed Assistant General Manager, and J. C. Dailey, Superintendent, succeeds Mr. Clarke. The office of Superintendent has been abolished.

H. E. Parker, Superintendent of Terminals of the Chesapeake & Ohio at Newport News, Va., has been appointed General Agent at Newport News and will have supervision of the export, import and coastwise merchandise business, and will perform such other duties as may be assigned to him by the General Manager.

J. B. Wallace, recently appointed Superintendent of the Mexican Central at Saltillo, Coah., Mex., was born in 1867 in Ohio. After a common school education he began railway work in 1882 on the New York, Pennsylvania & Ohio, now the Erie, as operator. He later became despatcher. In 1903 he was appointed Chief Despatcher of the Chicago & Alton at Bloomington, Ill., and later became Passenger Trainmaster. In June, 1908, he became Terminal Superintendent of the Mexican Central at El Paso, Tex., which position he held until his recent appointment.

C. W. Jones, Superintendent of the Iowa division of the Chicago, Rock Island & Pacific, at Des Moines, Iowa, has been appointed General Superintendent of the Southwestern district, with office at Topeka, Kan., succeeding A. E. Sweet, promoted. H. P. Greenough, Superintendent of the El Paso division, at Dalhart, Tex., succeeds Mr. Jones. H. L. Reed, Superintendent of the St. Louis division, at Eldon, Mo., succeeds Mr. Greenough. A. W. Kelso, Superintendent of the Chicago Terminal division, at Chicago, succeeds Mr. Reed, and F. M. Patt, Trainmaster of the Illinois division, succeeds Mr. Kelso as Acting Superintendent of the Chicago Terminal division.

The headquarters of J. P. Folger, Trainmaster of the Idaho division of the Oregon Short Line, has been changed from Pocatello, Idaho, to Kemmerer, Wyo., and the North Kemmerer branch has been put under his jurisdiction. The headquarters of C. L. Eldred, Trainmaster of the Idaho division, has been changed from Pocatello, Idaho, to Nampa, with jurisdiction over the Fourth district of the Malheur Valley, Boise district and Glenns Ferry yard. George J. Cunningham, depot master of the Ogden (Utah) Union Depot, has been appointed Trainmaster of the Idaho division, with headquarters at Pocatello, Idaho, with jurisdiction over the Third and Fifth districts of the Minidoka & Southwestern and Pocatello yard.

The terminals and floating equipment of the Pennsylvania in and around New York have been placed in a newly created division to be known as the Hudson division. It includes the New York Bay Railroad, east of Newark Bay, and branches, including Greenville yard and piers; the line from Harsimus Junction to Harsimus Cove, including the freight yard, elevators and piers at Harsimus Cove; the ferry stations in New York and Brooklyn; the freight stations in New York, including One Hundred and Twenty-fifth street station, East river station and stations in Brooklyn; the Hoboken shops, and ferries between Jersey City, New York and Brooklyn. A. M. Parker, Principal Assistant Engineer of the New Jersey division, has been appointed Superintendent of the Hudson division. George P. Miller, Assistant Engineer of the New York division, succeeds Mr. Parker. R. V. Massey, Assistant Engineer of the Schuylkill division, succeeds Mr. Miller, with office at Jersey City. J. P. Charlton, Supervisor of the Schuylkill division at Norristown, Pa., succeeds Mr. Massey, with office at Reading, Pa.

John G. Walber, Assistant to the Third Vice-President of the Baltimore & Ohio, has been appointed General Superintendent of Transportation of the Baltimore & Ohio, succeeding Arthur Hale, resigned. Mr. Walber was born in 1871 at Cincinnati, Ohio. After a public school education he began railway work in February, 1885, in the President's office of the Ohio & Mississippi, now part of the Baltimore & Ohio Southwestern. He was later made Secretary to the President. In 1893 he was appointed Secretary to the Second Vice-President and Traffic Manager of the Baltimore & Ohio Southwestern, and in 1896 was made Secretary to the Vice-President and General Manager, with office at Cincinnati, Ohio. In 1898 he became Chief Clerk to the Vice-President and General Manager. Four years later he was made also Assistant Secretary and put in direct charge of the Taxes and Insur-

ance departments. In 1904 he was made Assistant to the General Manager, and in 1906, Assistant General Manager. In January, 1908, he was appointed Assistant to the Third Vice-President of the Baltimore & Ohio, and he was appointed to his present position on January 1 of the current year.

Hiram W. Sheridan, whose appointment as Superintendent of the Southern Pacific, at Sacramento, Cal., has been announced in these columns, was born February 9, 1864, near La Crosse, Wis. He was educated at the La Crosse schools and business college. He began railway work April 15, 1880, as freight clerk on the Chicago & North Western, remaining in the services of this road until 1884 as operator, agent, brakeman and conductor. From 1884 to 1886 he was in the service of the Union Pacific as operator, brakeman, switchman and conductor. From 1886 to 1890 he was with the Boston & Maine as operator, conductor and yardmaster. From 1890 to 1898 he was with the Kansas City, Wyandotte & Northwestern, now a part of the Missouri Pacific, as conductor, yardmaster, Despatcher, Roadmaster, Trainmaster and Superintendent. He re-entered the service of the Union Pacific in 1898, serving until 1902, as yardmaster, traveling conductor, Trainmaster and Assistant Superintendent. In 1902 he was made yardmaster of the Atchison, Topeka & Santa Fe, at Kansas City, Mo., and in 1903 he served as yardmaster of the Chicago, Rock Island & Pacific at Kansas City, Mo. In 1904 he was appointed yardmaster of the St. Louis, Iron Mountain & Southern, at Texarkana, Ark., and later Trainmaster at McGehee, Ark. In November, 1906, he returned to the Union Pacific as yardmaster, at Cheyenne, Wyo., and in February of the following year he was promoted to the position of Trainmaster at Green River, Wyo. In January, 1908, he was appointed Assistant Superintendent of the Sacramento division of the Southern Pacific, which position he held until his appointment as Superintendent.

Traffic Officers.

J. T. Redmon has been appointed Commercial Agent of the Iowa Central at Peoria, Ill.

J. W. Brooks has been appointed Traveling Freight Agent of the Chicago, Cincinnati & Louisville, with office at Muncie, Ind.

C. I. Fuchs has been appointed to the new office of Traveling Freight Agent of the Missouri Pacific, at Chattanooga, Tenn.

J. G. North has been appointed Commercial Agent of the Macon & Birmingham, with office at Macon, Ga., succeeding W. E. Streyer.

I. G. Hipsley has been appointed City Freight and Passenger Agent of the Wabash at Council Bluffs, Iowa, succeeding C. J. Sayles, promoted.

S. E. Nirdlinger has been appointed General Agent, Freight and Passenger departments, of the Chicago, Burlington & Quincy at Leavenworth, Kan.

D. P. Drewery, Chief Clerk in the Passenger department of the Grand Trunk at Buffalo, has been appointed Traveling Passenger Agent at Cortland, N. Y.

The office of the Traffic Manager of the Missouri & North Arkansas has been changed from Eureka Springs, Ark., to the Security building, St. Louis, Mo.

J. J. Seay, Traveling Freight Agent of the Southern, at Rome, Ga., has been appointed Commercial Agent, with office at Rome. C. T. Cope succeeds Mr. Seay.

R. M. Locke has been appointed General Freight and Passenger Agent of the Charlotte Harbor & Northern, with office at Arcadia, Fla., succeeding J. L. de Treville, resigned.

Frank A. Spink, General Manager of the National Car Line Co., Chicago, has been appointed Traffic Manager of the Chicago & Western Indiana and the Belt Railway of Chicago, with office at Chicago.

H. J. Neff, Traveling Freight Agent of the Trinity & Brazos Valley, at Houston, Tex., has been appointed Chief Rate Clerk in the general freight offices. J. N. Steele, Traveling Freight and Passenger Agent of the Texas Midland, at Houston, succeeds Mr. Neff.

J. B. Hayes, Agent of the Wabash at Pontiac, Ill., has been appointed Commercial Agent of that road at Alton, Ill., in charge of the freight and passenger business, reporting to the General Freight Agent.

Herbert D. Howe has been appointed General Land and Tax Agent of the New York Central Lines, with office in Chicago. Mr. Howe is of the firm of Glennon, Cary, Walker & Howe, Attorneys for the New York Central.

C. B. Condon, Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, at Kansas City, Mo., has been appointed Assistant General Freight Agent, with office at Minneapolis, Minn. W. M. Hardin succeeds Mr. Condon.

J. A. Russell has been appointed Traveling Passenger Agent of the Missouri Pacific, the St. Louis, Iron Mountain & Southern, and leased, operated and independent lines, at Chicago, succeeding H. D. Armstrong, resigned to engage in other business.

O. G. Burrows, Commercial Agent of the Kansas City, Mexico & Orient, at Wichita, Kan., has been appointed General Traffic Manager of the Kansas City, Mexico & Orient of Texas, with office at Sweetwater, Tex. J. R. Holcomb, Commercial Agent of the Quincy, Omaha & Kansas City, at Quincy, Ill., succeeds Mr. Burrows.

Vernon V. Beard, for several years Assistant General Eastern Passenger Agent of the New York Central & Hudson River, and for the last year or two in charge of the Excursion department of that road, has resigned, and has taken a position with the Gillespie Kinports Company, excursion managers, New York and Philadelphia.

The office of General Agent of the Pennsylvania at New York has been abolished, and the traffic duties heretofore performed by the General Agent have been assigned to the new office of Division Freight Agent. Gilbert H. Cobb, Division Freight Agent at Baltimore, has been appointed Division Freight Agent at New York, with office at 2 Beaver street.

James Nelson Tittemore, whose appointment as General Traffic Manager of the Pere Marquette has been announced in these columns, was born March 2, 1864, in Waushara county, Wisconsin. He was educated in the common schools at Eureka and Poy Sippi, Wis. He began railway work in 1880 as station agent of the Milwaukee, Lake Shore & Western, now a part of the Chicago & North Western, at Kempster, Wis. Later he served in the same capacity at Summit Lake, Eagle River and Prentice, Wis. He then became operator for the same road at Sheboygan, Wis., after which he was appointed traveling auditor of the Chicago & North Western, returning later to the Milwaukee, Lake Shore & Western as Traveling Passenger Agent. He again left this road to become Traveling Freight Agent of the Minneapolis, St. Paul & Sault Ste. Marie, later becoming Chief Clerk in the Traffic Department of that road. He then went to the Great Northern as Traveling Freight Agent, later being appointed General Freight Agent of the Sioux City & Northern and the Pacific Short Line, a part of the Great Northern, finally becoming Assistant to the President of these roads. In May, 1894, he was appointed General Freight and Passenger Agent of the Des Moines, Northern & Western, now a part of the Chicago, Milwaukee & St. Paul. In March, 1898, he was appointed General Freight Agent of the Iowa Central, and in September, 1899, he was appointed Acting General Manager. In January,

James N. Tittemore.

1905, he was made Traffic Manager of the Iowa Central and the Minneapolis & St. Louis, which position he held until his recent appointment.

James H. R. Parsons, who has for a number of years been in the office of J. C. Stubbs, Vice-President and Traffic Director of the Harriman Lines at Chicago, has been appointed General Passenger Agent of the Morgan's Louisiana & Texas Railroad & Steamship Co., and the Louisiana Western, succeeding Frank E. Batturs, whose appointment as Assistant General Passenger Agent of the Southern Pacific, at San Francisco, Cal., has been announced in these columns.

R. J. Menzies, Commercial Agent of the New York Central & Hudson River and the West Shore, and New York District Agent of the New York Central fast freight lines, has been appointed General Eastern Freight Agent of the territory of Greater New York, Jersey City, Bayonne, Hoboken, Weehawken, Long Island and all stations south of Hudson, Catskill and Boston Corners. He is to have charge of the solicitation of both east and westbound freight traffic, as well as traffic of all the fast freight lines operating over the New York Central & Hudson River and the West Shore.

Engineering and Rolling Stock Officers.

Frank Rusch has been appointed Master Mechanic of the Chicago, Milwaukee & St. Paul lines west of Butte at Seattle, Wash.

R. D. Parker, Resident Engineer of the Houston & Texas Central, has been appointed Chief Engineer of the Texas Railroad Commission, succeeding R. A. Thompson, resigned.

George P. Smith, Chief Engineer of the Lake Erie & Western, has been appointed Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis, succeeding William M. Duane, who resigned some months ago.

B. P. Flory, Mechanical Engineer of the Central of New Jersey, has been appointed Superintendent of Motive Power of the New York, Ontario & Western, succeeding G. W. West, deceased. G. W. Rink, chief draftsman of the Central of New Jersey, succeeds Mr. Flory.

OBITUARY.

C. H. Yoakum, General Attorney for the St. Louis & San Francisco, and brother of B. F. Yoakum, died at Ft. Worth, Tex., on January 1.

Major Isaac W. Maclay, at one time Chief Engineer of the Long Island Railroad and a civil engineer, died December 29 at his home in Yonkers, N. Y.

D. D. Carothers, Chief Engineer of the Baltimore & Ohio, died January 2 at his home in Baltimore, Md. He was born in 1860 in Washington county, Ohio, and began railway work in 1882 as rodman and assistant engineer on the Northern division of the Wheeling & Lake Erie. A year later he was made assistant engineer, and in 1885 he became Chief Engineer of the Columbus & Cincinnati Midland, now part of the Baltimore & Ohio. In 1889 he was Trainmaster and Chief Engineer, and in 1890 was appointed Engineer, Maintenance of Way, of the Baltimore & Ohio Southwestern. In December, 1901, he was appointed Superintendent of the Chicago division of the Baltimore & Ohio, and a year later was made General Superintendent of the Baltimore & Ohio Southwestern. On February 1, 1904, he was appointed Chief Engineer of the Baltimore & Ohio. F. L. Stuart, Chief Engineer of the Erie, and a close personal friend of Mr. Carothers, adds: "Mr. Carothers typified not only a successful engineer but a success as a man. As an engineer and railway official he had initiative power, and his education and long experience, backed up by one of his most dominant characteristics which was common sense, gave great strength to his views among other men of his profession. As a man his sterling qualities and manliness drew everyone that came in contact with him to him. The men that worked in close touch with him were the men that appreciated and respected his opinions most. Notwithstanding the position in the railway world that he had made for himself, those who knew him felt that this was but the beginning of his true usefulness; and they all feel a deep sense of personal loss at his death."

Railroad Construction.

New Incorporations, Surveys, Etc.

Algoma Central & Hudson Bay.—Application will be made at the next session of the Canadian Parliament for an act extending the time for building this line from the Canadian Pacific main line north to a point on James Bay.

Alsek & Yukon.—The company is applying for an act to extend the time within which the proposed railway may be built and also for other purposes. The company was incorporated in 1907 with power to build a railway from Pleasant Camp, on the Klihini river, at the international boundary of British Columbia, in a northwesterly direction along valleys of the Klihini, Tatsenshini, Shakwak and Alsek rivers, and Kluane lake, Donjek and White Riversby, the most feasible route to the international boundary between Yukon and Alaska. Lewis and Smellie are the solicitors for the applicants.

Athabasca Railway.—Application will be made at the next session of the Canadian Parliament for an act extending the time for building this projected line from Edmonton, Alb., northeast, following the north bank of the North Saskatchewan river to township 59, range 19, west of the fourth principal meridian, thence northeast past Smoky Lake to the western end of Lac Labiche, thence in a northerly direction to the junction of the Athabasca and Clearwater rivers.

Beaumont & Great Northern.—Press reports from Beaumont, Tex., indicate that the property of this company, along with 150,000 acres of timberland in Polk county, Tex., has been bought by a syndicate of which B. F. Yoakum is the head, and also that this syndicate proposes to build a cut-off between Beaumont, Tex., and Dallas or Fort Worth and will utilize the Beaumont & Great Northern and several other railway properties in the vicinity of Beaumont.

Big Bend Transit Co.—See Spokane & Inland Empire.

Bluffton, Berne & Celina Traction.—Incorporated in Indiana, with $50,000 capital, to build an interurban line from Bluffton, Ind., southeast to Celina, Ohio, 47 miles. The company's headquarters will be in Bluffton. R. Sourer, B. Bates and R. Schug are directors.

Chicago, Kenosha & Milwaukee (Electric).—Application has been made by this company to the Wisconsin State Railroad Commission for a certificate of necessity and convenience to build a line from Kenosha, Wis., south to the Wisconsin-Illinois state line. The line is to be extended south through Waukegan, Ill., to Chicago. George G. Wilcox is President; Volney Foster, Vice-President; F. R. Grover, Secretary and Treasurer.

Chicago, Milwaukee & St. Paul.—Reports from Milwaukee indicate that this company has notified the common council that it has under consideration a plan for depression and elevation of its tracks in the northwestern part of the state, and that resolution has been introduced in the common council asking for the appointment of the commission of experts to decide upon the plan for abolishing all grade crossings in that section.

Clinton, Danville & Peoria.—Incorporated in Illinois, to build a line from Chicago south to coal fields in the east central part of Illinois. W. S. Bogle, R. K. Hammond, H. Hafer, J. E. Hitt, J. K. Deing, G. W. Traer and J. E. Ford, all of Chicago, are incorporators.

Colorado & Mexico.—Incorporated in Arizona, by men of Bisbee, Ariz., to build a railway from Douglas, Ariz., to Cortland.

Denver, Kingfisher & Gulf.—The rights, franchises and property of this company have been bought, it is said, by a new company headed by W. M. Bonson, of Dubuque, Iowa, and C. G. Jones, of Oklahoma City, Okla. The D., K. & G., which was financed by D. K. Cunningham and other residents of Kingfisher, made a permanent survey some years ago from Oklahoma City northwest through Kingfisher, Kiel and Okeene, and had finished about two-thirds of the grading between Okeene and Kingfisher. The new company owns

about 8,000 acres of coal lands in northwestern New Mexico, to which point the line is ultimately to be extended.

Estacado & Gulf.—Press reports say that this company is buying material for building this line from McCauley, Tex., northeast to Stamford and Abilene. Work is now under way from McCauley southwest to Roby. It is expected to have trains in operation on some of the line by April. (Sept. 11, p. 932.)

Fairburn & Atlanta Railway & Electric Co.—Incorporated in Georgia, with $75,000 capital, to build an electric line from Fairburn, Ga., north to College Park, six miles. The incorporators include J. F. Golightly, of Atlanta; W. T. Roberts, J. H. Harris and J. F. Logino, all of Fairburn.

Glenray & Richwood.—Incorporated in West Virginia to build a line from Alderson, in Monroe county, W. Va., north to Richwood, 40 miles, where connection is to be made with the Baltimore & Ohio. Surveys made and part of the rights of way secured. It is expected that work will be started early this spring. The incorporators include F. M. Arnold, A. G. Corbett, H. E. Rugh, A. J. Davis and H. F. Stratton.

Gulf, Texas & Western.—D. B. Cane, of Tyler, Tex., is quoted as saying that a line from Fort Worth, Tex., northwest to the coal fields of Young and Jack counties, will soon be built. Work has already been started at Jacksboro, and as soon as terminal facilities can be arranged for construction is to be started from Fort Worth. The line is eventually to be extended to either Roswell, N. Mex., or Texico. The charter already granted only provides for a line from Burrs Ferry, Tex., in Newton county, on the Sabine river, west through Dallas, Fort Worth and Jacksboro, to Benjamin, in Knox county. (Nov. 13, p. 1375.)

Idaho & Washington Northern.—The newspapers report that work on the extension of this road from Newport, Wash., north to Cement, 52 miles, is to be rushed. Grant, Smith & Co., of Spokane, who have the grading contract, have sublet, it is said, all the work with the exception of the tunnel, to be 1,100 ft. long, at Blueside, about 40 miles south of Newport. Piling for a large trestle across Ashenfeiter Bay is being driven. About 500 are now at work, and more men will be put to work as soon as the weather permits. (Dec. 11, p. 1560.)

Laramie, Hahns Peak & Pacific.—Orders are said to have been given recently by this company for material to build 70 miles of line. The road is being extended south to a point in Colorado. It is expected that trains will be in operation soon from Laramie, Wyo., into Routt county, Colorado. (Dec. 11, p. 1560.)

Mexican Central.—Surveys are said to have been made by this company for reconstructing the division between Irapuato, Guanajuato and Guadalajara, 161 miles. The estimated cost of the work is $2,000,000.

Mountain Valley & Plain.—The newspapers report that this company has made financial arrangements and that construction work will be pushed forward rapidly on this proposed line from Cimarron, N. Mex., east through the Panhandle of Texas, to Oklahoma City, 400 miles, of which 150 miles will be in Texas. The headquarters of the company are at Dalhart, Tex. D. W. Herrington, of Dalhart, is interested. (Sept. 4, p. 889.)

North Missouri Central.—Incorporated in Missouri, with a capital stock of $6,000,000, to build a railway from Mexico, Mo., through Columbia and Cedar City to Jefferson City, about 60 miles. The directors include T. F. Whiteside, T. S. Gordon and A. J. Estee, of Columbia, and W. C. Carroll, of New York.

Ohio & Michigan Southern (Electric).—Incorporated in Michigan, with $17,000,000 capital, to take over the Toledo, Ann Arbor & Detroit, a partially completed electric line between Toledo, Ohio, and Ann Arbor, Mich. Former Governor Andrew E. Lee will be President of the new company, with headquarters in Toledo. In addition to Mr. Lee, whose present address is at Vermillion, S. Dak., the directors include W. E. Niles and S. D. Williams, of Sioux Falls; O. Zazel, of Atlanta, Minn.; D. C. F. Niles, of Duluth, and H. A. Reese, of Chicago.

Pennsylvania Roads (Electric).—Surveys are said to be under way for a line from Slippery Rock, Pa., north to Grove City, 10 miles, also beyond that place north to Meadville, 35 miles. The first section is projected by H. H. Long, of Slippery Rock, Pa.; J. A. Jolliffe, of Wheeling, W. Va., and S. L. McClure, of Washington, Pa., while the section north from Grove City is projected by Cleveland, Ohio, capitalists. H. C. Graves is in charge of the work between Slippery Rock and Grove City.

Surveys are said to have been started for an electric line to be built from Mars, near the southern boundary of Butler county, Pa., west to Rochester, in Beaver county, 14 miles. The project is said to be backed by Pittsburgh capitalists. The route partly follows an old survey that was never developed.

Rimouski International.—The Canadian Parliament will be asked at its next session to pass an act incorporating this company with power to build a railway from a point between the city of Rimouski, Que., and the wharf at Father Point, to Edmundston, N. B., through the townships of Duquesne, Chenier, Biencourt, Robitaille and Rouillard. It is also the intention of this company to operate vessels on the navigable waters with which the proposed railway will connect, also to build telegraph and telephone lines, hotels, parks, pleasure resorts, etc. L. M. Asselin, Rimouski, Que., is solicitor for the applicants.

Salt Lake & Ogden.—An officer is quoted as saying that this road will be electrified. Simon Bamberger, President and General Manager, is now making arangements to finance the change. The road is 50 miles long and parallels the Oregon Short Line between the cities named. (Oct. 23, p. 1227.)

San Luis Valley (Electric).—Incorporated in Colorado with $500,000 capital to build a line through Saguache, Rio Grande and Conejos counties in San Luis valley, Colo. J. M. Moses is said to be interested.

Southern Pacific.—Newspaper reports say that a cut-off is to be built by this company from Beaverton, Ore., east to Willsburg (Portland), 10.17 miles, and will cost about $1,000,000. Of this amount, $214,894 is for the right of way, material for bridges, and for the grading.

Spokane & Inland Empire (Electric).—This company and the Big Bend Transit Co. have both filed in the land office claims for the same ground in the Spokane-Indian reservation, as site for terminals, in the Big Bend country. The land is at the mouth of the Spokane river, where it joins the Columbia river. Terminal rights were granted the Transit company by the Department of the Interior some time ago, but upon the rights lapsing, the Spokane & Inland filed an application for the same site. The Transit company has applied for a renewal of the old lease. It is understood that the decision of the Department of the Interior in granting the site for terminals, will decide which road will build into the Big Bend country.

Stamford & Northwestern.—Contract is said to have been let by this company for building the first section of its proposed line from Stamford, Tex., northwest. Additional contracts are to be let at once and the work pushed to completion. The plans call for a line from Stamford northwest to a point in Dickens county, about 65 miles. P. G. Burns, Chief Engineer, Stamford. (Nov. 20, p. 1419.)

West Virginia Roads.—A franchise has been granted to Dr. Geo. Keener, of Weston, W. Va., by officials of that place, to build an electric line from Weston south to Bendale, three miles. The terms provide that work must be started within six months and the line finished within one year.

Yellowhead Pass Coal & Railway Company.—Application is to be made by this company to the Canadian Parliament for incorporation. The company plans to build a line from the Grand Trunk Pacific main line, west of Pembina Crossing, Alb., southwesterly to the Embarras river, thence southerly to the headwaters of the Little Pembina river, about 100 miles, and from the Grand Trunk Pacific main line along the Embarras river, southwesterly to the McLeod river, about 25 miles. J. A. Ritchie, of Ottawa, is the solicitor.

Youngstown & Ohio.—Press reports say that this company will put in operation this month the extension from Lisbon, Ohio, southeast to East Liverpool. (R. R. G., May 8, p. 656.)

Railroad Financial News.

Atlanta, Birmingham & Atlantic.—H. M. Atkinson, President, and P. S. Arkwright, Vice-President, have been appointed receivers, the interest on $8,173,000 outstanding bonds having been defaulted. The Atlanta, Birmingham & Atlantic bought the Atlanta & Birmingham in 1906 and the two roads were consolidated, making a total of 498 miles of line owned.

Beaumont & Great Northern.—R. C. Duff, representing, it is said, B. F. Yoakum, chairman of the executive committee of the Chicago, Rock Island & Pacific, has bought a controlling interest in the Beaumont & Great Northern, which operates 34 miles of line from Trinity, Tex., to Livingston. (See this company under Railroad Construction.)

Boston & Lowell.—The company is to sell at auction on January 13, in Boston, Mass., $250,000 of its stock. There is now outstanding $6,599,400 stock.

Central Pacific.—The Guaranty Trust Co., New York, is offering at 97¾, $3,000,000 first refunding mortgage 4 per cent. guaranteed bonds of 1899-1949. Of the authorized issue of $100,000,000 bonds there is outstanding $99,801,000. The bonds are guaranteed principal and interest by the Southern Pacific, and are a first mortgage on about 1,347 miles of road. At the offering price they yield about 4.10 per cent.

Chicago & Western Indiana.—William Salomon & Co. and Moffat & White, both of New York, have bought the consolidated mortgage 4 per cent. bonds of 1882-1952, deposited as collateral for $8,000,000 collateral trust 5 per cent. notes, dated December 22, 1908, and called for payment February 1, 1909, and are offering to exchange the mortgage bonds for the notes, giving a $25 cash bonus for each $1,000 note exchanged for a $1,000 bond.

Chicago, Cincinnati & Louisville.—George A. Fernald & Co., New York, are offering $250,000 6 per cent. prior lien receiver's certificates of 1908-1911 at 100¼. This is part of $1,000,000 receiver's certificates authorized in May, 1908.

Chicago, Milwaukee & Puget Sound.—See Chicago, Milwaukee & St. Paul of Washington.

Chicago, Milwaukee & St. Paul.—See Chicago, Milwaukee & St. Paul of Washington.

Chicago, Milwaukee & St. Paul of Washington.—Stockholders have voted to increase the capital stock from $3,000,000 to $100,000,000, and to change the name to the Chicago, Milwaukee & Puget Sound. The entire capital stock of the Chicago, Milwaukee & Puget Sound is to be held in the treasury of the Chicago, Milwaukee & St. Paul.

Chicago, Rock Island & Pacific.—Press despatches from St. Joseph, Mo., say that the Chicago, Rock Island & Pacific has bought an interest in the Union Terminal Railway. The Rock Island has been entering the stock yards in South St. Joseph over the tracks of the Union Traction and paying rental.

Cleveland & Marietta.—A dividend of 5 per cent. on the $2,000,000 stock has been declared. In 1907, 4 per cent. was paid, and in 1906, 3 per cent. The Pennsylvania Company owns $1,788,500 of the stock.

Denver & Rio Grande.—Blair & Co., William Salomon & Co. and Wm. A. Read & Co., all of New York, are offering the unsold portion of $17,500,000 first and refunding mortgage 5 per cent. bonds of 1908-1955 at 92½. Bonds are secured by a mortgage upon over 2,500 miles of line of the Denver & Rio Grande and the old Rio Grande Western, which is now consolidated with the Denver & Rio Grande, and is also secured by the deposit of the outstanding issue of second mortgage bonds and two-thirds ($50,000,000) of the stock of the Western Pacific.

Interborough Metropolitan.—It is said that the company has sold the $6,000,000 stock of the Third Avenue which it held in its treasury. It is thought that the stock was sold to the general public, no one interest having acquired any very large part of it.

Interborough Rapid Transit.—Theodore P. Shonts, chairman of the executive committee, has been elected president, succeeding E. P. Bryan, resigned.

Lake Superior Corporation.—Robert Fleming and associates, of London, have bought a large part of the securities of the Lake Superior Corporation. The Lake Superior Corporation was incorporated in May, 1904, as successor to the Consolidated Lake Superior Co. Directly or through control of the Ontario Lake Superior Co., the company owns all the capital stock of the following corporations centered around Sault Ste. Marie: Algoma Central & Hudson Bay Railway, Algoma Commercial Co., Algoma Iron Works, Algoma Steel Co., British-American Express Co., International Transit Co., Lake Superior Iron & Steel Co., Lake Superior Power Co., Manitoulin & North Shore Railway, Sault Ste. Marie Pulp & Paper Co., Tagana Water & Light Co., Trans St. Mary's Traction.

New England Investment & Security Co.—A. Willard Damon and Henry L. Higginson have been elected trustees, succeeding Nathaniel Thayer and William Skinner. The two trustees who retire are both directors of the New York, New Haven & Hartford, and the change is explained as due to the decree of the Supreme Court of Massachusetts directing the New Haven company to relinquish its interest in 16 trolley lines in Massachusetts. The control of these trolley lines is vested in the New England Investment & Security Co.

New York Central & Hudson River.—See New York State Railways.

New York, New Haven & Hartford.—See New England Investment & Security Co.

New York State Railways.—This is the name of a new company which is being organized with the approval of the New York Public Service Commission, Second district, to consolidate the Rochester Railway, the Rochester & Sodus Bay and the Rochester & Eastern Rapid Railway. The new company is to issue $23,140,200 stock, of which $3,862,500 is first 5 per cent. cumulative preferred, $4,500,000 second preferred and $14,777,700 common stock. The Rochester & Eastern Rapid Railway lately increased its capital stock from $1,500,000 to $15,290,200, and bought from the New York Central & Hudson River and the Central (Andrews) Railway Syndicate at par, 50 per cent. of the stock of the Schenectady Railway, all of the stocks of the Utica & Mohawk Valley Railway, and a controlling interest in the stock of the Oneida Railway and the Syracuse Rapid Transit. Horace E. Andrews, President of the Rochester Railway, says in regard to the control of the company:

"The New York Central & Hudson River and the Central Railway Syndicate, as the owners of all of the common stock, namely, $1,100,000, of the Rochester & Sodus Bay Railway, and all the stock, namely, $15,290,200, of the Rochester & Eastern Rapid Railway, will, under the terms of the consolidation agreement, take the common stock of the new corporation in exchange therefor, so that the first preferred stock of the new corporation will have back of it the entire investment of the New York Central & Hudson River and the Central Railway Syndicate, not only in the consolidating companies, but also in the Schenectady, Utica, Oneida and Syracuse properties."

Old Colony Railroad.—The Massachusetts Railroad Commission has been asked to authorize the issue of $500,000 additional stock to provide for improvements and for floating debt. There is now outstanding $18,871,400 stock.

Pennsylvania.—The directors at the annual meeting in March are to ask the authority of the stockholders to issue $80,000,000 new securities for the purpose of refunding short term notes and bonds falling due in the next two years. There are $60,000,000 three-year collateral trust 5 per cent. notes falling due March 15, 1910, and also $19,997,820 general mortgage 6 per cent. bonds due in July, 1910.

Pennsylvania Company.—See Cleveland & Marietta.

PUBLIC SERVICE RAILWAY (NEW JERSEY).—An initial dividend of two-thirds of 1 per cent. was paid on December 31 on the $37,114,800 stock outstanding. The company is controlled through stock ownership by the Public Service Corporation of New Jersey and operates 657 miles of street railways in New Jersey.

ST. LOUIS & SAN FRANCISCO.—Speyer & Co., New York, are offering at 89½ the unsold portion of $30,000,000 general lien 5 per cent. bonds of 1907-1927. The mortgage securing the bonds will, after June 1, 1909, become a first mortgage on 665 miles of line, subject only to $489,125 existing bonds, for the redemption of which general lien bonds are reserved.

SEABOARD AIR LINE.—Sutro Brothers & Co., New York, are offering a block (about $500,000) of 5 per cent. receivers' certificates series C, of 1909-1912, at 99, yielding about 5⅜ per cent. This is the remainder of a total authorized issue of $4,250,000. The certificates rank equally in every respect with the series A, amounting to $3,000,000, and series B, amounting to $260,000.

THIRD AVENUE.—See Interborough Metropolitan.

UNION TERMINAL RAILWAY.—See Chicago, Rock Island & Pacific.

WABASH.—The directors have declared a semi-annual dividend of 3 per cent. on the debenture A bonds and a dividend of 1 per cent. on the debenture B bonds. Six months ago no payment was made on either issue. In January, 1908, 3 per cent. was paid on the A bonds and 1 per cent. on the B bonds. In 1907, 6 per cent. was paid on the A bonds and 1 per cent. on the B bonds.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Maine Central has ordered three Pacific and two eight-wheel passenger locomotives from the American Locomotive Co.

The Saxman Coal & Coke Co. has ordered from A. B. Kaiser & Co., Philadelphia, Pa., one second-hand consolidation locomotive, with cylinders 20 in. x 24 in.

The Paulista Railway (Cia Paulista de Vios Ferreas e Fluviaes), F. de Monlevade, Insp. Gen. and Loco. Supt., Sao Paulo, Brazil, is aking prices on six locomotives.

The Chicago, Cincinnati & Louisville, as reported in the *Railroad Age Gazette* of December 25, has ordered five simple consolidation locomotives from the Baldwin Locomotive Works for delivery February 1.

General Dimensions.

Weight on drivers	156,000 lbs.
Total weight, engine	195,000 lbs.
Cylinders	22 in. x 28 in.
Diameter of drivers	56 in.
Boiler, type	Straight top
" working steam pressure	200 lbs.
" diameter	72 in.
Heating surface, tubes	2,453.7 sq. ft.
" " firebox	169.0 "
" " total	2,622.7 "
Tubes, number	309
" diameter	2 in.
" length	14 ft. 6 in.
Firebox, length	101⅞ "
Firebox, width	65⅞ "
Grate area	46.5 sq. ft.
Tender, style	U-shaped
Tender, water capacity	7,000 gals.
Tender, coal capacity	14 tons

Special Equipment.

Boiler steel	Worth
Firebox steel	Otis
Tires	Standard
Boiler covering	Johns' asbestos
Valves	American balance
Injectors	Friedmann
Couplers	Tower
Headlights	Dressel
Brakes	Westinghouse
Safety valves	Crosby
Lubricators	Chicago
Metallic packing	United States
Steam gages	Crosby
Whistles	Crosby
Sanding device	Leach

The Cincinnati, Hamilton & Dayton, as reported in the *Railroad Age Gazette* of November 27, has ordered ten simple six-wheel switching locomotives from the American Locomotive Co. for delivery in January.

General Dimensions.

Weight on drivers	134,000 lbs.
Total weight, engine	134,000 "
Cylinders	19 in. x 26 in.
Diameter of drivers	51 in.
Boiler, type	Straight top
" working steam pressure	180 lbs.
" diameter	66¼ in.
Heating surface, tubes	1,600 sq. ft.
" " firebox	160 "
" " total	1,760 "
Tubes, number	280
" diameter	2 in.
" length	11 ft.
Firebox, length	108 in.
" width	42 in.
Grate area	31.5 sq. ft.
Tender, style	Sloping
Water capacity	5,000 gals.
Coal capacity	8 tons

Special Equipment.

Boiler steel	Worth
Firebox steel	Otis
Tires	Latrobe
Springs	Railway Steel-Spring
Valves	Allen-Richardson
Injectors	Ohio
Couplers	Simplex
Journal bearings	Bronze, Am. Loco. Co.
Headlights	Adams-Westlake
Brakes	Westinghouse
Tender brake-beams	Sterlingworth
Safety valves	Consolidated
Lubricators	Chicago
Metallic packing	Jerome
Steam gages	Ashton
Whistles	Am. Loco. Co.
Bell ringers	Cook & Strong
Sanding device	Leach
Blow-off valves	Am. Loco. Co.
Driving wheel centers	Steeled cast iron

CAR BUILDING.

The Western Maryland, B. F. Bush, Receiver, has been authorized by the United States Circuit Court to purchase two mail and express cars and two baggage cars.

The British Columbia Electric Co., it is reported, will build twenty-four 42-ft., semi-convertible cars, two observation cars, 13 box and two flat cars. This item is not confirmed.

The Milwaukee Northern Railway, reported in the *Railroad Age Gazette* of December 4 as having ordered 10 trucks from the Baldwin Locomotive Works, is reported to be in the market for additional passenger equipment and complete freight equipment. This item is not confirmed.

The Pittsburgh & Lake Erie has ordered 500 fifty-ton steel hopper cars from the Standard Steel Car Co. These are in addition to the 500 similar cars ordered from this company, as reported in the *Railroad Age Gazette* of December 25. These, with the 1,000 ordered from the American Car & Foundry Co., make a total of 2,000 recently ordered by this road.

IRON AND STEEL.

The International & Great Northern will be in the market early this year for 85-lb. rails to equip about 165 miles of road.

The Panama Railroad, F. C. Boggs, General Purchasing Officer, Washington, D. C., received bids up to January 5 for 60,000 lbs. of spikes. (Req. No. 1342.)

RAILROAD STRUCTURES.

GALVESTON, TEX.—Press reports indicate that the Santa Fe has authorized the signing of the causeway contract. Vice-President and General Manager F. G. Pettibone is quoted as having said that actual work will commence within 60 days. (November 13, p. 1366.)

PORTLAND, ORE.—Plans are said to have been made for a new bridge over the Willamette river, to be paid for jointly by the city and the Oregon Railroad & Navigation Co. The new structure is to take the place of the present steel bridge, and is to be built from the end of Glisan street, on the west

side, to the intersection of Oregon and Adams streets, on the east side, and is to have a height of 62½ ft. above high-water. The bridge is to be about 1,700 ft. long.

Tacoma, Wash.—The Chicago, Milwaukee & St. Paul has given the contract for the erection of the terminal freight house and platforms to the H. Chase Co., of Seattle, Wash. The structure will be built at Twenty-fifth and A streets, and will be 600 ft. x 500 ft., with a shipping platform on the north end 16 ft. x 150 ft. Work is to begin at once. (Dec. 25, p. 1666.)

Tulsa, Okla.—The Oklahoma State Corporation Commission has approved the plans of the Missouri, Kansas & Texas for a new passenger station to replace the one burned about a year ago. The station is to be of brick construction and will extend from Main street to Boston avenue. The improvements are to cost $40,000.

Vancouver, B. C.—Reports from Vancouver say that the Hill interests recently bought property costing $500,000 along the north shore of False creek, in Vancouver. The property is to be used jointly by the Great Northern and Northern Pacific for terminal purposes.

New Steel Barges for the Lehigh Valley.

The Lehigh Valley has just launched the first of a number of steel coal barges, which are being built to carry coal from the storage yards at Perth Amboy, N. J., to points along the eastern coast. Wooden barges have been used almost universally heretofore. The steel barge carries a larger load on much less draft than the old wooden barge and will tow much easier.

The dimensions of the barge just launched, which corresponds exactly with other barges being built for the Lehigh Valley, are as follows:

Length, over all	200 ft.
Breadth, over all	35 "
Depth of hold, lowest point of sheer	17 ft. 6 in.
Draft, loaded, 1,620 tons	14 " 6 "
Draft, loaded, 1,900 tons	17 ft.

It has watertight bulkheads in bow and stern, also three steel bulkheads for dividing cargo, the boat being divided into four bins, enabling shipments of four different kinds of coal in the same barge. It is provided with a donkey boiler, steam capstan, Baldt anchors, and large anchor chains of ample length. There are three masts, 76 ft. long, provided with three leg-of-mutton sails, enabling it to proceed under its own sail in case it breaks adrift from the tow boat. It is also provided with a modern lifeboat, in addition to a dory used as a workboat. The captain's quarters, located on the main deck, are finished in polished ash. The pilot house and the quarters of the crew are on the upper deck, making the barge one of the most complete now employed on the Atlantic coast in the coal trade.

British Patent Law.

An important decision under the new British patent law has been rendered revoking the patent for an American sewing machine in which a few minor parts were removed and replaced by parts made in England. The defendants pleaded that it was scarcely possible to manufacture the machine entirely in England owing to the lack of the necessary tools and the highly skilled labor that was essential, but the Comptroller-General of Patents ruled that the American patentees had not adequately worked the patent in England by merely making a small number of substituted parts.

Scherzer Lift Bridge in Burma.

The long bridge across the Ngawun river, India, on the main line extension of the Burma Railways from Rangoon to Kyngin was completed in December. This bridge is the largest in Burma, the total length being 820 ft., with a movable span 220 ft. long. The Ngawun river is in the fertile delta of the Irawaddy river and forms a connection between this river and the Bay of Bengal. The government required the large movable span to expedite railway traffic and the heavy river traffic of the Irawaddy Flotilla Company, whose vessels traverse these waterways from the coast to the interior of Burma as far as Mandalay, more than 400 miles. The bridge was designed by the Scherzer Rolling Lift Bridge Co., Chicago, and made in England at the works of Spencer & Company, Melksham, Wilts. It was erected in Burma under the charge of the engineers of the Scherzer company. Though the difficulties were great, the bridge was built within a year. During the rainy season, extending from May to October, the river was subject to great floods. During the dry season several hundred natives died from an epidemic of Asiatic cholera.

Supply Trade News.

Arthur L. Stevens, industrial and furnace engineer, has taken a position in the Rockwell Furnace Co., New York.

Hereafter the department of Track Devices of the Quincy, Manchester, Sargent Co., Chicago, will be operated under the old name of The Q & C Company.

E. S. Van Tassel, formerly Trainmaster of the Colorado division of the Union Pacific, has taken a position in the New York office of Manning, Maxwell & Moore, New York.

T. M. Murray, heretofore with the Protectus Company, Philadelphia, Pa., has been appointed Eastern Sales Manager of the Arlington Manufacturing Co., Canton, Ohio, paint makers.

The Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., will supply the bolsters for the 500 box cars recently ordered by the Delaware, Lackawanna & Western from the American Car & Foundry Co.

A. D. McAdam has been elected Vice-President of the Damascus Brake Beam Co., Cleveland, Ohio. He was formerly Auditor of the American Car & Foundry Co., and later Manager of Sales of the Michigan Malleable Iron Co.

J. S. Seeley, formerly Resident Manager at Denver, Colo., of the Galena Signal Oil Co., Franklin, Pa., has been appointed General Manager of the western branch of the Nathan Manufacturing Co., New York, with office in the Old Colony building, Chicago.

John N. Douglas, Supervisor of Materials, Scranton plant of the American Locomotive Company, has resigned and will devote his entire time to the affairs of the American Safety Lamp & Mine Supply Co., Scranton, Pa., of which he is Secretary and Treasurer. Brass car and locomotive fittings will be among the specialties of the company.

The Chicago Steel Car Co., Chicago, the incorporation of which was reported in our issue of October 16, has purchased the steel car department of the E. A. Bryan Co., Harvey, Ill., and will make a specialty of building steel tank cars. The officers are: President, L. H. Foster; Secretary, G. H. Gibson; Treasurer, W. H. Tucker. The offices of the company are in room 1018, First National Bank building, Chicago.

The Commercial Testing & Engineering Co., Chicago, has opened an office and laboratory in the Old Colony building, Chicago, as Consulting Fuel Engineer and Chemist. The company will specialize on boiler room economics, coal analysis, heat value method of purchasing fuel and coal washing and preparation for operators. Edward H. Taylor is President; Harry W. Weeks, Vice-President; W. D. Stuckenberg, Treasurer, and B. J. Maynes, Secretary.

The Raymond Concrete Pile Co., New York and Chicago, has recently established two new branch offices, one at 204 Perrin building, New Orleans, La., and another at 620 Chestnut street, St. Louis, Mo. The New Orleans office is in charge of G. B. Raymond, one of the sons of the late A. A. Raymond, inventor of the pile. Mr. Raymond will take care of all business in the southern states. The St. Louis office is in charge of Warren A. Tyrell, C.E., who has represented the Raymond company in that city for some time.

The Inter Ocean Steel Co., capitalized at $2,000,000, has been organized to make open-hearth steel locomotive and car wheel tires, other forged and rolled shapes, and also steel-

tired car wheels. W. L. Jacoby, formerly General Manager of the Latrobe Steel & Coupler Co., Philadelphia, Pa., whose works were at Melrose Park, Ill., is President of the new company. The plant, which will be at Chicago Heights, Ill., will be designed by Julian Kennedy. The shares of the new company are largely held by men prominent in railway and banking circles.

The National Malleable Castings Co., Cleveland, Ohio, has bought the stock of the Latrobe Steel & Coupler Co., Philadelphia, Pa., whose plant is at Melrose Park, near Chicago. This stock has been heretofore owned by the Latrobe Steel Co., which is in liquidation. As the last named company sold its steel tire plant to the Railway Steel-Spring Co., New York, some time ago, the Latrobe Steel Co. can now wind up its affairs. The Latrobe Steel & Coupler Co. will still be operated as a separate company, with the following officers: President, Albert A. Pope; Vice-Presidents, Henry F. Pope and John Havron; Secretary and Treasurer, John Henderson.

The Franklin Manufacturing Co., Franklin, Pa., has been given the contract for covering the Cunard pier of the Boston & Albany at East Boston, Mass., which was recently destroyed by fire, with reinforced corrugated asbestos sheathing. It also has the contract for covering with this material the elevator conveyor housings on top of the Clyde pier for the same company. The Clyde pier is the one which the fire did not touch, and the new elevator has been erected on top of it. The company also has the order for covering the Waterbury, Conn., train sheds of the N. Y., N. H. & H. with corrugated reinforced asbestos roofing. It is now getting out the material for all these orders and expects to start work at an early date.

William B. Dickson, as already mentioned in these columns, has been elected First Vice-President of the United States Steel Corporation, succeeding James Gayley. Mr. Dickson was born in Pittsburgh, Pa., in 1865, and started work in the Carnegie mills at Homestead, Pa., in 1881. He served there in a number of capacities, and later rose through minor official positions until in 1899 he was taken into partnership. At this time also he was given the position of Managing Director. In this office he was not directly connected with the sales department, but was in charge of the execution of orders after the business had been placed on the books, supervising in this department the relations of the mills to the customers. He was later made also Assistant to the President of the Carnegie Steel Co., in charge of buying pig iron and scrap. When the United States Steel Corporation was formed, Mr. Dickson went to New York as Assistant to the President of that company, and was afterwards elected Second Vice-President. His duties in the Steel Corporation have been particularly in connection with the supervision of the operating relations of the different subsidiary companies, such as the distribution of semi-finished products between plants. Part of his duties as First Vice-President will be those which he has been handling, but his jurisdiction is enlarged. No comment on this deserved promotion is necessary. Mr. Dickson's record and the recognition by the United States Steel Corporation speak for themselves.


W. B. Dickson.

The Northern Railway Supply Co., Chicago, the incorporation of which was reported in our issue of December 11, has its main offices in the Chamber of Commerce building, Chicago, with branch offices in New York, Cincinnati, Detroit and Toledo. The factories of the company are in Kansas City, Benton Harbor, Mich., and at Thirty-fifth street and Ashland avenue, Chicago. The malleable iron plant at Benton Harbor has recently been enlarged at an expense of $35,000 to provide facilities for an increasing business. Two of the specialties manufactured are the Rogers dust-proof journal box, adaptable to steam and electric cars, and the Neudeck steel grain door. The officers are: President, John F. O'Malley; Vice-President, A. W. Neudeck; Secretary and Treasurer, H. W. Drew.

Among orders recently received by the Link-Belt Company, Nicetown, Philadelphia, Pa., is one for a locomotive coal, ashes and sand station for the Philadelphia & Reading at Ninth and Wallace streets, Philadelphia. The plans of the station, which will eventually supersede the one now in use, call for reinforced concrete bins, supported by an under-structure of steel, covered with concrete. There will be 12 pockets for coal, two to each of six coaling tracks; total capacity, 2,000 tons. Ashes will be kept in two pockets having a capacity of 250 cubic yards. For sand storage there will be six hoppers, three on each side of station, to hold 48 cubic yards of sand. The conveying machinery comprises duplicate systems, and each will have a capacity of 100 tons per hour of coal, and of ashes 250 cubic yards in 10 hours. It is expected that work will be begun early in the new year. Other installations in Pennsylvania include elevating and conveying machinery at cement mills, paint works, hat manufactory and fueling equipment for a mining company. An open-top carrier will be installed for a contracting firm in New York, and an ashes hoist for a manufacturing concern in North Carolina.

TRADE PUBLICATIONS.

Missouri Pacific.—A folder contains a description of the "Gregory Tour" through Old Mexico, to leave St. Louis on February 2. Detailed information may be obtained from C. B. Gaussen, Passenger and Ticket Agent, Missouri Pacific-Iron Mountain Lines, St. Louis, Mo.

Machines and Small Tools.—The Cleveland Punch & Shear Works Co., Cleveland, Ohio, has issued a 40-page stock list of machines and small tools for the fabrication of iron and steel plates, shapes, etc. The publication contains a number of specification sheets for convenience in ordering supplies.

Dump Cars.—The Wm. J. Oliver Manufacturing Co., Knoxville, Tenn., has just issued an attractive catalogue on the Oliver all-steel dump cars. Both half-ton and line drawings of these cars are shown. The Oliver 20-yard dump car was illustrated and described in the *Railroad Age Gazette* of September 4, page 873.

Equipment for Central Stations.—Bulletin No. 5910-9, covering electrical equipment for central stations, has just been issued by the Western Electric Co., New York. This bulletin contains information regarding a.c. and d.c. generators, arc lamps and switchboards. A number of half-tone illustrations are also included.

Rubber Belt Conveyors.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued catalogue No. 67-D on the subject of the Jeffrey Century rubber belt conveyors. The catalogue contains a large number of illustrations of installations, also a number of detailed illustrations showing the standard three-pulley carrier, troughing carriers, idlers, etc.

Concrete Mixer.—The Chain Belt Co., Milwaukee, Wis., has issued a catalogue descriptive of the chain belt concrete mixer which it manufactures. The company claims that the new features to be found in this type of mixer are an improvement over the various patterns now being used. A view of the plant of the Chain Belt Co. appears on the back page of the publication.

Laurentide Micanneal.

Steel becomes stronger and more uniform in structure by slow heating to high temperature and slow cooling. The requisites for successful results in this process are said to be but recently well understood. The most important among these are the correct ultimate maximum temperature and the very slow and uniform heating and cooling. To

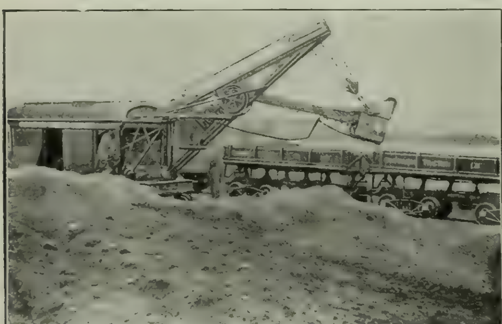
secure this latter, a covering must be given to the steel in order to prevent rapid cooling and oxidation of the surface. A protective packing must be such as to allow the heat to pass through it slowly and also must not contain any constituents which are liable to affect the quality of the steel either through fusing or oxidation. This requires that the packing shall be infusable at the temperature used and shall not be capable of absorbing gases.

The Laurentide Mica Co., Ltd., Pittsburgh, Pa., has just placed on the market a product known as Micanneal, which is said to have proven itself an excellent packing. It is said to be infusable, that it will not absorb gases and that it is a remarkably good heat insulator; also that it prevents the steel from being heated or cooled too rapidly and protects it from oxidation. Specimens of steel come out clean and free from scale when packed in micanneal. Steel packed in this material is said to require from 25 to 150 per cent. more time to heat and to cool than with any other packing.

Electric Power Shovel Cost Records.

For a number of years, power shovels operated by electricity have been in successful operation in different sections of the country, for such work as digging ballast for electric railways, dry placer gold mining, etc., but until recently no accurate records of the cost of work done by such shovels has been attainable. There have now been gathered some accurate records of work done by one of these shovels digging ballast for the Chautauqua Traction Co., Jamestown, N. Y.

The shovel, which was made by the Vulcan Steam Shovel Co., Toledo, Ohio, weighs about 40 tons complete. The car body is 27 ft. long by 6 ft. 8 in. wide and is mounted on standard railway wheels. It is equipped with $1\frac{1}{2}$ cu. yd. dipper which has a clear lift of 12 ft. with door open. It will make a 26-ft. cut at level of rails and will



Vulcan Electric Shovel.

dump out 21 ft. 6 in. either way from the center of the shovel. It is equipped with three separate motors, one for hoisting the dipper, one for swinging the crane and a motor on the crane for crowding the dipper into the bank. All motors are of the regular railway type, variable speed, d.c. 600 volts, 700 r.p.m.

In hoisting the dipper through the material, it will frequently strike hard material which would stall the motor and burn it out, while a motor strong enough to stand such strains without burning out would tear the dipper to pieces. This objection is overcome in the shovel under consideration as follows: The main or hoisting motor is 75 h.-p. and is provided with an automatic magnetic controller and a circuit breaker which will throw off the current as soon as the motor has exerted its maximum safety power. The important feature, however, is the series overload relay with which each motor is also equipped and which is to the motor what a governor is to a steam engine. As soon as the dipper meets any obstruction in the shape of hard material or boulders, this overload relay automatically relieves the motor of the excess current and prevents it being overloaded or burning out, no matter what the conditions of service are. When the crane or boom of any shovel is being swung, it acquires a momentum which if not checked in some way makes it drift around too far and thus is liable to do considerable damage to the structural part of the shovel. On a steam shovel this drifting motion is cushioned by slightly reversing the engines. On the electric shovel this momentum is taken care of by the solenoid brake, the clutch of which is thrown in by springs. When the current is turned on to the swing motor, it is automatically turned on to the mechanism of the brake also, energizing a magnet which throws back the springs and releases the brake. As soon as the current is cut off the springs throw on the brake, bringing the crane to an easy stop at any desired point, and without any reverse power being exerted by the motor. The swinging motor is 30 h.-p. and is also safeguarded with circuit breaker, etc. The crowding or crane motor is also 30 h.-p. and is provided with automatic controller, circuit breaker, overload relay, etc. It is safeguarded in much the same manner as the hoisting motor. In addition to this, however, it has a foot brake operated by the craneman, so that should the circuit breaker be automatically thrown out, as the result of overloads or other causes, the dipper can be held at any point desired.

The cost of the work referred to above is shown in the following extract from a letter to the manufacturers from A. N. Broadhead, President of the road: "A short time ago we placed an ammeter and volt-meter on the shovel for the purpose of ascertaining cost of operation per hour and hand you the enclosed memorandum. Of course the shovel did not work constantly during this time, owing to the shortage of cars; if we had been able to keep the shovel at work without a let-up, we feel sure the cost per hour would be materially reduced."

Cost of Power and Labor.

Cubic yards handled per hour	$66\frac{2}{3}$
1 man per hour	$ .33
1 man per hour	.25
2 men at $0.15 per hour	.30
20.346 k.w. hrs. at $.0088	.18
Oil and waste, estimated	.04
Total cost per hour	$1.10
8 hours at $1.10	$8.80
8 hours at $66\frac{2}{3}$ cu. yds	534 cu. yds.
$8.80 divided by 534 cu. yds	$.0164 per cu. yd.

The material being dug was a mixture of gravel, sticky clay and sand, which was hard to handle, but, as will be seen from the above figures, the cost of this work was very low. There are several causes for this, the principal ones being: First, as the shovel required no boiler, the cost of a fireman and of hauling coal and water was eliminated; second, the work of the shovel was intermittent and when idle no power was consumed, as would be the case with steam shovel where steam must be kept up just the same. The shovel could have been operated to its maximum capacity, which would have given twice the yardage at nearly the same cost, as the men had to be paid whether they were working or idle, and the additional cost for power would not have been more than twice what it was, which, on the same basis, would mean 1,068 yds. at a cost of $10.24 or $.00958 per cu. yd.

Autogenous Welding With the Oxy-Acetylene Flame.*

Autogenous welding is a process uniting metals of the same nature by fusion at high temperatures, without the intervention of a different metal, as is the case in soldering or brazing. This welding is accomplished by use of a blow pipe, known as the oxy-acetylene torch.

The high temperature of the oxy-acetylene flame was discovered by M. H. Le Chatelier in 1895. In a note to the Academy of Sciences he presented his calculations, showing that with an equal volume of oxygen, acetylene would give a temperature of about 4,000 deg. C., or 72,000 deg. F., which is 1,000 deg. C., or 18,000 deg. F. greater than the temperature of the oxy-hydrogen flame. The first experiments were greatly impeded by the so-called flash back, which is caused by rapid propagation of the flame. It was not until 1901, six years after Le Chatelier had announced his results, that a practical torch was obtained.

There are three different types of oxy-acetylene torches, the high, low and medium pressure torches. The high pressure torch can be used only with both the acetylene and oxygen under pressure and the apparatus must be provided with positive check valves to prevent the gas of one container from going into the other. In cases of flash backs, these high pressure torches have become so heated that portions have been melted. Another defect of this torch is that as both the gases are under very high pressure they issue from the tip with very great force and it requires an expert to make a weld without blowing away the molten metal. The operator has perfect control of the mixture for the flame, being able to increase or reduce the volume of either gas.

The low pressure torch is used with the oxygen under pressure while the acetylene is taken at a much less pressure from an ordinary lighting generator. In this torch, the gas is mixed by injection, the acetylene being drawn into the mixing chamber from the surrounding chamber by velocity of the oxygen passing through it. As there is no means in this torch of forcing the acetylene, the operator must depend entirely upon the oxygen to secure the mixture. As the proper mixture is one part of acetylene to 1.28 parts oxygen and the mixture by the injector being problematical, a perfect flame is difficult to obtain and almost invariably there is too much oxygen and the weld is oxidized.

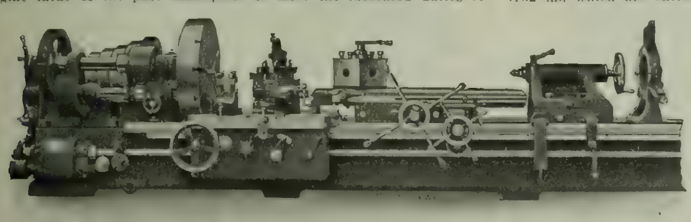
The medium pressure torch was devised to remedy, as far as possible, the defects of the other two types. This torch is made very similar to the low pressure torch, except that the mixing of the gases is

*From a paper read before the Technology Club of Syracuse, N. Y., November 17, 1908, by Eugene Bournonville, Vice-President, Davis-Bournonville Co., New York.

accomplished entirely in the nozzle or tip. This arrangement enables the operator, by simply changing the tip, to change the combination of gases, and to obtain a flame best adapted to the thickness of the metal to be welded, without changing the torch itself. An advantage which this torch has over the high pressure torch is that the mixing chamber and the aperture through the torch is about six times as large as the injector through which oxygen is introduced at 15 lbs. pressure and consequently the blowing force of the flame is not half that of the same size high pressure torch. In cases of flash backs, the flame cannot extend beyond the injector tip, therefore there is no injurious effect on the torch itself. In addition to changing the size of the flame without changing the torch itself, this torch does not depend entirely upon the injector for the proper mixture of acetylene, but both gases being under medium pressure, the flame can be adjusted to requirements. The flow of gas for a low pressure torch to give a stable flame must have a velocity of not less than about 330 ft. per second. For the reason stated, the medium pressure torch is the ideal tool for autogenous welding and the field of its application in metal working is almost unlimited.

36-Inch American Engine Lathe.

Recent developments in modern shop practice, together with the present extensive use of high speed tool steels, has made the ordinary engine lathe of the past inadequate to meet the increased duties of modern shops. To meet these changed conditions, the American Tool Works Co., Cincinnati, Ohio, has designed and built a line of new improved lathes, one of which is illustrated and described herewith.



36-Inch American Engine Lathe.

The improved quick change gear mechanism provides 32 changes for feeding and thread cutting, the range of threads being from one thread in 4 in. to 16 threads per in., including 11½ pipe thread. The feeding range is 6.4 to 92 cuts per in. The feed or screw pitches obtained are multiplied through the compound gears, it being necessary to change only one gear on the quadrant for each additional thread. This arrangement gives flexibility to the screw cutting mechanism, making it possible through the introduction of certain gears to cut a large range of special worms or threads.

The bed is of deep section, very heavy and of a patent drop-V pattern, with cross box girders at short intervals its entire length. The bed is further strengthened by a rack cast in the center, for engaging the pawl of the tailstock. The headstock is built with triple gears and is firmly bolted to the bed. The cone has 5 steps, the largest of which is 20 in. in diameter by 4¾ in. on the face. The spindle is made of high carbon special steel accurately ground and has a 2⅝-in. hole through its entire length. The bearings are of phosphor bronze with improved oiling facilities. The triple gears are of the slip gear type, readily engaged by rack and pinion at the front of the head. The internal ear i planed integral with the face plate and the pinion is cut solid with the shaft. All the gears are of coarse pitch with wide face. Fifteen speeds are obtained in geometrical progression. The ratio of gearing is high and calculated for great power.

The tailstock is strongly proportioned, with large continuous bearings on the ways and is moved rapidly along the bed by crank and gear. It is provided with a set-over feature for turning tapers. The base is rigidly clamped to the bed and is further secured by a rack cast in the center of the bed. The spindle has exceptionally long travel and is actuated by a hand wheel and screw. The carriage is very heavy, especially in the bridge, due to the drop-V bed and has continuous bearings of 50 in. on the ways. This carriage is also gibbed to the bed through its entire length.

The apron is tongued, grooved and bolted to the carriage along its entire length. The longitudinal and cross feeds are reversed from the front of the apron. This feature is of special value on long beds where the operator is far removed from the head. All the gears and pinions are of steel and of wide face, coarse pitch and cut from solid metal with special cutters and bronze bushed where running loose. The bevel pinion is never disengaged, thus avoiding much trouble from breakage. The compound rest is fitted with taper gibs, and the top slide is provided with power angular cross feed with 13½ in travel. The mitre gears are of steel cut from solid metal. This swivel is graduated and top slide and cross feed screws have micrometer dials. The back gears are automatically disengaged when slipping the pinion into internal gear and vice versa. The longitudinal feed of the carriage is controlled by a friction and the cross feed by a saw-tooth clutch. The feed box on the front of the machine beneath the headstock gives three instantaneous changes for feeding and screw cutting for each change of the gears on the quadrant.

The turret on the shears is of a new design and has many valuable features. It is equipped with a new indexing mechanism, which is self-compensating for wear. This mechanism is placed at the front of the turret top slide which brings the locking pin very near the tool. The turret can be tripped or revolved automatically or by hand and the mechanism can be set so as to be inoperative, when wishing to run the slide back to the limit, without withdrawing the locking pin or revolving the turret. The top slide is supported on its outer end by a gibbed bracket attached to the front of the slide which travels along the V's of the bed and through the support of which any tendency to spring, due to the long reach, is eliminated. The bottom slide of the turret is moved along the bed by a wheel at the rear end. It is clamped to the bed by two eccentrics and further secured from slipping by pawl which engages a rack cast in the center of the lathe bed.

Eight feeds are supplied to the turret, ranging from .005 in. to .162 in., which are entirely independent of the regular carriage and apron feeds. The turret top slides may be quickly attached to the compound rest slide. This is a valuable feature when wishing to impart to the turret the feeds of the carriage, such as in large tapping operations. In this instance a positive lead is imparted to the tap, since the screw cutting mechanism can be engaged in the apron and the proper lead transmitted to the turret slide. This feature relieves the tap of all dragging at the start and the positive lead prevents the reaming tendency. The taper attachment is of heavy substantial construction, designed to eliminate all tendencies of the parts to bind which insures smooth and uniform action. It is supported on the bed and is supplied with a vernier attachment to facilitate fine adjustment.

Rail Joints.

The Rail Joint Company, New York, makes three forms of base supported rail joints. The advantage of the base support in a rail joint is primarily to give a proper area of support to the end of the receiving rail, which takes the blow from the wheel. The base-plate also adds to the stiffness of the joint, though all the designs illustrated herewith have also a large amount of metal disposed in the shape of angle bars.

The Continuous joint has the advantage of simplicity, there being no more parts than in an ordinary angle bar splice. It consists of two angle bars, with an extra broad bearing on the tie and with the lower flanges bent inward to form the base plate. In common with the other two designs, this joint flashes with both the top and bottom faces of the rail flange. The Weber joint is made up of four parts, beside the bolts. On one side is an ordinary angle bar and on the other a channel, fishing into the rail in the ordinary manner. A wood filler fits into the channel bar to act as a cushion when the bolts are tightened. This block increases the elasticity of the joint, and deadens the noise from the wheel blows, and to some extent prevents the parts from working loose. The fourth part is an angle called the shoe angle, of which the vertical leg bears against the wooden block, while the horizontal leg serves as the base plate. The Wolhaupter joint consists of angle bars, the lower flanges of which are bent in to grip the corrugated base plate. This base plate has a shoulder along one edge to take the outward thrust, while on the inner side of tne rail the plate and the angle bar are interlocked, the lower part of the angle bar being cut away at both ends, while the base plate is cut out at the middle. This is

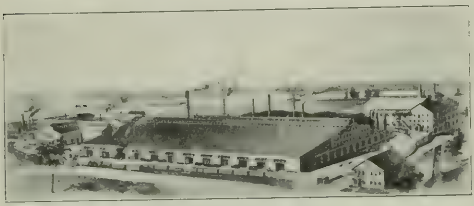
Continuous Joint.

Weber Joint.

Wolhaupter Joint.

indicated by the white dotted line in the illustration. The inside spikes are driven through holes punched through the base plate and bear against the edge of the rail flange where the ends of the splice bar are cut away. The fact that the base plate is shouldered gives it the advantage of a shoulder tie plate, in that the inner spikes help to hold the rail from spreading. In this joint all the bearing surfaces are inclined toward the center, so that by tightening up the bolts wear can be taken up and all the parts held tight against the rail.

Within 14 years, the Rail Joint Company has put its rail joints in service on more than 50,000 miles of road. The company's plant is at Troy, N. Y. These works were originally the Albany Iron & Steel



Troy Plant; Rail Joint Company.

Works, where during the Civil War the plates for the Monitor were made. This plant has been almost entirely rebuilt. The steam rolling mill was recently enlarged, making the annual capacity 62,000 tons. The output of these works, however, is but a quarter of the entire output of the company, since the Illinois Steel Co., the Carnegie Steel Co., the Lackawanna Steel Co. and the Pennsylvania Steel Co. all make these joints for the Rail Joint Company. The company has distributing agencies in America, Canada and England.

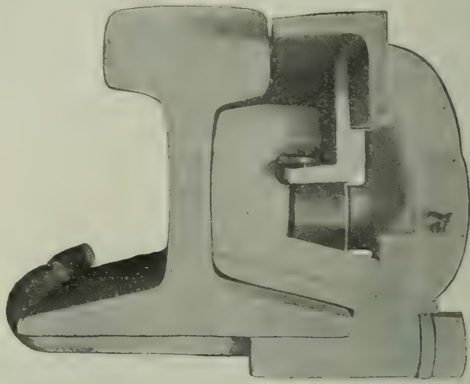
The company's rolling mill is 430 ft. x 194 ft., while the storehouse adjoining it is 150 ft. x 79 ft. The yard is served by traveling cranes on a 610 ft. runway, whose span is 65 ft. On this runway are operated two 10-ton electric traveling cranes for carrying billets to the furnaces. The rolling mill is equipped with two 20-in., 3-high, roll trains, each served with an 8-ton jib electric train for rapid roll changing. There are also 10 finishing machines. The capacity of both trains in a single turn of 12 hours is 200 net tons a day, or about

View of Troy Plant from North End.

62,000 tons a year. The boiler capacity is 1,500 h.p. and the capacity of the electric plant is 500 k.w. The roll shop is 136 ft. x 25 ft. and contains five modern roll lathes, motor driven. It is served by a 5-ton electric traveling crane running the length of the shop. The machine shop is fully equipped with lathes, planers, shapers, and all necessary tools for repairing any of the machinery in the plant or for building new machinery. The heating furnaces are so arranged as to be fed continuously while the trains are in operation, the raw material being carried from the yard by the electric cranes. The water power is a gravity system, fed from a storage of over 1,000,000 gallons on the company's property. The plant is connected with the New York Central & Hudson River by a mile of single track, while there are also facilities on the company's property for shipment by water. The general offices of the Rail Joint Company are at 29 West Thirty-fourth street, New York, and its officers are: President, F. T. Fearey; Vice Presidents, L. F. Braine and Percy Holbrook; Treasurer, F. C. Runyon, and Secretary, Benjamin Wolhaupter.

Federal Switch Guard.

The Federal switch guard is a new device, designed to prevent throwing under the train of the switches controlled by an interlocking plant. The common detector bar is said to have proven unsatisfactory, especially on curves, with wide gage, narrow wheels treads and wide head rails. Attempts to make this bar effective in all cases have not proven entirely successful. When the various parts



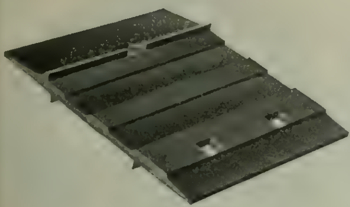
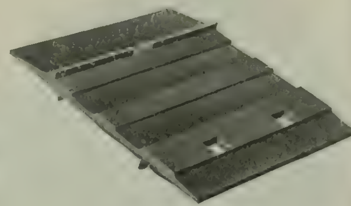
End View of Switch Guard in Normal Position.

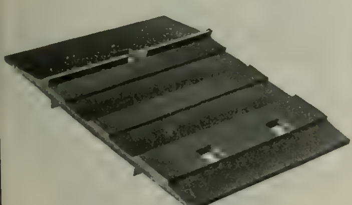
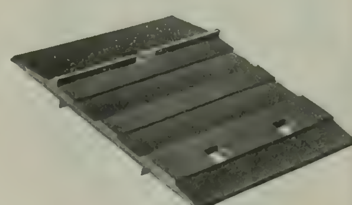
of the bar become worn, it will often fail to operate, since a very slight variation from normal conditions will permit it to slide up outside of the wheels of a passing car. Electric track circuits have also been used in attempts to overcome the unsuccessful operations in detector bars, although these have not proven entirely satisfactory.

The Federal switch guard has been developed to overcome the defects resulting in connection with detector bars and track circuits. As shown in the accompanying illustrations, the switch guard consists of an angle iron held in proper relation to the rail by guides. In normal position, the upper or horizontal leg of the angle has its edge in contact with the head of the rail and slightly below it. This

End View of Switch Guard in Raised Position.

angle iron must be raised above the top of the rail and then moved inward before the switch, to which the guard is attached, can be operated or even unlocked. The vertical motion necessary is ¾ in. and the horizontal motion 1 in. Another advantage is that the use of special rail braces are avoided and there is ample room between the vertical leg of the angle and the head of the rail for any rail brace. This switch guard is said to have been tested in service and that it is being installed on a number of important railways.

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ALL OPERATING OFFICIALS recognize the economy and safety of long time switch and semaphore signals.

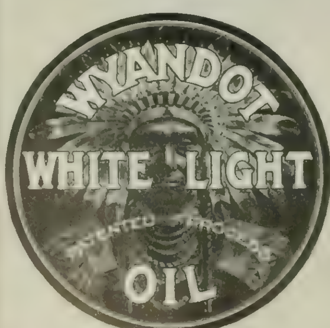
Heretofore it has been impossible to secure a satisfactory oil for such use.

We are pleased to announce that we have produced by a new and patented process of refining our

Wyandot White Light Long Time Burner Oil

which burns without attention from one week upwards, according to the capacity of the oil font. We solicit a trial order.

Many leading railroads can certify to the above from actual service tests.



THE WYANACME CO.

(Railway Sales Agent for Wyandot Refineries Co.)

Williamson Building, CLEVELAND, OHIO

Great Northern Bldg., CHICAGO, ILL.
Hudson Terminal Bldg., NEW YORK

CLASSIFIED ADVERTISEMENTS AND PROPOSALS

Undisplayed advertisements are inserted at two cents a word for first insertion and one cent a word for each consecutive insertion of same advertisement. Minimum charge, 50 cents. Proposals are inserted at twenty cents a nonpareil line per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

POSITIONS WANTED.

WANTED—Operating man with 10 years' experience as superintendent and general superintendent is open for position as general manager or general superintendent on steam railroad. Can furnish best of references. Address Box 220, *Railroad Age Gazette*, 83 Fulton St., New York.

WANTED—Chief clerk wants position in same capacity or as confidential man. Seven years' varied experience in operating department. Now employed on a leading eastern road. Thoroughly understands handling correspondence and modern office methods. Applicant is also expert stenographer. Age 26; married. Best references. Address Box 226, *Railroad Age Gazette*, 83 Fulton St., New York.

NEW YORK, Jan. 4, 1909.

The annual meeting of the stockholders of *The Railroad Gazette*, for the election of three directors and for the transaction of any proper business, will be held at No. 83 Fulton St., New York, on Jan. 21, 1909, at 3 o'clock p. m.

RAY MORRIS, Secretary.

POSITIONS WANTED.

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CONTENTS

The *Railroad Age Gazette* is neither a high tariff paper nor a low tariff paper, nor do we intend to take a partisan attitude in the discussion now being carried on in and out of Congress. But there is one way in which the tariff discussion comes home to us and to all railways and manufacturers alike, regardless of personal views. It is extremely easy to make mistakes in tariff adjustment, although it is usually possible to live under the adjustments, right or wrong, after a sufficient period of time has shown how it is to be done. Both adjustment and the rumor of adjustment, however, are extremely damaging to all conservative business. More especially is this true when the adjustment is expected to follow a series of rather irregular hearings, in which a number of frankly selfish witnesses argue before a committee which is trying to do the work of years in a few weeks, and has to deal with many conflicts of testimony; conflicts which would be comic if they were not so serious. It seems to us that this way of adjusting a tariff in no way befits the seriousness of the situation. We venture to suggest that a tariff commission, containing not to exceed five members, be created by Congress, tenure of office to be during life or good behavior; that this commission be given authority to conduct such investigations and hold such hearings as it may deem necessary, and to report to Congress such changes in the tariff as appear to it to be desirable, during the congressional session in 1911, and thence biennially. We suggest that this commission be made up of two broad-gage business men, two economists of the type of Charles Francis Adams and one federal judge; that the commissioners devote their whole time to the task before them, and receive salaries commensurate with the importance of their work. In this way we believe that haste, foolishness and politics can forever be eliminated from the making of the tariff.

It is with regret that we must call attention to what appears to be deliberate unfairness in the annual report of the Interstate Commerce Commission. The Commission starts its report by saying, in effect, that the financial depression did not hit the railways of the country as hard as they made out, and that they were unjustified in saying that the losses inflicted were so severe as to warrant universal advances in rates or reductions in wages, or both. To demonstrate this, the Commission compares the revenues of the fiscal year ending June 30, 1908, with those for several previous fiscal years, and demonstrates that the gross earnings for the fiscal year 1908 were only some 6¾ per cent. smaller in 1908 than in 1907. Of course, the fallacy of this argument lies in the fact that depression did not strike the railways at its worst, until very near the first of January, 1908, so that the first half of their fiscal year showed the highest gross earnings in American railway history. The 1908 falling off in railway gross earnings in this country amounted to a great deal more than 6¾ per cent.; but the depression must be measured by the calendar year, and not by the fiscal year.

WORK OF THE RAILWAY BUSINESS ASSOCIATION.

We print in another column the extraordinary record of the Railway Business Association since its organization last fall. This record in itself is clear evidence that the Association has passed the experimental stage, and has reached the point where it can perform and is performing the immense public service of standing as a great, impartial body, strong enough to tackle gross legislative injustice to the railways, and strong enough to rebuke the varying forms of corporate rudeness that have brought about much of this legislation, and are still obstructing the way to mutual understanding between railways and their customers. The Association is not lobbying; neither is it engaging in a foolish and purposeless effort to obscure some of the glaring defects that still exist in the public relations of the railways. It exists as an organized protest against injustice from without and from within. It realizes that the railways are responsible for most of their sorrows, and that the way out of these difficulties, in the last analysis, is only to be found in a widespread determination to fill the length and breadth of the country with petty friends of the management instead of petty enemies. The association that can make this so clear to a general manager that he will do something about it, and that can stop the mouth of the agitator-legislator by convincing him that his own popularity lies in fairness instead of unfairness, is doing a mighty important work in this country, and it ought to have the wholehearted support of every manufacturer.

It may be said that the active present service of the Association lies in building up the forces of Reason until they shall loom as big as the forces of Wrath. It is a curious fact at this time, that this work should still be hazarded by the continuance of what may be described as the claim-department type of relations between railways and their clients. Perhaps it is over-statement to say that all railway claim departments

cost more than they save; perhaps not. At all events, the broad, general claim-department principle of paying the man who promises to make the most trouble and economizing on the man who is apt to make the least, adds a brick every day to the wall which separates the admirably important and skilful transportation work of the railways from the appreciation which it deserves; a wall which the Business Association is trying hard to tear down. We know of a mercantile claim department that settled $75,000 worth of claims every year and itself cost $25,000 a year to run, which was abolished entirely and the experiment tried of settling claims at sight, for the advertising value of such a settlement. The result at the close of the first year was a clear gain in dollars and cents to the company. How much it gained in reputation and general popularity by this act can less easily be measured, but it is safe to assume that it did not lose.

The Association is making a first-rate endeavor to smother the hostility towards railways and at the same time to teach general managers the value of friendship as an asset. To the best of our belief, this is the first time that any one organization has had the strength and the wisdom to carry on this kind of a campaign from both ends at once.

MR. BROWN'S OPPORTUNITY.

A little more than a year ago the New York Central—to paraphrase the remark of one high in its counsels—was going toward receivership at 40 miles an hour. At the very brink it was turned aside by two strong men and headed on a safe path. One of these men becomes president of the company on the first of February. In the hour of urgent need he demonstrated his fitness to begin and carry on the work which made the enormous operating economies of 1908 effective. To make an efficient operating machine out of the helter skelter aggregation of great properties comprising the New York Central system is the huge and inspiring task which awaits Mr. Brown. Ten years ago the New York Central was a family road, connected by marriage with several other family roads. At that time it owned almost no lines outside the state of New York. Since then it has acquired actual, tight control of the Lake Shore, the Big Four; Michigan Central; Pittsburgh & Lake Erie; Lake Erie & Western; Boston & Albany; Chicago, Indiana & Southern; Rutland; New York & Ottawa, and lines running into the Pennsylvania coal fields which, for the first time in its history, gave the New York lines assurance of undisturbed fuel supply. It now operates over 12,000 miles of road, with gross earnings more than doubled in the last ten years. This great system has substantially a water grade between New York and Chicago, passing through the rich cities of Albany, Schenectady, Syracuse, Rochester, Buffalo and Cleveland; it also has a highly important feeder system bringing traffic from most of the best traffic points in the Middle West, and it has long-established relations of harmony and mutual helpfulness with one of the great Granger roads, operating in the northwestern states.

The opportunities of this system are boundless. It is apparently only starting on the great career of usefulness for which it is destined, and heretofore it has been harassed up to the limit of its strength by the problems which confronted it. It has had to provide at New York the most expensive system of terminal improvements which the world had then seen; it has had to make over into a high-class transportation machine a very profitable old-fashioned railway along the banks of the Hudson river; it has had to harmonize all the operations of its trunk lines and its feeder lines, and it has had to do all these things at once. During the past ten years, not far from $100,000,000 has been spent in New York state in making bridges and track strong enough for heavy trains at high speeds, in eliminating grade crossings and in the comprehensive terminal improvements in the electric zone.

It may be said briefly that the New York Central has suffered during recent years in three fundamental particulars. It has been imperatively necessary for it to take on simultaneously a large number of construction, organization, and operation problems; while engaged in this work it has been underofficered, and the extremely capable men at the head of the organization have not been given a free hand. It is interesting and instructive to compare very roughly the basic principles of the organization of three great properties—the Harriman group of roads, the New York Central roads and the Pennsylvania roads. In the Harriman group, direction of the financing and of the broad policies has been concentrated on the remarkable man who is at once the nominal and actual head of the system. He has two extraordinary lieutenants—Mr. Stubbs and Mr. Kruttschnitt. Each of them governs a province, one being responsible for the basic principles of getting the business; the other for the fundamentals of taking care of it after it is gotten. But these colonial governors do not attempt detail administration. Mohler is, to all intents, king of the Union Pacific; Bancroft, king of the Oregon Short Line; Calvin, of the Southern Pacific. No matter how able the man who sits in the office at Chicago, he cannot personally attend to details of first rate importance that arise day by day in the management of these enormous properties. There must be a man on the ground, and he must have authority.

The theory of the Pennsylvania organization is somewhat different, but it works in about the same way. McCrea is responsible for the lines east and west; Wood, viceroy of the lines west. McCrea has his headquarters staff and divisional staff as well; so has Wood, and the headquarters organization located at Pittsburgh for the joint benefit of the Northwest system and Southwest system is so strong that the actual operation of each broad division is ably handled by its general superintendent.

In the case of the New York Central lines, the headquarters organization is an extremely strong one; but it is located in Grand Central Station, with a single strong offshoot at Chicago. The actual headquarters organization of each of the distinctive properties, such as the Lake Shore, the Michigan Central, etc., is an absentee organization, with the result that the general manager who is the operating head, is far removed from his official base. His authority is limited, and he knows well that it is limited. The Grand Central staff simply has not hands enough, or eyes enough, or hours enough, to attend to the affairs of each principality as they should be attended to.

We believe that such defects as exist in the New York Central organization are capable of comparatively easy remedy; we believe that the new executive head has the ability to operate the road as it should be operated, and we hope he will be given a free hand. Assuming that these things are so, the history of the New York Central during the next ten years ought to be one of the most interesting records in the annals of American railway transportation.

A NEW RAILWAY COALITION.

If one glances at the railway map of Canada there appears in the Canadian Pacific system one of the most striking as well as symmetrical groups of railway lines to be found in the world. It is vast as well as symmetrical. It has a mileage which in round numbers may be fixed at 14,000. It is trans-continental, spanning the whole American Continent with trans-Atlantic and trans-Pacific steamship connections. It has a great network of subsidiary lines tapping the British American wheat regions and another group of subroads reaching the mining regions of the far Northwest. It is a railway backbone in the more populous regions of old Eastern Canada. Its huge subsidies received from the Canadian government in the form of the land grant of 25,000,000 acres and cash in the form of the same number of dollars

are matters of history. It reaches by its connections on our own side of the border Detroit, Chicago, St. Louis and the Southwest, as well as St. Paul and Minneapolis. Six years ago it had a mileage of 7,590; now its mileage is nearly double. Drawn on a map of size the system meets the eye as a "running" group of railway lines to the last degree graphic and impressive.

While this great railway development has been in progress East, West and Northwest in British America, President Mellen, of the New York, New Haven & Hartford, has also been doing things. His annexation of the Ontario & Western, of the Poughkeepsie Bridge system, of steamboat lines and of some 1,300 miles of trolley lines may be cursorily referred to, but big as they are, having only incidental relation to his more important acquisition of the Boston & Maine. Spite of Massachusetts and federal obstacles the New Haven control of the Boston & Maine may be regarded as practically assured through the so-called "Billard" private ownership —pretty transparent as a "holding" device but stalwart legally. With the Boston & Maine in hand the territorial control of New England by the New Haven becomes well nigh complete and only modified by the isolated lines of the Grand Trunk, the independent Bangor & Aroostook and the "long bridge" of the Boston & Albany, reaching between those cities and with practically no subsidiary and branch lines. The acquired Boston & Maine with its acquisitor, the New Haven, forms a system of about 6,000 miles—counting in roads like the Ontario & Western and the Central New England, not yet formally merged—and with the outlying Boston & Maine, welding the system to the Canadian Pacific. On the map the New Haven system has thus become a kind of huge Canadian Pacific terminal in a region highly productive of first class freight and reaching New York City. Two railway systems and two only thus constitute an "all-rail" line between the Pacific Ocean, on the West, and New England and the Metropolis, on the East.

An early signal of this new and expansive coalition based on natural physical conditions was to be looked for. It came last June but was almost at the time unobserved. The New Haven system south of the Boston & Albany line had for years been cut off from the lower westward "commodity" differentials enjoyed by Northern New England and by the water lines from New York, including the Southern steamship lines, the Hudson river and lake routes and the Grand Trunk route via boat line to New London, Conn., on which, however, the New Haven company owned the boats. The signal referred to was the announcement last June of a new differential agreement between the New Haven and the Canadian Pacific represented in cents per hundred weight by 5, 4, 3, 3, 2 and 1 for New Haven territory proper, and the six classes of freight, respectively, and the higher differential of 10, 8, 6, 4, 4 and 3, as applied to New York City over the "all rail" New Haven and Canadian Pacific.

That was last June, as stated, when the new agreement attracted but scant attention. Since then the better part of a year has intervened. Considerable traffic has been directed over the New Haven lines from New York and elsewhere to the Canadian Pacific, albeit the distance is some 350 or 400 miles longer to westward points—and the significance of the agreement is beginning to attract serious attention now with, if we are not mistaken, threats of the southern marine lines of cutting rates. One meeting of the executive committee of the trunk lines has already been held to consider the situation and another is due next week with results very obscure in a highly complicated case, especially now that shippers in Southern New England and New York have "tasted" the lower rates of the new differential, and the business by the new "all-rail" combination is increasing.

From time to time in the past we have pointed out the meanings of that well nigh absolute territorial control of New England, which the New Haven has been rapidly securing with its annexed power of diverting freight as well as—in a less degree—passenger traffic, and of making new agreements favorable to itself with connecting railway systems. A big railway system with highly productive territory substantially immune to invasion can do many things which it cannot do otherwise. The recent compromise with the Reading and Baltimore & Ohio, resulting in transfers of freight to the Poughkeepsie Bridge system is one instance and the New Haven-Canadian Pacific differential has every outward aspect of another upon a much larger scale. It will hardly escape attention, also, how closely it synchronizes with the control of the Boston & Maine as a connecting link with the foreign railway corporation. Deeper searched this project of an enduring all-rail trans-continental coalition of great railway systems bears not only on traffic situations but may have an acute political significance not entirely localized to New England.

THE STATE RAILWAY COMMISSIONS.

The important analytical study of the state railway commissions that we print on another page shows that more commissioners are still recruited from the law than from any other vocation. So many of the problems of railway commissions have legal phases that probably every such body of three members should contain one good lawyer. Where there are five or more members, perhaps two should be lawyers. But on some commissions lawyers predominate, while on others there are none. Furthermore, many of the lawyer-commissioners owe their places less to their success in the practice of law than in the practice of politics; and to say that a man is a successful practitioner of politics is apt to be the same thing as to say that he dances on the railways on every stump.

The commissions contain a large number of manufacturers, merchants, farmers and other shippers, and a small sprinkling of former railway officers and employees. The main duty of the commissions is to arbitrate between shippers and railways. A shipper who becomes a railway commissioner is pretty sure to have a bias in favor of shippers, just as a railway man who becomes a commissioner is pretty sure to have a bias in favor of railways. A commission composed of one man having the railway's point of view, another having the shipper's point of view, and a third the impartial point of view of a jurist, probably would do approximate justice. But while the politician's and the shipper's points of view usually are represented, the judicial and the railway points of view often are neglected. With one exception, the railway men that are on the state commissions do not come from the traffic department, and therefore lack special knowledge for dealing with the most vital questions passed on by these bodies; those affecting rates. However upright the intentions of the state commissions, the previous occupations and affiliations of most of their members gives them a bias, conscious or unconscious, against the railways. Many are, in effect, packed courts.

Men having more or less special fitness for railway commissioners can be found among lawyers, among railway officers, among shippers who have given special study to traffic matters, among engineers. Some of the best equipped men in the country for the work of commissions could be found among the economists in the various universities who have specialized on railway economic problems, but university professors seldom have political influence, and the only prominent economist in the country on a commission is B. H. Meyer, Chairman of the Wisconsin board. If all the state commissions were appointive by the governors, their personnel probably would be improved in special fitness. To get and keep the right kind of talent higher salaries must be paid. The size of the salaries should, no doubt, be related to conditions in the particular states; but, allowing for conditions,

most of the present salaries of commissioners and the principal employees of the commissions are ridiculously low compared with the earnings of men of ability and experience in business and the professions.

Next to choosing experts to do difficult work, the best way is to keep at the work those chosen until experience makes them experts. The duties of railway commissions are complicated and technical. It is a labor of years for even a man of exceptional ability and industry to get a firm grasp of the principles of railway economics and rate making; and railway commissioners have to deal also with operating, engineering and other classes of problems. If they are to handle these hard subjects with a semblance of intelligence, and not to the detriment of all lines of business, their tenure of office must depend, like that of the judges of most of our courts, mainly on good behavior, and they must give all their time and energy to their official work. Experience has shown that men of ability who go on railway commissions without much knowledge of railway affairs may ripen into fair and expert regulating authorities if given ample time to study their duties and to master more or less of the details of the business of the railway and the shipper. The fairest and wisest members of a railway board are usually those who have been on the longest, regardless of the views they held when first elected or appointed. There are but few commissions that would not be much better commissions ten years from now if meantime their membership should be unchanged. But the term of office of state commissioners is only from two to six years; they spend a good deal of their time and energy seeking reappointment or re-election; and in spite of their efforts to hold their jobs the average time the present incumbents have served is less than the minimum required for a man of ordinary ability, but unfamiliar with railway affairs, to learn enough about rates or operation to do any important act that will not seem to the adept in railway matters a folly or a crime.

Instead of six years being the maximum term of office it should be the minimum. In many states the term of office of district judges is two or three times as long as that of railway commissioners. The judge always comes to the bench with the knowledge and experience of a lawyer, while the commissioner usually has to spend most of his first term getting acquainted with his duties; yet, while the wholesome practice of repeatedly re-electing judges is general, the unwholesome practice prevails widely of retiring railway commissioners before they have had time to get thoroughly acquainted with their work.

Inexperienced and inexpert railway commissions will harm shippers, railways and public. They have harmed them and are harming them now. No matter how much natural ability a man may have who sets himself up as a lawyer, he is pretty sure to lose his client's case if he has not some knowledge of law and judicial procedure. No matter how much natural ability a man may have who sets himself up as a surgeon, he is is pretty sure to kill his patient if he has not studied long and hard the use of medicine and the knife. And no matter how much natural ability men may have, no matter how good their intentions may be, no matter what their experience as lawyers, or merchants or manufacturers may have been, it is folly to think that, without previous thorough study of railway matters, they can step right from their law office or counting rooms to the office of a railway commission, and begin changing rates, regulating operation and supervising accounts without injustice to some of the interests affected and injury to all of them.

The secretary of one of the state commissions wrote, in sending information for the article on another page: "Our commission feels the need very greatly of larger salaries and an increased office force." No doubt many other commissions feel much the same way. If regulation by commissions is not to be futile in some states, unmitigatedly harmful in others and of value in but few, the policy of the public in constituting and dealing with most of the commissions will have to be radically changed.

NEW PUBLICATIONS.

Notes on Practical Mechanical Drawing. By Victor T. Wilson and Carlos L. McMaster. Second edition, revised and enlarged. East Lansing, Mich.: Wilson & McMaster. 100 pages; 6 in. by 9 in.; 66 illustrations. Cloth.

This, like many other books of a similar character, was originally, in part, the subject matter of a course of lectures prepared for engineering students. It differs from the usual drawing instructions in that the purely geometrical work is almost entirely omitted and it plunges at once into the handling of practical problems, in connection with which there are numerous suggestions that are of value not only to students but to many who are regularly employed as draftsmen. The chapter on lettering is especially good in that it tells and shows that, in this branch of work, it is effect and not accuracy of measurement that is desired, and that this effect can best be obtained by a slight distortion of dimensions from absolute agreement in height and width.

A large section is devoted to detailed instructions regarding minor but essential matters, such as the care and handling of instruments, paper, tracing cloth and the methods to be employed in the production of clean straight lines that are joined without any blurring or running of the ink.

Another feature that will be of value to a student is the method of representing the studies from which working drawings are to be made. This is done by means of a perspective illustration of the object with all the dimensions given. This shows the student how it looks and leaves him to his own ingenuity and the instructions that he has received to make the drawings required. For a book of its size it is remarkably minute in its directions, and these directions are such that they are applicable to a wide range of work. For example in the matter of inking in, after the drawing has been made, the student is told to consecutively ink all small circles and arcs of circles with the bow pen; ink larger circles and arcs with the compass; ink regular curves with curve ruler; ink all horizontal lines with the T-square; ink all vertical lines with triangle resting on T-square edge; ink all 45-deg., 30-deg. and 60-deg. lines in groups in order; ink other oblique lines not at the above angles; section lining; dimensioning; surface tinting and shading; lettering and descriptive matter. This is a sample of the method followed throughout by which a valuable students' manual has been produced in a limited number of pages.

Harper's How to Understand Electrical Work. By William H. Onken, Jr., and Joseph B. Baker. 359 pages; 5½ in. by 7½ in.; 172 illustrations. Cloth. Price, $1.75.

The authors and publishers of this book must have been hard pressed for a title that would describe it. Perhaps the one selected is as good as any, though it is far from ideal. The book is not intended for electricians, though he must be an expert indeed who cannot receive suggestions from it, but is written in order to give the layman an idea of the range of the application of electricity to the affairs of everyday life, and the extent to which this is done will be a surprise to most people.

There is no attempt whatever to deal with the principles of electric phenomena; the results only are considered. In short, the book is a rather complete catalogue of electric apparatus and machinery without, in any way, partaking of the trade features of an advertisement. Nor are there any instructions as to the methods of using the apparatus described. The only approach to technicality on the subject is to be found in the first chapter, where there is a generalized summary of the generator, the magnetic field and the electric units. The methods of distribution are described, but the reader needs a pretty good understanding of the

subject in order to read it understandingly. The second chapter is on light, and describes the various kinds of light in a way that is clear as far as it goes. For example in discussing the arc light, the character of the carbons, the way they act, the main source of the light, the high temperature and the fact that they are automatically adjusted are all touched upon without entering at all into the details of the mechanism involved. The same holds true of the chapters on electric heat, power and traction and electricity in the home, on the farm, in the hospital, aboard ship, in the mines, in the manufacture of steel and the transmission of intelligence. All this is done in a concise and popular form and in a manner that cannot fail to be full of suggestiveness to any reader and of interest to the layman whose ideas on the subject are hazy and vague. So that any one who reads it will have a pretty clear idea of what is being done in the electrical field.

The book closes with an excellent dictionary of technical terms of about 50 pages.

Contributed Papers.

PENNSYLVANIA RAIL SPECIFICATIONS.

The Pennsylvania has made public the specifications (revised under date of December 10, 1908), according to which the 135,500 tons of rails for 1909 delivery are to be rolled. The new specifications are a revision of those of February 4, 1908 (*Railroad Gazette*, April 17, 1908, p. 539). The changes consist of the addition of a second classification of the chemical composition of open hearth rails, and a number of modifications of the rules for tests and inspection. The manufacturers who will roll the new rails are: Illinois Steel Co. and Carnegie Steel Co., 62,500 tons; Cambria Steel Co., 25,000 tons; Pennsylvania Steel Co., 25,000 tons; Lackawanna Steel Co., 13,000 tons, and Bethlehem Steel Co., 10,000 tons. The new specifications in full are as follows:

Chemical Composition.

1. The steel of which the rails are rolled shall conform to the following limits in chemical composition:

	Bessemer			Open-hearth, Classification A			Open-hearth, Classification B		
	Lowr limit.	Dsird composition.	Upper limit.	Lowr limit.	Dsird composition.	Upper limit.	Lowr limit.	Dsird composition.	Upper limit.
	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.
Carbon	0.45	0.50	0.55	0.70	0.75	0.83	0.62	0.70	0.75
Manganese	0.80	1.00	1.20	....	....	0.80	....	....	0.80
Silicon	0.05	0.12	0.20	0.05	0.12	0.20	0.05	0.12	0.20
Phosphorus	...	....	0.10	....	....	0.03	....	....	0.04

Process of Manufacture.

2. Ingots shall be kept in a vertical position until ready to be rolled, or until the metal in the interior has had time to solidify.

3. No "bled" ingots shall be used.

("Bled ingot"—One from the center of which the liquid steel has been permitted to escape.)

4. There shall be sheared from the end of the bloom formed from the top of the ingot sufficient discard to insure sound rails.

(All metal from the top of the ingot, whether cut from bloom or rail, is the top discard.)

5. In reheating, care shall be taken to avoid burning the steel, and under no circumstances shall a "cinder heat" be used.

("Cinder heat"—One in which the scale on the sides of the ingot becomes fluid.)

6. The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a rail 33 ft. in length, of 6¼ in. for 85-lb. section, and 6½ in. for 100-lb. section. These allowances to be decreased at the rate of $^1/_{100}$ in. for each second of time elapsed between the rail leaving the finishing rolls and being sawed. The bars shall not be held for the purpose of reducing their temperature, nor shall any artificial means of cooling them be used between the leading and finishing passes, nor after they leave the finishing pass.

Mechanical Requirements.

7. The name of the maker, the weight and type of the rail, and the month and year of manufacture shall be rolled in raised letters and figures on the side of the web, and the number of the heat shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars. A letter shall be stamped on the web to indicate the portion of the ingot from which the rail was rolled.

8. The section of rail shall conform as accurately as possible to the templet furnished by the railway company. A variation in height of $^1/_{64}$ in. less or $\frac{1}{32}$ in. greater than the specified height, and $\frac{1}{16}$ in. in width of flange, will be permitted; but no variations shall be allowed in the dimensions affecting the fit of the splice bars.

9. The weight of the rails specified in the order shall be maintained as nearly as possible, after complying with the preceding paragraph. A variation of one-half of 1 per cent. from the calculated weight of section, as applied to an entire order, will be allowed.

10. The standard length of rails, at a temperature of 60 deg. Fahrenheit, shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying as follows: 30 ft., 27½ ft. and 25 ft.; and all No. 1 rails less than 33 ft. long shall be painted green on ends. A variation of ¼ in. in length from that specified will be allowed.

11. The rails must be free from injurious mechanical defects and flaws; shall be sawed square at the ends, a variation of not more than $\frac{1}{32}$ in. being allowed; and burrs shall be carefully removed.

12. The rails shall be smooth on the heads, straight in line and surface, and without any twists, waves or kinks; particular attention being given to having the ends without kinks or drop.

The hot straightening shall be carefully done, so that gagging under the cold presses will be reduced to a minimum. Any rail coming to the straightening presses showing any sharp kinks or greater camber than that indicated by a middle ordinate of 4 in. in 33 ft. will be at once marked as a No. 2 rail, and only accepted as such. The distance between the supports of rails in the straightening presses shall not be less than 42 in.

13. Circular holes for splice bars shall be drilled to conform accurately in every respect to the drawing and dimensions furnished by the railway company, and must be free from burrs.

Tests and Inspection.

14. One drop test shall be made on pieces of rail not less than 4 ft. and not more than 6 ft. long from each heat of steel. These test pieces shall be cut from the rail bar next to either end of the top rail, as selected by the inspector.

The test piece shall be placed head upwards on solid supports, 5 in. radius, 3 ft. between centers, and both 85-lb. and 100-lb. sections shall be subjected to an impact test from a weight of 2,000 lbs., falling 15 ft.

The deflection for No. 1 classification rails must not exceed that indicated by a middle ordinate of 2 in. in 3 ft. for 100-lb. section, and 2¼ in. for 85-lb. section.

The temperature of the test pieces shall be between 60 and 120 deg. Fahrenheit.

Test pieces shall be tested to destruction.

(*a*) If a test piece breaks without showing physical defects, two more pieces from the same heat shall be tested, and if neither of these pieces fails, all rails of the heat will be accepted as No. 1 or No. 2 classification, according as the deflection is less or more, respectively, than the prescribed limit. Separate records shall be kept of these tests.

If either of the second test pieces fails, all the rails from the heat will be rejected.

(*b*) If, however, the test piece broken under test "*a*" shows physical defect, the top rail from each ingot of that heat shall be rejected; and

(*c*) A second test shall then be made of a test piece selected by the inspector from the top end of any second rail of the same heat. If this second test piece breaks, the remainder of the rails of the heat shall also be rejected. If this second piece does not break, the remainder of the rails of the heat will be accepted as either No. 1 or No. 2 classifica-

tion, according as the deflection is less or more, respectively, than the prescribed limit.

(*d*) If the test pieces (test "a") do not break, but when nicked and tested to destruction show pipe, the top rail from each ingot will be accepted as "Special" rails, either as No. 1 or No. 2, and a separate record made of the test. The remainder of the rails of the heat will be accepted as either No. 1 or No. 2 classification, according as the deflection is less or more, respectively, than the prescribed limit.

15. The drop-testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in. The anvil block of the drop testing machine shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to, the anvil. The foundations for the anvil block shall be such as will meet the approval of the railway company.

16. Rails which, by reason of surface imperfections, are not classed as No. 1 rails, will be accepted as No. 2 rails; but No. 2 rails, which contain imperfections in such number or of such character as will, in the judgment of the inspector, render them unfit for recognized No. 2 uses, will not be accepted for shipment.

17. Rails improperly drilled, or straightened, or from which the burrs have not been properly removed, shall be rejected, but may be accepted after being properly finished.

18. No. 2 rails to the extent of 5 per cent. of the whole order will be received. All rails accepted as No. 2 rails must have the ends painted white, and all top rails accepted as "Special" rails under Paragraph 14 (*d*) must have the ends painted blue. All classes of rails must be kept separate from each other, and be shipped in separate cars.

19 Rails will be accepted and billed according to actual weights.

20. All rails must be loaded in the presence of the inspector.

21. For Bessemer steel, the makers shall furnish the inspectors with the carbon determination of each heat, and, also, two complete analyses which shall represent the average steel of each day's work, before the rails are shipped.

For open hearth steel, the makers shall furnish the inspectors with the complete chemical analyses for each melt.

These analyses shall be checked from time to time by the railway company's chemist, and, on request of the inspector, the makers shall furnish a portion of the test ingot for check analyses.

22. Inspectors representing the railway company shall have free entry to the works of the makers at all times when the contract is being filled, and shall have reasonable facilities afforded them by the makers to satisfy them that the finished material is furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture, prior to shipment.

THE BAKER-PILLIOD VALVE GEAR.

In the *Daily Railroad Age Gazette*, June 23, 1908, page 302, we printed a small diagram illustrating the Baker-Pilliod valve gear, and on account of its more extensive use at present we show in the cuts attached more complete drawings of this new locomotive valve gear. It has been in use during the past year on a 10-wheel engine of the Toledo, St. Louis & Western and recently on a Chicago & Alton Pacific locomotive, and is being applied to an Atlantic type on the Chicago & North Western.

The Chicago & Alton recently ordered from the American Locomotive Co. 20 consolidation, 5 Pacific. and 5 six-wheel switchers, all to be equipped with the Baker-Pilliod valve gear. The figured drawings show the gear as applied to the Toledo, St. Louis & Western engine. This engine has cylinders 19 in. x 24 in. and 69-in. drivers. The total weight of the valve gear, for both sides, as shown in Fig. 5, is 2,555 lbs., and the total weight of the moving parts on both sides is 1,028 lbs.

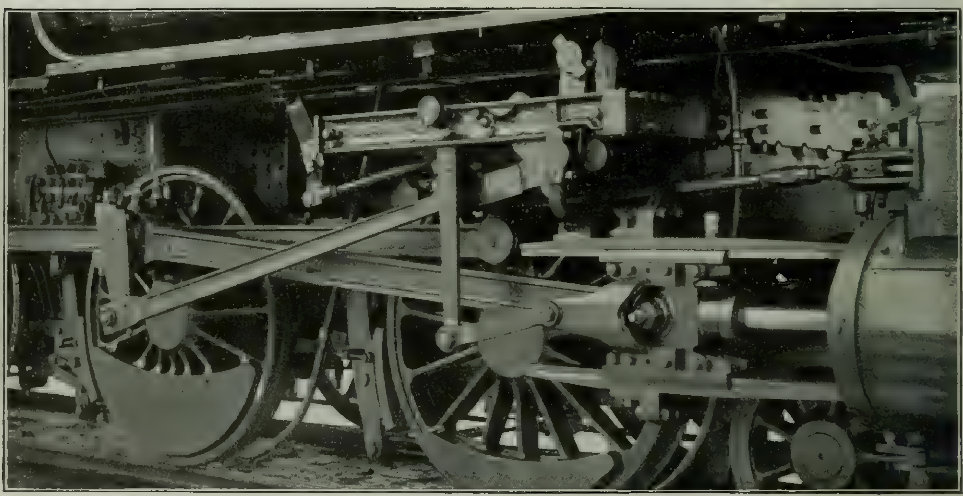


Fig. 1—Baker-Pilliod Valve Gear on Toledo, St. Louis & Western Engine 157.

The half-tone, Fig. 1, is a near view of this gear as originally applied to the same engine, and Fig. 2 shows the Chicago & Alton engine 602 as equipped with the Baker-Pilliod valve gear. This is one of the largest Pacific locomotives in the service of the Alton between Chicago and St. Louis.

This gear dispenses with the links and sliding block and is made up of levers, cranks and rods having plain pin connections and bearings. The cost of maintenance is smaller than that of the Stephenson or Walschaerts gear and the construction is such that there is little stress on the reverse lever.

It reduces back pressure and pre-admission, secures quick opening and closing, late release and late compression. The full port opening is obtained at full gear by 5 per cent. piston travel, thereby securing high mean effective pressure. The names of the different parts are indicated on the diagram, Fig. 4, and in the detail drawings, Fig. 5, and by reference to them and to the general plans, Fig. 3, the following explanation will be understood.

The motion of the valve is derived from two independent

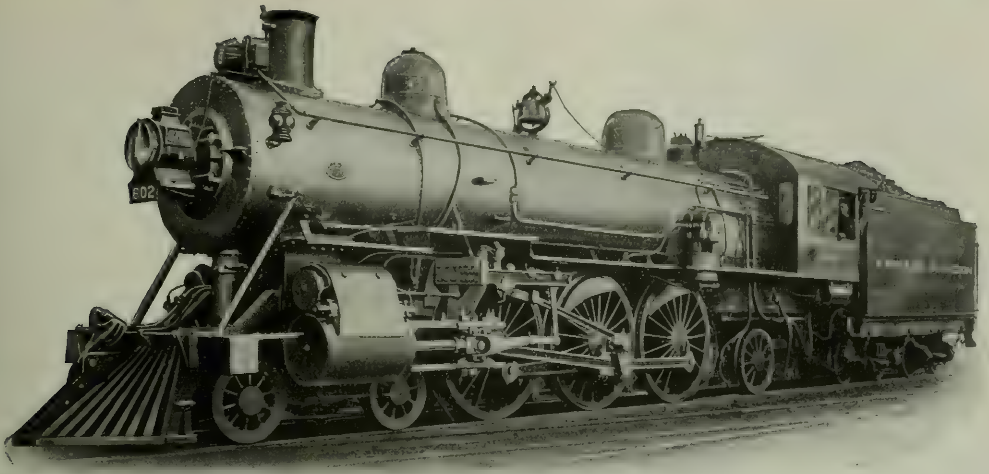


Fig. 2—Chicago & Alton Pacific Engine Equipped With the Baker-Pilliod Valve Gear.

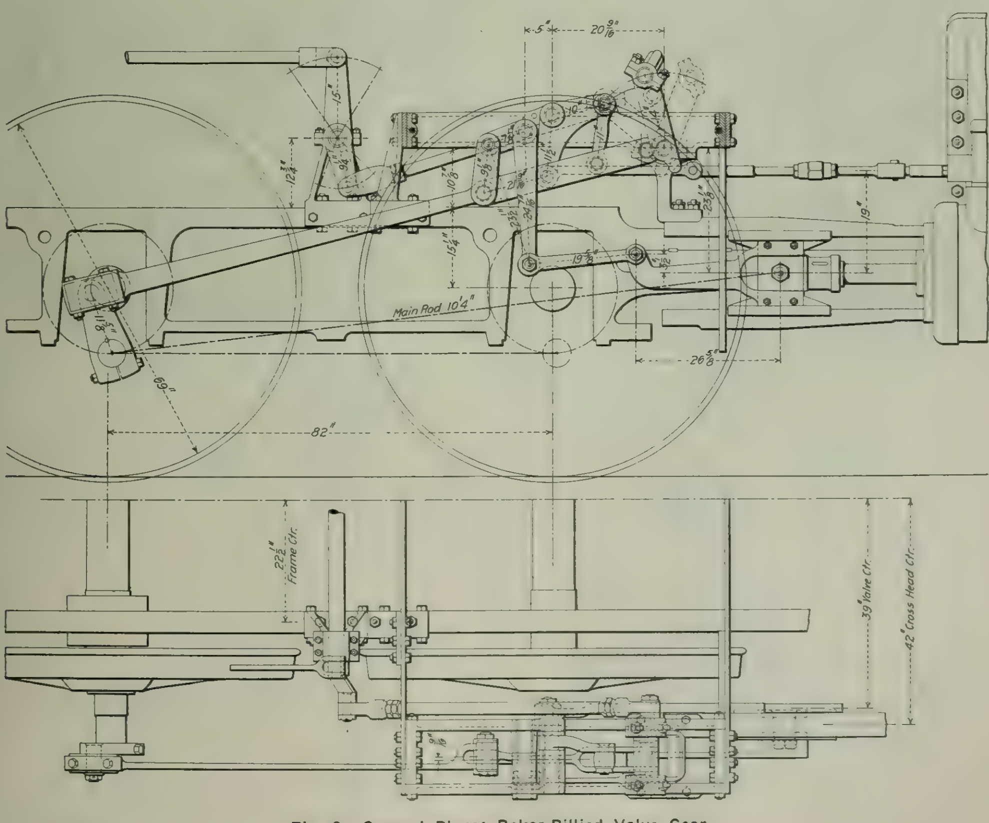


Fig. 3—General Plans; Baker-Pilliod Valve Gear.

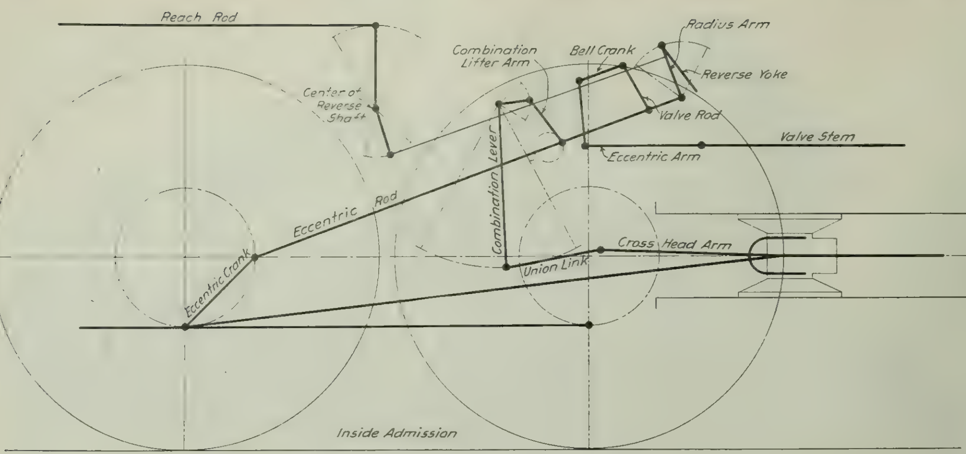


Fig. 4—Diagram Showing the Names of Parts.

sources, by connection to the crosshead and from an eccentric crank opposed at right angles to the main crank. A radius arm is suspended from a reversing yoke, which is movable to any desired angle to impart the required throw and cut-off. The lever action of the eccentric arm actuates the lap and lead and maintains a constant lead.

The crosshead connection imparts the motion of lap and lead when the combination lever and the reversing yoke are in central position. Therefore, in the mid-gear, with the reverse lever in the center notch, this will be practically all the motion imparted to the valve. By moving the reverse lever forward the angle of the reverse yoke is changed and brought into combination with the main imparting motion, towards the eccentric arm, whereby the opening motion of the valve is accelerated for the forward motion of the engine. For the backward movement, the reverse yoke is changed to an opposite position while the path of the valve rod remains the same as for the go-ahead movement. Following are some of the features of the Baker-Pilliod locomotive valve gear:

The throw of the eccentric crank is 6½ in. for any valve travel from 2½ in. to 6 in. and speed has therefore less destructive or deteriorating effects; the eccentric rod travels in parallel, therefore has no angles to dissipate; the reverse requires no change in reciprocating parts, no adjustment of

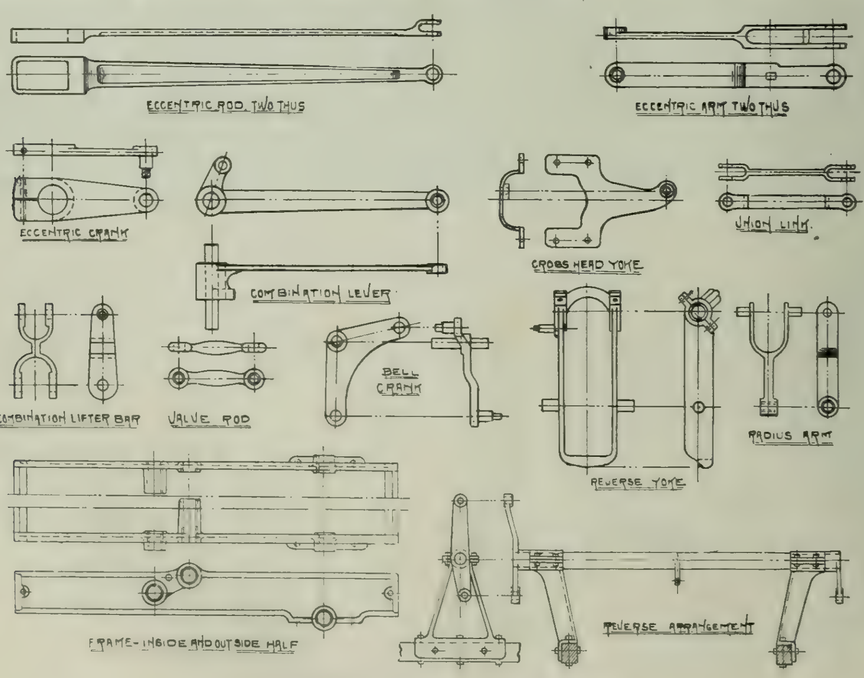


Fig. 5—Details of the Baker-Pilliod Valve Gear.

its bearings or alinement, merely a movement of its positive connected radius arm overcoming such objections in any type of valve gear that employs a link movement; no strain on the reverse lever, which can be unlatched and moved up or down under any conditions, with throttle open or closed; the effect of wear where it is greatest, is not direct upon the valve, as with the Walschaerts or Stephenson; equalization of the cut-off by special adjustment without changing gear parts; in equipping old locomotives no changes are required other than two new main crank pins; it produces a greater range of valve events than any other type of valve gear for the reason that its various positions are due to a positive and direct-connected movement.

It maintains uniform lead at all points of cut-off; a larger port opening at all points of cut-off; any cut-off from 75 per cent. to 85 per cent. can be had at full gear by lengthening quadrant so that lever can be moved down, thus dropping reverse yoke down lower, which increases the travel of the valve and increases cut-off at full stroke; late release, at quarter stroke, releases at 85 per cent., that is on 24-in. stroke with 6-in. cut-off, exhaust port opens when piston has traveled 20½ in., or 85 per cent. of the stroke, while with Walschaerts, 24-in. stroke, 6-in. cut-off, exhaust port opens when piston has traveled about 15 in., or about 65 per cent. of stroke; late and balanced compression, excessive compression in the short cut-off is entirely eliminated; reduced back pressure because of quick complete release; lower terminal pressures, which permits of larger exhaust nozzle; it is especially adapted to high speed, producing efficiency equal to valve gears employing two to four valves; it increases the pulling power of the engine because the movement of the valve produces a higher effective and more uniform pressure on the piston.

The valve events for the Baker-Pilliod gear as compared with the Walschaerts and Stephenson link gears are shown in the following tables:

TWENTY-SECOND ANNUAL REPORT OF INTERSTATE COMMERCE COMMISSION.*

The temporary financial depression resulted in the diminution of railway revenues considerably below the high point reached in 1907, and in several instances the necessity for placing railway properties in the hands of receivers was wholly or partially due to the serious and unexpected decrease in earnings. In view, however, of the widely circulated reports that the loss inflicted upon the railways was so severe as to warrant universal advantages in rates or reduction in wages, or both, it is noted that the gross earnings of all railways for 1908, although $164,464,941 less than gross earnings for 1907, were $98,875,470 in excess of the gross earnings for 1906 and $342,158,231 in excess of those of 1905, and that the net earnings for 1908, although $111,051,006 less than for 1907 and $59,349,138 less than for 1906, were $37,658,504 in excess for those of 1905. These figures indicate that whatever may have been the fact in individual cases, the railways of the country, as a whole, did not suffer so severely as in comparison with years of normal traffic and business conditions as may have generally been supposed. A continuing business depression could not be held to justify the maintenance of particular rates which are unreasonable in themselves or unduly discriminatory, since the right to equal treatment at reasonable rates does not depend upon the financial condition of the carrier.

Referring to the suit of E. H. Harriman against the Commission, in which Harriman was justified in refusing to answer certain questions propounded by the Commission, the Commission says:

The Union Pacific, in which Mr. Harriman was the dominant factor, had purchased of the Chicago & Alton and Illinois Central certain very large blocks of stock, and he was asked

*Transmitted to Congress January 11. Extracts from abstract issued by the Commission.

VALVE MOTION REPORTS.

T., St. L. & W. R.R. Engine 42. Taken May 20, 1908. Ten-wheel Baldwin Passenger Engine. Baker-Pilliod Valve Gear. 19-in. x 24-in. *Cylinders; 69-in. Drivers; Valve travel, 4¾-in.; Steam lap, 1 1/16-in.; Lead, constant, 3/16-in.*

	Cut-off position. Per cent.		Pre-admission Front.	Pre-admission Back.	Port opening Front.	Port opening Back.	Cut-off Front.	Cut-off Back.	Release Front.	Release Back.	Compression Front.	Compression Back.	Lead Front.	Lead Back.
Forward motion	..	Full gear	0	0	1¼	1¼	18¼	18¼	23	23	1	1	3/16	constant
	66		0	0	13/16	13/16	16	16	22¾	22¾	1¼	1¼	3/16	"
	50	Half stroke	0	0	5/8	5/8	12	12	22½	22½	1½	1½	3/16	"
	33		0	0	7/16	7/16	8	8	21½	21½	2½	2½	3/16	"
	25	Quarter stroke	0	0	5/16	5/16	6	6	20¾	20¾	3¼	3¼	3/16	"
	20		¼	¼	5/16—	5/16—	4¾	4¾	20¼	20¼	3¾	3¾	3/16	"
Backward motion	..	Full gear	0	0	1⅛	1¼	17¾	18½	23	23	1	1	3/16	constant
	66		0	0	13/16	1	16	16¾	22¾	22½	1¼	1½	3/16	"
	50	Half stroke	0	0	5/8	¾	12	12	22½	22½	1½	1½	3/16	"
	33		0	0	7/16	½	8	8⅜	21	21½	3	2½	3/16	"
	25	Quarter stroke	0	0	5/16	5/16	6	6¼	20¾	21¼	3¼	2¾	3/16	"
	20		¼	¼	5/16	5/16—	4¾	5	20¼	20¼	3¾	3¾	3/16	"

A. L. Co. Brooks. Feb. 27, 1907. Ten-wheel Passenger Engine. Walschaerts Motion; 21-in. x 26-in. *Cylinders;* 63 in. *Drivers; Valve travel,* 5¾ *in.; Steam lap,* 1-*in.; Lead, constant,* 3/16-*in.*

	Cut-off position. Per cent.		Pre-admission Front.	Pre-admission Back.	Port opening Front.	Port opening Back.	Cut-off Front.	Cut-off Back.	Release Front.	Release Back.	Compression Front.	Compression Back.	Lead Front.	Lead Back.
Forward motion	..	Full gear	0	0	1 13/16	1 15/16	22	22	24⅝	22⅝	1⅜	1⅜	3/16	constant
	66		1/16	1/16	13/16	7/8	17 3/16	17 3/16	22⅝	22⅝	3⅜	3⅜	3/16	"
	50	Half stroke	3/16	3/16	½	17/32	13	13	20⅞	20¾	5⅛	5¼	3/16	"
	33		7/16	⅜	5/16	11/32	8½	8½	18½	18 7/16	7½	7 9/16	3/16	"
	25	Quarter stroke	¾	⅝	¼ +	¼ -	6⅛	6⅛	16 11/16	16 11/16	9 5/16	9 5/16	3/16	"
	20		⅞	13/16	¼—	¼—	5 3/16	5 3/16	15⅞	15⅞	10⅛	10⅛	3/16	"
Backward motion	..	Full gear	0	0	1⅞	1⅞	22 3/16	22 3/16	24⅞	24⅝	1⅛	1⅜	3/16	constant
	66		...	...	...	...	...	...	...	...	...	...	...	...
	50	Half stroke	3/16	3/16	½	17/32	13	13	21⅛	20 15/16	4⅞	5 1/16	3/16	"
	33		7/16	⅜	5/16	5/16	8½	8½	18¾	18⅝	7¼	7⅜	3/16	"
	25	Quarter stroke	⅝	⅝	...	...	...	...	...	...	...	...	...	...
	20		...	...	¼ +	¼ +	6 5/16	6 5/16	17⅛	17⅛	8⅞	8⅞	3/16	"

A. L. Co. Brooks. January 7, 1906. Ten-wheel Freight Engine. Stephenson link: 19-in. x 26-in. *Cylinders;* 57 in. *Drivers; Valve travel,* 5 *in.; Steam lap,* ⅞-*in.; Link radius,* 38 *in.*

	Cut-off position. Per cent.		Pre-admission Front.	Pre-admission Back.	Port opening Front.	Port opening Back.	Cut-off Front.	Cut-off Back.	Release Front.	Release Back.	Compression Front.	Compression Back.	Lead Front.	Lead Back.
Forward motion	..	Full gear	0	0	1 11/16	1 11/16	23	23	25 3/16	25¼	1 1/16	¾	0	0
	66		⅛	⅛	¾	23/32	17 3/16	17 5/16	22⅞	23	3⅛	3	3/16	3/16
	50	Half stroke	7/16	7/16	½	15/32	12 7/16	12¾	20¾	20⅞	5¼	5⅛	¼	7/32
	33		15/16	⅞	11/32	5/16	8⅜	8½	18 9/16	18⅝	7 7/16	7⅜	¼	¼
	25	Quarter stroke	1⅜	1⅜	5/16	9/32	6 3/16	6 3/16	16 11/16	16 15/16	9 5/16	9 1/16	9/32	9/32
	20		1 11/16	1 13/16	19/64	17/64	5⅛	5⅛	15⅜	15⅜	10⅝	10⅝	9/32	9/32
Backward motion	..	Full gear	0	0	1⅝	1⅝	23¼	23 5/16	25¼	25 5/16	¾	11/16	0	0
	66		...	...	...	...	...	...	...	...	...	...	...	...
	50	Half stroke	7/16	7/16	½	½	12⅜	13 3/16	20⅞	21	5⅛	5	9/32	¼
	33		15/16	⅞	⅜	⅜	8¼	9 3/16	18 9/16	18 13/16	7 7/16	7 3/16	9/32	¼
	25	Quarter stroke	1⅜	1¼	5/16	5/16	6 5/16	7	16⅞	17¼	9⅛	8¾	9/32	9/32
	20		...	...	...	...	...	...	...	...	...	...	...	...

whether he had a personal interest in the stocks of these companies purchased by the Union Pacific. It appeared what the price paid by the Union Pacific was, and Mr. Harriman was also asked in one instance to state, in case he owned any of the stock thus purchased by the Union Pacific, what price he had himself paid for the same. These questions he declined to answer, and in this refusal he is now sustained by the court.

This commission in administering its power of investigation, which it has assumed to exercise in the past, has repeatedly held that the private dealings of individuals in private matters could not be inquired into. It has, however, ruled that it might inquire to the fullest extent into the operations of railways and the officers of railways. The Union Pacific Railroad is not a private enterprise—it is a public servant, discharging, as the agent of the government, a public function. Its stocks are worthless except as they derive value from the charges which are imposed upon the public for the rendering of this public service. In the opinion of this Commission, when Mr. Harriman assumes control of the Union Pacific Railroad he ceases to be a private individual to that extent and can no longer claim protection, which, as a private person engaged in a strictly private pursuit, he might insist upon. It was our opinion that he might properly be required to state whether as an individual he had sold to the Union Pacific, which he controlled, stocks belonging to himself, and if so, that he should further be required to state what profit he had individually made out of this transaction. If this gentleman is allowed to accumulate from the manipulation of these public agencies vast sums of money which must finally come from the body of the people, we think he is so far a trustee of the people that he cannot object to stating the manner in which these accumulations have been made.

The Supreme Court, however, is of the contrary opinion, and the Commission can of course only suggest to Congress that if there is to be any full investigation by the federal authorities of these financial dealings some action must be taken by the Congress.

During the year 5,194 complaints, formal and informal, have been filed with the Commission. The number of formal cases and investigations instituted during the year was 554, or an increase of 33½ per cent. over the previous year; 573 hearings and investigations have been held. More than two-thirds of the informal complaints have been satisfactorily adjusted through correspondence. The Commission is now practically abreast of its work and all complaints are disposed of with such delay only as is inherent in the nature of the case. An ordinary court decision involves only the rights of the parties to the case, whereas any important readjustment of rates applies not only to complainant but also to all shippers under those rates and the Commission has to consider the propable commercial effect of its orders upon communities, carriers, and shippers who are not represented.

Previous to July 1, 1908, only a single suit had been filed to set aside an order of the Commission, but since that date 16 suits have been begun for that purpose, and few orders of important significance have been permitted to go without contest. The questions presented by these various suits are fundamental. The constitutionality of the act itself is in issue. . . . In 6 of the 17 cases preliminary injunctions were granted, and refused in 6. It has been from the first well understood that the success of the present act as a regulating measure depended largely upon the facility with which temporary injunctions could be obtained. If a railway company, by mere allegation in its bill of complaint supported by *ex parte* affidavits, can overturn the result of days of patient investigation, no very satisfactory results can be expected. The railway loses nothing by these proceedings, since if they fail it can only be required to establish the rate and to pay to shippers the difference between the higher rate collected and the rate which is finally held to be reasonable. In point of fact it usually profits, because it can seldom be required to return more than a fraction of the excess charges collected.

Several of these cases are before the Supreme Court of the United States, and the rest will be at once taken there. The decisions of that court must go far toward determining the effectiveness of the present act; and, indeed, the possibility of any effective railway legislation under the present Constitution of the United States. The orders of the Commission which are at present the subject of such suits in court are summarized in the report.

The Commission has no authority to restrain an advance in rates. No proceeding can be begun before the Commission until the schedule establishing the rate has been filed. The order of the Commission when made can not take effect in less than thirty days. If the investigation is to be one in reality as well as in name, if all parties are to be heard as they should be, several weeks, and usually several months, must elapse before a conclusion resulting in an order can be reached. Meantime the rate established by the carrier remains in effect. No carrier should be required to reduce its rates without a fair hearing; neither, in the Commission's opinion, should the public be required to pay advanced rates without opportunity for a fair hearing. The Commission has recently held that a rule in Official Classification territory prohibited the consolidation at carload rates of shipments belonging to different individuals is unlawful. The carriers secured from the circuit court an injunction suspending the order of the Commission during the pendency of a suit to determine its lawfulness. For the first time transcontinental lines have now filed tariffs establishing the same rule, effective January 1. There is every reason why such a rule should not take effect until the Supreme Court of the United States has passed upon the lawfulness of the regulation. It ought not, in the opinion of the Commission, to be left to the grace of the carriers themselves to say whether such postponement shall or shall not be granted.

In several cases courts have granted injunctions against changes in rates pending proceedings before this Commission, but such injunctions have run only in favor of complainants, with the result that at the present time these carriers have established and are collecting one rate under their tariffs, and, under an order of court, are collecting another rate from parties to the proceeding. The jurisdiction of the courts to grant such injunctions is vigorously combated by the railways, and very difficult questions arise where the several carriers making up the through line are in the jurisdiction of different courts. As a practical matter, in such proceedings the small shipper who can not file bond to secure an injunction can not and does not continue in business under the higher rate. The Commission renews its recommendation of one year ago that it be given authority to restrain the advance of a rate or the change of a railway regulation or practice, pending a proceeding before it.

The effort to reach definiteness, clearness, and simplicity and absence of conflicts and contradictions in the rate schedules of carriers has been vigorously and persistently pursued, with the result that material and substantial progress has been made.

In April, 1908, a regulation was promulgated by the Commission requiring that tariffs applying on traffic exported to or imported from foreign countries not adjacent to the United States must show the rates, fares, and charges of the inland carriers to the port and from the port in the United States, and, for good cause shown, carriers were given permission to make changes in their rates applicable to such import and export traffic to and from our Pacific coast ports upon notice of three days of reduction in rates and of ten days as to advances in rates.

Following this order the transcontinental lines withdrew (November 1) all their through import and export rates via

the Pacific ports and applied to the inland carriage of export and import traffic to those ports the domestic rates applicable to and from the ports proper. The Canadian Pacific, in connection with a large number of carriers in the United States (east of the Mississippi river) published and filed proportional class and commodity inland rates applicable to Vancouver, British Columbia, on traffic destined to Oriental points, the Philippines, Australia, and New Zealand, which proportional rates are much lower than the domestic rates applying on traffic destined to Vancouver proper. No opinion was expressed by the Commission that the inland portion of export and import rates might not reasonably and properly be less than the domestic rates to the ports. The order simply required the carriers to conform to the plain requirements of the law and to publish in the manner prescribed by law whatever rates they saw fit to establish on this traffic.

During the year the Commission has established general regulations covering the publication of tariffs of express companies similar, in so far as possible, to those already established in respect of railway tariffs.

Accidents.—In the year ending June 30, 1908, there was a remarkable falling off in the number of casualties to both passengers and employees. . . . Attention is called to the necessity of legislation authorizing an investigation, under direction of the Commission, of train accidents, for the purpose of obtaining light on the question of preventive measures for the future.

By the act of May 30, 1908, it is made unlawful to use any locomotive in interstate traffic not equipped with an ash pan which can be emptied without the necessity of any employee going under such locomotive, on and after the 1st day of January, 1910. Plans of inventions have been presented and have been referred to the block signal and train control board for examination and report.

Safety Appliances.—With the possible exception of power brakes the condition of safety appliances is steadily improving. It is not clearly understood why the maintenance of the brakes does not keep pace with progress of improvement of other details of equipment, but . . . cars not exceeding 25 per cent. of the total in the train may have their brake equipment "cut out" of the connection, and no liability ensues to the carrier if the remaining brakes are sufficient to control the speed of the train. There is an imperative need for regulation governing cars that are equipped with both hand and power brakes, operating in opposition to each other.

The leading court decisions of the year bearing upon the safety-appliance law are discussed at length, and the conclusion is drawn that the law is now well established. During the present year there have been transmitted to the various United States attorneys 276 cases, involving 1,117 distinct violations of the safety-appliance law. The number of violations reported during the past twelve months is only about half of the number reported during the preceding year. The Commission desires to see automatic hose couplings required by law; also uniformity in location of ladders, sill steps, and grab irons.

The Hours of Service Law.—This law became effective March 4, 1908. In order to enforce the provisions of this act the Commission adopted the method of requiring railways under oath to report every instance in which their employees had been on duty for longer periods than those prescribed by the statutes. Eleven carriers have instituted proceedings to restrain this effort of the Commission to enforce the law, and the pending suits have not yet been decided.

A number of clauses of the law are ambiguous or insufficient and the Commission asks Congress to perfect it. Nearly all of the carriers, however, have adapted their practice to the interpretations of the Commission.

Hours-of-service laws of Missouri, Wisconsin and Arkansas have been held unconstitutional (in the first two by the highest court of the state).

Block Signal and Train Control Board.—The annual report of this board to the Commission will appear as an appendix to the Commission's report. [This is given on another page.—Editor.] This board has endorsed the Commission's recommendation that legislation be enacted looking to the compulsory use of the block system. The work of the board thus far may be summarized as principally (1) the giving of authoritative opinions on a large number of plans and devices which were supposed by their inventors to have decided merit, but which in fact were, for the most part, substantially without value; (2) the systematic investigation or supervision (or the beginning of such supervision) of a very few inventions, now about to be tried, which promise to demonstrate the reliability of certain classes of automatic train-stopping apparatus; and (3) the beginning of necessary inquiries concerning the present practices of the railways in block signaling. Under an order issued by the Commission the board is gathering statistics showing the mileage of railway operated by the block system as of January 1, 1909.

Uniform Bills of Lading.—During the current year, as a result of proceedings which have been pending before the Commission since 1904, the Commission recommended the adoption by all carriers in the United States of a bill of lading which had been agreed upon by a joint committee of carriers and shippers, and substantially all of the leading carriers in the United States have already adopted the new bill. This bill is concededly a great improvement upon the bills heretofore in general use and may confidently be expected to remove much of the confusion which has existed and measurably to avoid in the future the irregularities and injustices which have heretofore occurred. * * *

Transportation of Explosives.—In conformity with an act approved May 30, 1908, the Commission has approved regulations for the safe transportation of explosives, binding upon all common carriers engaged in interstate commerce which transport explosives by land. It is believed that the regulations are absolutely necessary to the protection of other property and the traveling public. Such modification of the regulations as may appear necessary will be made from time to time in accordance with the terms of the act. The Commission submits for the consideration of the Congress, without recommendation, the propriety of amending the act of May 30, 1908, so as to authorize the Commission to make binding regulations for the safe transportation of inflammable articles and acids similar to those already prescribed in respect of explosives.

Court Decisions.—The decisions rendered in the United States courts during the year relating to the application of the act to regulate commerce and supplementary acts are briefly stated.

Prosecutions.—The enforcement of the act by means of criminal prosecutions still continues to be necessary. This work has gone forward satisfactorily during the past year. Since December 1, 1906, 46 indictments for giving or receiving rebates have been returned in the various judicial districts of the country. In the same period 41 prosecutions were concluded, 24 by convictions or pleas of guilty in the trial courts, 7 by convictions upon appeal, 3 by acquittal, 1 by quashing of an indictment by the Court of Appeals after conviction in the trial court, and 6 by entry of nolle prosequi before trial. The Division of Prosecutions has also investigated many practices of carriers during the year, which have been held not to be of sufficient gravity for prosecutions, but which being of doubtful propriety have been required to be corrected or discontinued.

Arrangements by which carriers farm out a portion of their duties to shippers generally result in discrimination. Under this heading may be placed the evils arising from private ownership of freight cars, the allowance paid by the carriers being frequently excessive. Elevators operated by shippers and furnishing a service covered by railway tariffs usually

result in more or less complete monopoly of the grain business passing through them. Lighterage arrangements when made between carriers and shippers are also means of discrimination. The ownership of cotton compresses by shippers and the treatment of their services as a railway duty also works discrimination in the handling of cotton. Other like instances might be given. It is sufficient to say, however, that any use by carriers of instrumentalities owned by shippers in the performance of their obligations to other shippers usually results to the unlawful advantage of the owners of such instrumentalities.

The decisions of the courts during the year just passed have, with two or three exceptions, served to strengthen the law against discriminations.

The ruling of the Circuit Court of Appeals of the third circuit that the commodities clause of the act is unconstitutional has served to embarrass and delay the fight against discrimination. A considerable number of carriers are owners of and dealers in commodities carried by them. Such carriers succeed in practically every case in monopolizing or at least dominating the markets in which they deal. * * *

Accounting.—A uniform system of operating accounts has been promulgated for express companies and electric railways, so far as they come under the jurisdiction of the Commission. The financial accounts for all agencies of transportation have been brought to a point at which general questions of public policy, as well as technical questions of accounting, claim consideration. In the matter of annual reports, also, many changes have been made during the past year. Such reports are now required from express companies, from electric railways, and from sleeping-car companies. The forms for reports of steam railways have been arranged so as to require a less extended report from the small railways than from the large railways. A special form of report has been adopted for switching and terminal companies, as well as for lessor companies which maintain financial accounts only.

The organization of the Board of Examiners, by means of which it is expected that the system of uniform accounts prescribed by the Commission will be made effective, has claimed constant attention during the year. The plan of organization in its general outlines has been well defined, as well as the purpose of both the general and special examinations and the rules and methods for conducting them. It is believed that enough competent men can be secured, though there has been difficulty; that provision for a physical valuation of railway property is again recommended. Some adequate method of federal control over railway capitalization is also deemed necessary.

Statistics.—The report has in past years included a statement of the revenues and expenses of railways for the fiscal year ending June 30 immediately preceding its date of issue; but this year a compilation is given based on monthly reports received for the twelve months ending June 30, 1908. This report shows that on a basis of average mileage operated during the year of 226,121 miles, the freight revenue was $1,665,119,842, passenger revenue $566,905,109, all other revenue from transportation $167,873,795, revenue from operations other than transportation $24,687,932, making total operating revenues $2,424,640,637, or $10,722 per mile of line. The total operating expenses were $1,695,101,879, or $7,496 per mile of line, leaving the net operating revenue $729,538,758, or $3,226 per mile of line. Deducting from the net operating revenue taxes of $83,860,516, the net operating income for the year was $645,678,242 for the entire mileage, or $2,855 per mile of line. The ratio of operating expenses to earnings as shown by this report was 69.91 per cent.

SUMMARY OF RECOMMENDATIONS.

That the Commission be given authority, in its discretion, to restrain the advance of a rate or the change of a rule, regulation, or practice pending proceedings before it to determine the reasonableness of the advance or change.

That the act be so amended as to remedy the defect disclosed by the recent decision of the Supreme Court in the Harriman case.

That appropriate legislation be enacted in respect of the misquotation of rates.

That the Commission's authority in respect of enforcement of the hours of service law be made more definite.

That legislation be enacted looking to the compulsory use of the block-signal system.

That the twentieth section of the act be so far modified as to authorize the Commission to issue orders specifying the records and accounts of carriers which may be destroyed, and prescribing the length of time for which such records and accounts shall be preserved.

That provision be made for a physical valuation of railway property and for the supervision and control of railway capitalization.

LARGEST STOCKHOLDERS IN LEADING RAILWAYS.

The *Wall Street Journal* in a recent issue prints a compilation of some of the principal stock interests in leading railways. The following abstract has been made from this compilation:

New York Central.

Holders.	Par value.
W. K. Vanderbilt	$10,000,000
D. O. Mills.	1,260,000
J. J. Astor	2,800,000
Alice Vanderbilt and others	2,470,000
J. O. Hughes, New York	1,810,000
F. W. Vanderbilt	1,500,000
Harriman & Co.	1,475,000
J. W. Davis & Co.	1,300,000
General Education Board of New York	1,875,000
C. W. Harkness	2,880,000

C. W. Harkness is a "Standard Oil" man. He is wealthy, and his stock probably represents his own holdings.

Two names conspicuous for their absence in the above list are E. H. Harriman and the Union Pacific. The latter owns $14,285,000 directly, while associates of the road and its management are known to be very large holders; but the Union Pacific's name cannot be found here.

Union Pacific's stock probably stands in the name of fifty or seventy-five individuals who are the registered holders, and who have probably transferred it in blank to that company. William Rockefeller's name is absent, so is James Stillman's.

When the late Cornelius Vanderbilt (brother of the present W. K. Vanderbilt) died, his stock holdings in the New York Central had a par value of $2,835,000; but in addition, he had $4,046,800 par value of New York & Harlem stock 10 per cent., guaranteed by New York Central and $2,000,000 par value of the Beech Creek Railroad—a Central affiliation.

Of course, Cornelius Vanderbilt, at the time of his death, did not represent the holdings of the entire Vanderbilt family. He was just one of them, but his holdings even then, were very large.

Northern Pacific.

Holders.	Par value.
John S. Kennedy	$10,000,000
James J. Hill.	8,000,000
George F. Baker	3,000,000
Clark, Dodge & Co.	3,100,000
Moore & Schley	2,200,000
James Estate	3,280,000
Lord Strathcona	4,000,000
Margaret Howard	1,990,000

Pennsylvania Railroad.

Henry C. Frick	$4,320,000
Direction der Disconts Gesellschaft (Berlin).	2,175,000
Home Insurance Company of New York	1,000,000
Henry Phipps	980,000
Adams Express Company.	2,770,000
Mutual Life Insurance Co. of New York	3,000,000
William Waldorf Astor, New York	1,100,000
Cassatt Estate	750,000

Erie.

	Par value	
Holders.	Common.	Preferred.
W. B. Horn	$14,500,000	....
Gordon Brown	6,000,000	....
Haselton Power Ld. Co., London.	1,315,000	$2,448,000
Leon Bros., London	3,200,000	488,000
Raphael Sons, London	3,600,000	118,000
J. W. Davis & Co., New York	1,700,000	1,200,000
Huggins & Clark, London	3,821,000	1,555,000

There is nothing very striking about the list of Erie stock-

holders. The first two blocks of the above, representing $20,000,000 of the common stock was held in the office of Morgan & Co. It probably represents Mr. Morgan's holdings and those of Norman B. Ream, and others. As usual, the name of E. H. Harriman does not appear, although he is known to be a very large stockholder.

The list of St. Paul stockholders is very interesting:

St. Paul.

Holders.	Par value Common.	Par value Preferred.
C. W. Harkness	$650,000	$1,020,000
Mutual Life Ins. Co. of New York	....	1,500,000
S. B. Chapin & Co.	2,100,000	....
William Rockefeller	1,000,000	950,000
Jesup & Lamont	3,200,000	....
Thomas Moffet	2,130,000	50,000
J. W. Davis & Co.	2,075,000	....
J. M. Amory & Son	....	1,400,000

The most of these names represent holdings of men identified with the Standard Oil Co. Jesup & Lamont are popularly called brokers for men associated with the Standard Oil Co. Other names may be easily recognized.

The Union Pacific, that is to say the Oregon Short Line, does not appear in this, nor does E. H. Harriman, although Union Pacific is known to hold about $6,500,000 of St. Paul common stock and common and preferred stock subscription certificates.

Chicago & North Western.

Holders.	Par value Common.	Par value Preferred.
H. C. Frick	$3,700,000	$600,000
W. K. Vanderbilt	1,250,000	2,450,000
Frank Work	3,491,800	100,000
F. W. Vanderbilt	725,000	1,000,000
Ames Estate, Boston	1,270,000	15,800
Trustees Estate of C. Vanderbilt	357,800	907,000
J. W. Davis & Co.	2,080,000	30,000
American Express Company	1,470,000	300,000
Field Estate	1,275,000	200,000
Executors of will C. Vanderbilt	600,000	617,800

One of the peculiar things about this list is that neither E. H. Harriman nor his Union Pacific can be found here, and yet the Union Pacific alone owns $3,215,000 of the common stock.

Frank Work, the second largest stockholder, is a New York capitalist.

It is interesting to recall that when the late Cornelius Vanderbilt died he held 1,250,000 of Northwestern preferred.

Louisville & Nashville.

Holders.	Par value.
Atlantic Coast Line	$30,600,000
Joseph Pulitzer	500,000
Aetna Life of Hartford	290,000
Huggins & Clark, London	700,000
Leon Bros., London	870,000
R. L. Day & Co.	320,000
Darr, Luke & Moore	300,000
J. B. Dodd	250,000
Japhet & Co., London	370,000

One of the interesting things here is: Where stands Mrs. Hetty Green? She used to be the largest individual holder of L. & N.

New York, New Haven & Hartford.

Holders.	Par value.
Mutual Life Ins. Co. of New York	$3,564,000
L. C. Ledyard	2,054,200
C. Pratt & Co., New York	1,046,300
Pennsylvania Railroad	990,000
J. P. Morgan	507,000
American Express Company	2,349,300
C. M. Pratt	669,000
W. W. Astor	505,100

Baltimore & Ohio.

Holders.	Par value Common.	Par value Preferred.
Pennsylvania Railroad	$5,725,000	$14,273,600
Robert Garrett & Sons, Baltimore	2,370,000	....
Swiss Bankverein	3,536,200	....
C. Wallace	2,500,000	....
L. E. Stropp	2,500,000	....
Deutsche Bank, Berlin	18,683,700	....
E. S. Steinam	2,962,500	....
S. Hayman	2,719,500	....
Pennsylvania Company	13,421,200	5,000,000
O. Schwabe	2,500,000	....

The Union Pacific, or rather the Oregon Short Line, which owns $39,540,600 of the Baltimore & Ohio does not appear among this list of stockholders, although there are several names which are identified with the Union Pacific, whose holdings total up to only $12,000,000. Evidently, the Union Pacific occupies, superficially, a humble position in the stock lists of some of these roads, in which it is known to be a very large stockholder.

Great Northern.

Holders.	Par value.
J. S. Kennedy, New York	$7,000,000
James Estate	3,225,000
Lord Strathcona	2,880,000
Clark, Dodge & Co.	2,350,000
James J. Hill	2,000,000
George F. Baker	2,800,000
Edward Tuck	2,400,000
Margaret C. Howard, London	1,700,000

Within eighteen months or two years, Mr. Hill has stated on the witness stand that he owned about 7 to 7½ per cent. of the Great Northern stock, so that his holdings then would have been $10,000,000 or more. Subscription certificates to new stock not having been counted in the above. There is reason to say that Mr. Hill's holdings are now not far from $10,000,000.

Chesapeake & Ohio.

Holders	Par value.
E. V. W. Rossiter	$5,000,000
L. E. Stropp, New York	1,090,000
Algemeene Tr. Mattschappij, Amsterdam	2,416,000
S. Hayman	3,460,000
W. K. Vanderbilt (trustee)	2,000,000

THE BRICK ARCH.*

BY GEORGE WAGSTAFF.

In studying this subject from all its various standpoints, weighing the advantages and disadvantages and the opinions pro and con, of those who have used brick arches, I cannot help but express myself strongly in my belief, that, in view of the recent great improvement in boiler care and maintenance, in addition to the successful treatment of water, and the successful improvements in hot water boiler-washing plant, etc., the disadvantages claimed for the brick arch have almost been practically overcome.

From the earliest history of the arch there does not seem to have been any question about its advantages and its value in locomotive operation, and therefore, with the wiping out of the disadvantages, the non-use of the brick arch means the practical throwing away of a large amount of valuable power. The arch is recognized as the most efficient device for reducing the quantity of sparks thrown from the stack, and, on this account, it becomes directly valuable as a fuel saver. It increases the length of the flame way, and the finer fuel, when lifted from the grate, is baffled by the arch, and is consumed instead of passing directly to the tubes and out of the stack in the form of sparks. It causes more equal distribution of the draft over the grate and thus improves the furnace action. Its function in the firebox being that of a mixer and baffle, bringing about a more complete mingling of the gases, and, thereby aiding combustion resulting in the higher temperature, and the production of a smaller proportion of carbonic oxide. These claims have been fully sustained by the locomotive tests conducted by the Pennsylvania Railroad at St. Louis in 1904.

The two consolidation locomotives there tested were almost identical in grate area and heating surface, but one of them was equipped with the brick arch and the other was not. The draft riggings in the smokeboxes were not alike, one being arranged to clear the box of cinders, while the other allowed them to remain in the front end. However, the effect of the brick arch on sparks and cinders is shown in the total amount drawn through the tubes, which is given as an average (for the four tests at 160 revolutions) of 380 lbs. for the boiler with the brick arch and 505 lbs. for the one without.

The temperature of the firebox as an average of the above four tests was 2,202 deg. F. for the brick arch, and 1,982 deg. F. for the tests without it. The maximum temperature was 2,312

* From a paper presented before the Central Railway Club, Nov. 13.

deg. F. with the brick arch, and 2,112 deg. F. without it. The firebox with lowest temperature had the highest amount of CO due to imperfect combustion. The maximum percentage of loss of heat in coal fired due to imperfect combustion of CO was only 2.09 for the brick arch and 16.33 per cent. for the firebox without it.

The above advantages of better combustion and consequent fuel economy are only a part of the advantages to be obtained from the use of the brick arch, and in my mind, in view of the problem of the present day operation, they are the smallest. We know that the first requirements made of the motive power department, by the operating department, are to furnish efficient power in order to move the traffic; next, to move it expeditiously, and, last, as economically as possible.

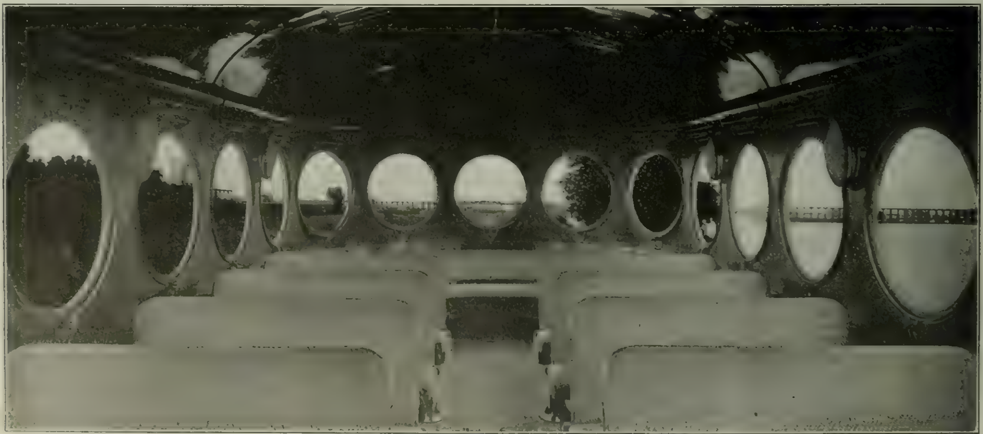
We know that the economy frequently is, and must be, lost sight of when large movements of traffic confront our railways, and it is in this situation that I believe the brick arch assumes its largest value to the railway. We have frequently seen instances where a poor steaming engine or engines have seriously impeded the movement of traffic, resulting in congested terminals, delayed passenger trains and a large amount of overtime for the employees in all classes of service. These are losses that can hardly be measured in dollars and cents, as the ability of a road to pay dividends is directly dependent upon its ability to handle its traffic with the minimum amount of delay.

It may seem to some that I place an exaggerated importance upon the brick arch in its relation to the modern locomotive boiler, but I cannot see, in view of the present demands made upon the motive power department, how any device that increases the efficiency of the locomotive boiler from 5 to 10 per cent. can be allowed to pass with any less consideration.

THE McKEEN MOTOR CARS.

The Union Pacific began building gasolene motor cars in 1905. Motor car No. 1 and later designs have been described in the *Railroad Gazette* and *The Railway Age*, and the results of their performance given. These cars were designed particularly to be run in conjunction with the regular service, operating jointly with passenger trains through interurban districts, and to displace low-revenue train service on branch lines. A standard motor car, with a trailer for baggage, mail and express, makes an economical substitute for the usual three-car branch line train and locomotive. Nine such motor car services have been established on the Union Pacific, averaging over 6,000 miles each a month. Up to date 35 of

McKeen Combination Passenger and Baggage Motor Car.

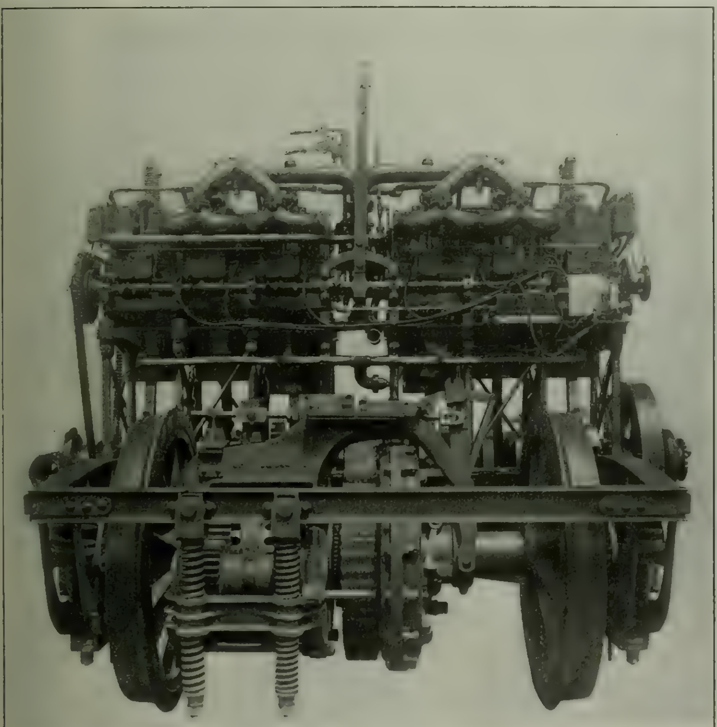


Interior of Passenger Compartment.

these motor cars have been built and 20 more are under construction. All cars thus far turned out are in daily revenue service.

The growing demand for these cars necessitated the formation of a company for their manufacture, and the McKeen Motor Car Company was incorporated in July, 1908. (See *Railroad Age Gazette*, July 17, 1908, page 551.) W. R. McKeen, Jr., the inventor of the car, and Superintendent of Motive Power and Machinery of the Union Pacific, when the company was formed, resigned his position to become President and General Manager of the new concern. Although these cars have previously been described in these columns, it may be well to give again briefly their principal characteristics in connection with later developments.

The circular or port-hole windows, which are a peculiar feature, and which give an almost unobstructed panoramic view from the inside, enable the sides of the car to be used as a deep girder in the design of the framing, with over 8 ft. between top and bottom chord. In addition to permitting this great increase in the strength of the car side, these windows are said to be greatly appreciated by passengers on account of their tightness when closed. Even the fine dust of the western prairies is excluded, as well as winds and rain, by the rubber sealing gaskets. The tapered front end, by decreasing wind resistance and facilitating acceleration, becomes an economical feature, lessening the consumption of gasolene per mile run. The side door entrance is another peculiarity. The roof is lower than that of the ordinary passenger car and the width is greater. The special ventilating system affords a change of air every four minutes, if desired. The cars are built of steel.



Front Truck, With Engine and Transmission Gear; McKeen Motor Car.

To run them in conjunction with regular service trains, passenger and freight, requires that they be thoroughly reliable as to performance, and able to withstand the rough usage incident to such service. The engine, therefore, is provided with large wearing surfaces and heavy parts. It is not a constant-speed engine, but is flexible, so that the car speed can be controlled by the engine speed. The engine is rated at 200 h.p. at 350 r.p.m. On brake tests it has developed as high as 250 h.p. The power is transmitted from the six 10-in. x 12-in. cylinders to the main driving axle by a Morse silent chain and a friction clutch, giving a power transmission efficiency of 96 per cent. The engine is reversible, and can drive the car at 60 miles an hour. In fact, speeds of 70 and 75 m.p.h. have been attained on level track. The vibration and noise from the engine have been so minimized as to be imperceptible to passengers. The exhaust is muffled, and the burnt gases escape at the rear. The car is braked on all eight wheels by the direct system. The air pump is driven from the crank shaft and maintains 100 to 150 lbs. pressure in three reservoirs. A small auxiliary reservoir in the engine room is for emergency use. The engine is started with compressed air by means of a sliding cam shaft, three of the cylinders being converted momentarily into a two-cycle air engine.

Mr. McKeen has lately developed some novel features in the design of the carburetor, giving greatly improved flexibility in the control of the engine, and increasing the power developed at the lower speeds. He expects that further study and development of the carburetor will produce even greater economies.

The operating costs are given as varying between 14 and 18 cents per car mile, depending upon local conditions. Single cars can be run on level grades with a fuel consumption of about 1/3 gal. per mile.

The latest model of this company is a 70-ft. car carrying also baggage, mail and express. Where mixed service is required every trip, this style is considered the most economical, but where this mixed service is irregular the motor car and trailer plan is better. The accompanying photographs show a combination passenger and baggage car.

The company is prepared to turn out the following equipment:

55-Ft. Passenger Motor Car. Seating capacity, 75 persons; with or without smoking compartment.

55-Ft. Combination Passenger and Baggage Motor Car. Seating capacity, 56; standard size of baggage compartment, 7 ft. 6 in., but made any size desired.

70-Ft. Combination Passenger, Baggage and Mail Motor Car. Seating capacity, 69. Eliminating baggage and mail compartments increases seating capacity to 105.

55-Ft. Freight Motor Car.

31-Ft. Baggage, Mail and Express Trailers. They have separate compartments for these services.

Switching Locomotives for industrial plants.

Gasolene Engines.

Air Compressors.

The present output of the shops at Omaha, Neb., is four cars a month. It is expected to double this in the near future.

HEAVY FOUR-SPINDLE MILLING MACHINE.

The accompanying illustrations show an unusually large milling machine recently built for the Pennsylvania Railroad by the Newton Machine Tool Works, Inc., Philadelphia, Pa., for use at the Altoona shops.

This machine will mill 16 ft., having a table which is 42 in. wide and 18 ft. long. The maximum distance between the end of the horizontal spindles is 60 in., and the minimum distance is 36 in. The maximum distance between the end of the horizontal spindles and the top of the work table is 66 in. The two side heads and the right-hand head are of the same general design. The spindles are 5⅜ in. in diameter, with a brass bushed bearing 17 in. long, and double taper bearings 8¾ in. long in the mouth of the adjusting sleeve. The ends of the spindles are provided with an external thread to which the face cutters may be fitted or a No. 5 taper to which the end mills may be fitted. The retaining bolt is fitted into a hole which runs through the spindle. There is also a broad face lock in the end of the spindle to correspond with the broad face cutters used.

The drive is through steep lead sleeve heavy bronze worm wheels about 26½ in. in diameter, and a hardened steel worm having roller thrust bearings. Both of these are in-

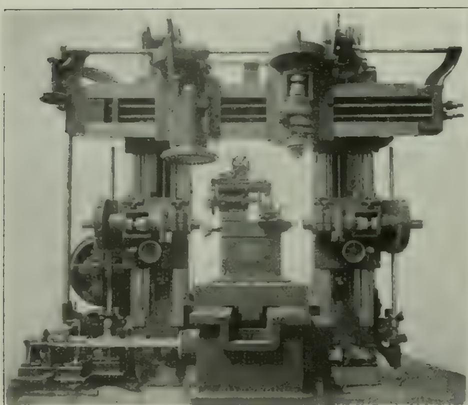


Fig. 1—Newton Four-Spindle Milling Machine.

cased and run in oil. The rack sleeve is sufficiently long to permit a 12-in. independent spindle adjustment on the saddle, through the adjusting worm and worm wheels shown. The left-hand saddle carries an auxiliary slide on which is mounted the spindle carrying a solid cast-steel rotary planing head 20 in. in diameter over the cutting tools. This cutter head is driven through steep lead bronze worm wheel and hardened steel worm by a pinion shaft meshing with the internal taper bearings 8¾ in. long in the mouth of the adjoining cutter head gear. The cross rail, also the slide heads, is counterweighted and has a plain surface on the bottom, so that the side slide may be attached to it by swinging bolts. This side head may be elevated by power along with the rail. The elevating screws have both top and bottom roller thrust bearings on the rail, which maintain the tension on the screws when pulling the cutter into the work. A type CCL 50 frame General Electric Co. motor, running at from 560 to 1,120 r.p.m., is used for driving the elevating screws. The power is transmitted through the idler rawhide pinions, as shown in Fig. 2, thence through a shaft from which the drive is taken for the two vertical heads for the feed and fast traverse. To a hub idler pinion a smaller pinion is fitted, which meshes with the pull pin gears. Motion is transmitted to the shaft through these gears and taken from it for the side heads. The location and relative position of these gears are shown in Fig. 3. The motion for the fast traverse and feeds is transmitted through a shaft to the working side of the machine, on which is shown the feed box of standard design, which gives nine changes of feed. The feed and fast traverse are arranged on the horizontal feed shaft and are operated by the clutch. Motion is taken from this hori-

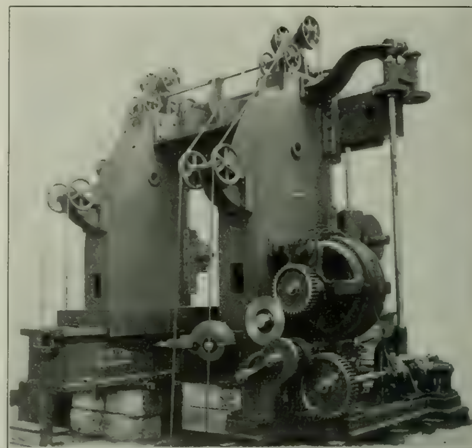


Fig. 2—Newton Four-Spindle Milling Machine.

zontal feed shaft for raising the rail and adjusting the heads on the cross rail. As these motions are all clutched, individual or simultaneous, drive for the heads and feed, for fast traverse of the table, the cross rail and cross adjustment of the heads on the rail, are available. Drive of the left-hand rotary planer head is clutched as shown, this clutch being operated by a lever. The right-hand spindle is arranged to be driven direct or through the back gears.

Table feeds from .789 in. to 8.15 in. per min. are available at high speed of the motor, and from .394 to 4.08 in. per min. at slow speed. Quick return in both directions at the

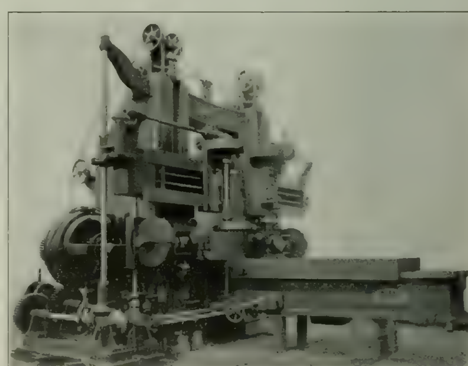


Fig. 3—Newton Four-Spindle Milling Machine.

rate of 21.94 ft. per min. is provided. The maximum vertical feed of the rail and the saddles on the rail is 4½ in. per min., with the motor running at 1,120 r.p.m.

We are obtaining some additional data as to the feeds and speeds used by this machine on different classes of locomotive work, which data will be published in a subsequent article.

WILLIAM C. BROWN.

In stepping into the presidency of the New York Central & Hudson River, W. C. Brown is taking responsibilities for which he has been specially trained during the last few years. Mr. Newman chose him as his probable successor in 1906, when he made him Senior Vice-President. At that time the titles of the New York Central vice-presidents, each in charge of a particular department, in no case indicated rank superior to another vice-president. It is often the case that it is not fair to such officers to indicate, numerically or otherwise, their degree of importance in the organization of a company. But to raise one man above the level of all the others is a different matter, and Mr. Newman, therefore, coined a new title. He has since then been turning over one at a time certain presidential duties to Mr. Brown, and he leaves the company with entire confidence that the property will be in the hands of a man thoroughly equipped to carry on the work along the lines chosen by his predecessor, and to wisely originate such new policies as will be necessary.

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W. C. Brown.

Mr. Brown was born in 1853 in Herkimer county, N. Y. He has worked his way up with no other help than the strong constitution and mental capacity with which he began life. He is a studious man, clear-headed, with retentive memory, and learns a new thing quickly. It follows that he is an accurate judge of men and of subjects. He began railway work when he was 16 years old. For a year he worked as a section hand and fireman on the Chicago, Milwaukee & St. Paul. He learned telegraphy and was made a telegraph operator. After two years he went to the Illinois Central as a train despatcher, and served in this position later on the Chicago, Rock Island & Pacific and on the Chicago, Burlington & Quincy. He was made chief train despatcher on the latter road in 1880, and in 1881 was made Trainmaster. He was appointed Assistant Superintendent in 1884 and Superintendent in 1887. In 1890 he was appointed General Manager of the Hannibal & St. Joseph and the Kansas City, St. Joseph and Council Bluffs, both part of the Burlington system. In 1891 he was made also General Manager of the Chicago, Burlington & Kansas City and the St. Louis, Keokuk & Northwestern, and in 1896 became General Manager of the Chicago, Burlington & Quincy. In July, 1901, Mr. Newman, then President of the Lake Shore & Michigan Southern, brought Mr. Brown to that property as Vice-President and General Manager. At this time Mr. Newman had just been made also President of the New York Central & Hudson River, and he chose Mr. Brown as the man to be left in direct charge of the Lake Shore. He had previously worked with him for a number of years. This recognition of Mr. Brown's value is particularly striking, as Mr. Newman's action was an exception to his long-established policy of never bringing to a property an outside man of his own. A few months after he came to the Lake Shore, Mr. Brown was made also Vice-President of the New York Central & Hudson River, and later his authority was extended over other New York Central lines.

Mr. Brown has been much before the public during the last few months, through his many discussions and addresses on freight rates. This work, however, has been entirely in addition to his duties as Senior Vice-President. During this period he has paid so much attention as ever to the details of the operation of the system, but he has had to work nights to do it. For the basis of his studies of freight rates he has called on the traffic and legal departments for figures and information, and particularly on the General Manager's office for unit costs, specific data and details of operation. He has used these effectively. For the last six years he has been learning all there was to know about the New York Central. As Senior Vice-President, reports have gone through him, and he has passed them on to the President after approving them or adding his own recommendations.

MASSACHUSETTS RAILROAD COMMISSION.

The Massachusetts State Railroad Commission, in its fortieth annual report, just issued, discusses the Boston & Albany Railroad, the smoke nuisance, electrification, abolition of grade crossings, street railway fares, the Boston Elevated Railway, street car fenders, electric railways and express rates.

The Boston & Albany is commended for curing the grave faults which existed in its service a year ago, but is told that it must yet spend large sums on improvements if it is to meet the just demands of the public. Discussing the smoke nuisance, statements from the principal roads are printed in the report. The board had suggested that the use of electric motive power in and near Boston was the remedy. The New Haven road replies that its electric installation on the New York end of the road is now giving good service, with no more interruptions than were experienced when steam was used; but the expense is very much greater; therefore, the company believes it wise to wait at least a year before installing additional electric apparatus. The public will profit by waiting for the full results of the present experiment. The Boston & Maine, having studied the experience of the New Haven as a guide, thinks that the time has not arrived for electrification of its Massachusetts lines. It has no tunnels and a good deal of its territory is not thickly settled, so that the smoke nuisance is not very bad. Moreover, a good many of the passenger engines burn coke. The Boston & Albany presents an estimate of the probable cost of electrification of its two lines to Riverside, aggregating about 25 miles of road. Judging by the experience of the New York Central at New York, this would cost nearly $5,000,000, and it is estimated that there would be an additional annual expenditure of about $715,000 to secure gross revenue of about $420,000. During the last eight years the passenger traffic on this suburban section has increased only about 14 per cent.; therefore, the company

cannot see its way clear to make the change. General Manager A. H. Smith, who writes the letter, says that it will be better for Boston and the state of Massachusetts if the company spends its available funds on the improvement of its freight terminal facilities.

The number of highway grade crossings abolished in Massachusetts during the past year is 27. Since 1890 the sum expended for this work in the state has been $30,682.177, of which the railway companies have spent nearly 19 millions, the state nearly eight millions and the cities and towns something over four millions.

During the past year several street railways have increased their fares, and this action has been in some cases complained of. The board has had occasion to decide both for and against complainants. It is hoped that business is now sufficiently restored so that further reductions will not be necessary. A law passed last year requiring street railways to carry pupils of public schools at half fare, is to be tested in the courts, the Boston & Northern Street Railway refusing to carry the pupils of evening schools at half rates.

The Boston Elevated is now running trains through the Washington street tunnel, and it has built an extension of the elevated structure to Forest Hills; and extensions to Cambridge, Malden and Medford are proposed. The commission urges the company to hasten the extensions.

Street car fenders and wheel-guards were tested by the commission a year ago, and the street railway companies are trying several devices; but the tests will have to be continued a much longer time in order to secure instructive results.

The more liberal law in regard to the issuance of new stock by railways, which was passed last year, has not been in effect long enough to afford ground for comment.

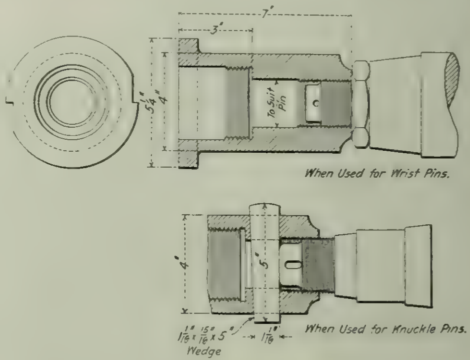
In October last the commission, after holding an investigation, found that express rates within 50 miles of Boston were excessive. The express companies made certain reductions, but still there were complaints, and further hearings and conferences were held. Finally the express companies presented a tariff which was satisfactory.

The board in 1907 ordered the experimental installation of certain fire extinguishers in passenger cars. The experience with these has not yet been sufficient to afford data for conclusions, and the inspections are to be continued.

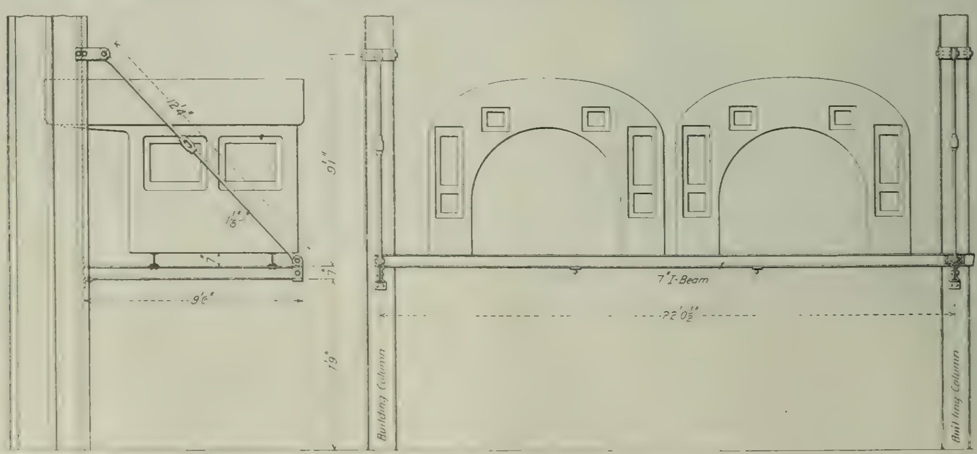
The bridge engineer of the board now has in his office a complete list of all the bridges in use by street railways in the state, with comparatively full information regarding the character and dimensions of each bridge. For many of the bridges, however, no plans can be had.

USEFUL DEVICES AT SILVIS SHOPS OF THE ROCK ISLAND.

It is estimated that the method of preparing and fitting frame bolts in the locomotive repair shop of the Rock Island at Silvis, Ill., saves 80 per cent. in time and cost over the old method; that is, of centering and rough turning the bolt in a lathe, threading in a bolt cutter, and then finally fitting it in a lathe, the latter requiring one or more trips by the machinist to a tool anywhere from 75 to 300 ft. away. To save the time thus wasted a portable bolt-fitting lathe was provided, which is carried by the crane to the locomotive where the machinist is working; also the number of operations in preparing the bolt have been minimized. The rough bolt is taken to a double-head bolt cutter having one head fitted with plain cutters which scrape off the stock as the bolt is forced in; this in lieu of rough turning in a lathe. The end of the bolt is then rounded off and the bolt threaded in the other head. With a lathe at his side the machinist can fit these bolts to the frame in minimum time. He screws a center button on to the bolt and catches the head in a three-jaw universal chuck, obviating centering. There are two of the portable lathes in the shop. They are 16 in. x 6 ft., direct



Chuck for Turning Knuckle and Wrist Pins.

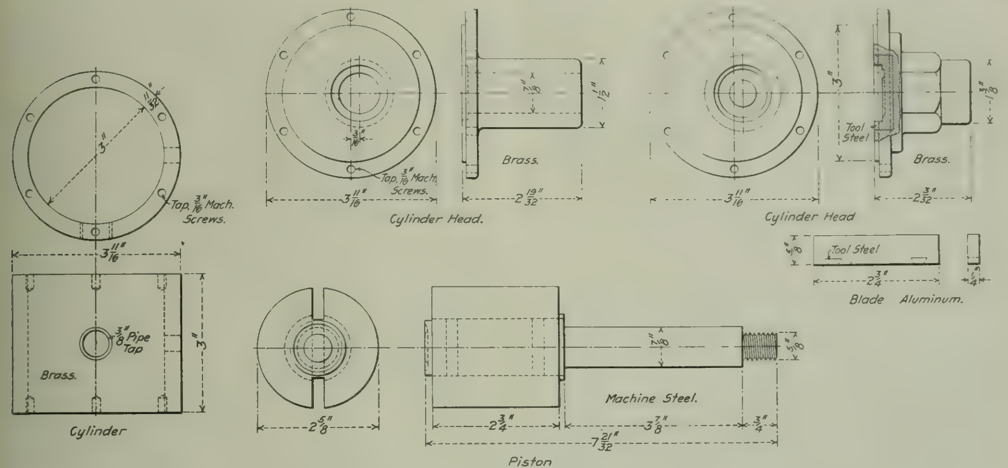


Cab Rack; Silvis Shops of the Rock Island.

motor driven, and have a bracket at the center of gravity for picking up by the crane. The average cutting speed is 150 ft. per minute with 1/16-in. feed, two cuts being taken. Before this scheme was adopted, men working on the lathes could not keep up with the demand for frame bolts. Now one boy keeps the machinists supplied with bolts ready for fitting.

Another great convenience is the cab rack shown. It is swung to the building columns 7 ft. 9 in. above the floor, alongside the longitudinal erecting pits. It is made of 7-in. I-beams and is supported from above.

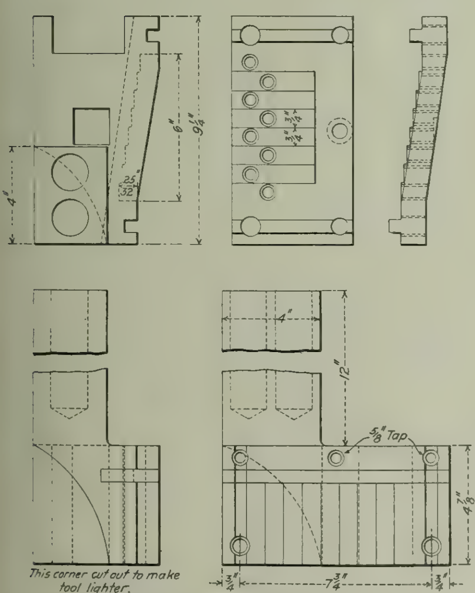
A simple but most satisfactory little air motor was devised for drilling telltale holes in staybolts. It has a rotary piston



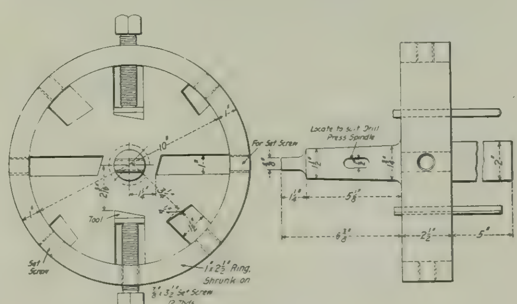
Details of Parts; Air Motor for Drilling Telltale Holes; Silvis Shops of the Rock Island.

made of machine steel, with two aluminum blades, each having a vulcanized fiber wearing strip set into the contact edge. It runs at 2,200 r.p.m.

Another ingenious device is the tool holder for boring side rods on a drill press. In using it, it is only necessary to drill first a center hold for the guide. The cut is made half way through the rod and the latter then turned over so that the cutters may be kept as short, and therefore as stiff, as possible. The hole is cut 1/32 in. small and finished with a solid cutter, of the proper size, on a boring bar. The holder carries two tools or cutters, one round nose and the other square, for finishing. These are forged rough in the blacksmith shop. Varying diameters are provided for in the holder by the differing depths of the several slots in which the cutters are held by the set screws.



Gang Tool for Planer.



Tool Holder for Boring Side Rods.

The chuck for turning knuckle and wrist pins shown herewith is a convenience and time-saver, obviating centering the pins before turning. Wrist pins are held tight in the chuck by the nut, but for knuckle pins a wedge is provided for driving through an opening in the chuck back of the pin, as shown. If it is desired, the tail-stock center may be moved up against the free end of the pin further to steady it.

The gang tool shown is for planing the outsides of shoes and wedges. It has eight cutters, each ⅛ in. wide, and a finishing cutter.

We are indebted to G. W. Seidel, Superintendent of the Silvis Shops, for this information.

ANNUAL REPORT OF THE BLOCK SIGNAL AND TRAIN CONTROL BOARD.*

This board was appointed by the Interstate Commerce Commission in July, 1907. The doings of the board for the first five months were made the subject of an informal report to the Commission November 21, 1907. The duties of the board embrace the investigation of (*a*) block signals, (*b*) automatic stops and cab signals, and (*c*) other devices designed to promote the safety of railway operation. The two subjects first mentioned (*a* and *b*) were reported on by the Commission February 23, 1907. In that report the Commission gave a succinct account of the state of the art of block signaling in the United States at that time and recommended the enactment by Congress of legislation looking to the gradual compulsory adoption of the block system on all passenger lines, except those traversed by less than six trains each way weekly. This recommendation made by the Commission in 1907 (a repetition of recommendations made in former years) was indorsed by this board in its informal report of one year ago.

Block signals, both automatic and non-automatic, have already been intelligently developed in this country, and the time of the board has therefore been devoted mainly to automatic stops and cab signals, which have not been so fully developed.

Plans and specifications of 371 devices have been examined to date. Of these, 248 relate to block signal, cab signal, or automatic train stopping devices, while 123 relate to other devices. Of the 371 files placed under examination, 184 have been reported on, and 187 are still in course of examination. Of the 184 files reported on, 12 signal and train stopping devices have been considered to possess sufficient merit to warrant the board in saying that if the proprietors should install the same on a railway under practical working conditions the board would examine the installations with a view to determining whether tests should be conducted at government expense. Of these 12 devices, four are now being installed, one of these being reported ready for test, and the board is advised that the installation of four others will be begun in the near future.

It has been necessary to spend much time on some of the most ill-considered inventions, for in rejecting a device or plan, cherished by its originator as promising great benefits to mankind and vouched for by patent experts as unique, it is necessary to marshal the reasons for our action in the most logical and forcible manner. Such inventors often are exceedingly persistent, and some of them, sorely disappointed at the unfavorable decision of the board, return again and again.

The work of the board during the past 12 months has been pursued along the same lines as before, but in addition to investigations in this country two members of the board, in March last, visited England, France and Belgium, to secure information concerning the use of cab signals in those countries.

* * * The board requires that each invention be suitably described, with drawings if necessary, and as a rule these drawings and descriptions must be examined and passed upon by the board before the question of testing a device will be taken up, and before hearings or interviews will be given. When the plan of a device has been examined and the thing described is held to have merit, the board, if satisfied that a test would be of value or interest to the public, advises the proprietor that if an installation, made by himself, when tested by himself, confirms the favorable impressions given by the plans, the board will undertake a test on behalf of the Government. * * *

*Appendix to annual report of the Interstate Commerce Commission, sent to Congress January 11. The members of the Board are: M. E. Cooley, Azel Ames, F. G. Ewald and B. B. Adams.

AUTOMATIC STOPS AND CAB SIGNALS.

The automatic stops and cab signals now in use are few in number and do not call for extensive investigation, for their characteristics are known. Most of them are installed in situations free from the troubles incident to frost, snowstorms, and certain other adverse conditions which prevail on railways generally.

Carrying out what we believe to be the purpose of the resolution of Congress, the object kept in view by this board in this matter is the securing of accurate information concerning the usefulness and efficiency of automatic stops in general railway service. Experience with stops in subways or in other places not exposed to snow, rain and frost does not afford the lessons sought, and therefore the board is devoting its attention chiefly to such devices as are offered for test in unprotected situations during the winter season. Experience on city passenger railways is unsatisfactory also because of the absence of some of the conditions which must be met on ordinary railways; such as irregularity in the length of trains and differences in design of engines and cars; also because in consequence of the very heavy traffic on those lines very frequent inspection is practicable. On ordinary railways such highly efficient inspection would probably be excessively costly.

Automatic Stops.—The principal automatic stop devices which have had our attention are as follows: The mechanical trip devices used in connection with electro-pneumatic block systems in use on the Boston Elevated, the Interborough Rapid Transit of New York City (subway), the Philadelphia Rapid Transit, and the underground lines in London, England. Mechanical trip train stops of the same general design, but worked by electric motors rather than by compressed air, are in use on the Hudson and Manhattan tunnel under the Hudson river between New York, N. Y., and Hoboken, N. J. The officers of these roads are unanimous in their testimony as to the satisfactory operation of the stops, and there have been occasions when but for the action of the automatic stop collisions would have occurred in consequence of neglect on the part of the motormen.

Two experimental installations of automatic stops have been made recently, one of the mechanical trip type, with certain modifications, by the Rowell-Potter Safety Stop Company, on the Chicago, Burlington & Quincy near Chicago, and one of the intermittent contact rail type, with a normally closed engine circuit, by the Simmen Automatic Railway Signal Company, of Los Angeles, on the Atchison, Topeka & Santa Fe in southern California.

The Rowell-Potter Company has been before the public for 15 years or more and devices made by it have been in use in past years to some extent, notably by the elevated roads of Chicago, but the apparatus now installed on the Chicago, Burlington & Quincy has been tried but a short time, and the board is not yet prepared to report on it. The Simmen devices include a system of remote control of a number of signals in a block system from a central point, such as a despatcher's office. This installation also has been in use but a short time, and no detailed investigation of it has been made.

The board has made a partial test of the Perry-Prentice cab-signal and train-stop device as recently installed experimentally on the line of the Suburban Railroad Company of Chicago. This system forms, so far as known, the first application of the use of the Hertzian waves to railway signaling. It makes use of "wireless" communication between a line wire strung along the track and apparatus in the engine cab. A coherer is included in a normally closed engine circuit, which circuit is broken if the particles of metal in the coherer cease to be held in cohesion by the action of the Hertzian oscillations emanating from the aerial conductor extending through the block.

Cab Signals.—While, as previously noted, a number of in-

stallations of automatic train stops have been made on certain city railways in this country, none of these installations provide for a visible or an audible signal indication on the vehicle. The automatic stops are used in connection with fixed visual signals only, it being generally assumed by the officers of these roads that it is unnecessary to supplement the indication of the fixed signals with any indication on the vehicle, and that the motorman, guided by the fixed signal indications, will properly control his train under all conditions except those which incapacitate him for proper action, in which event the automatic stop will come into play and control the movement of the train.

On the other hand, the European idea seems to be that if a sufficiently clear and reliable indication is given to the engineman he can be depended upon properly to control his train; and therefore automatic stopping devices are not favored. Most of the descriptions of automatic train-stop devices submitted, however, provide for the use of a cab signal; and some cab-signal devices have been presented which do not include the use of an automatic train-stop. The immediate problem in either of these devices is to produce certain effects on apparatus carried on the vehicle by the existence of certain conditions upon the track, and if the apparatus or system provides a proper means for carrying out this object the means are equally available for the control of an automatic train-stop or cab-signal or other device of that character fixed on the vehicle.

The only cab signals which have been used regularly for any considerable length of time are: (1) That used on the Northern Railroad of France; and (2) that on the Northeastern Railroad of England. That on the Northern of France is an electric contact apparatus. It is used in connection with fixed manual visual signals throughout the lines of that company, over 2,400 miles in extent, and has been so used on most of those lines for twenty years. A whistle is sounded in the cab of the locomotive when a fixed distant (visual) signal is passed at "caution." The system cannot be approved, however, because the electric apparatus is arranged on the open-circuit principle. As the silence of the whistle in the cab indicates a clear track, any derangement of the apparatus, for example the accidental breakage of a wire, would produce a false clear indication. The apparatus being arranged on this principle, there is no way of knowing with exactness how well it has served its purpose, for it may have been out of order an unknown number of times without being promptly discovered.

The board has communicated with the officers of the Northern Railroad of France, but their experience is relatively of little value as throwing light on the problems which have to be met in this country, because of the open-circuit feature and because in the climate of France the apparatus is not subject to severe weather conditions.

The cab signal on the Northeastern of England is a mechanical arrangement and it has been in limited use for ten years. Like the electric device just mentioned, however, it gives no warning of its own failure, and therefore the records of its service are of little value as throwing light on the degree of perfection with which it has worked.

A cab-signal combining the functions of both these types but operated on the closed-circuit principle, is in use on the Great Western Railway of England, where it has been in regular service on a short branch line for over a year. This apparatus gives proceed indications as well as caution indications, and the Board of Trade has permitted the abandonment of the fixed distant block signals where this system is in use.

A cab signal actuated by magnetic induction was tried on the Manchester, Sheffield & Lincolnshire several years ago, and with good results, but the experiment was given up because, in consequence of the number of foreign locomotives running over the line, the company concluded that no cab signal of any kind would be desirable.

It will be observed that automatic stops are in use in America, but not elsewhere, except on the London underground lines. Cab signals, on the other hand, are in use in England and France, but not at all in America.

Comparison of automatic stops and cab signals.—In considering the characteristics and use of automatic stops as compared with cab signals, we have the following facts:

1. Automatic stops have been adopted for regular service only on city railways which carry a heavy traffic and are worked by electric power. Their lines are in tunnels protected from snow, or on elevated structures where snow does not accumulate in troublesome quantities. Motormen do not have a companion or monitor in the cab with them, as does the engineman of a steam locomotive, and there is therefore a stronger argument for an automatic stop. Being worked under exacting conditions, these city roads are very efficiently inspected.

2. The Northern of France uses cab signals, but it does not get from them the full benefit of which they are capable, and therefore France must be left out of the account.

3. Leaving out facts 1 and 2, both automatic stops and cab signals are to be looked upon as still in the experimental stage, although they have been proposed for many years. Cab signals have been tried in many places, but all of the experiments have been short-lived, except that on the North Eastern of England. British railway officers naturally prefer a cab signal, because, with the high efficiency of their locomotive runners, they do not feel the need of an automatic stop. They have more trouble from fog than is experienced in America, and therefore feel a more definite need of a cab signal for use as a convenience in ordinary working, regardless of the question of safety. In America both cab signals and automatic stops have been proposed as safety devices purely, and on the assumption that the vigilance of enginemen and motormen cannot be improved to the point of insuring a satisfactory degree of safety while using only the present visual signals.

TELEGRAPH BLOCK SYSTEM.

In connection with the falling off in freight traffic throughout the country since the beginning of the depression in business in October, 1907, some roads have carried their economies so far as to discontinue the use of the block system where it had been regularly maintained for some years; and this expedient is reported to have been adopted on two single-track lines where the controlled manual system (without track circuits) had been in use several years. Again, on lines where the block system is still maintained a part of the block stations have been closed to save the expense of maintaining signalmen both night and day. In still other cases a part of the block stations on a line have been put under new schedules under which they are closed a part of the time; as, for example, an office will be closed eight hours out of twenty-four, thus saving the expense of one signalman. In some cases an office will be kept open in the daytime and not at night, while perhaps at the next station no signalman will be found on duty in the daytime, but one will be on duty at night. Other odd arrangements of hours have been introduced. These irregularities have been introduced not alone because of the depression in business, but also because of the law enacted by Congress March 4, 1907, limiting the hours of service of block signalmen, which increases the expense. As business improves the block system will be restored, probably; but this making of extensive changes in the methods of train operation by so many roads emphasizes the importance of the bill which was before the last Congress to authorize the Interstate Commerce Commission to secure full information regularly concerning this department of railway operation. This feature of the bill introduced by Hon. J. J. Esch, of Wisconsin, in the last session of the Fifty-ninth

Congress is no less important than that making the use of the block system compulsory.

As was remarked in the report of the Commission on the block system in February, 1907, many block signalmen in America are young and lacking in training and experience. This has been indicated in the records of railway accidents, this deficiency being a cause of disastrous collisions. This fault in the personnel of railway operation has not been so conspicuous during the past year as it was during the heavy traffic of 1905-1907, because, first, the diminished number of trains has made the work of the signalman simpler and easier, and, second, the same cause has made possible the improvement of the block-signal service by eliminating the less competent signalmen. This improvement in the personnel has not been universal, however, and the board has information of instances here and there of signalmen whose incompetence was manifest, and in some of these cases there has been evidence of excessive use of intoxicants. The information the board has gained as the result of the investigation it has conducted along these lines justifies the continuance of this investigation.

While on the subject of the personnel of telegraph offices it is proper to observe that the difference in habits, capacity, and training of signalmen on the railways of Great Britain as compared with those of American roads, which was referred to in the above-mentioned report, was confirmed by the observations of members of this board in England and Scotland last spring.

Under the head of the telegraph block system, mention should be made of the superiority of the block telegraph instruments used in England—which are modifications of the well-known needle telegraph—as compared with the communicating methods used with the simple manual or telegraph block system in this country. With the needle system the receiving instrument gives a visual as well as an audible signal, and the visual part, by the position in which it remains after each operation, serves as a constant indication before the signalman's eyes of what the last operation was.

A modification of the telegraph block system has lately been introduced on the Northern Pacific Railway—single track—which merits attention. This is the simple telegraph block system, but each operation by the signalman—or, rather, the series of operations by which a signalman assures himself that a block section is unoccupied and then gives the proceed signal to a train—is carried out under the immediate supervision of the train despatcher, all the block-signal stations of a district being on a single wire connected with the despatcher's office. This system is commonly called the "A B C" system. A train is admitted to a block section only on a signal in which the despatcher and two block signalmen have co-operated, thus greatly reducing the chances of error. The operations are further safeguarded by requiring each train to stop at every station, unless the signalman both displays a clear signal and delivers written cards to the enginemen and the conductor. (By means of large hoops these cards are delivered to trains passing at 25 miles an hour and faster.) By the employment of these safeguards provision against collisions of trains is so fully secured that the officers of the road have felt warranted in the discontinuance of the rule requiring all meeting orders to be written out, telegraphed, repeated, and receipted for. This writing and repeating process is so slow that it causes many delays to trains.

On some divisions of the Northern Pacific the freight trains are now run over the road in 20 to 25 per cent. less time than formerly. This not only effects an economy for the road, but also enables the trainmen to earn more wages per hour. The arrangement of meeting points without using the full written and repeated telegraphic orders is equally practicable with the electric train staff, and the same saving in time is accomplished. This is shown by the results on those parts of the Southern Pacific and the Atchison, Topeka & Santa Fe, where the train staff is used. The difference in the Northern Pacific practice as compared with the use of the staff system is that the method under which the despatcher cooperates with the signalman may be introduced on any line, no matter how light its traffic, and with but little preparation; and the cost of the electric staff apparatus, which is considerable, is saved. On the other hand, the number of despatchers may have to be increased, and the maintenance of the discipline necessary to make the three-man block signaling operation satisfactorily free from liability to error is probably more of a task than the maintenance of the same degree of safety by means of the electric staff, which is a highly efficient "controlled manual" apparatus for single-track lines. As a preventive of false clear block signals, this apparatus theoretically should be superior to any number of cooperating men.

The term "telegraph block system" as used on American railways is applied to all man-operated systems not fitted with electric control of levers, and includes lines where the telephone is the means of communication. Telephones have been used to a limited extent for several years for sending train orders. They have lately been introduced quite extensively in block signaling, however, as was shown by the block-signal statistics published by the Commission in the present year.

Theoretically, telephones are as safe and as convenient as the long-used Morse telegraph, and the experience of many roads for the last year or two has confirmed this theory. We touch upon this subject in this place merely to make reply to the query, voiced in several places, whether the change in apparatus and methods has involved any lessening of safety. The only serious question that has ever been raised concerning the safety of telephones is in regard to the liability of indistinct transmission of syllables and words. In the Morse telegraph or any other system this contingency must be provided for, and with the telephone, as with the telegraph, mistakes are guarded against by good training and discipline, and by repeating back all communications.

CONTROLLED MANUAL BLOCK SYSTEM.

Within the last four years controlled manual apparatus without track circuits has been introduced extensively on single-track lines of the Illinois Central, the Chicago, Burlington & Quincy, and the Chicago & Eastern Illinois railways, and the electric train staff, embodying similar principles, has been put in use on 100 miles of the Southern Pacific.

As a safety device, the controlled manual system is already well understood and well developed, so that the investigation of it cannot be looked upon as calling for special attention on the part of this board; but these extensive installations on single-track lines are in some respects new departures in American railway practice, and a study for the purpose of comparing these with each other and with other systems may be desirable at a later date.

AUTOMATIC BLOCK SIGNALS.

As shown by the statistics which have been published by the Commission, the railways of the country made comparatively rapid progress in automatic signaling for several years up to the end of 1907. Since then only a few important new installations have been begun; but within the past month the St. Louis & San Francisco gave an order for the equipment of 712 miles of its single-track lines, and the Southern Pacific is resuming work on some of the installations which were suspended a year ago.

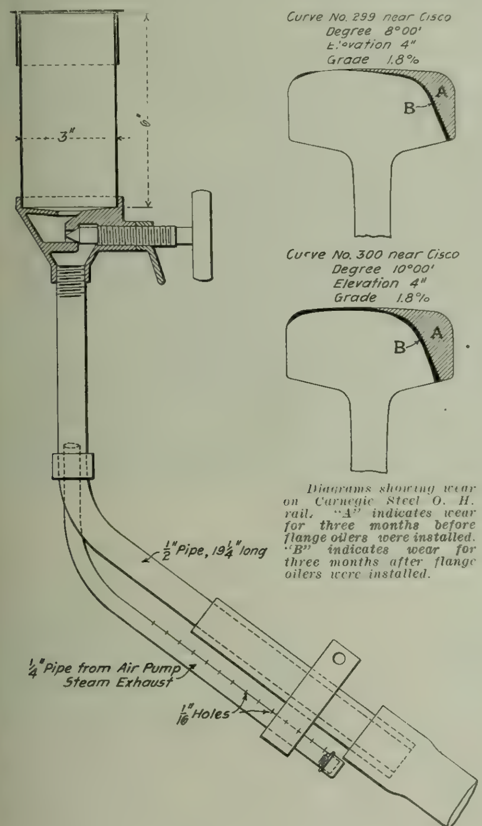
The extensive installation on the New York Central & Hudson River in and near New York City of automatic block signals adapted for use in connection with railway tracks, the rails of which are traversed by powerful electric currents used with electric propulsion of trains, constitutes one of the notable instances of progress in the signaling art.

The report goes on to set forth the principles and conditions of mechanical and electrical science and of railway

operation, by which it has been guided in rejecting imperfect or worthless or dangerous inventions. This and other parts of the report, including the report of Messrs. Ames and Adams on their observations in Europe are deferred until a future issue.

FLANGE LUBRICATION ON SOUTHERN PACIFIC SYSTEM.

With the advent of heavy consolidation locomotives on mountain grades, or on lines with sharp curvature, there has been a noticeable increase in the wear of tire flanges and also of rail. The Sacramento and Shasta divisions of the Southern Pacific lines are nearly all mountain territory and in following the tortuous windings of canyons and spurs over the ascents it was necessary to use a great many ten degree curves. In recent years, since the adoption of heavier power, it has been necessary to relay many of these curves inside of eighteen months. As a result of this there was, of course, a very material wear on driver flanges, especially the front and back drivers of consolidation locomotives, necessitating the turning of tires on account of flange wear long before it was necessary on account of tread wear, and frequently necessitating the shifting of tires from forward wheels to back wheels in order to avoid excessive waste of material in turning. To overcome this the flange lubricator was devised by the master mechanic and roundhouse foreman of the Sacramento Division, under the direction of the general superintendent. This device consists of a small galvanized iron cup soldered to a base that contains a needle valve for regulating the flow or oil from the cup to the flange through suitable pipe connection. This is secured by a bracket to the guide yoke on the frame or suitable projection on the locomotive, the pipe being screwed into the base of the oil cup and bent downward towards the flange of the tire. On the end of the one-half inch pipe is placed a short section of one inch rubber hose with the end of hose cut out to fit the flange of the tire. The cup can be filled with wool waste or any other suitable absorbent.



Diagrams showing wear on Carnegie Steel O. H. rail. "A" indicates wear for three months before flange oilers were installed. "B" indicates wear for three months after flange oilers were installed.

Reservoir and Piping; Southern Pacific Flange Lubricator.

In localities where low temperatures would interfere with the free movement of oil from the cup through to the tire, arrangements have been made for tapping a small pipe into air pump steam exhaust pipe and carrying the branch along side and under the oil pipe, with suitable perforations so that the exhaust steam will keep the pipes warm, and thus insuring that the proper amount of lubrication will reach the flange.

The details of the construction are clearly shown in the accompanying illustration.

In order to show the effects of the lubricator two diagrams are given illustrating the wear of a steel rail before and after the application of the lubricator to the flanges of the locomotives. The hatched portion on the side of the rail head shows the amount of metal that was worn away in three months before the application of the lubricator and the section shown in black that which was worn away in the three months following its application. In the statement of the tonnage and mileage hauled over this section of the track, which was between Sacramento and Sparks, it will be seen that it appears that there was an increase of about 30 per cent. in engine mileage and a total tonnage increase of more than 30 per cent.

The following is a statement in detail of the results obtained by the application of this device to the forward driving wheels of 69 consolidation engines, from which it appears that there is a notable saving in tender as well as driving wheel flanges.

Saving (Estimated) Effected by Use of Driver-Flange Lubricators on Forward Drivers on Mountain Engine, Sacramento Division.

Total mileage of 10 selected engines before application of flange lubricators, from January 1, 1906, to date of application	629,703
Total cost of tire attention, from January 1, 1906, to date of application of flange lubricators	$6,108.00
Cost of tire attention per mile run, before application of flange lubricators	.0097
Number of times tires were changed from January 1, 1906, to date of application of flange lubricators, including tire turning	71
Average mileage per change of tire, before application of flange lubricators, based on limit of flange wear—¼-in.	8,869
Average mileage per 1/32-in. wear of flange, before application of flange lubricators	1,109
Cost of tire attention per 1/32-in. wear of flange	$10.76
Total mileage of engines since application of flange lubricators to July 31, 1908	79,430
Average mileage per 1/8-in. wear of flange	3,972
Average mileage per change of tire, before application of flange lubricators, based on limit of flange wear, ¼-in.	31,776
Per cent. of increase in mileage per change of tire	258.29
Cost of tire attention per mile run, after application of flange lubricators to July 31, 1908	.00271
Per cent. of decrease in cost of tire attention	72.06

69 consolidation engines.	Average mileage per month.	Mileage per year.	Cost per mile run.	Total cost of tire attention 1 year's service
Before application	2,491	2,062,548	0.0097	$20,006.72
After application	2,645	2,190,060	.00271	5,935.06
Amount saved.*	.....	....	......	$14,071.66
Inc. mileage effected.*	.....	127,512	......	....

Number of pairs of tender truck wheels changed from January 1, 1906, to date of application of flange lubricators	148
Mileage run per change of tender truck wheels	3,517
Estimated cost of change of 1 pair of tender truck wheels	$15.55
Cost of tender truck wheel tire attention per mile run	.00442
Number of pairs of tender truck wheels changed from date of application of flange lubricators to July 31, 1908	5
Total mileage of engines from date of application of flange lubricators to July 31, 1908	79,430
Miles run per change of tender truck wheels	15,886
Per cent. of increase in mileage per change, tender truck whls	351.69
Cost of tender truck wheel tire attention per mile run	.00098
Per cent. of decrease in cost of tire attention	77.82

69 consolidation engines.	Average mileage per month.	Mileage per year.	Cost per mile run.	Total cost of tire attention 1 year's service
Before application	2,491	2,062,548	0.00442	$9,116.46
After application	2,645	2,190,060	.00098	2,146.26
Amount saved.*	.....	....	......	$7,970.20

*By use of lubricators.

ELECTRIC LOCOMOTIVES FOR THE GREAT NORTHERN.

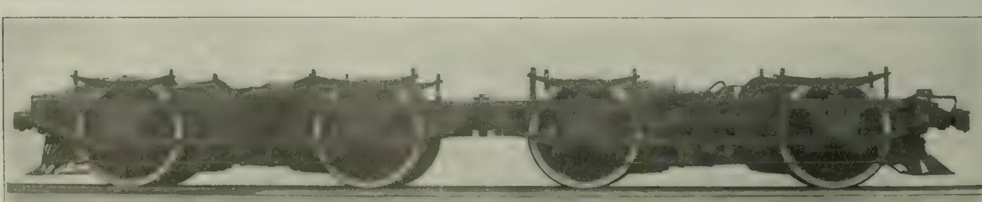
The Great Northern recently had built by the American Locomotive Co., in conjunction with the General Electric Co., four electric locomotives for operating trains through the Cascade tunnel. These locomotives were built under the supervision of Dr. Cary T. Hutchinson, Consulting Engineer for the Great Northern.

Each of these locomotives has a total weight, in working order of 230,000 lbs., all of which is carried on the drivers. The locomotives are 44 ft. 2 in. long, over all, the driving wheels are 60 in. in diameter, and the rigid wheel base is 11 ft. Each truck is equipped with two three-phase induction type motors, which have plain secondary circuit rheostatic control and are capable of exerting a maximum torque of at least three times the guaranteed full load running torque at any speed to within 2 per cent. of synchronism. The motors are wound for 8 poles and when operated at 25 cycle have a synchronic speed of 375 r.p.m. On account of the large size of the geared motors, a special form of drive is used, there being pinions on each end of the motor shaft. These pinions engage gear bands shrunk on the extension of the driving wheel centers. The gear bands are cut in pairs and are set so that the teeth on the two wheels line up accurately. This form of drive prevents any tendency to tilt the motor, as in the case where the pinions are located on the end of the motor shaft. The gears do not have an excessive width of face, as the drive strain of each motor is divided between the two sets of gears of 1-4.28 ratio. An idea of the construction is given in the accompanying line drawing of the truck.

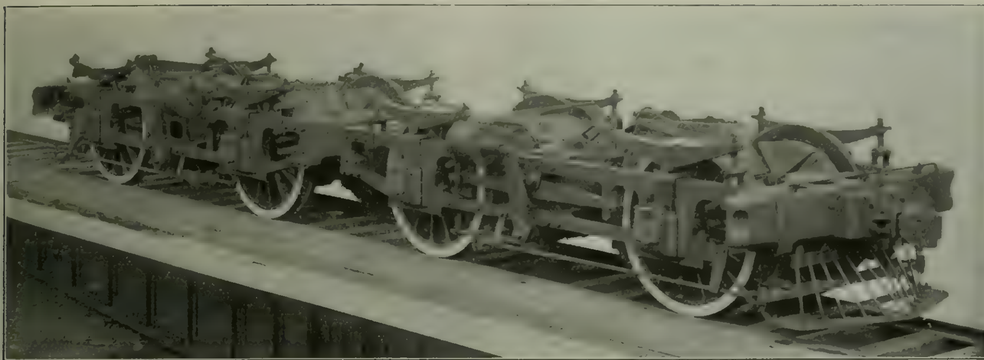
The mechanical design represents a distinct departure from previous practice in electric locomotive construction, as it also represents the adaptability of steam locomotive practice to electric locomotive construction. The wheel arrangement, as seen in the illustrations, is a modification of the builder's practice in design of articulated steam locomotives to suit requirements of electric service. The locomotive is mounted on two four-wheel trucks, connected by a center pivot. This pivot is located in the center of the engine, midway between the inside axles of the two trucks. With this form of construction, the distance between the center pins supporting the cab platform varies as the trucks pass around curves. One center pin, therefore, is designed to allow sufficient longitudinal movements to provide for this condition.

Electric Locomotive for the Great Northern.

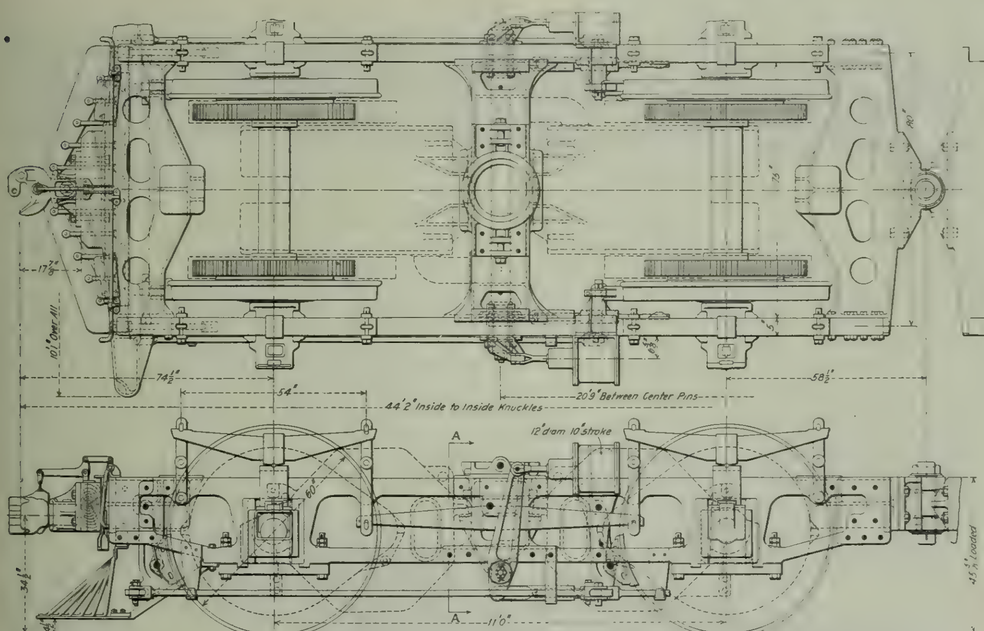
The advantage of this articulated design is that all the draw-bar pull is directed through the truck frames, permitting a much lighter construction of cab platform than in those designs where the pull is directed through the platform sill. Moreover, the only strain which this puts on the center pin is that which is due to the weight of the cab, its equipment and the cab platform. The truck frames are cast steel, those of the front and back trucks being interchangeable. As all the pulling is done through the truck frames, these are made unusually large and heavy. Since on these locomotives it is necessary to add weight in order to obtain the necessary adhesion, account is taken of a part of the weight of the frames and all parts of the truck. Ballast is also used on the cab platform for the same reason. The particular features of the truck construction are shown in the illustration. The method of weight equalization is also of interest. On the No. 1 end truck, the weight on the drivers is carried by semi-



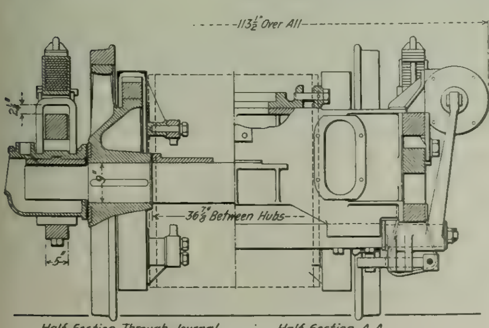
Electric Locomotive Trucks, Showing Pivot Connection.



Electric Locomotive Trucks, Showing Positions of Motors.



Plan and Elevation of Truck; Great Northern Electric Locomotive.



Sections Through Truck.

elliptic springs resting on saddle placed on the top of the journal boxes. The two drivers on each side are equalized together by wrought iron equalizing beams, placed between the upper and lower rails of the frame, similar to the practice in steam locomotive construction. The weight on the drivers of the No. 2 truck is also carried on the same style of springs, supported on the driving boxes in a similar manner, but in this case there is no equalizing beam between the two drivers on one side, but the two front drivers are equalized together by cross beams. The truck bolsters are cast steel, of box construction, with center plates cast integral. These are rigidly connected to the frames. The cab, which carries the controlling apparatus as well as air compressors and other accessories, consists of angle iron framing with a covering of ⅛-in. sheet steel. The arrangement of the car body and end hoods is such as to afford the engine-man a clear view of the track.

These locomotives are now being tried out by a series of

tests under service conditions. At present it is planned to use these locomotives through the Cascade tunnel, which is somewhat less than three miles long, with a uniform grade in one direction of about 1.7 per cent. The following are the principal dimensions of these locomotives:

Total weight	230,000 lbs.
Length over all, inside to inside knuckles	44 ft. 2 in.
Length over cab	44 " 1¾ "
Height over cab	14 "
Width over all	10 "
Total wheel base	31 " 9 "
Rigid wheel base	11 "
Gage	4 " 8½ "

STEEL UNDERFRAMES FOR BAGGAGE CARS.

The Burlington is building at its Aurora shops a number of baggage cars with steel underframes to replace those recently burned in Chicago. The underframes were manufactured by the Barney & Smith Car Company, Dayton, Ohio, and are illustrated in the accompanying engravings.

These frames weigh each complete 21,000 lbs. They are 65 ft. 8½ in. long over all, 9 ft. 8 in. wide and 46 ft. 2½ in. center to center of trucks. They are of fish belly built up sill construction, the web plates being 5/16 in. steel in one piece.

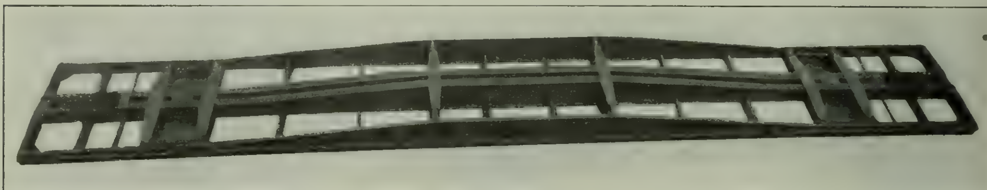
The center girder is 27¼ in. deep and has ¼ in. top cover plate, 3 x 3 x 5/16 in. top outside angles, 4½ x 3 x 7/16 in. bottom outside angles, 3½ x 3½ x ⅜ in. inside bottom angles, all angles and the top cover plate extending the full length of the girder except inside bottom angles, which extend to draft rigging cheek pieces only.

The side sills are 28 in. deep at center, having 3½ x 3 x 5/16 in. top and bottom angles and 4 x 3½ x 5/16 in. angle riveted to the outside of the web plate to support the wood side sills or nailing strips. The end sills are of 14 x ⅜ in. steel plates reinforced with angles in the usual manner.

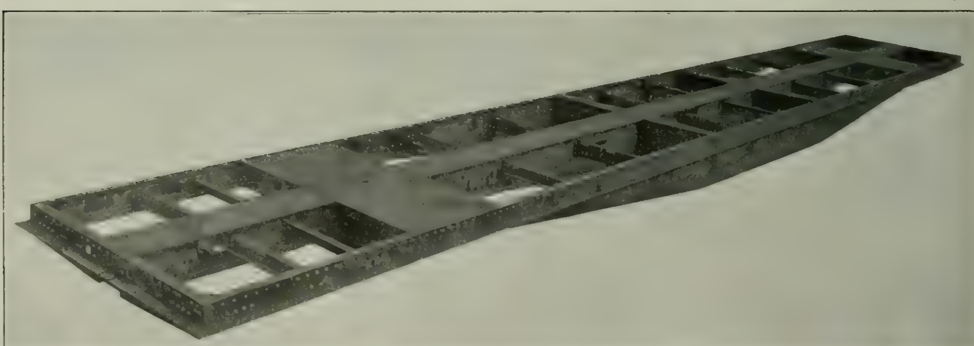
The bolsters are each made up of four 5/16 in. pressed steel fillers—two each being placed back to back—the bolsters being of the double type, that is, spaced 3 ft. 6 in. center to center, and having one large top cover plate 50 in. x ¼ in. extending between the side sills.

The needle beams, two per car, are made of 5/16 in. web plates with 3 x 3 x 5/16 in. top and bottom angles. There are eight channel iron cross ties and eight "Z" bar cross ties, all spaced as shown in the engravings. At all four corners of the car, at center sill and end sills there are 5/16 in. gusset plates reinforcing these points. The center plate is carried on a large steel casting which reinforces the center sills and forms a center arch extending from bolster to bolster.

There are also pressed steel center fillers at each needle beam. Wood nailing strips for the floor will be supported on angle irons which are riveted to the channel iron cross ties.



Chicago, Burlington & Quincy Underframe for Baggage Cars, Fig. 1.



Chicago, Burlington & Quincy Underframe for Baggage Cars, Fig. 2.

CAR INTERCHANGE REPORTS.*

Correct interchange reports are the basis of the per diem accounts, and unless we can secure such reports we cannot make prompt and full settlements. If I have not reported all the per diem that is due for the month of July, it is because my reports do not agree with the reports that are made by the agents of connecting lines to their Car Service Departments.

During July, 1908, we recorded the movements of 44,000 foreign per diem cars, and on August 22d, when our per diem reports to owners were ready for mailing, only 133 cars of this number were not properly recorded, so that the full amount of per diem due on each one of them could be reported. Of this number, the records of 129 cars have since been completed, and full per diem has been allowed in subsequent reports. We can therefore claim that, with the exception of four cars, we have returned full per diem on all foreign cars handled on our line during that month.

The condition of our August records is better still. In that month we handled 46,300 foreign per diem cars, and only 116 of them showed incomplete records when the per diem reports were mailed, and at the present writing we have only 51 of that number on which our records are not com-

*From a paper by W. E. Beecham (C., M. & St. P.) read at Peoria, October 13.

plete. The records of these cars will be straightened up before claims for shortages can be presented, and full per diem will be allowed, so I may be pardoned for claiming that the condition of our foreign car records for the months of July and August, 1908, are very nearly perfect, and I believe that if the uniform interchange report was in use at all interchange points, and the method prescribed by the American Railway Association for conducting interchange established, there would be no claims for shortages in our per diem reports for those months.

The following statement shows how the work of recording foreign cars is done in our office:

Number of record clerks	12
Average number of cars per clerk for the month	3,858
Average number of moves made by each car	5½
Total number of moves recorded by each clerk for the month	212,190
Average number of moves recorded per day, per clerk	1,400
Total number of working days in August, 1908	24½
Number of working hours per day	8
Average number of moves recorded by each clerk per hour	175

This may not be considered a very high average in car recording, but that is not the object to be attained.

Our record clerks, in addition to recording the movements of cars assigned to them, are required to issue correction sheets to straighten up and complete the records, make full and complete reports of per diem due thereon, check claims for shortages presented by other roads, and, besides that, to furnish information required by tracing clerks, which alone interferes very greatly with their work; in short, each one of the record clerks must answer for the accuracy of his record in all its details, so you can readily see that, exacting as much as we do from a record clerk, it would be unreasonable in addition to require a high numerical average in car recording. Our plan is to sacrifice everything for accuracy.

Carbon copies of all correction sheets sent out are retained, and if answers are not promptly returned immediate attention is attracted to it by a clerk having special charge of the files. Our records have, however, become so accurate within the last few months that few correction sheets are sent out, and agents are burdened very little with the work of answering them.

It is my ambition to earn for the St. Paul a reputation for sending out the most nearly accurate per diem reports of any road in this country. I may not succeed. I may be surpassed by younger, more intelligent, more energetic men, but if I am, they will have to devote so much of their time to the details of their work that there will be little left for rest and none for recreation. I should not be charged with boasting, because it is nothing more than I ought to do in any event, nor is it more than others should do; but I want to direct your attention to the fact that it costs money to maintain a Car Service Department of a large road in a high state of efficiency, and any road which does that has certain well defined rights it is bound in justice to itself to assert.

No road can reasonably expect to obtain promptly 99½ per cent. of the per diem earnings of its cars in possession of other roads and be delinquent in making returns to others, and if such a course is persisted in, it will eventually lead to disagreements, and possibly retaliatory measures, the latter never to be indulged in if possible to avoid.

However, experience with per diem the last six years justifies the statement that conditions are not satisfactory, and that many radical changes in the present practice of settling accounts are essential to establish and maintain in the future such conditions as will be satisfactory to all concerned.

Most of our troubles are due to inaccurate interchange reports, but there is a remedy for this, and that is in the enforcement of the rules and practices laid down by the American Railway Association for making interchange reports in quadruplicate and conducting the interchange according to the method prescribed by that Association.

If this step is taken, it will preclude all possibility of disputes arising over a difference in dates, which is the most prolific cause of shortages, and probably occasions 99 per cent. of all the troubles now found in settling per diem accounts.

When this plan is inaugurated throughout the country, both the delivering and the receiving line will be recording the interchange of cars from the same data, and what few errors occur in transcribing, making entries and reporting on junction cards will not amount to very much, and they will be very readily straightened up in the Car Record office. Any errors that are discovered in the interchange reports will be quickly taken up by both the delivering and receiving line, and if it is found the agents are not complying with the rules, by verifying and checking the interchanges, pressure will be brought to bear upon them from both sides, which will undoubtedly tend to remove difficulties of that kind, and prevent errors from occurring in the future.

THE STATE RAILWAY COMMISSIONS.

BY SAMUEL O. DUNN,
Western Editorial Manager, *Railroad Age Gazette.*

Regulation of railways by commissions has become the general policy of both the nation and the states. The work of these bodies is important, complex and difficult. It will unanimously be conceded that able men should be chosen to serve upon them. It will be conceded that whether able men will be chosen will depend largely upon the mode of appointment or election, the salaries paid, the term of office, etc. It will be conceded that it is desirable that the men chosen shall have special qualifications for their duties; and that if, when chosen, they lack such qualifications, they shall be kept in office long enough to acquire them, and to use them during a considerable period for the benefit of the public.

The work of the secretaries, counsel, chief engineers, rate clerks and other principal employees of the commissions is often almost as important as that of the commissioners. They are the expert advisers and executive officers of the commissions. They often hold their places while the personnel of the boards repeatedly changes; and it is then their task to instruct the new commissioners about their powers and duties. For these reasons the principal employees of the commissions should be men of ability and special fitness; and to get and keep such men they must be paid well and their tenure of office must depend mainly on efficient service.

To find out what is being done in the various states to make the state railway commissions measure up to the demands of their important work, the *Railroad Age Gazette* lately wrote to these bodies asking for the following facts about their members and their principal employees: (1) Names. (2) Elective or appointive. (3) Annual salary. (4) Term, years. (5) Number of years each had served. Part or all of the data requested was furnished by each of the state commissions except those of Texas and Tennessee; and the facts about the past careers of the Texas commissioners were already available. The data, as supplied by the commissions themselves is given in a table below. An editorial commenting on it appears elsewhere in this issue.

The commissioners of 18 states are appointed by the governors, and of 22 are elected by the people. A compilation published by *The Railway Age* in its issue of January 27, 1905, page 106, showed that then 12 commissions were appointive and 17 elective. The states whose commissions are now appointive are the following: Connecticut, Illinois, Indiana, Maine, Massachusetts, Michigan, Nevada, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, Washington and Wisconsin. As New York has two commissions, the total number of appointive state commissions is 19. The states whose

commissions are elective are: Alabama, Arkansas, California, Colorado, Florida, Georgia, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Montana, Nebraska, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota and Texas. The number of state commissions has been increased by 12 in the past four years and many changes have been made in the personnel and powers of the old commissions, but the proportion that are appointive has increased meantime but slightly.

The number of lawyers on the commissions, 42, is much larger than the number of men from any other vocation. Their past careers show that many of these lawyers have been active politicians. Many have held local or state offices. At least four commissioners have been judges. John F. McClure, who recently succeeded Union B. Hunt on the Indiana Commission, was for 12 years on the Indiana Circuit bench. Ira B. Mills, Chairman of the Minnesota Commission, and R. R. Prentis, Chairman of the Virginia Commission, were also state judges. Nathaniel Ewing, Chairman of the Pennsylvania Commission, was United States District Judge for the Western District of Pennsylvania.

Among the members of the commissions are 13 former railway officers and employees. These and their former positions on railways are: Bishop (Mass.), Roadmaster of the Fitchburg Railroad; Dickinson (Mich.), Railway Superintendent; Boyle (Mont.), Assistant General Superintendent, Northern Pacific; Morley (Mont.), 14 years Auditor of the Wisconsin Central; Jones (Wash.), Foreman of Blacksmith Shops of the Northern Pacific; Wood (Ind.), Railway Operative; Ryan (Kan.), Telegraph Operator; Keizer (Maine), Conductor; Webb (Miss.); Wightman (Mo.), Conductor; Shaughnessy (Nev.), Assistant Superintendent, Salt Lake division, Southern Pacific; Morris (Ohio), Conductor and Yardmaster, Erie; Gothlin (Ohio), Traveling Freight Solicitor, Wisconsin Central, and later Traffic Manager, National Cash Register Co.

The previous occupations of other members of commissions were reported as follows: Business men, 5; merchants, 3; cotton factors, 2; real estate dealers, 2; insurance agent, 1; mine operator, 1; engineers, 3; railway contractor, 1; farmers, 12; manufacturers, 5; lumberman, 1; newspaper men, 2; liveryman, 1; physician, 1; assistant secretary Municipal Art Commission, 1; assistant secretary Interstate Commerce Commission, 1; state land agent, 1; bankers, 6; coal operator, 1; teacher, 1; economist, 1; commissioner of labor, 1; sheriff, 1.

Of the secretaries of the commissions only four are reported to have had railway experience. One of these, Wilson (Va.), was formerly General Freight and Passenger Agent of a steam line. Seven secretaries have been newspaper men. Ten commissions have rate clerks of railway experience. Nine have chief, consulting or inspecting engineers of railway experience in some capacity. Among the prominent engineers who are serving the commissions are Prof. W. D. Pence, University of Wisconsin, Chief Engineer of the Wisconsin Commission; Henry B. Seaman, Consulting Engineer, New York Commission, First district; H. P. Gillett, Valuation Engineer, Washington Commission; Prof. E. B. Kay, University of Alabama, Consulting Engineer, Alabama Commission, and Prof. George F. Swain, Massachusetts Institute of Technology, Consulting Engineer, Massachusetts Commission. Several inspectors, accountants and other employees of the commissions have had railway experience.

In nine of the states—Alabama, Georgia, Kentucky, Maine, Massachusetts, Nevada, New Hampshire, Vermont and Virginia—the chairmen of the commissions receive higher salaries than the other members, but the difference usually is not large, and the average salary of both chairmen and commissioners is a little over $4,000. This average, however, is apt to mislead. The ten members of the New York commissions get salaries that aggregate $150,000 a year, which would furnish salaries at $4,000 for 37 commissioners. The comparatively large salaries of the New York commissioners greatly raise the average. The range of salaries of commissioners is from $1,200 in North Dakota to $15,000 in New York. Twenty-four states pay less than $4,000. Nineteen pay $3,000 a year or less. Twelve pay $2,500 or less. Six—Massachusetts, New Jersey, New York, Ohio, Pennsylvania and Wisconsin—pay $5,000 or more.

The average annual salary of the secretaries of the commission is $2,500. The rate clerk usually gets less than the secretary, although in several cases he gets more. Where engineers are regularly employed they are usually paid more than other employees, the amounts ranging from $3,000 to $15,000 a year.

The terms for which commissioners are elected or appointed are from two to six years, the average being four years. They are chosen for as little as two years in four states, and for as much as six years in 18 states. The states in which the very short term of two years obtains are Arkansas, Illinois, Kansas and North Dakota.

Of more interest and importance than the length of the legal term is the number of years that commissioners are kept in office. A glance at the last column in the table will show that this varies much, and is longer in the East than in the West or South. The time that the present commissioners have been in office ranges from 22 years for Chairman Putney, of New Hampshire, to zero for several who took office about January 1. The average time that the present state commissioners have served is three years. That the average number of years the present incumbents have served is actually less than the average length of the legal terms is due not only to the fact that changes are frequently made in the personnel of the commissions, but also to the fact that a number of new commissions with long terms have been created since 1907 whose members have served only part of their legal terms.

The average number of years served by the secretaries of the commissions is five years. The average that has been served by other employees is considerably less.

States and Names of Com'rs.	Previous occupation.	Annual salary.	Years served.
Alabama: Elective; term, 4 years.			
Charles Henderson, Pres't..	Mfr. and merchant..	$3,500	2
W. D. Nesbitt, Commissioner	Cotton factor	3,000	2
John A. Lusk, Commissioner	Lawyer	3,000	..
S. P. Kennedy, Secretary..	Mfr. & ry. employee.	2,400	2
J. W. Kirtland, Rate Clerk.	Railway employee....	1,500	..
E. B. Kay, Consult'g Engr.	Engineer	....	..
Arkansas: Elective; term, 2 years.			
R. P. Allen, Chairman.....	Banker & fruit ship'r	2,500	2
J. E. Hampton, Com'r.....	Merchant and banker	2,500	6
J. W. Crockett, Com'r.....	Lawyer & politician.	2,500	2
William E. Floyd, Secretary.	Cashier and clerk...	1,500	..
G. W. Swaim, Rate Clerk...	Railway rate clerk..	1,400	..
California: Elective; term, 4 years.			
A. C. Irwin, President.....	Real estate dealer..	4,000	6
H. D. Loveland, Com'r.....	Wholesale grocer.....	4,000	1
Theo. Summerland, Com'r..	Insurance agent.....	4,000	2
Colorado: Elective; term, 6 years.			
Fred'k J. Chamberlin, Pres't	Real estate dealer...	3,000	1
Halsted L. Ritter, Com'r...	Lawyer	3,000	1
Bulkeley Wells, Secretary..	Mine operator.......	3,000	1
Connecticut: Appointive; term, 4 years.			
Andrew F. Gates, Chairman.	Lawyer	3,000	4
Wm. O. Seymour, Com'r...	Engineer	3,000	22
O. R. Fyler, Commissioner..	Business man	3,000	12
Florida: Elective; term, 4 years.			
R. Hudson Burr, Chairman.	Merchant and farmer	2,500	6
John L. Morgan, Com'r....	Ry. contractor and orange grower....	2,500	10
Newton A. Blitch, Com'r...	Farmer & stock raisr.	2,500	2
Royal C. Dunn, Secretary..	Lawyer and editor..	1,500	7
Louis C. Massey, Counsel..	Lawyer	4,500	2
F. P. Damon, Insptg. Engr..	Railway engineer....	2,100	..
Georgia: Elective; term, 6 years.			
S. G. McLendon, Chairman.	Lawyer	4,000	2
H. W. Hill, Commissioner..	Lawyer	2,500	5
O. B. Stevens, Commissioner	Farmer	2,500	2
Fuller E. Callaway, Com'r..	Mfr. and banker....	2,500	2
George Hillyer, Com'r......	Lawyer	2,500	2
Geo. F. Montgomery, Sec'y.	....	2,000	..
Illinois: Appointive; term, 2 years.			
W. H. Boys, Chairman.....	Lawyer	3,600	2
Jas. A. Willoughby, Com'r.	Lawyer & newspaper man	3,600	2

States and Names of Com'rs.	Previous occupation.	Annual salary.	Years served.
B. A. Eckhart, Commissioner	Manufacturer	3,600	2
William Kilpatrick, Sec'y...	Railway employee...	2,500	11
Frank G. Ewald, Cons. Engr.	Railway engineer....	3,000	11
Indiana: Appointive; term, 4 years.			
William J. Wood, Com'r...	Lawyer & Ry. officer.	4,000	2
John F. McClure, Com'r...	Jurist	4,000	3 mo.
Henry M. Dowling, Com'r..	Lawyer	4,000	6 mo.
Charles B. Riley, Secretary.	Shipper	2,500	2
L. E. Morton, Tariff Clerk.	Railway clerk	1,800	2
Alexander Shane, Ch. Inspr.	Railway employee...	2,100	..
Iowa: Elective; term, 4 years.			
W. L. Eaton, Chairman....	Lawyer	2,200	2
D. J. Palmer, Commissioner.	Farmer	2,200	8
N. S. Ketchum, Com'r.....	Mfr. and jobber.....	2,200	4
Dwight N. Lewis, Secretary.	....	1,800	9
Kansas: Elective, term, 2 years.			
G. W. Kanavel, Chairman..	Banker and farmer..	2,500	2
C. A. Ryker, Commissioner.	Lumberman	2,500	2
F. J. Ryan, Commissioner..	Telegraph operator...	2,500	2
E. C. Shiner, Sec'y & Rt. Clk.	....	1,800	..
Kentucky: Elective; term, 4 years.			
A. T. Siler, Chairman.....	Lawyer	3,600	1
L. P. Tarlton, Commissioner	Lawyer	3,000	1
McD. Ferguson, Com'r.....	Farmer & politician.	3,000	1
D. B. Cornett, Secretary...	Lawyer	1,200	1
Roy Wilhoit, Rate Clerk...	Railway clerk	1,800	1
Louisiana: Elective; term, 6 years.			
C. L. de Fuentes, Chairman	Cotton broker	3,000	10
J. J. Meredith, Com'r......	Banker, farmer and sheriff	3,000	2
Shelby Taylor, Commissioner	Lawyer	3,000	..
W. M. Barrow, Secretary and Rate Clerk..........	Court reporter and lawyer	2,400	9
Maine: Appointive; term, 3 years.			
Joseph B. Peaks, Chairman.	Lawyer	2,500	15
Parker Spafford, Com'r....	Engineer	2,000	9
Frank Keizer, Commissioner	Ry. conductor	2,000	1
E. C. Farrington, Clerk....	....	....	19
Massachusetts: Appointive; term, 3 years.			
Walter Perley Hall, Chmn..	Lawyer	6,000	1
George W. Bishop, Com'r...	Ry. roadmaster	5,000	13
Clinton White, Commissioner	Business man	5,000	7
Charles E. Mann, Clerk....	Newspaper man	3,000	6
George F. Swain, Cons. Engr.	Engineer	3,000	10
Fred E. Jones, Supervisor of Accounts	Ry. accountant	2,500	17
Michigan: Appointive; term, 6 years.			
Cassius L. Glasgow, Chmn..	Merchant	3,000	1
George W. Dickinson, Com'r.	Railway officer	3,000	1
James Scully, Commissioner	Lawyer	3,000	1
L. C. Cramton, Secretary...	Editor and lawyer..	2,000	1
James Bice, Ch. Inspg. Engr.	Locomotive engineer.	2,000	1
R. R. Darwin, Ch. Rt. Inspr.	Ry. tariff clerk.....	1,650	1
Minnesota: Elective; term, 4 years.			
Ira B. Mills, Chairman.....	Jurist	3,600	15
Charles F. Staples, Com'r...	Farmer & legislator.	3,600	8
Charles E. Elmquist, Com'r.	Lawyer	3,600	..
A. C. Clausen, Secretary....	Ch. grain inspector..	2,600	8
Mississippi: Elective; term, 4 years			
F. M. Lee, President.......	Sheriff	2,000	2
J. A. Webb, Commissioner..	Railway employee...	2,000	2
W. R. Scott, Commissioner..	Merchant and newspaper man	2,000	2
T. R. Maxwell, Secretary...	....	2,000	2
Missouri: Elective, term, 6 years.			
John A. Knott, Chairman...	Newspaper man	3,000	6
Frank A. Wightman, Com'r.	Railway conductor..	3,000	4
H. R. Oglesby, Commissioner.	Livery man	3,000	2
T. M. Bradbury, Secretary...	....	....	6½
Montana: Elective; term, 6 years.			
B. T. Stanton, Chairman...	Shipper & merchant.	4,000	2
Dan Boyle, Commissioner...	Railway officer	4,000	..
E. A. Morley, Commissioner.	Railway officer and real estate dealer..	4,000	2
Nebraska: Elective; term, 6 years.			
Hudson J. Winnett, Chmn..	Physician	3,000	2
Joseph A. Williams, Com'r..	Lawyer	3,000	2
H. T. Clarke, Jr., Com'r....	Lawyer	3,000	2
Clark Perkins, Secretary....	Newspaper man	2,000	2
U. G. Powell, Rate Clerk..	Railway employee...	1,800	2
Nevada: Appointive; term, 3 years.			
H. F. Bartine, Chairman...	Lawyer	5,000	2
Henry Thurtell, Com'r.....	Engineer	2,500	2
J. F. Shaughnessy, Com'r...	Railway officer	2,500	2
E. H. Walker, Sec. & Rt. Clk.	....	1,800	2
New Hampshire: Appointive; term, 4 years.			
Henry M. Putney, Chmn...	Journalist	2,500	22
A. G. Whittemore, Clerk....	Lawyer	2,200	6
George E. Bales, Com'r.....	Lawyer	2,000	4
New Jersey: Appointive; term, 6 years.			
James W. Congdon, Pres't..	Manufacturer	5,000	1½
Borden D. Whiting, Com'r..	Lawyer	5,000	1½
Frank H. Sommer, Com'r...	Lawyer	....	3 mo.
Alfred M. Barber, Secretary.	Indus. Dept. Mgr...	3,000	1½
Chas. D. McKelvey, Ch. Insp.	Railway Supt.	3,600	1½
Chas. A. Mead, Engr. Bridgs.	Consult'g Engineer...	3,000	1½
James Maybury, Asst. Inspr.	Railway Lawyer ..	2,400	1½
New York, Fisrt District: Appointive; term, 5 years.			
William R. Willcox, Chmn..	Postmaster & Lawyer	15,000	1½
John E. Eustis, Com'r......	Lawyer	15,000	1½

States and Names of Com'rs.	Previous occupation.	Annual salary.	Years served.
Milo R. Maltbie, Com'r....	Asst. Sec. Municipal Art Com.	15,000	1½
Edward M. Bassett, Com'r..	Lawyer	15,000	1½
William McCarroll, Com'r..	Pres. Am. Leather Co.	15,000	1½
Travis H. Whitney, Sec'y..	Lawyer	6,000	6 mo.
George S. Coleman, Counsel.	Lawyer	10,000	1
Henry B. Seaman, Ch. Engr	Engineer	15,000	2
New York, Second District: Appointive; term, 5 years.			
Frank W. Stevens, Chmn...	Lawyer	15,000	1½
Thomas M. Osborne, Com'r.	Manufacturer	15,000	1½
Martin S. Decker, Com'r....	Asst. Sec. Int.-State Commerce Com....	15,000	1½
James E. Sague, Com'r.....	V.P., Am. Loco. Co.	15,000	1
John B. Olmsted, Com'r....	Lawyer & Bus. Man	15,000	1
Ledyard P. Hale, Counsel...	Jurist	10,000	9 mo.
John S. Kennedy, Secretary.	Railway Employee...	6,000	1½
William J. Meyers, Ch. Div. Statistics and Accounts..	Statistican I. C. C..	5,000	..
Frank Barry, Ch. Div. Trafc.	Freight Com.	4,000	..
W. E. Griggs, Ch. Div. Tarif.	Railway Employee..	3,500	..
North Carolina: Elective; term, 6 years.			
Frank McNeill, Chairman..	Lawyer	3,000	9
Samuel L. Rogers, Com'r...	Business Man	3,000	9
B. F. Aycock, Com'r.......	Farmer	3,000	9
H. C. Brown, Clerk........	Accountant	2,700	..
North Dakota. Elective; term, 2 years.			
C. S. Deisem, President....	Merchant	1,200	4
E. A. Stafne, Com'r.......	Farmer	1,200	4
Simon Westby, Com'r......	Farmer	1,200	2
J. W. Foley, Secretary.....	Newspaper Man ...	1,000	2
Ohio: Appointive; term, 6 years.			
J. C. Morris, Chairman....	Railway Employee..	5,000	2
O. H. Hughes, Commissioner	Lawyer	5,000	2
O. P. Gothlin, Com'r.......	Freight Solicitor & Indus. Traf. Mgr.	5,000	2
H. D. Manington, Sec'y....	Newpaper Man	....	..
Oklahoma: Elective; term, 6 years.			
J. E. Love, Chairman......	Farmer	4,000	2
A. P. Watson, Com'r.......	Farmer	4,000	2
J. J. McAlester, Com'r.....	Business Man	4,000	2
C. B. Bee, Rate Clerk......	Railway Employee..	2,500	..
J. M. Lee, Chief Engineer..	Engineer	3,600	..
Henry Willmering, Accountant and Rate Clerk......	....	2,500	..
G. A. Henshaw, Counsel....	Lawyer	2,750	..
W. L. Chapman, Secretary..	....	2,000	..
Oregon: Elective; term, 4 years.			
Thomas K. Campbell, Chmn.	Business Man	4,000	2½
Oswald West, Com'r.......	State Land Agt....	4,000	2½
C. B. Aitchison, Com'r.....	Banker	4,000	2½
O. Goodall, Secretary......	Court Stenographer.	2,000	2½
E. G. Miller, Rate Clerk....	Railway Employee..	1,800	2
Pennsylvania: Appointive; term, 5 years.			
Nathaniel Ewing, Chairman	Federal Judge.......	8,000	1
Charles N. Mann, Com'r...	Lawyer	8,000	1
John Y. Boyd, Com'r......	Coal Operator & Iron & Steel Mgr......	8,000	1
William H. Allen, Counsel..	Lawyer	4,000	..
Harry S. Calvert, Secretary.	Newspaper Man....	4,000	
Rhode Island: Appointive; term, 3 years.			
J. P. Burlingame, Com'r...	Manufacturer	2,500	1½
South Carolina: Elective; term, 6 years.			
B. L. Coughman, Chairman.	Farmer	1,900	6
J. H. Earle, Com'r........	Lawyer	1,900	4
J. M. Sullivan, Co'mr......	Merchant	1,900	2
South Dakota: Elective; term, 6 years.			
F. C. Robinson, Chairman..	....	1,500	..
W. G. Smith, Vice-Chairman	Breeder	1,500	4
George Rice, Commissioner..	....	1,500	2
Texas: Elective; term, 6 years.			
Allison Mayfield, Chmn....	Lawyer	.....	12
O. B. Colquitt, Com'r......	Lawyer, Banker & Politician	.....	6
L. J. Storey, Commissioner..	Lawyer & Politician	.....	14
Vermont: Appointive; term, 6 years.			
John W. Redmond, Chmn...	Lawyer	1,500	3
Eli H. Porter, Commissioner	Banker	1,200	3
S. Hollister Jackson, Com'r.	Lawyer	1,200	3
Rufus W. Spear, Clerk....	County Clerk	1,000	3
Virginia: Appointive; term, 6 years.			
Robert R. Prentis, Chmn...	Jurist	4,200	1½
Joseph E. Willard, Com'r...	Lawyer	4,000	3
William F. Rhea, Com'r....	Lawyer	4,000	1
R. T. Wilson, Clerk........	Railway Officer	.....	..
Washington: Appointive; term, 6 years.			
H. A. Fairchild, Chairman..	Lawyer	$4,000	4
John C. Lawrence, Com'r...	Teacher & Bus. Man	4,000	4
Jesse S. Jones, Com'r......	Railway Shop Foreman & State Sen..	4,000	2
H. P. Gillett, Valuat'n Engr.	Engineer	12,000	.
O. O. Calderhead, Secretary and Rate Clerk	Railway Employee..	4,000	4
A. W. Perley, Engr. & Inspr.	Ry. Mas. Mechanic..	2,000	4
Henry L. Gray, Engineer...	Ry Engineer	2,000	4
Wisconsin: Appointive; term, 6 years.			
B. H. Meyer, Chairman....	Economist	5,000	3½
Halford Erickson, Com'r...	Com. of Labor.....	5,000	3
John H. Roemer, Com'r....	Lawyer	5,000	1
W. D. Pence, Chief Engr...	Engineer	.....	2
J. M. Winterbotham, Sec'y..	Deputy Commissioner	.....	..

COST OF CONCRETE CONSTRUCTION AS APPLIED TO BUILDINGS.*

BY LEONARD C. WASON.
President, Aberthaw Construction Company.

In the following tables only typical jobs are given, whose results are correctly known. The results of a number of jobs have been spoiled by a change of timekeeper during the progress of the work, the new man missing for a day or two the proper classification or some other such small matter. It appears to the writer, moreover, that the results from a few typical jobs would be of more interest than a mass of figures from all kinds, some of which would be of no value. Enough are given for a fair average, except in the case of long span flat slab, which is, by comparison, a recent type of construction. The figures for the highest, lowest and average totals in the fourth and last columns are taken from the vertical column in which they stand and have no relation to the other figures in their horizontal line.

SUMMARIZED RECORDS OF VARIOUS CONTRACTS.

Basis of summary.	Forms per sq. ft.				Concrete per cu. ft.						
	Carpenter labor.	Lumber.	Nails and wire.	Total.	Concrete labor.	General labor.	Cement.	Aggregate	Team and miscel.	Plant.	Total.
Concrete Columns.											
Highest	.133	.082	.002	.181	.166	.056	.109	.084	.041	.034	.340
Lowest	.057	.013	.001	.075	.064	.003	.062	.027	.008	.013	.271
Av. of 9.....	.082	.036	.001	.130	.096	.027	.085	.049	.021	.023	.301
Beam Floors of Reinforced Concrete.											
Highest	.165	.107	.004	.275	.186	.035	.194	.101	.052	.055	.470
Lowest	.037	.027	.001	.067	.047	.004	.071	.037	.007	.010	.202
Av. of 18.....	.070	.045	.002	.116	.111	.020	.106	.063	.025	.024	.354
Flat Slab Floors.											
Highest	.078	.039	.003	.118	.146	.017	.109	.084	.026	.039	.374
Lowest	.067	.037	.001	.106	.043	.004	.087	.053	.012	.010	.252
Average	.071	.038	.002	.111	.097	.009	.096	.070	.019	.024	.315
Concrete Slabs between Steel Beams.											
Highest	.110	.071	,003	.184	.144	.048	.208	.080	.064	.046	.428
Lowest	.028	.012	.001	.049	.073	.005	.076	.026	.004	.010	.272
Average	.061	.032	002	.095	.102	.019	.128	.068	.024	.017	.359
Building Walls above Grade.											
Highest	.136	.073	.005	.176	.146	.052	.105	.187	.077	.055	.446
Lowest	.046	.016	.001	.079	.042	.004	.034	.043	.007	.005	.174
Av. of 17.....	.085	.036	.002	.128	.090	.016	.073	.076	.025	.019	.301
Foundation Walls.											
Highest.	.134	.048	.004	.193	.213	.037	.203	.116	.057	.040	.599
Lowest	.032	.009	.001	.056	.040	.002	.038	.027	.003	.010	.148
Av. of 14.....	.068	.033	.002	.103	.076	.015	.080	.062	.019	.017	.269
Footing and Mass Foundations.											
Highest	.119	.077	.003	.198	.081	.020	.098	.099	.013	.049	.275
Lowest	.016	.006	.001	.018	.025	.001	.047	.043	.003	.010	.181
Av. of 10.....	.057	.034	.002	.093	.045	.007	.071	.077	.007	.021	.229

Steel.

Highest	Cost per ton, $16.47
Lowest	" " " 2.54
Average of 21..............................	" " " 8.52

By reference to the general averages on form work in the foregoing tables of forms per square foot of surface contact, namely, columns $.13, floors with reinforced concrete beams $.116, flat floors without beams $.111, short span slabs between steel beams including the fireproofing on the sides of the beams $.095, walls exposed to view above ground, $.128, foundation walls $.103, mass foundations $.093, the writer believes all higher in price than usually believed to be a fair cost by the majority of builders. It is upon the success of handling forms that good results financially depend. In regard to concrete, labor is the variable item which must be carefully considered. Anyone of intelligence can make a careful estimate of the materials to be used but note the average prices per cubic feet of labor, namely for columns, $.123, beam floors $.131, flat floors $.106, floors between steel beams $.121, walls $.106, foundations $.091 and mass work in connection with buildings $.052; not until the last item is reached is a price obtained in experience which, according to the observation of the writer, the majority expect to obtain in building work in general. Many men who have had wide experience in handling large quantities of concrete in mass have at times attempted a lighter type of construction and been greatly surprised at the large expense connected therewith. It has come to the writer's notice a number of times that men with this experience have added 50 per cent. to 100 per cent. to the cost of mass work and felt that they were amply covered for light structural work. The fallacy of this can be seen by a very recent experience of the writer's. In building a dam this past year across the Connecticut River about 5,500 cubic yards of concrete were placed. Cement and aggregates were received on a bridge abutment 26 feet above the river. Aggregates were dumped upon an inclined chute where they were to be washed, and from the end of the chute they fell into bins from which they were drawn through measuring hoppers into a mixer and dumped from this into tram cars four feet above the water. The total exepense for labor of washing, charging, mixing and dumping into the cars was only $.12 per cubic yard and for moving it in cars an average distance of 700 feet, dumping and placing was only $.30 per cubic yard, or a total cost of $.0155 per cubic foot. The table of steel omits entirely the first cost of the material. After it is received at the site of the work in the shape sold by the manufacturer, these prices cover the cost of fabricating into units for columns or beams, bending the stirrups, placing and all incidentals whatsoever prior to the actual embedding in concrete. In the case of the highest cost, a coal pocket, there was very limited storage space, 1¼-inch bars had to be bent diagonally so as to pass over the top of the support at columns, and numerous stirrups, all of which had to be made by hand. The job was too small to justify any mechanical arrangement for bending or for handling material. The next highest, office building, Portland, Me., there was a sufficient amount to require proper machinery. The hoops for columns were all welded. The vertical bars were all wired inside of these hoops. There was a mushroom head of bent and circular bars wired together at the top and great numbers of long bars of small section spread in all directions over the floor. The lowest price filter at Lawrence was made entirely of straight bars placed loose, the only expense being cutting them in a hand shear to length and placing them.

*From a paper presented to the Fifth Annual Convention of the National Association of Cement Users.

THE BUREAU OF EXPLOSIVES.*

The first proposition to deal comprehensively with the transportation of explosives was made in April, 1905, by an officer of the Pennsylvania Lines, two disastrous explosions having occurred in Ohio; and a committee of the American Railway Association was appointed to consider the subject. Before this committee had finished its work 20 persons were killed by the disastrous explosion at Harrisburg, Pa., which cost the Pennsylvania $500,000. The regulations were finally approved by the association in November, 1905. They did not enforce themselves, and therefore the bureau was established. It began its work June 10, 1907. A few months later the regulations for explosives were supplemented by rules for dealing with inflammable materials and acids.

Colonel Dunn then explained in detail how thoroughly the subject had been explored and with what care the representatives of chemists, paint makers, and all classes of shippers had been conferred with; this to convince his hearers that the railways had not dealt with the subject in a narrow or selfish spirit. Over 300 million pounds of explosives are carried yearly by the railways. The railways have spent $75,000 yearly to maintain their bureau and are doing everything possible to promote safety in the performance of the unwelcome but necessary duty of transporting dangerous articles. Under the Act of Congress of May 30, 1908, the regulations for the transportation of explosives now have the force of law.

*Abstract of address delivered before the Railway Club of Pittsburgh by Col. B. W. Dunn, Chief Inspector of the Bureau of Explosives of the American Railway Association.

Traffic in inflammables is not directly regulated by law, but the two subjects are so linked together that they cannot be separated.

The Interstate Commerce Commission did not prescribe rules for the transportation of inflammables, but it required the railways to do so, and this is also required indirectly by Section 4 of the Act of Congress. The common carriers are enjoined by the Interstate Commerce Commission to keep inflammable articles of all kinds and acids out of cars that contain explosives and out of adjacent cars, and to make these rules effective. It is, therefore, necessary for the common carriers to define inflammable articles and acids and to provide practical means for distinguishing them on freight platforms.

Section 4 requires shippers of "explosives and other dangerous articles" to mark packages correctly and, further, to give the common carrier information of the *character of the contents*. To make this part of the law effective, the common carrier must define "other dangerous articles," tell the kind of information required of shipper as to contents of packages and provide practical means for them to furnish it.

In addition, the common carrier still has, as he always has had, the right under the common law to prescribe, without discrimination, the conditions under which he is willing to assume the risks of transporting any articles deemed by him dangerous.

It follows, therefore, that any shipper desirous of challenging the legality of any of the rules under discussion must prove to the satisfaction of a court of competent jurisdiction that the rule is unreasonable and unnecessary. If he can do that, it is believed that he can more readily convince me, secure my assistance in convincing the Committee on Transportation of Explosives and the American Railway Association, and thereby arrive more directly at the remedy sought. A judge is not liable to assume the responsibility of telling a common carrier that he need not adopt the precautions against accident and fire deemed necessary by the carrier. To do so would make the court responsible, morally at least, for anything that might happen, including a disastrous explosion and loss of life. The Interstate Commerce Commission would have no jurisdiction of a question of this kind, so long as freight rates and discrimination are not involved.

As to inflammables, the principal point is to have suitable labels on packages. The railways require the shippers to affix these labels. There has been some objection to this, but, as Colonel Dunn showed, it is unsafe to depend on having the labels put on after the goods reach the freight house. Axle grease, lubricating oil and many other things are dangerous under certain conditions, and there is a difficulty in deciding how many articles should be included in the class to be labeled. If labels are too common, they are liable to be disregarded. Unfortunately it is impracticable to make rules recognizing, for example, the difference between a dangerous liquid which is well packed and one which is poorly packed. In hot weather the temperature in freight cars sometimes rises above 110 deg. F., and in summer the temperature is liable at any time to make gasolene dangerous.

If we decide to take the risks on liquids flashing above 100 deg. F., why, it is asked, should we not come down still lower, say to 90 deg., and take these risks also? The further we come down, the more rapidly we increase the number of our assumed risks, and the number of occasions where cars will present the dangerous combination of leakage and sufficiently high temperature. In spite of my desire to accommodate shippers and to relieve the already overburdened railway employee from unnecessary work, I have not felt at liberty, in my capacity of advisory expert, to recommend a lower dividing line than 100 deg. F., until experience may show it to be necessary to secure practicability.

And there is a large class of articles on which it is not practicable to require labels but concerning which the railways should have an assurance from the shipper as to the character of the article. Therefore the phrase "no label required" is properly demanded by the railways from shippers of dangerous goods. A large firm in Indianapolis has prepared a printed blank shipping order on which the general term, "Drugs," appears in four places with the words, "No Label Required," "Red Label," "Yellow Label" and "White Label," printed after it successively. All that is now necessary for the shipping clerk to do is to enter in each case the number of packages of "Drugs" whose characteristics bring the packages under the different classifications.

If a shipper presents his package, with a shipping order properly prepared and certified, it is not the duty of the agent, without grave reason for his suspicion, to question the veracity or accuracy of the shipper. The shipper has assumed in this case full responsibility and is liable to a fine of $2,000 and 18 months imprisonment for misrepresentation. If the agent has any reasonable doubt and the shipper insists, after being cautioned, that his certificates and notations are correct, the agent should forward the shipment and then take steps under paragraph 1,871 to have the matter investigated by the Bureau of Explosives.

Shippers who have doubts about the characteristics of their products, as related to the requirements of the railways, may have them tested in the chemical laboratory of the bureau at South Amboy, N. J.

To avoid the necessity of taking a lantern into cars containing inflammable articles, Colonel Dunn recommends the lighting of freight yards by electric light wherever possible.

COST-KEEPING ON CONCRETE CONSTRUCTION ON THE C., B. & Q.

BY DON E. MOWRY.

The superintendent of the new bridge construction department of the Burlington was once a foreman, who on account of his experience and training in bridge work, was advanced to the position of superintendent. Although he had need of a system of cost-keeping, he viewed the subject from the side of the foreman, and not from the side of the contractor whose profits depended upon his knowledge of costs.

Hence, the clerical force needed consisted of one man who had other duties to perform and did the cost-keeping when the other work was done. This system was used on gangs under 11 foremen who were on separate jobs most of the time. The foreman had no time-keepers and did their own clerical work. In as much as the time of these men was checked, finally, in the general offices, their pay rolls had to go in on the standard forms provided for all employees of the railway. The time was entered daily by the foremen on the payroll (Form A) and on the distribution sheet (Form B). A daily report (Form C) was also sent to the superintendent which corresponded to what was entered each day on the distribution sheet. The forms B and C had to correspond in time with the pay-roll sheet.

The daily reports kept the superintendent in closer touch with the work, most of which he manged to visit once a week. By adding up these daily reports the amounts spent on the different items could be found at any time. They were not kept added up, but were summarized once of twice while the job was under construction, and then, when the job was finished, reports were made. One of the faults with this method of cost-keeping it that it lagged too far behind the actual construction.

Materials were ordered by the superintendent from the company's store by requisition. Each requisition had a number assigned to the job when the material was to be used. When the store shipped the material the storekeeper sent a shipping notice bearing the requisition number to the superintendent. The superintendent's copy of the requisition was then marked "shipped," and the shipping notice sent to the foreman to be checked on receipt of the material, and, when returned, the

requisition was then marked "filled." All materials were ordered in this way, and the amount used on each job could be ascertained.

Tables showing bridge piers, abutments and a box culvert were selected as examples. These reports show only the cost of labor, as it was impossible to get the cost of materials which were bought by the general purchasing agent of the railway. Yet they were more complete than is required by the bridge department. A table summarizing all of the work done for about seven months (January 1, 1906, to September 1, 1906) or, the greater part of the season, shows that considerable attention should be paid to other parts of the work than forms, mixing and placing concrete, as these items, while important ones, form only about 40 per cent. of the total.

The greatest difficulty in keeping track of the materials was that they were ordered for one job and were used on another. There were difficulties in the time-keeping.

The foreman's part in cost-keeping must be reduced to the minimum. For, many foremen are unable to make up the simplest kind of a report.

If this cost-keeping were attempted again some changes should be made. It would be almost impossible to change the printed forms of the time and distribution sheets, as this step would complicate the work in the general offices. The best use must be made of these forms. Each job should be studied, and it should be determined in advance to what items the time should be charged.

At the end of the month the time sheets are required to be turned into the general offices as soon as possible. The clerk of the bridge department could take the time and distribution sheets and at a glance at the time sheets see where any man had worked less than a day, and put on the distribution sheet in red ink the actual hour.. The time sheets could then be sent in at once, the distribution sheets being kept and summarized, and, if required, the summary sheet could be sent in a few days later. This would in no way change the forms or break any of the general rules of the railway concerning how time shall be kept.

The method would have the advantage of being more accurate, for, by the old method, the foreman entered his time from his pocket time book on the time roll each night, and then made out the distribution and the daily report. Frequently he would not remember how many men he had doing this or that work and their rates. Generally, he guessed at it and made it check with his time sheet. By this method, on making the distribution, he had to think of each man and then what each was doing in the morning and in the afternoon. It requires less clerical work and no arithmetical work of the foreman. This sort of work they dislike. In one instance, a foreman handed in his resignation because he could not fill out the sheets as required by the company. This is important, as no time-keepers are allowed, and many of the foremen had considerable trouble in making out the distribution.

It might be argued that this method limits the possible minimum distribution to a half day, but on this kind of work, considering that it is not contract, but railway construction, this objection is of less moment. Moreover, it is not very often that each man is so shifted around in a day that his time has to be charged to three items. Any smaller distribution would require a different form. The old method, while theoretically permitting a closer distribution, does not insure the better results.

The daily reports would be made more simple and the aim would only be to keep the superintendent in touch with the gangs.

A method used at the end of the season of permanently binding together all requisitions for each job and noting on the requisition any change in the place where the material was used, would make a simple record of materials and assist in ordering future materials.

CRUDE OIL TIRE HEATERS ON THE LEHIGH VALLEY.

In the accompanying illustration are shown crude oil tire heaters, which have been recently introduced on the Lehigh Valley in the shops at Sayre, Pa. These are said to have proven superior to former methods of using gasolene with perforated rings for removing and applying steel tires.

Crude Oil Tire Heating on the Lehigh Valley.

The heater consists of six oil burners mounted on an adjustable frame. The frame is made of wrought iron piping, mounted on a pair of wheels. On the main part of the frame, a combination air and oil chamber is arranged to slide forward and back, and in conjunction with a six-point star, the various adjustments of the burners to suit different diameters of wheels obtained.

On the front side of the supply chamber there are six ball-joint connections to the oil supply, also six connections to the air supply. When using gasolene for removing tires, it required two men for from 20 to 50 minutes per tire, while with this heater the same number of men can do this work in from 7 to 11 minutes.

At the right hand side of the illustration is shown a number of new tires placed one upon another on three cast iron blocks. A large crude oil burner, having capacity sufficient to fill the inside of eight tires with flame which will heat them for application, is placed on the floor below the center of the pile. About 20 minutes is required for heating these tires sufficiently for application. Both of these heaters are said to be comparatively smokeless and to give perfect satisfaction. During a test with these burners, six old tires were removed and six new ones applied in 1 hour and 52 minutes. We are indebted to J. W. Hamm, Machine Foreman of the Lehigh Valley at Sayre, Pa., for the information and photograph given herewith.

General News Section.

Sixty chief clerks on the Missouri Pacific have organized a club, which will hold monthly meetings.

The Railroad Commission of Louisiana has ordered the roads in the state to show cause, at a hearing on January 26, why all tracks that are used by more than one railway should not be equipped with block signals.

Track prizes have just been awarded on the Lackawanna. Thomas H. Powers takes first prize for general condition of the division from Buffalo to Bath. The prize was a sum of money and a medal. The section foremen under Mr. Powers who won the prizes for the best sections in their territory are James McLaughlin, first prize, $60 in money and silver medal; J. Machley, second prize, $30; Frank Duffy, third prize, $15.

A meeting of representatives of southeastern railways was held at Atlanta, January 12, to consider the advisability of forming a southeastern car service association, similar to the Eastern Association of Car Service Officers and the Central and Western Association of Car Service Officers. F. J. Parham, Car Accountant of the Columbia, Newberry & Laurens, was chairman of the committee that brought about the conference.

The Post Office Department has abandoned its practice of imposing severe fines on railways for delays in transporting the mails. It appears that the imposing of heavy penalties which has been general during the past two years has been due to special provisions in the appropriation bills for those years. But in the appropriation bill for the current year the provision relating to fines was omitted, and the department has therefore returned to its former custom.

In Portland and other places in Maine members of the Brotherhood of Locomotive Engineers are circulating a petition, to be presented to the legislature of the state, asking that a proposed extension of the Bangor & Aroostook shall be exempt from taxation for 10 years. The petition sets forth that the proposed extension will give employment to additional railway men and that it will make accessible timber now standing which, without a railway, will decay and be wasted. The line of the proposed extension is from West Seboois to Fort Kent, 143 miles.

It has been reported that the Chicago, Milwaukee & St. Paul will establish agricultural experiment stations along its Pacific coast extension. An officer of this road writes to the *Railroad Age Gazette*: "The matter of establishing agricultural experiment stations on the Pacific coast extension of this railway is still under consideration. Nothing definite has so far been decided. In any event the agricultural experiment stations will not be established by the railway but will probably be established in Montana by the state government, and the railway will assist the state in establishing and maintaining these stations."

Five railways, in pleading guilty in the federal court at Chicago on January 5 to violations of the 28-hour law, filed statements with the court asserting that their failure to take live stock from trains as required by the law was due to the negligence of employees and to unavoidable accidents. The railways entering pleas, the number of cases against each and the amount of fines paid by them are as follows: Chicago, Milwaukee & St. Paul, 33 cases, fine $3,300; Chicago & North Western, 6 cases, fine $600; Chicago, Burlington & Quincy, 1 case, fine $100; Chicago Great Western, 1 case, fine $100; Chicago, Rock Island & Pacific, 2 cases, fine $200.

In the district court of Bexar county, at San Antonio, Tex., on Wednesday of last week, a jury found a verdict of $40,000 damages against the International & Great Northern Railroad in favor of Frank Brice, an engineman who had lost a leg in consequence of a collision. It appears that the suit had been tried three times, and between the first and second trials a second amputation had had to be made. The first judgment was for $15,000. On appeal this was reduced to $12,000, but the next court above ordered a new trial. Then a verdict of $25,000 was given, but the Court of Appeals reversed this, and the third trial followed, resulting in a verdict of $40,000, which was the sum sued for at first, and was $15,000 *more* than was asked for in the final arguments. The company contended that Brice himself was partly responsible for the collision, because he approached a station with his train not under control.

The so-called co-employee negligence law of Wisconsin is held constitutional by the Supreme Court of Wisconsin in a decision handed down in the case of Kiley vs. the Chicago, Milwaukee & St. Paul. Kiley brought suit for damage of $15,000 for the loss of an eye through the negligence of fellow-employees while discharging his duty. He attempted to pull a staple from a wire fence under orders from his foreman, and meanwhile two fellow-employees jerked the staple out by pulling on the wire. The staple struck Kiley, ruining an eye. The railway company demurred, claiming that the statute is unconstitutional as class legislation, inasmuch as it exempts shops and offices. The Supreme Court holds that the legislature has power to prescribe a rule for making comparisons in cases of comparative negligence, and that the exemption of shop and office employes from the operation of the law is appropriate. Their conduct does not bear so directly in securing the safety of the public.

The Indiana supreme court has rendered a decision making perpetual an injunction issued by a lower court, forbidding Marion and Vigo counties to compel the Vandalia to pay taxes on money deposited in banks at different points along its line. These counties have attempted to collect taxes on deposits in banks at Terre Haute and Indianapolis which have varied at Terre Haute from $145,000 in 1889 to $1,568,000 in 1904 and at Indianapolis from $249,430 in 1897 to $2,068,000 in 1904. The amount of taxes sought to be collected in Vigo county was $156,000 and in Marion county, $123,000. The court said that money is like rolling stock in that it comes and goes every day, and for one county to reap the full benefit of the taxes to the exclusion of others would be unfair. Therefore the method of requiring a state board to take into consideration in assessing railway property the amount of capital stock was adopted; and as taxation of a railway's money was nowhere provided for, by the state statutes, it was not legal.

The Supreme Court of the State of Washington, on January 5, rendered a decision holding that the organization of the Spokane, Portland & Seattle was not in violation of the anti-trust provisions of the Washington constitution nor of the Federal anti-trust act. The Spokane, Portland & Seattle sought to condemn rights-of-way across the rights-of-way of the Cascade Railroad, the Oregon Railroad & Navigation Co., and land owned by the New York Trust Co. The question of the legality of its existence was raised in view of the fact that of the 50,000 shares of its capital stock, 49,995 were subscribed for by C. M. Levey, vice-president of the Northern Pacific, in trust for the Great Northern and the Northern Pacific companies, and that these companies advanced the money for the construction of the line. The supreme court said that the intention of the constitutional and statutory prohibitions against the consolidation of parallel and competing lines was to preserve to the public existing facilities offered by competing companies, and in this case competition was not suppressed.

The Missouri Pacific has announced the following track inspection premiums for the year 1908. The premiums, for the best condition of line and surface at the time of the inspection, are as follows: Best Roadmaster's subdivision, $200; second best Roadmaster's subdivision, $100; third best Roadmaster's subdivision, $50; best track section on each Superintendent's division, $25. Second best track section, 10 days' leave of absence at full pay, with transportation for section foreman and immediate family to any point on Missouri Pacific System. Roadmaster's first premium, J. C. Davis; sec-

ond, J. C. Ellison; Third, E. G. Masters. Section foremen: Eastern division—First, E. McReynolds; second, W. F. Skinner. Joplin division—First, W. Garvey; second, J. Miller. White River division—First, N. P. Knapp; second, N. N. McHolland. Missouri division—First, T. Nance; second, T. L. McGee. Arkansas division—First, J. H. Lair; second, Geo. Eaton. Memphis division—First, M. J. Corcoran; second, O. E. Butler. Memphis H. & L.—First, I. M. Lewis; second, O. L. Kirkendall. Eldorado & Bastrop: First, T. J. Calcote; second, J. Toole. New Orleans & N. W.—First, J. M. King; second, J. L. Claughton and H. Stewart. The last two being tied for second premium, each receives the 10 days' leave of absence and transportation.

J. W. Congdon, President of the New Jersey State Railroad Commission, declines to recommend the passage in New Jersey of a law similar to the Public Utilities Law of the state of New York for regulating railways and other corporations. The commission has made its annual report, and the other two members, Messrs. Whiting and Sommer, recommend that New Jersey follow the example of New York, with a few modifications; but Mr. Congdon says that the benefits to the public in New York have not been sufficient to justify the great expense involved. Moreover, the people are not now demanding the severe regulation of railway rates which was so popular two years ago. Farmers in the West own shares in railways, and they are not applauding their legislators for passing severe laws. It is unwise to lodge unlimited power in railroad commissioners lacking in technical knowledge and practical experience. This is now seen by many of the people and a more conservative sentiment prevails. A single commission should not be charged with the oversight both of the common carriers and of other corporations. The New Jersey commission is unanimous in asking for more power in the matter of abolishing grade crossings.

American Railway Clearing House.

The number of railways belonging to the American Railway Clearing House has been increased by 27 within the past two months, making the total present number of members 41.

The roads which have begun to clear their accounts through the Clearing House since November 30 are as follows:

The Central Pacific, the Chicago Terminal Transfer, the Corvallis & Eastern, the Delaware & Hudson, the Galveston, Harrisburg & San Antonio, the Galveston, Houston & Northern, the Gulf, Western Texas & Pacific, the Houston & Shreveport, the Houston & Texas Central, the Houston East & West Texas, the Iberia & Vermillion, the Louisiana Western, Morgan's Louisiana & Texas Railroad & Steamship Company, the Napierville Junction, the Nevada & California, the New Mexico & Arizona, the New York Texas & Mexican, the Oregon & California, the Oregon Railroad & Navigation Company, the Oregon Short Line, the Oregon, Washington & Idaho, the Quebec, Montreal & Southern, the St. Joseph & Grand Island, the Southern Pacific Company, Pacific System, the Southern Pacific, Coast Lines, the Texas & New Orleans and the Union Pacific.

Beginning January 1 all members east of Pittsburgh and Buffalo report to the New York office of the Clearing House and all west of these points report to the Chicago office.

Washington Letter.

WASHINGTON, Jan. 13.—It is made clearly apparent, from all the circumstantial evidence as well as from direct statements, that the pending prosecutions of the Chicago packing house people originated with the Interstate Commerce Commission, and that it has had the aid of the railways centering at Chicago. Or, perhaps it might be more accurate to say some of the railways, as it is not known that all of them have rendered assistance.

But from that which the government has so far established it appears that the packers are under strong suspicion of having ridden a free horse to death. That is to say, they have ground the railways until they could stand it no longer. It is not directly charged that the railways instigated the prosecutions. Very possibly it would be too much to allege this to be so. But there is no doubt that the railways have been of material assistance to the Federal authorities in securing evidence to lay before the grand jury now considering it.

The situation regarding these packing houses is and has been that they were insatiable, apparently. They have had an elaborate system of claiming damages from the railways, and since the passage of the Hepburn law it is the belief of the government authorities that by the "damage" road they were holding up the railways to as great an extent as ever. This at least is what the government is now trying to establish. The government for one thing believes that when the packers permitted James R. Garfield, then Commissioner of Corporations, to see their books and thereby secured an immunity bath, they did not show the real books. In other words, that the packers kept two sets, and gave Garfield access to but one. The set which told the tale of the relations between the railways and the packers did not come within the range of his vision.

But when the present investigation was undertaken the government secured from some source information of the existence of the second set of books. Demand for them was made. The demand was not complied with. Thereupon the United States attorney, feeling sure of his ground, sent word to the packers that if the secret set of books was not in his office in two hours some people connected with the packing industry would sleep in jail that night. This brought the books, and these books are now in the hands of the grand jury.

It is not the expectation of the Federal authorities that they will be able to bring into court the chief men in the packing business on the charge of extorting rebates from the railways. In this case the government will have to rely upon the documentary evidence procured, and the Federal attorneys feel certain that the principals will not have left any trace in writing of orders issued to their subordinates. But it is evident that they expect to indict some who are "fairly well up in the packing business," as one attorney put it.

However, from the information the government has, it is anticipated that when this matter is aired in the courts the country will be astonished at the extent to which the railways have been compelled to submit to the demands of the packers. If the proof shows, as it is expected to show, that this system of holding up the railways has been practiced for no other purpose than that of obtaining what was nothing less than a rebate, the total figures will be large. G. G.

The Wall Street Journal Breaks Into Song.

State Regulation of Street Railways in New York City.

The receivers of the Metropolitan Street Railway Company, New York City, finding that within two or three years it will probably be necessary to spend many millions of dollars to put the property in condition to give adequate service; and as they have already expended $8,000,000 to $10,000,000 have sent the State Public Service Commission a letter, in which they say:

"At the recent hearing on the proposed 59th street joint rate matter the testimony established that the properties in our care, under the present method of operation, are earning substantially no return whatever upon the assessed valuations, nor any amount approximating such a return. No testimony was offered to the contrary.

"It was reasonably expected by us that the facts thus developed would receive fair consideration by you and would effect some change in the attitude you had theretofore maintained toward the Metropolitan Street Railway property; but * * * you either fail to appreciate the actual situation or are bent upon making orders which you must know are practically confiscatory in their character.

"You certainly must understand that these roads cannot continue to be operated in a satisfactory manner without the expenditure of large sums of money in excess of the revenue which they now yield. We know of no method of obtaining the necessary funds except by resorting to the financial markets of the country and availing of money seeking safe investment.

"Your policy of oppression, maintained and persisted in, notwithstanding the indisputable evidence submitted to you, constitutes such a menace that any attempt on our part to procure the requisite cash to enable us to carry on operations successfully would be utterly futile. If you intend that orders of the character of those you have issued with reference to the Eighth street line shall be complied with you must point out to us some practical method of raising the necessary funds.

"The fact that you are now making an appraisal of this property would seem to be a concession that the data at your command were insufficient to afford a basis for intelligent orders involving expenditure. Nevertheless, you are continuing to issue such orders requiring large capital expenditures and a great increase in operating expenses, and this you are doing, notwithstanding the repeated protests of those acquainted with facts which you apparently refuse to admit, although unable to disprove.

"Your orders with reference to the Brooklyn and East Tenth street ferry branches of the Eighth street crosstown line make necessary the addition of between twenty-five and thirty car units, representing an outlay of from $375,000 to $450,000, to say nothing of additional operating expenses, estimated to amount to over $100,000 a year.

"In our letter to you of December 14, 1908, we told you that we did not have sufficient cars to operate the schedule you suggested without robbing other lines of equipment. It is true that we expect to receive 127 new cars during the winter, but in ordinary course only a small part of the additional equipment thus at our disposal would be allotted to the Eighth street crosstown line. The transportation requirements taken as a whole will not justify the assignment to the Eighth street crosstown line of so many additional cars as your orders require. * * * The requirements of your final orders, Nos. 1015 and 1016, unquestionably seem to make it unprofitable for the receivers to continue to operate the property of the Central Crosstown Railroad Company, which includes the Eighth street crosstown line, under a temporary agreement expiring April 30 next, which agreement relieves us from the necessity of paying the sum of $22,500 quarterly as part of the stipulated rental under the terms of the lease.

"The result of our former investigation, when orders pertaining to this line were issued by you last spring, and the decrease in travel on the line under consideration, due to the operation of the Hudson tunnels, has led us to consider the advisability of asking the court which appointed us for instructions in the matter of continuing to operate the property of the Central Crosstown Railroad Company. * * *

"We hope that in view of the facts above pointed out you may see fit to make some modification of your final orders, Nos. 1015 and 1016. If, however, you insist upon putting them into effect without any modification, we shall be glad if you will indicate from what other lines the cars are to be withdrawn in order that we may comply with the orders regarding Eighth street.

"It seems only fair that if you are bent upon demonstrating to the public the superiority of your judgment and the breadth of your knowledge of practical railroading you should assume the responsibility for the results. * * *"

Chairman Willcox, of the commission, made a reply to this letter which was as spirited as the letter itself. The law of the State requires every street railway corporation to give adequate service, and the receivers are subject to the law. The statutes also put upon the Public Service Commission the duty of deciding whether the railroads adequately perform their functions and to require good service if there is a lack. The commission will continue to perform its duty. Twelve hearings have been held concerning complaints of service on the Metropolitan lines, at none of which did the receivers appear, nor did they send a representative. The receivers have never asked to be relieved from the obligation to run a sufficient number of cars on the Eighth street line. The declaration that no new cars are to be bought seems to be a refusal to obey the laws of the State of New York. The commission "notes with astonishment" the veiled threat to break up the Metropolitan system into small sections. Such disregard of the law will be resisted to the fullest extent possible. The law can be obeyed, it is declared, without the harmful results which the receivers threaten. To withdraw cars from other lines in order to increase the service on Eighth street, would be a plain violation of the statute, and the commission will keep watch to see whether the plan is carried out. If orders are not complied with, resort will be had to the courts.

One day later the receivers rejoined with another letter. They have not denied that they are subject to the statutes of New York. They have not violated the law, nor do they intend to do so. They are rendering the best service in their power. The suggestion that they should surrender the franchise is "singularly futile." The commission has no power to deprive the creditors of the company of their security because of its arbitrary views with regard to what constitutes adequate service. "Fortunately there are tribunals which consider evidence, have regard for existing facts and are guided by the settled rules of law." If the commission undertakes to destroy the value of the property, the receivers will resist by every lawful means. The receivers stayed away from hearings because so directed by the court; but they have furnished all information asked for. A small number of cars had been leased to the Belt line (Fifty-ninth street) solely to promote the convenience of the public; it was of no advantage to the receivers. Mr. Willcox's reference to threats is unjustified; and he has failed to meet the essential points in the receivers' first letter.

A Note on Discipline.

Oscar Tschirky, one of the managers of the Waldorf, the man who rose by successive steps from head waiter to be one of the managers at $25,000 a year, told the secrets of his success to members of the International Stewards' Association at a meeting recently in the Marlborough Hotel. In regard to his training school for waiters he said: "In a business which employs many men the best scheme is to get them together about once a week for instruction. In the case of the Waldorf, with its many different dining-rooms, this is necessary to secure a uniform service. Otherwise there would be one kind of service in the cafe and another in the main dining-room, and that would never do. I have found that with my school it has been possible to make an indifferent waiter into a perfect waiter. When I started the school I gave each of the head waiters a complaint-book, in which he was required to make note of every error made by a waiter. I would then go over the book, call the waiter's attention to his mistake, and at a meeting of the school bring the matter up, so that every one might have the benefit of the mistake and correction. Another point, equally important, is the appearance of the waiters, and I started the

scheme that when the men came on duty and signed their time slips they should be subjected to a rigid inspection as to the neatness of their clothes, shoes, hands and hair. Any manager or head waiter who will treat his men right, not laugh and fool with them and insist on this sort of discipline can have the same kind of service as is given at the Waldorf."—*New York World.*

The Squelching of the Scalpers.

The Railway Ticket Protective Bureau reports that during the past year, through injunctional and other legal procedure, ticket scalping has been eliminated at Cincinnati, Columbus, Toledo, Denver, Omaha, El Paso and at Chicago, with the exception that in the latter city three or four shops have managed to maintain an uncertain existence by the manipulation of party labor tickets, and a single broker at Toledo has, as opportunity afforded, conducted an inappreciable traffic in return portions of week-end excursion tickets. Applications for injunctions are pending in the Federal Court to suppress ticket scalping at Buffalo and Niagara Falls. The Bureau's second extermination of these parasites at Denver was an undertaking of some moment and was accomplished only by exhausting the authority of federal, state and municipal courts, combined with an unremitting and systematic supervision of the broker's offices. Incidental to this last movement at Denver, a pair of clever professional ticket "raisers" and forgers were uncovered, tried and sentenced to penitentiary terms, and, on the confession of one, accomplices and confederates of these men were apprehended in the East and are awaiting trial. The officers of the Bureau believe that the business of ticket scalping as for many years systematically conducted in the principal commercial cities of the United States has been decreased in the number of people engaged and in the volume of their transactions at least ninety-five per cent.

Must Move Back Shops or Pay Penalty.

The long pending action at law of the town of Ashley, Ind., against the Wabash Railroad Company for damages caused by the removal of the company's shops has just been decided by the Federal court. It was shown that the town contributed a bonus of $18,000 to secure the shops which were established in the town but soon thereafter removed to another city. The court held that the company must either pay back the $18,000 or move the shops back to and operate them in Ashley. This suit has been in the courts for years and has been watched with much interest. The railway company has not yet decided with what portion of the judgment it will comply.

Directory of Telegraph Companies.

The *Telegraph Age*, in its issue for January 1, prints a directory—filling about 30 pages, and the first one of the kind ever compiled—giving the names of officers and other useful information concerning all of the telegraph lines of North America, including land lines, submarine cables, wireless telegraph companies and the signal service of the United States army.

Mexican Railways.

S. M. Felton, President of the Mexican Central, now in Chicago, speaking about the merger of the National Railroad of Mexico, the Mexican Central, the Mexican International, the Hidalgo & Northeastern and the Interoceanic of Mexico under government control, says that the government will leave the operation of the lines in private hands, though it owns 70 per cent. of the stock of the company. Mr. Felton denied a report that he was to resign as President of the Mexican Central. He said that the growth of traffic on existing lines was rapid. "The merger plan is a new experiment in the direction of government ownership, and one that appeals to all thinking people, having many advantages over direct operation such as exists in Europe." The roads will continue to be operated by their present officers and under the direction of a board of directors. "The government influence will only be felt in the direction of preventing unnecessary railway construction and in using the resources of the company for development of the republic and furnishing railway facilities where they do not now exist."

The mileage embraced in the merger is 7,012 miles. In addition, the Vera Cruz & Pacific, 265 miles, and the Tehuantepec National, 206 miles, are controlled by the Mexican government. The total railway mileage of Mexico, not counting small branches to mines and industrial tracks, is approximately 10,105 miles. Continuing, Mr. Felton said:—

"The start in Mexico has been made early enough to prevent a repetition of the enormous waste of money that was seen in this country through the construction of parallel and competing lines. The concentration of so large a mileage into one control should produce large economies in operation. The securities provided for in the organization of the new operating company to the National Railway of Mexico, will take care of the necessary improvements, and also the construction of new lines for many years to come."

Steamship Connections of St. Paul System.

The Chicago, Milwaukee & St. Paul has entered into an arrangement with the Osaka Shosen Kaisha (Osaka Mercantile Steamship Company, Ltd.) of Japan, to carry freight between points in the United States and the Orient. The Osaka Shosen Kaisha is now building six steamers. The steamship company has a fleet of 106 vessels with a gross tonnage of 110,000 tons and now maintains regular service along the Japanese, Chinese, Siberian and Korean coasts. The first of the six boats to be used in the trans-Pacific business will be launched at Kobe, Japan, this month and will be called the Tacoma Maru. The names of the other boats will be the Chicago Maru, the Panama Maru, the Suez Maru, the Canada Maru, and the Mexico Maru. It is expected that the Pacific coast extension of the St. Paul will be ready to carry through freight in June, and on August 1 through service, with semi-monthly sailings, will be established. The steamships to be used will be of 7,200 tons capacity, with a speed of 14 knots.

President Butler on Railway Regulation.

"To gain a seat upon a state railway commission or upon the Interstate Commerce Commission ought to be the highest ambition of a successful railway man, just as to gain a seat upon the Supreme Court bench of his state or of the United States is the highest ambition which a competent lawyer can entertain.

"What the railways now most fear, and justly fear, is supervision by ignorant and narrow minded men who have no real conception of the problems of railway construction, operation and management. We have long since substituted judicial procedure for the primitive trial by ordeal in ordinary criminal cases, but it may well be doubted whether we are not even to-day compelling the transportation systems to submit to trial by ordeal rather than to judicial inquiry and determination. Moreover, in our state and national supervision of the common carriers we must have a care that we do not attempt to substitute these governmental commissions for the boards of directors."—*Nicholas Murray Butler.*

Car Interchange and Inspection at Chicago.

The General Superintendents' Association of Chicago recently appointed a committee of five to investigate and report upon the advisability of establishing a bureau or bureaus for car inspection, to pass upon the physical condition of cars handled in interchange and to gather and compile interchange data within the Chicago switching limits. It is composed of the following: C. L. Ewing, General Superintendent Illinois Central, chairman; D. L. Bush, General Superintendent Chicago, Milwaukee & St. Paul; W. D. Cantillon, Assistant General Manager Chicago & North Western; E. Ryder, General Superintendent Indiana Harbor Belt, and B. W. Duer, Division Superintendent Baltimore & Ohio.

This committee referred the matter to their car service officers, and the following committee of car service officers was named to do the work: J. M. Daly, Illinois Central, chairman; R. W. Willis, Indiana Harbor Belt; F. M. Luce,

Chicago & North Western; W. E. Beecham, Chicago, Milwaukee & St. Paul, and J. R. Kearney, Baltimore & Ohio. The A. R. A. committee on car efficiency is having its representatives collect data regarding interchange and inspection at Chicago, which will be submitted to this committee of car accountants.

Meantime the subject of inspection is also being considered by the mechanical officers of Chicago roads. It has been found that several roads are far behind in the issuance of defect cards, some being as far back even as 1902, and the following committee of mechanical officers is working on a plan to bring the defect cards up to date and to prevent a recurrence of the present situation: T. R. Morris, Chicago, Milwaukee & St. Paul, chairman; F. C. Shultz, Chicago, Burlington & Quincy; P. T. Dunn, Pennsylvania Lines; T. H. Goodnow, Lake Shore & Michigan Southern; E. F. Jones, Chicago & Western Indiana; J. L. Hodgson, Grand Trunk, and A. S. Sternberg, Wabash.

U. S. Forestry Station at Wisconsin University.

The United States Forest Service has decided to locate an experimental laboratory station at the University of Wisconsin, Madison, Wis. The Forest Service will equip the laboratory at a cost of $14,000, and will provide the entire staff of investigators, whose salaries will aggregate $28,000 a year. All the experimental work in forestry carried on by the United States Government east of the Rocky mountains will be concentrated here. This will be the only station of its kind maintained by the government, except a small laboratory on the Pacific coast. Preservation of wood, such as railway ties, by different processes, and the use of preservative fluids will be an important field of investigation, for which complete equipment is to be provided.

Railway Business Association.

The movement for moderation in the restriction of railways, to promote which the Railway Business Association was organized three months ago, has gone forward with such vigor and effectiveness that railway officers generally are enthusiastic about the new organization. The president of one of the most extensive systems last week remarked to a group of members of the Association: "I have means of knowing the results of your work which you cannot possibly have, and I assure you that they have been greater than you can imagine." Recently a high officer in one of the associations of operating managers told the same gentleman that he was receiving many inquiries, and after investigating would hereafter say: "The Railway Business Association is doing for railways what we could not possibly have done for ourselves."

The Association on December 5, being informed that Senator Fulton, of Oregon, was pressing for a report from the Committee on Interstate Commerce on his bill postponing the going into effect of rate increases until all protests as to their reasonableness shall have been finally passed upon by the Interstate Commerce Commission, caused several hundred telegrams to be sent to its members and others in 16 states and to members of the Senate committee, and the president of the Association telegraphed every member of the Senate, declaring that the bill would take the rate-making power away from the railways, to the great injury of all those interested in the welfare of transportation enterprises, and asking that the measure be not advanced in the Senate without opportunity for the fullest hearing. The following forenoon the committee reported the bill adversely by a vote of 6 to 5. The Railway Business Association has no way of knowing what effect its representations had upon the committee, but in view of the closeness of the vote it feels justified in feeling that it may have had some influence. Certainly it did no harm.

A feature of the work of the Association is the writing of letters to senators and representatives, national and state. A suggestive draft of letter sets forth the injury done to local interests through enforced idleness of employees in concerns making equipment and material for railways and asks the legislator to use his influence "to secure fair consideration of railway measures, to discourage purely anti-railway legislation and to favor such an adjustment of transportation rates as will adequately be remunerative to the railways and assure maintenance of the wage scale."

Hundreds of such letters have been sent. In the home newspapers of various congressmen, despatches from Washington have reported the receipt of the letters, together with names of writers. Replies have been made by a large number of legislators. The *Railroad Age Gazette* has obtained copies of two typical answers. Representative E. J. Hill, of Bridgeport, Conn., a member of the Committee on Ways and Means of the national House of Representatives, writes a manufacturer of his district: "I am in receipt of your letter of the 16th, and in reply would state that, in my judgment, it is as full of wisdom as an egg is full of meat, and will have my careful consideration, and I may add furthermore, cordial co-operation." State Senator John Humphrey, of Chicago, writes: "I believe that if the times are good and railways are doing good business, their employees will get good pay. I shall also try to do all I can in regard to the matter, and if there is any railway legislation that comes up this winter I shall be very glad of your help, and if there is anything you know in regard to legislation, if you will let me know, I will endeavor to do what I can and help on good times again. I believe that this continual legislation against railways and corporations makes trouble and does no good."

The members of the Association are writing to concerns from which they purchase, asking them to do missionary work. Many replies from such concerns say that they consider their interests identical with those of the establishments which sell directly to the railways, that they would co-operate, and in some instances they express a desire to join the Railway Business Association.

Admittedly actuated by a selfish motive, namely, to reassure investors, provide working capital for railways and thus obtain orders for themselves, the members have set out to convince as many interests as possible that they, too, have a selfish motive in reassuring investors. An appeal was sent recently to hundreds of business bodies to adopt resolutions asking Congress and the legislatures to support conservative and constructive legislation affecting railways. The day following the distribution of this circular the Southern Commercial Congress, assembled at Washington, and comprising delegates from 64 business bodies in 14 southern states, complied with the request, the committee reporting unanimously through its chairman, Gov. Hoke Smith, of Georgia. Southern business men seem to realize that for the development of the resources of their section they must depend largely upon enormous increases in railway facilities. A systematic campaign is now being carried in in the South to obtain such resolutions from the associations in the several cities which were represented in the congress.

The day after the Southern Commercial Congress had led the way, the New York Board of Trade and Transportation unanimously urged "the business men of the country to favor such freight rates as will insure the railways adequate revenues for maintaining the equipment of roadbed and handling the traffic." This resolution was published widely by the press.

The next body to act was the New York Merchants' Association. Although on record in the form of previous resolutions, the Merchants' Association cordially reiterated its position, ordering the resolution sent to senators and representatives in Congress and to the members of the New York Legislature. These resolutions were published in the *Railroad Age Gazette* last week. They were sent by the Merchants' Association to a large number of railway officers. The Pennsylvania Lines West of Pittsburgh gave one whole page of the cover of their passenger time table to these resolutions.

The Detroit Board of Commerce adopted a resolution merely upon receipt of the circular; so did the boards of trade of Indianapolis, Clarksburg, W. Va., and Jacksonville, Fla.

More than fifty boards of trade have notified the Railway Business Association that they have the matter of resolutions under advisement. Members of the Association in various states are endeavoring to secure action by their local boards. Several national organizations of particular lines of trade and manufacture have communicated with the Association, in some instances where the annual meetings are some months distant, offering to obtain by mail from members of executive commit-

tees authorization of resolutions. The Association has arranged to be represented at meetings of various bodies. It is proposed in a short time to embody all resolutions adopted in a pamphlet, to be sent to senators and representatives in Congress and members of all state legislatures.

Having created public opinion favorable to railway construction and carried the concrete evidence of such opinion to legislators, the Railway Business Association completes the circular by appeals to members of the stock exchanges in the principal cities, asking them to inform investors who consult them, concerning the efforts making and the results already accomplished in the direction of safeguarding investments in railway securities.

This is a fragmentary account of the work done by the Association up to the present time. The effectiveness of this work must vary directly with the size of the membership and the real representation it carries. The Association had a very strong list at the close of 1908. In the first ten days of 1909 it has added members who employ about 39,000 men when their plants are running at full capacity. It is safe to say that every concern which now joins in the movement will be adding a vote for economic stability proportionate to the number of its employees.

St. Louis Railway Club.

The speaker at the monthly meeting of the St. Louis Railway Club at the Southern Hotel on January 8 was George A. Post, President of the Railway Business Association. His subject was "The Smile Combine."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The name of the Texas Car Service Association has been changed to "Texas Demurrage and Storage Bureau."

The United States Express Company has given notice that it will operate over the Rock Island-Frisco Lines after July 1, next.

The Pennsylvania Railroad carries free to New York, Philadelphia or Baltimore, relief goods for the Italian earthquake sufferers.

Governor Gillett of California, in his message to the legislature, recommended legislation to prohibit rebating and unjust discriminations by railways and to provide adequate penalties for such offenses.

The Canadian Pacific has made a rate of 22½ cents per 100 lbs. on grain from points in Alberta to the Pacific coast. The company, it is stated, expects to move a large quantity of grain through Vancouver to Mexico, and also some to the Philippine Islands and Asia.

The Board of Trade of Chicago has adopted a resolution deprecating "unjust agitation against corporate and railway interests or any drastic legislation directed against such interests" and favoring "co-operation with the railways in bringing about measures calculated to benefit alike the shipping public and the carriers."

The semi-annual meeting of the Western Classification Committee is being held this week at Mobile, Ala. A party of railway traffic officers and representatives of large shipping concerns left Chicago on January 11 on a special through train which ran over the Chicago & Alton from Chicago to St. Louis and from there by the Mobile & Ohio.

The Chicago & Alton, J. N. Faithorn and F. A. Wann will ask the Supreme Court of the United States for a rehearing in the case in which they were fined an aggregate of $60,000 for the payment of rebates to the Schwarzchild & Sulzberger Company. The request is made on the ground that as the Supreme Court arrived at its decision by a tie vote and no written opinion was rendered a question vitally affecting the relations between railways and shippers is left unsettled.

The Chicago, Burlington & Quincy has announced a rate of $62 for the round trip from Chicago to Seattle for the Alaska-Yukon-Pacific Exposition. The lines belonging to the Transcontinental Passenger Association had already made a rate of $50 for the round trip from St. Paul and Missouri river points. The roads belonging to the Western Passenger Association has had under consideration for some time the proposal to make a $62-rate, but had been unable to agree. Other western lines will now also make this rate.

The California Traffic Association and kindred organizations are preparing to make complaint to the Interstate Commerce Commission against the advance in freight rates that the transcontinental lines put into effect on January 1. The shippers' executive committee, appointed to represent all interested California shippers, has wired to the district chairmen in 45 cities that "the silence of railways means necessity for a stubborn fight." It seems to have been decided that no application will be made to the courts for an injunction, but that the entire matter shall be fought out before the Commission. A conference between members of the Oregon and Washington Railroad Commissions and Portland shippers was held recently to discuss this matter and jobbers of those states may appeal to the Commission. The Transcontinental freight bureau will give a hearing at Chicago, January 28, to shippers opposing the advance.

The United States Circuit Court of Appeals for the fifth circuit rendered a decision at New Orleans on January 6, overruling a previous decision by Judge Emory Speer of the southern district of Georgia, in which Judge Speer issued an injunction restraining the railways from collecting freight bills at the advanced rates that they had made between the Ohio river and southeastern points. The case was that of the Atlantic Coast Line, *et al.* v. the Macon Grocery Company. The opinion of the Circuit Court of Appeals was written by

Judge A. P. McCormick and was assented to by Judge D. A. Pardee. Judge David D. Shelby dissented. The Circuit Court of Appeals held that Judge Speer erred in issuing the injunction and held that the question of whether the action of the roads in advancing rates was legal was a matter to be determined exclusively by the Interstate Commerce Commission. The United States District Court was held to have been without jurisdiction, and was directed to dismiss the proceeding. The question of the reasonableness of the rates in litigation is now pending before the Interstate Commerce Commission. The decision of the Circuit Court of Appeals seems to enable the roads to collect the higher rates until the Commission shall rule upon their reasonableness.

STATE COMMISSIONS.

The New York Public Service Commission, First district, has dismissed the application of the New York, New Haven & Hartford and the Harlem River & Port Chester Railroad for permission to electrify the road of the Harlem River & Port Chester, which is the Harlem Branch of the New Haven and is now being six-tracked. The Commission held that it had no jurisdiction to act on such an application. The proceeding was brought before both Commissions; the Commission for the Second district concurred in the opinion rendered by Commissioner Bassett, and will take action similar to that taken by the Commission for the First district. It was held that the railway could make the change without obtaining the approval of either Commission.

INTERSTATE COMMERCE COMMISSION.

Allowances at New York for Transfer of Sugar Condemned.

In the matter of allowances for transfer of sugar. Opinion by Commissioner Cockrell.

Certain allowances for the transfer of sugar from the refinery or warehouse to the car are made by the railways and coastwise steamship lines terminating in New York. Originally this allowance for transfer of sugar was a rebate, paid to equalize a rebate then being given at Philadelphia. Witness testified that "before it was illegal, we had straight out and out rebate and generally called it so. I tried to get my 4⅕ cents, the same amount that was allowed in Philadelphia, and I could not make it; two cents is all I could get." In 1898 an arrangement was made for a uniform allowance of two cents for transfer, and it appears that the payment to refineries was understood by the railways and by Mr. Havemeyer, of the American Sugar Refining Co., to be consideration for the maintenance of a pool percentage between shipments offered to the railways by the American Sugar Refining Co., that is to say, prior to 1898 the allowance was a rebate to equalize certain Philadelphia rebates; in 1898 it was compensation for the maintenance of an unlawful pool; to-day it is the same allowance, but it is insisted that it has a new reason for being, that is, transfer. The companies making this allowance may be divided as follows: Those which offer an allowance for the transfer of sugar from the refineries; their language is "rates named herein on sugar include transfer charge of two cents per hundred pounds from refineries to cars at New York and Brooklyn stations, Jersey City, N. J., and Edgewater"; class 2, those which offer transfer allowance without restricting such allowances to shipments from refineries; class 3, those which offer an allowance upon all shipments or commodities from certain designated districts, but make no allowance on the same commodities when from other districts. These tariffs, so far as they apply to shipments of sugar from refineries in or near New York, include two cents per hundred pounds for transfer, in addition to lighterage allowance. No one of the carriers in this proceeding furnishes cartage to shippers of sugar; all of them undertake to pay shippers for furnishing such cartage for themselves. Having thus undertaken to regard a service outside of transportation as a service to the transportation company, to be paid for out of the transportation rate, the carriers also furnish store door reception to one-third of shipments by means of floats and switch tracks, thus making cartage of such shipments not only superfluous but impossible. Defendants claim that the allowance is in the nature of a difference between a net and gross rate given to all shippers alike, but if this were so, all carriers within the past year have violated the act [to regulate commerce] by restricting their net rates on sugar to shippers from refineries, quoting to all other possible shippers a rate two cents per hundred pounds higher than this net rate, and all the carriers but one are still so violating the act. Wherever it is possible, as it is here, for carriers to file a net rate as such, we are clear that this is their duty. The transfer allowance here considered is by every test afforded by the law a rebate. The commission will expect the carriers in question at once to conform their tariffs to the principles here announced. No order will be made at this time.

Pennsylvania Two-Cent Fare Law Declared Invalid.

In a suit tried at Easton, Penn., January 11, to restrain the county of Northampton from collecting fines from the Central of New Jersey, for violations of the 2-cent rate law, the court found for the railway company, placing the costs on the county.

The Court (Judge Scott) decides that the county must be enjoined from collecting the penalties provided in the second section, whether the rate be confiscatory or not, because the Act contravenes the Bill of Rights and violates the Fourteenth Amendment to the Constitution of the United States. It is held that its purpose was, by levy of excessive fines, to deter a railroad, while maintaining charter rates, from resorting to the courts to determine the reasonableness of the legislative regulation, and by compelling submission, take its property without due process of law. It is suggested, but not decided, in view of the decision in the Consolidated Gas Company case (just handed down by the Supreme Court of the United States) that this ought to make the whole statute void.

The alternative of disobedience, says Judge Scott, "was to obey the provisions of the law, accept a diminished revenue with a loss in any event beyond recovery. If the inevitable effect of aiding the second section was to force the plaintiff into submission while the commonwealth could take its property or franchise by operation of the first section (and did take it without hearing and hold it without compensation) does it not logically seem to follow that in such cases, and in respect to those who are thus affected, it is the statute as a whole which operates to deny to them the equal protection of the laws? The highwayman who picks your pocket is not less guilty than his companion who holds up your hand against defense. Our own bill of rights provides that private property shall not be taken or applied to public use without authority of law, and without just compensation first made or secured; that all courts shall be open, and every man for an injury done him shall have remedy by due course of law; that excessive fines shall not be imposed ($2,000,000 a day). What becomes of these provisions if the Legislature may say it will take away property, unless you submit to these penalties, but that you can then go to the courts and inquire if we had the lawful power to do this?"

Chicago Transportation Association.

George H. Ingalls, Freight Traffic Manager of the New York Central Lines and President of the Traffic Club of Chicago, was the speaker at the first annual meeting and dinner of the Chicago Transportation Association, at the Wellington Hotel, on the evening of January 11. The following officers for the year 1909 were installed at this meeting:

President, John Bickel, Wisconsin Central.

Vice-President, Ernest G. Woodward, Chicago, Milwaukee & St. Paul.

Secretary, S. McClurkan, Chicago, Cincinnati & Louisville.

Financial Secretary, George H. Brown, Grand Trunk.

Treasurer, J. W. Betts, New York Central Lines.

Trustees: Frank Scanlon, Goodrich Transportation Company; J. C. McCutcheon, Northern Pacific; Joseph Angell, St. Louis Southwestern; John J. Foster, Canadian Pacific, and W. A. Cox, Chicago & North Western.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1908.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with 1907.
Baltimore & Ohio	3,992	$4,572,318	$982,830	$5,948,085	$682,929	$961,848	$126,567	$2,117,573	$118,890	$4,007,807	$1,940,278	$46,339*	174,390	$1,719,549	†$98,119
Boston & Maine	2,242	1,975,816	1,018,868	3,238,298	367,196	379,149	33,302	1,438,742	70,112	2,388,501	949,797	10,043	149,971	809,869	102,893
Central of New Jersey	668	1,539,409	324,150	1,975,074	204,639	287,312	25,565	489,848	35,646	1,043,010	932,064	1,855*	222,484	707,725	†134,253
Chicago, Burlington & Quincy	9,023	4,579,457	1,500,502	6,632,676	1,155,701	1,085,870	123,002	2,133,470	164,300	4,662,343	1,970,333	46,694*	212,600	1,711,039	261,212
Chicago, Milwaukee & St. Paul	7,516	3,788,155	924,794	5,129,361	597,318	697,498	116,149	1,899,976	87,616	3,398,557	1,730,804	7,423	197,811	1,540,416	94,230
Cincinnati, Hamilton & Dayton	1,036	490,460	134,226	694,702	72,748	122,451	21,653	296,378	20,403	533,633	161,069	314*	25,010	135,745	89,129
Cleve., Cin., Chic. & St. Louis	1,982	1,415,608	520,376	2,148,948	255,394	369,306	68,196	945,139	43,444	1,681,479	467,469	3,910*	70,000	393,559	†43,929
Colorado & Southern	1,246	676,135	102,344	816,111	92,187	125,578	12,799	251,269	24,528	506,361	309,750	621*	21,225	287,904	†21,024
Delaware & Hudson	845	1,414,092	186,178	1,634,274	76,786	180,320	15,106	572,218	35,046	879,476	754,798	558*	35,000	719,240	†21,531
Denver & Rio Grande	2,552	1,368,993	391,131	1,836,889	204,364	345,181	34,091	653,449	52,457	1,289,542	547,347	267*	65,000	482,080	†119,326
Galveston Harrisbg. & San Antonio	1,340	732,529	174,124	956,303	127,138	100,993	21,679	373,193	27,493	650,496	305,807	7,278*	18,985	279,544	133,783
Houston & Texas Central	789	467,743	130,521	628,216	86,371	74,067	14,194	196,904	18,896	390,432	237,785	.....	4,002	233,782	98,236
Lake Shore & Michigan Southern	1,508	2,275,694	654,737	3,362,836	355,779	441,489	68,518	1,090,769	56,675	2,013,230	1,349,606	2,161*	110,000	1,237,445	72,500
Michigan Central	1,746	1,415,874	496,595	2,118,326	258,129	274,988	57,512	853,006	34,090	1,477,725	640,601	2,613*	97,000	540,988	†36,118
Missouri, Kansas & Texas	3,072	1,670,947	551,481	2,318,061	268,783	349,566	52,346	888,616	69,645	1,628,956	689,105	1,535*	138,691	548,879	88,278
Mobile & Ohio	926	662,041	98,123	878,989	102,340	178,060	27,691	279,643	30,739	618,473	260,516	8,158*	16,100	236,258	20,680
Nashville, Chatt. & St. Louis	1,230	680,835	186,621	930,237	165,456	166,079	32,493	332,207	21,199	717,434	212,803	2,937*	20,000	189,866	8,443
New York Central & Hudson River	3,588	4,587,263	2,029,172	7,369,423	1,014,756	1,095,448	195,435	2,687,566	144,009	5,137,214	2,232,209	21,322	468,834	1,784,697	626,599
New York, Chicago & St. Louis	554	643,025	123,902	790,547	106,972	62,774	40,694	321,157	12,883	544,480	246,067	1,260*	28,000	216,808	54,394
Oregon R. R. & Navigation Co.	1,264	823,716	278,218	1,170,103	117,571	73,190	18,805	293,362	27,804	530,732	639,371	1,592*	42,123	595,656	†114,825
Oregon Short Line	1,456	1,286,182	325,530	1,680,755	77,894	139,131	15,865	299,520	26,122	558,532	1,122,223	315*	48,083	1,073,825	235,901
Pennsylvania Co.	1,414	2,626,651	494,613	3,436,074	312,965	564,693	63,313	1,186,545	69,261	2,196,777	1,239,297	5,113*	182,230	1,051,954	†42,656
Pennsylvania R. R.	4,163	8,709,162	2,338,600	11,884,046	898,562	2,478,396	128,493	4,066,151	276,485	7,848,087	4,035,959	65,318*	174,339	3,796,302	29,811
Pere Marquette	2,354	853,230	245,426	1,189,803	127,391	166,738	23,965	465,123	28,509	811,726	378,077	863*	48,948	328,266	57,515
Philadelphia & Reading	1,007	2,780,787	488,799	3,407,310	225,958	818,887	34,233	1,027,530	51,359	2,157,967	1,249,343	38,574	60,817	1,227,100	†137,371
Philadelphia, Baltimore & Washington	714	638,034	573,577	1,379,060	128,126	253,522	17,081	556,293	27,037	982,059	397,001	.....	31,142	365,859	†18,314
Pittsburgh, Cincinnati, Chic. & St. L.	1,472	1,870,406	555,138	2,765,536	353,814	482,329	57,209	960,354	53,929	1,907,635	857,901	1,143*	138,840	717,918	†68,185
St. Louis Southwestern	773	497,902	103,832	629,526	87,999	88,508	23,589	151,363	20,381	371,840	257,686	557*	15,025	242,104	42,942
St. Louis Southwestern of Texas	697	285,537	78,770	392,510	88,780	59,568	9,171	143,113	15,876	316,508	76,002	239*	9,166	66,597	114,890
San Pedro, Los Angeles & Salt Lake	1,099	376,659	171,853	590,582	118,663	72,978	23,493	198,504	20,653	434,291	156,291	3,405*	25,433	127,452	4,297
Seaboard Air Line	2,611	999,757	255,447	1,379,396	213,318	181,352	48,902	483,188	49,410	976,170	403,226	3,560*	50,500	349,166	79,997
Southern	7,294	3,167,845	1,044,095	4,570,107	560,506	695,750	102,139	1,611,360	149,833	3,119,588	1,450,519	14,866	152,845	1,312,540	308,322
Texas & Pacific	1,885	1,140,279	305,719	1,517,794	151,770	211,448	13,227	520,030	32,068	928,543	589,251	192*	20,582	568,477	262,144
Union Pacific	3,309	3,174,175	768,577	4,276,792	396,567	410,090	72,088	972,811	87,483	1,939,039	2,337,753	4,375*	107,662	2,225,716	345,278
Vandalia	829	499,292	173,097	760,886	108,832	128,034	19,837	285,663	16,480	558,846	202,040	.....	25,281	176,759	31,203
Wabash	2,515	1,426,763	469,734	2,081,345	265,147	354,163	66,478	834,472	59,414	1,579,674	501,671	2,690*	63,255	435,726	7,509
FIVE MONTHS OF FISCAL YEAR.															
Baltimore & Ohio	3,992	23,372,014	$5,865,144	30,952,639	$3,731,838	$4,409,260	$660,769	10,208,265	$596,348	19,606,480	11,346,159	$214,580*	$845,849	10,285,730	†$644,271
Boston & Maine	2,242	9,518,622	6,497,361	17,283,373	2,233,199	1,799,097	202,132	7,258,073	355,199	11,847,700	5,435,673	56,466	702,078	4,790,062	†216,612
Central of New Jersey	668	6,789,253	1,928,870	9,220,869	951,770	1,530,746	135,249	2,428,877	179,735	5,226,377	3,994,492	302,344	572,350	3,724,486	†646,877
Chicago, Burlington & Quincy	9,023	22,893,315	9,158,649	34,860,273	5,551,213	5,411,334	656,877	10,276,118	823,832	22,719,374	12,140,899	54,486*	1,063,000	11,023,413	†842,719
Chicago, Milwaukee & St. Paul	7,516	19,379,697	6,160,736	27,573,907	3,660,430	3,127,714	537,971	9,166,368	432,521	16,925,004	10,648,903	154,071	990,288	9,812,686	116,666
Cincinnati, Hamilton & Dayton	1,036	2,451,908	787,170	3,531,879	419,912	660,180	110,731	1,397,226	98,706	2,686,755	845,124	14,468	125,394	734,198	82,037
Cleve., Cin., Chic. & St. Louis	1,982	6,963,802	3,163,565	11,188,620	1,296,997	1,709,973	355,876	4,281,081	209,151	7,853,078	3,335,542	8,644*	311,120	3,015,778	†157,090
Colorado & Southern	1,246	2,792,619	759,469	3,741,988	501,003	612,800	71,155	1,115,561	129,886	2,430,405	1,311,583	2,209	104,297	1,209,495	†18,479
Delaware & Hudson	845	6,411,459	1,441,169	8,045,677	662,407	861,129	96,101	2,672,921	173,622	4,466,180	3,579,497	1,407	175,000	3,405,904	†703,707
Denver & Rio Grande	2,552	6,395,849	2,428,213	9,240,966	1,121,852	1,374,389	198,663	2,969,694	259,191	5,923,789	3,317,177	38,257	324,750	3,030,684	†439,405
Galveston Harrisbg. & San Antonio	1,340	3,321,548	873,859	4,405,643	510,765	502,188	100,526	1,728,385	133,670	2,975,534	1,430,109	15,738*	116,630	1,297,741	442,617
Houston & Texas Central	789	1,998,123	649,898	2,801,073	361,463	357,096	74,389	963,006	96,747	1,852,701	948,372	.....	53,172	895,200	206,236
Lake Shore & Michigan Southern	1,508	11,226,328	4,315,693	17,709,043	2,384,207	2,442,712	394,114	5,320,245	277,794	10,819,072	6,889,971	6,838*	550,000	6,333,133	†552,371
Michigan Central	1,746	6,918,831	2,934,499	10,791,880	1,425,049	1,381,141	286,248	3,994,084	172,295	7,258,817	3,533,063	4,989*	471,000	3,057,074	†751,458
Missouri, Kansas & Texas	3,072	7,988,763	3,035,827	11,583,493	1,439,450	1,778,263	239,999	3,949,839	325,698	7,733,249	3,850,244	5,967*	556,640	3,287,637	†656,530
Mobile & Ohio	926	2,946,931	524,027	4,034,311	467,648	616,628	136,343	1,366,868	143,897	2,731,384	1,302,927	39,304*	80,500	1,183,123	†58,458
Nashville, Chatt. & St. Louis	1,230	3,207,273	1,118,419	4,633,756	656,590	882,083	166,257	1,653,642	113,224	3,471,796	1,161,960	5,896*	100,000	1,056,064	†121,391
New York Central & Hudson River	3,588	21,455,179	12,725,543	37,987,906	4,934,698	6,175,428	887,158	13,199,534	802,790	25,999,608	11,988,298	97,761	1,771,147	10,314,913	†152,743
New York, Chicago & St. Louis	554	3,036,546	673,182	3,839,083	453,839	360,963	217,248	1,465,742	63,249	2,561,041	1,278,042	3,323*	140,000	1,134,719	33,505
Oregon R. R. & Navigation Co.	1,264	4,176,014	1,580,398	6,081,314	643,730	372,373	101,285	1,507,553	139,745	2,764,686	3,316,396	232*	210,807	3,105,589	67,421
Oregon Short Line	1,456	5,519,924	1,817,455	7,786,962	821,863	646,026	89,300	1,405,860	140,989	3,104,038	4,682,924	3,454	242,092	4,444,286	524,037
Pennsylvania Co.	1,414	13,977,642	3,000,433	18,469,367	1,537,285	2,787,647	306,846	5,786,456	352,236	10,770,470	7,698,897	8,521*	702,560	6,987,816	†611,515
Pennsylvania R. R.	4,163	41,743,186	12,771,741	58,294,326	5,921,720	10,803,715	769,879	20,262,951	1,401,226	39,159,491	19,134,835	252,178	871,696	18,515,317	†2,733,819
Pere Marquette	2,354	4,011,361	1,632,340	6,098,297	745,132	883,871	131,124	2,259,882	141,685	4,161,694	1,936,603	12,601	258,258	1,690,946	146,499
Philadelphia & Reading	1,007	12,780,288	2,669,742	16,141,598	1,324,484	3,209,207	189,891	4,842,414	266,131	9,832,127	6,309,471	124,847	304,556	6,129,762	†1,511,010
Philadelphia, Baltimore & Washington	714	3,391,575	2,915,500	7,027,176	882,514	1,121,395	103,002	2,819,638	138,522	5,065,071	1,962,105	.....	155,709	1,806,396	†139,982
Pittsburgh, Cincinnati, Chic. & St. L.	1,472	9,275,864	3,107,551	13,931,879	1,515,683	2,363,175	299,615	4,658,560	283,944	9,120,977	4,810,902	2,932*	578,255	4,229,715	†318,451
St. Louis Southwestern	773	2,236,408	490,417	2,844,437	337,020	464,562	100,870	698,661	97,708	1,698,821	1,145,616	2,725*	75,125	1,067,766	†124,281
St. Louis Southwestern of Texas	697	1,161,257	406,476	1,677,383	392,128	328,997	41,878	695,295	75,550	1,533,848	143,535	1,141*	45,833	96,560	30,637
San Pedro, Los Angeles & Salt Lake	1,099	1,708,862	1,004,960	2,895,159	525,236	368,140	115,382	949,027	87,895	2,045,680	849,479	11,169*	118,227	720,083	107,589
Seaboard Air Line	2,611	4,393,450	1,330,305	6,321,178	982,093	944,412	225,515	2,242,898	239,354	4,634,272	1,686,906	7,654*	252,500	1,426,752	47,162
Southern	7,294	14,481,866	6,002,671	22,265,078	2,684,410	3,269,651	489,660	7,632,826	703,332	14,779,879	7,485,199	58,841	790,423	6,753,617	1,313,623
Texas & Pacific	1,885	4,339,934	1,604,177	6,283,702	706,945	938,762	72,013	2,346,037	163,157	4,226,914	2,056,788	6,469*	342,598	1,707,720	136,926
Union Pacific	3,309	15,448,715	4,469,070	21,545,495	2,268,022	1,977,092	391,109	4,617,334	436,320	9,689,877	11,855,618	383	538,312	11,317,689	3,017,844
Vandalia	829	2,436,217	992,203	3,849,404	595,258	610,250	104,382	1,395,494	82,179	2,787,563	1,061,841	.....	126,411	935,430	†127,405
Wabash	2,515	7,341,423	3,001,614	11,219,910	1,264,378	1,595,539	333,540	4,111,275	322,004	7,626,736	3,593,174	3,848*	344,530	3,244,796	†475,294

*Deficit. †Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. E. Crane, Vice-President of the Fort Smith & Western, has been elected President, succeeding A. C. Dustin, resigned.

H. K. McHarg has been elected President of the Detroit & Mackinac, succeeding as President J. D. Hawks, who remains General Manager and becomes also Vice-President.

Henry T. Clarke, Jr., has been elected by his fellow commissioners Chairman of the Nebraska State Railway Commission. He succeeds Commissioner H. J. Winnett, who served as Chairman two years.

The following have been elected officers of the Chicago, Milwaukee & Puget Sound, the new company which has taken over the Pacific coast extension of the Chicago, Milwaukee & St. Paul. H. R. Williams, President, Seattle, Wash.; E. D. Dewall, Vice-President, Chicago; A. M. Ingersoll, Vice-President, Tacoma, Wash.; H. H. Field, General Counsel, Seattle, Wash.; E. W. Cook, Secretary, Seattle; W. B. Augir, Assistant Secretary, Seattle; E. W. Adams, Assistant Secretary, Milwaukee, Wis.; F. G. Ranney, Treasurer, Chicago; A. H. Barkley, Assistant Treasurer, Seattle; W. N. D. Winne, General Auditor, Chicago.

John Patterson Ramsey, who recently was elected President and General Manager of the Chicago, Peoria & St. Louis, as previously reported in these columns, was born at Covington, Ky., on November 24, 1864. He received his education in the public schools of Pennsylvania and in 1885 began railway work as assistant on an engineering corps of the Cincinnati, Hamilton & Dayton. Prior to this time, from 1876, he spent his summer vacations in the service of some railway, beginning as an office boy in a superintendent's office. In 1887, he was made Supervisor of the Indianapolis division of the Cincinnati, Hamilton & Dayton and in 1890 was appointed General Roadmaster of the Ft. Wayne, Cincinnati & Louisville, now a part of the Lake Erie & Western. In 1891, he was made Engineer of Maintenance of Way of the Columbus, Hocking Valley & Toledo, now a part of the Hocking Valley. In 1892 he was appointed Superintendent of the Ohio Southern, now a part of the Detroit, Toledo & Ironton. In 1894 he was made Roadmaster of the Chicago, Peoria & St. Louis and the Litchfield, Carrollton & Western, the latter now a part of the Chicago & Alton. In 1895 he was Engineer of Maintenance of Way of the Peoria & Pekin Union. From 1896 to 1904 he was General Manager of the Rio Grande, Sierra Madre & Pacific and President of the El Paso Southern. From 1897 to 1898, he was also General Manager of the Chihuahua & Pacific. In 1904 he was appointed General Manager of the Chicago, Peoria & St. Louis and the Litchfield & Madison. He was also elected, in 1904, a director and member of the executive committee of the Peoria & Pekin Union and later a director and member of the executive committee of the Missouri & Illinois Bridge & Belt Railroad. In 1906 he resigned as Manager of the Litchfield & Madison and was elected Vice-President and General Manager of the Chicago, Peoria & St. Louis. This position he held until his election as President and General Manager.

J. P. Ramsey.

Operating Officers.

E. D. Hogan, Superintendent of the Minneapolis & St. Louis, has been appointed Superintendent of the San Antonio & Aransas Pass, with office at Yoakum, Tex., succeeding C. P. Wade, who was Trainmaster at this point. The office of Trainmaster has been abolished.

H. B. Earling, General Superintendent of the Chicago, Milwaukee & St. Paul of South Dakota and the C., M. & St. P. of Montana, and General Superintendent of the Montana Railroad, has been appointed General Superintendent, lines east of Butte, of the Chicago, Milwaukee & Puget Sound, the new company which has taken over the Pacific coast extension of the Chicago, Milwaukee & St. Paul. F. W. Getty, Superintendent, Sleeping and Dining Cars, of the Chicago, Milwaukee & St. Paul, has been appointed also Superintendent, Sleeping and Dining Cars, of the new company.

W. L. Park, General Superintendent of the Union Pacific, has been temporarily detached from the Union Pacific and made a member of the personal staff of Julius Kruttschnitt, Vice-President in charge of maintenance and operation. With O. Rowell, also of Mr. Kruttschnitt's staff, Mr. Park will make an inspection tour of the Harriman system. During Mr. Park's absence from Omaha, Neb., Charles Ware, Superintendent of the Nebraska division, will become Acting General Superintendent of the Union Pacific; W. H. Cahill will act as Superintendent of the Nebraska division; T. J. Foley, Superintendent of Terminals at Omaha, will be made assistant to Mr. Cahill, and J. W. Adams, Chief Clerk to Mr. Ware, will be made Superintendent of Terminals at Omaha.

R. E. Comfort, whose appointment as General Superintendent of the National Railroad of Mexico, and of the Interoceanic of Mexico, the Hidalgo & Northeastern and the terminals at Mexico City, has been announced in these columns, was born at Cuba, N. Y., November 14, 1853. He received his education in the public schools and took part of a college course. He began railway work in 1876 as clerk to the Assistant General Superintendent of the Atchison, Topeka & Santa Fe. From 1877 to 1879 he was with a location and construction crew, working at different times as chainman, rodman, instrumentman and Assistant Engineer. From 1879 to 1883 he was station agent and later Terminal Agent for the same road. In November, 1883, he was appointed Traveling Auditor of the Mexican Central and in January, 1884, was made Superintendent. In January, 1897, he was appointed Commercial Agent at El Paso, Tex., and in October, Assistant Manager of the Mexico, Cuernavaca & Pacific, now part of the Mexican Central. In November, 1902, he was made Superintendent of the Cuernavaca division of the Mexican Central and in March, 1905, was appointed Division Superintendent of the Interoceanic, where he remained until his recent appointment.

Traffic Officers.

C. L. Hogan has been appointed General Agent of the Kansas City, Mexico & Orient, at Kansas City, Mo.

S. K. Martin has been appointed Commercial Agent of the Chicago, Rock Island & Pacific, at Denver, Colo.

R. M. Wilbur has been appointed Manager of Agents of the Denver, Laramie & Northwestern, with office at Denver, Colo.

N. Crawford Barnett has been appointed Traveling Freight Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at New Orleans, La.

W. C. Price, Contracting Agent of the Western Transit Co., Chicago, has been appointed General Agent of the Kansas City, Mexico & Orient, at Los Angeles, Cal.

A. Waldbauer, General Agent of the Kentucky Midland at Pittsburgh, Pa., has been appointed General Agent of the Kansas City, Mexico & Orient, at Pittsburgh.

Samuel P. Shane, Freight Traffic Manager of the Erie, with office at New York, has been appointed General Manager of the Gilchrist Transportation Co., of Cleveland, Ohio.

H. E. Dickinson, General Agent of the Chicago, Peoria & St. Louis, at Peoria, Ill., has been appointed General Agent of the Kansas City, Mexico & Orient, at Chicago, Ill.

F. W. Birchett, Jr., Traveling Freight Agent of the Chicago & Alton and the Toledo, St. Louis & Western, has been ap-

pointed General Agent, Freight Department, at New Orleans, La.

S. C. McCready, Traveling Freight and Passenger Agent of the El Paso & Southwestern, at Chicago, has been appointed General Agent, at Pittsburgh, Pa.

N. D. Hoke has been appointed Contracting Agent of the Blueridge Despatch, succeeding George W. Diehl, who was appointed last spring Commercial Agent of the Atlanta, Birmingham & Atlantic.

Kenneth C. Kerr, Commercial Agent of the San Pedro, Los Angeles & Salt Lake, at Riverside, Cal., has been appointed Commercial Agent at Salt Lake City, Utah. F. R. Kane succeeds Mr. Kerr.

N. E. Mann has been appointed General Agent, Freight Department, of the Chicago, Peoria & St. Louis, at Peoria, Ill., succeeding H. E. Dickinson, resigned to accept service with another road.

F. B. Townsend, Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, has been appointed General Agent, Freight Department, with office at Chicago, succeeding J. R. Veitch, resigned.

Charles Griffin, Traveling Freight Agent of the St. Louis & San Francisco at Paris, Tex., has been appointed Commercial Agent at Paris. The office of Traveling Freight Agent has been abolished.

T. C. Kimber, Immigrant Agent of the Missouri Pacific, has been appointed General Immigration Agent of the St. Louis, Iron Mountain & Southern, the Texas & Pacific and the International & Great Northern, with office at St. Louis, Mo.

John E. Rhodes, who has been in the office of the General Passenger Agent of the Central Vermont for the past 11 years, has been appointed Assistant to the Traffic Manager of the Peninsular & Occidental Steamship Co., with office at Jacksonville, Fla.

George T. Smith, who recently resigned as General Agent of the Pennsylvania at New York, has been elected President of the First National Bank of Jersey City, N. J. The assignment of his former duties to other officials was announced in these columns last week.

H. E. Fry, Commercial Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Mexico City, has been appointed Commercial Agent at Monterey, Mex., succeeding J. I. Johnson. J. S. Campbell, Traveling Freight and Passenger Agent, at Mexico City, succeeds Mr. Fry. No successor to Mr. Campbell has been appointed.

R. M. Calkins, General Freight and Passenger Agent of the Chicago, Milwaukee & St. Paul of South Dakota and the C., M. & St. P. of Montana, has been appointed General Freight and Passenger Agent, lines east of Butte, of the Chicago, Milwaukee & Puget Sound, the new company which has taken over the Pacific coast extension of the Chicago, Milwaukee & St. Paul. His office will be at Butte, Mont.

Engineering and Rolling Stock Officers.

J. P. Charlton has been appointed Assistant Engineer of the Schuylkill division of the Pennsylvania, succeeding R. V. Massey.

J. A. Prickett, Acting Right-of-Way Agent of the Missouri Pacific, with office at St. Louis, Mo., has been appointed Right-of-Way Agent.

E. F. Jones, Acting Master Mechanic of the Chicago & Western Indiana, has been appointed Master Mechanic, with office at Chicago, succeeding P. H. Peck.

J. M. Hood, Jr., Engineer of Way of the United Railways & Electric, of Baltimore, Md., has been appointed Chief Engineer, succeeding Charles O. Vandevanter, resigned.

J. R. Emerson, Division Engineer of the St. Louis, Iron Mountain & Southern at Van Buren, Ark., has been appointed Division Engineer of the Omaha division of the Missouri Pacific, with office at Kansas City, Mo. C. D. Painter, Roadmaster of the Missouri Pacific at Osawatomie, Kan., succeeds Mr. Emerson.

William G. Atwood, who has been in the Engineering Department of the Lake Shore & Michigan Southern for several years, has been appointed Chief Engineer of the Lake Erie & Western, succeeding George P. Smith, whose appointment as Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis was announced in these columns last week.

M. C. Blanchard has been appointed Acting Roadmaster of the Atchison, Topeka & Santa Fe, with jurisdiction over the territory from Emporia, Kan., to mile post 227, including Sand Creek yard, succeeding L. Bradley, granted a leave of absence and M. Connell, retired. The territory of Roadmaster William Eglinton will be extended to include that portion of the Third district from Mile Post 227 to South Winfield Junction and also Wellington district, Mulvane to east of the Wellington yards, succeeding M. Connell, retired.

E. J. Pearson, Chief Engineer of the Chicago, Milwaukee & St. Paul of Washington, has been appointed Chief Engineer of the lines west of Butte of the Chicago, Milwaukee & Puget Sound, which has taken over the Pacific coast extension of the Chicago, Milwaukee & St. Paul; and J. D. Whittemore, Chief Engineer of the C., M. & St. P., has been appointed Chief Engineer, lines east of Butte, of the new company; E. O. Reeder, Assistant Chief Engineer of the C., M. & St. P., has been appointed Assistant Chief Engineer, lines east of Butte, of the new company, and C. F. Loweth, Engineer and Superintendent of Bridges and Buildings. Mr. Pearson's headquarters will be at Seattle, Wash., and those of the others will be at Chicago.

B. P. Flory, the newly appointed Superintendent of Motive Power of the New York, Ontario & Western, was born at Susquehanna, Pa., on November 9, 1873. He graduated from Cornell University in the class of 1899, and before beginning railway work was for about three years a draftsman for the Anaconda Copper Mining Co. His first railway position was that of inspector on the Lehigh Valley, which position he took in 1899. He was later made chief draftsman, and in November, 1902, was made Mechanical Engineer. In 1903 he was transferred to a special staff, doing work pertaining to the, at that time, new shops at Sayre, Pa. In March, 1904, he was appointed Mechanical Engineer of the Central of New Jersey, which position he held until his recent appointment. Mr. Flory's constructive work is familiar to mechanical men: he has designed and invented a number of motive power and rolling stock improvements now in successful operation.

B. P. Flory.

Special Officers.

J. A. Hinsey, Special Agent of the Chicago, Milwaukee & St. Paul, has been appointed also Special Agent of the lines east of Butte of the Chicago, Milwaukee & Puget Sound, the new company which has taken over the Pacific coast extension of the Chicago, Milwaukee & St. Paul.

OBITUARY.

Otis E. Wood, well-known as a veteran telegrapher, died at his home in Etna, N. Y., near Ithaca, on January 11, at the age of 77. Mr. Wood was associated with his brother, O. S. Wood, and with Ezra Cornell and Professor Morse in the early days of the telegraph. He is often spoken of as the first Morse telegraph operator who read by sound. He is referred to in this connection on page 341 of Prescott's History of the Telegraph.

Railroad Construction.

New Incorporations, Surveys, Etc.

ABITIBI & HUDSON BAY.—The company will apply at the next session of the Canadian Parliament for an extension of time to build a line from the Grand Trunk Pacific, between Frederick House river and Abitibi Lake, Ont., to James bay, between Albany river, Ont., and East Main river, Que. H. Fisher, Ottawa, is solicitor for the company. (R. R. G., April 26, 1907, p. 598.)

BUFFALO CONNECTING.—Incorporation has been asked for in New York by this company to build a freight belt line around the city of Buffalo from a point on the shore of Lake Erie in the town of Hamburg, through West Seneca, Cheektowaga, Amherst and Tonawanda to Niagara river, thence southerly following the river to the international bridge, a total of 20.88 miles. The directors are Edward Michael, J. N. Schatchard, F. L. Bapst, H. C. Curtis, J. C. Conway, R. W. Schelling and M. D. Eames.

BUFFALO, ROCHESTER & PITTSBURGH.—An officer writes that the company began operating trains on January 8 through the new double-track tunnel at Empire, Pa., and over the new double-track line between Carmen, Pa., and Brockwayville. The company is not considering further improvements at the present time. (Oct. 23, p. 1226.)

CANADIAN NORTHERN.—The Brandon-Regina line of this company, 220.8 miles, which includes the Kipling section from Brandon west to Kipling, 127.5 miles, and the Regina section from Kipling west to Regina, 93.3 miles, is now in operation. The Rossburn section has been extended from Rossburn, Man., westward to Russell, 25.6 miles. (R. R. G., April 17, p. 559.)

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

COLORADO & SOUTHERN.—See Stamford & Northern.

FULTON CHAIN & BEAVER RIVER.—This company has been incorporated in New York with $90,000 capital stock to build from Fulton Chain, on the Mohawk & Malone, west to Otter lake, nine miles, the road to be operated by steam or electric power. The route is entirely within the Adirondack Park "Blue Line" and it is probable that no company will be allowed to build a road within these limits, unless it is operated by electricity or oil-burning locomotives. The directors of the new company are Lyon De Camp, of Fulton Chain; W. L. Marcy, H. W. Sprague and W. M. Wheeler, of Buffalo, and R. J. Gaffney, of Bradford, Pa.

GREAT NORTHERN.—The Vancouver, Westminster & Yukon, which is a subsidiary of the G. N., will apply to the Canadian Parliament at its next session to extend the time until July, 1912, to commence construction, and until July, 1914, for the completion of the following lines which it is authorized to build: From a point in the province of Lillooet, B. C., between Anderson and Green lakes, southeast along the Lillooet lake, Lillooet river and Harrison lake, thence southeasterly to the international boundary line at Huntington, B. C.; from a point between Lillooet and Quesnet in an easterly direction through the basin of the Quesnelle lake to Tête Jaune Cache; from a point between the Cottonwood and Willow rivers southeasterly to Barkerville; from a point on Willow river easterly to the Fraser river, thence along same to Tête Jaune Cache, through the Yellow Head Pass to Edmonton, Alta. (R. R. G., May 15, p. 688.) Power will also be sought to enter into agreements with the Burrard Westminster Boundary Ry. & Navigation Co., as noted in the *Railroad Gazette* of February 21, 1908, p. 263.

KANSAS CITY, MEXICO & ORIENT.—Track has been laid between Chillicothe, Tex., and Crowell, completing the line from Wichita, Kan., south to Sweetwater, Tex., 432 miles. Through trains are now in operation between these places. (Dec. 18, p. 1608.)

KETTLE RIVER VALLEY RAILWAY.—This company has applied to the Canadian Parliament for permission to build a line from Penticton, B. C., on Okanagan Lake to Nicola, on the Nicola, Kamwops & Similkameen. The Canadian Government at its last session granted a subsidy for the construction of a line not to exceed 100 miles between these two places.

MILWAUKEE LIGHT, HEAT & TRACTION.—This company has applied to the Wisconsin Railway Commission for a certificate of public convenience and necessity, to build an interurban line from Wauwatosa, Wis., in Milwaukee county, to Menomonee Falls and Oconomowoc. (Oct. 16, p. 1177.)

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—On the Minnesota division, the Duluth-Superior line has been opened for business from Brooten, Minn., northeast to Onamis, 87 miles. (Oct. 9, p. 1121.)

MORGAN'S LOUISIANA & TEXAS.—See Southern Pacific.

NEW ORLEANS GREAT NORTHERN.—The Bogue Chitto branch of this road has been extended from Franklinton, La., northward to Tylertown, Miss., 20 miles. (Oct. 16, p. 1177.)

NEW YORK & PORTCHESTER.—See New York, New Haven & Hartford.

NEW YORK, NEW HAVEN & HARTFORD.—The New York Public Service Commissions of both the First and Second districts recently granted a certificate of public convenience and necessity to the New York, Westchester & Boston (electric) to build its proposed line through the Borough of the Bronx. The Commissions have also approved the franchise to build, which was granted to the company by the Board of Estimate and Apportionment. The majority of this company's stock, and all of the New York & Portchester stock, is owned by the Millbrook Company, which in turn is controlled by the New York, New Haven & Hartford. The New York & Portchester also applied for rights to build over the same route, and for a long time opposed the plans of the N. Y., W. & B., but has since come under the control of the N. Y., N. H. & H. (R. R. G., Nov. 1, 1907, p. 542.)

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

NORTHERN PACIFIC.—The Lapwai line on the Idaho division of this road has been extended from Vollmer, Idaho, southward to Grangeville, 32 miles. (Dec. 4, p. 1500.)

NUECES, RIO GRANDE & MEXICO.—J. C. Deunis, of Temple, Tex., a promoter of this company, is quoted as saying that the capitalists back of the project are ready to start construction work on the proposed line. The projected route is from Artesia, Tex., northwest to a point west of Carrizo Springs. The line may eventually be extended northwest to Eagle Pass and from Artesia southeast to Aransas Pass, a total of 300 miles. A. Richardson, President, Carrizo Springs; J. T. Bivens, Vice-President, Pearsall, and E. F. Gaddis, Treasurer, of San Antonio.

OREGON RAILROAD & NAVIGATION COMPANY.—On the Oregon division, the line formerly in operation from La Grande, Ore., to Elgin has been extended from the latter place eastward to Joseph, 63 miles. (Oct. 9, p. 1121.)

ST. LOUIS SOUTHWESTERN.—The Lufkin division of the St. Louis South Western of Texas has been extended from Broaddus, Tex., southward to White City, 10 miles.

ST. LOUIS, WEBSTER & VALLEY PARK (ELECTRIC).—Work is said to be under way on the line projected about two years ago by this company, from West End Heights, Mo., southwest to Valley Park, 15 miles. Chas. Schueler has been given a contract for grading. Paul D. Cable, President and General Manager, 223 Wainwright building, St. Louis, Mo.

STAMFORD & NORTHERN.—Incorporated in Texas by the Colorado & Southern to build from Stamford, Tex., northwest to Plainview, about 155 miles. Contracts for a portion of the line are reported to have been let. This line will connect with the Wichita Valley division of the Colorado & Southern at Stamford and with the Atchison, Topeka & Santa Fe at Plainview. This incorporation is the first step toward the extension of this system since the acquisition by the Chicago, Burlington & Quincy. Among the incorporators is M. J. Spoonts, Fort Worth, Tex., attorney for the Colorado & Southern in Texas.

STAMFORD & NORTHWESTERN.—The contract recently let by

this company for building the first section of its projected line from Stamford, Tex., northwest, was given, it is said, to J. L. McSpaddon, of Fort Worth, Tex. It is expected that the line will be built and ready for operation from Stamford to the Spur Ranch in Dickens county, in time to handle this year's crops. (January 8, p. 89.)

Southern Pacific.—On the Cananea, Yaqui River & Pacific track having been laid for 37 miles between Del Rio, Sonora, and Zorilla, train service is now in operation from Del Rio west via Zorilla to Nogales, 108 miles. The line from Corral north to Cumuripa, known as the Aguas Calientes branch, has been extended north to Aguas Calientes. (Dec. 25, p. 1664.)

Press reports say that work is to be pushed on the line being built by Morgan's Louisiana & Texas from Lafayette, La., northeast to Port Allen (opposite New Orleans). Piers for the large bridge over the Atchafalaya swamp have been sunk, and nearly all the material for the superstructure is on the ground. Work is now under way east of the Atchafalaya river. It is expected to have the line in operation this fall. (October 9, p. 1122.)

Toronto, Niagara & Western Ry. (Electric).—This company will make application to the Canadian Parliament at its next session for an extension of time to build lines between Toronto, Ont., and Niagara Falls, N. Y.; Toronto and Windsor and St. Catharines and Port Colborne, and for power to increase the bond issue. This proposed railway is one of those in which Mackenzie, Mann & Co., Toronto, are interested. Plans of the proposed route were filed in May, 1907, and it was said recently that work was being done on the United States end of the route preparatory to the construction of a bridge across the Niagara river, on behalf of Mackenzie, Mann & Co., in connection with this project. The line between Toronto and Niagara Falls will follow the route of the present power transmission line between these places.

Vancouver, Westminster & Yukon.—See Great Northern.

Virginian Railway.—The Third division of this road has been extended from Big Stony, Va., westward to Rich Creek, 12 miles.

Press reports say that this road is now in operation from Norfolk, Va., west to Rich Creek, 320 miles. Work is nearing completion on the long bridge over the New river, and it is expected that through trains will be in operation this month from Norfolk, Va., west to Deepwater, W. Va., 436 miles.

Wheeling & Lake Erie.—An officer writes that the company expects to have the low grade cut-off line between Bolivar, Ohio, and Orrville, completed and ready for operation about May 1. The 1,800-car yard, roundhouse, coaling tipple and shop buildings at Brewster, Ohio, will not be completed by that time. (Dec. 18, p. 1610.)

Wheeling, Cadiz & Tuscarawas.—Surveys for a line to be built by this company will be finished soon, it is said, and arrangements have been made to begin construction work this spring. The proposed route is from Uhrichsville, Ohio, southeast via Dennison, Laceyville, Cadiz, Harrisville, Colerain, Martin's Ferry and Bridgeport, thence to Wheeling, W., Va., a total of about 55 miles. Power station and repair shops are to be built at Cadiz. The company has been incorporated for $10,000. A. E. Townsend, President and General Manager; G. W. Grissinger, Secretary, and J. E. Lacey, Treasurer, all of Cadiz.

Windsor Tunnel & Lake Erie.—This company will apply to the Canadian Parliament for a charter to build a line from Windsor, Ont., southerly through Sandwich West, Anderdon, Colchester North, Malden, Colchester South and Gosfield South to Kingsville, and branch lines from Harrow to Oxley, on the shore of Lake Erie; from Sandwich West to a point on the Detroit river; from Harrow westerly through Colchester South and Malden to Amherstburg. Powers will also be asked for to operate vessels on Lake Erie between Kingsville, Ont., and some point in the United States; and also to enter into an agreement with the owners of the Detroit river tunnel to operate its cars through the tunnel. G. J. Leggatt, Windsor, Ont., is solicitor for the applicants.

Railroad Financial News.

Canadian Pacific.—It is understood that this company has an option on control of the stock of the Wisconsin Central, and that the option will probably be exercised soon. The Wisconsin Central would provide a Chicago connection for the Minneapolis, St. Paul & Sault Ste. Marie.

Chicago & Alton.—A semi-annual dividend of 2 per cent. has been declared on the common stock. An initial dividend of 1 per cent. was declared in July, 1908. There is $19,542,800 common stock outstanding, of which the Toledo, St. Louis & Western owns a majority.

Chicago & Milwaukee Electric.—The receivers have been ordered to pay the semi-annual interest due January 1 on the $1,080,000 Chicago & Milwaukee Electric *Railway* 5 per cent. bonds of 1899-1919. The interest due July 1, 1908, and January 1, 1909, on the $4,000,000 Chicago & Milwaukee Electric *Railroad* 5 per cent. bonds of 1902-1922 remains unpaid, and holders of these bonds are asked to deposit their bonds with the Northern Trust Co., Chicago.

Chicago, Milwaukee & Puget Sound.—This company, until very recently the Chicago, Milwaukee & St. Paul of Washington, and which increased its capital stock from $3,000,000 to $100,000,000 at the time it changed its name, is to take over the Chicago, Milwaukee & St. Paul of Idaho, the C., M. & St. P. of Montana, and the C., M. & St. P. of South Dakota, thus placing the entire Pacific coast extension of the Chicago, Milwaukee & St. Paul under the management of one company. The increase in capital stock since all of it is owned by the Chicago, Milwaukee & St. Paul, is of interest to the public only in so far as it permits an issue of $200,000,000 of bonds. The laws of the state of Washington forbid the issue of bonds exceeding in amount twice the capital stock of a railway company.

Chicago, Milwaukee & St. Paul.—See Chicago, Milwaukee & Puget Sound.

Chicago Railways.—Of the $25,394,000 underlying bonds of the Chicago Union Traction Co., which the bondholders' protective committee have asked holders to deposit with the Harris Trust & Savings Bank, Chicago, all but $18,500 bonds have been deposited. The time has been extended to February 1 for the deposit of additional bonds.

Colorado & Southern.—See Stamford & Northern under Railroad Construction.

Detroit & Mackinac.—Henry K. McHarg has been elected President, with office at New York, succeeding as President J. D. Hawks, who remains General Manager and becomes also Vice-President.

Fort Dodge, Des Moines & Southern.—See Newton & Northwestern.

Missouri, Kansas & Texas.—First and refunding 4 per cent. bonds 1904-2004 amounting to $1,500,000 have been sold to Speyer & Co., New York, and also $3,170,000 general mortgage 4½ per cent. bonds 1906-1936 have been sold to Speyer & Co. This sale makes the total amount of bonds outstanding in the hands of the public $6,682,000 for the first and refunding bonds, and $13,170,000 for the general mortgage bonds.

Minneapolis, St. Paul & Sault Ste. Marie.—See Canadian Pacific.

Newton & Northwestern.—The Old Colony Trust Company bid in this road for $1,000,000 at a master in chancery sale at Boone, Iowa, on January 5. It is stated that the Fort Dodge, Des Moines & Southern retains control.

Toledo, St. Louis & Western.—See Chicago & Alton.

Western Pacific.—E. H. Rollins & Sons, Boston, Mass., are offering $1,000,000 first mortgage 5 per cent. bonds, 1903-1933, at 94½, to yield 5.40 per cent. There are $50,000,000 first mortgage bonds authorized and issued.

Wisconsin Central.—See Canadian Pacific.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Central of Brazil has ordered nine locomotives from the Baldwin Locomotive Works.

The Federal Furnace Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Columbia Trading Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Prescott & Northwestern has ordered one locomotive from the Baldwin Locomotive Works.

The Cuyahoga Valley has ordered two locomotives from the Pittsburgh Works of the American Locomotive Co.

The New Orleans Great Northern has ordered four locomotives from the Brooks Works of the American Locomotive Co.

The Denver, Laramie & Northwestern is reported in the market for three passenger and three freight locomotives. This item has not been confirmed.

The Wabash Pittsburgh Terminal Co., reported in the *Railroad Age Gazette* of January 1, has ordered 12 simple consolidation locomotives from the American Locomotive Co., for delivery about April 1.

General Dimensions.

Weight on drivers	205,000 lbs.
" engine	233,000 "
" tender	154,000 "
" Total	387,000 "
Cylinders	22 in. x 32 in.
Diam. of drivers	On 10 locos., 58 in.; on 2 locos., 55 in.
Boiler, type	Extended wagon top
Boiler, working steam pressure	200 lbs.
Heating surface, tubes	3,490 sq. ft.
" " firebox	190 "
" " total	3,680 "
Tubes, number	460
" outside diameter	2 in.
" length	14 ft. 6 "
" material	Tyler charcoal iron
Firebox	Radial stayed
" length	109 in.
" width	66 "
Grate area	50.5 sq. ft.
Water capacity	8,000 gals.
Coal capacity	14 tons

Special Equipment.

Bell ringer	Gollmar
Boiler lagging	Keasbey & Mattison sectional magnesia
Brakes	Westinghouse
Brake-beams	Sterlingworth
Brake-shoes	Am. Brake-Shoe Co. perfecto
Couplers	Tower
Headlight	Star round type, 18 in. diameter
Injector	Ohio
Piston and valve rod packing	Jerome
Safety valve	Consolidated
Sanding Devices	Leach
Lubricators	Chicago
Springs	Railway Steel Spring
Staying	Radial
Steam gages	Ashton
Superheater	On one large engine
Tires	Latrobe
Valve gear	Walschaerts

CAR BUILDING.

The Northern Pacific is asking prices on 600 box cars.

The Chicago, Rock Island & Pacific has ordered one composite passenger car from the Pullman Co.

The Green Bay & Western has ordered three passenger coaches from the Hicks Locomotive & Car Works.

The Armour Car Lines have ordered the building of 200 steel underframe refrigerator cars in their own shops.

The Chicago, Burlington & Quincy is in the market for four dining cars and four observation smoking cars.

The Lemac Carriers Company, Old Colony building, Chicago, has ordered 100 thirty-ton poultry cars from the Ryan Car Co.

The National Car Line, reported in the *Railroad Age Gazette* of December 18 as being in the market for 200 thirty-ton steel underframe beef cars, has ordered 200 beef cars from Haskell & Barker.

The Chicago, Wheaton & Western, Wheaton, Ill., reported in the *Railroad Age Gazette* of November 20 as having ordered three double-truck closed cars from the J. G. Brill Co., has increased the order to five cars.

The Denver, Laramie & Northwestern is reported in the market for 200 box, 75 stock, 25 flat and 50 coal cars also a number of cabooses as its initial freight equipment, and for 15 first class vestibuled passenger coaches and 3 combination baggage and smoking cars. This item has not been confirmed.

The New York Central Lines have ordered 2,500 fifty-ton self-clearing hopper cars as follows: from the American Car & Foundry Co., 1,000 cars for the Lake Shore & Michigan Southern; from the Standard Steel Car Co., 1,000 cars for the New York Central & Hudson River, and 500 for the Pittsburgh & Lake Erie.

The Louisville & Nashville has ordered the building of 1,000 freight cars in its own shops. This equipment includes 500 forty-ton drop bottom gondola cars to be built in the South Louisville shops and 400 box cars of 65,000 lbs. capacity and 100 forty-ton drop bottom coke cars to be built at the New Decatur, Ala., shops. We are officially advised that the material for this equipment has been purchased.

IRON AND STEEL.

The Chicago, Milwaukee & St. Paul is in the market for 500 tons of structural steel.

The Indiana Steel Co. has turned out the first rail at its new plant at Gary, Ind. The company will at once put three blast furnaces into operation, while a fourth is being built.

RAILROAD STRUCTURES.

Boca Grande, Fla.—An officer of the Charlotte Harbor & Northern writes that contract has just been let to McAuley Bros. & Durant, of Boca Grande, for extending the main line dock out to a depth of 30 ft. of water. Boca Grande is 110 miles south of Tampa, Fla., on the gulf coast. (July 3, p. 453.)

Brewster, Ohio.—See Wheeling & Lake Erie under Railroad Construction.

Brownwood, Tex.—The Gulf, Colorado & Santa Fe has prepared plans for a new passenger station. All details have not been decided upon and contract will not be placed until these are arranged. The station will cost about $40,000.

Chicago, Ill.—Bids are wanted January 20 by the Board of Trustees of the Sanitary District of Chicago, for the fabrication, erection and completion of the superstructure of two railway bridges crossing the North Shore channel of the Sanitary District of Chicago. One of the bridges is to be built on the line of the Mayfair cut-off of the Chicago & North Western in the township of Niles, and the other is to be built on the Milwaukee division of the same railway at Grand street in the city of Evanston, both structures to be finished by September 15, 1909. Separate contracts are to be given for each structure, but alternative bids may be made upon both structures by the same bidders. R. R. McCormick is President of the Board of Trustees. (Sept. 11, p. 927.)

Des Moines, Iowa.—Plans are now being completed for building the Seventh street viaduct. It will extend from Mulberry street to a point 400 ft. south of Elm street and will span Cherry, Market, Vine and Elm streets. The viaduct proper will be about 1,200 ft. long with two approaches, each approximately 400 ft. long. It will be of reinforced concrete. At a recent meeting of the representatives of the roads interested it was decided to apportion the cost of the structure as follows: Chicago, Rock Island & Pacific, 31.6 per cent.; Chicago, Burlington & Quincy, 24.5 per cent.; Des Moines Union, 22.8 per cent., and Minneapolis & St. Louis, 21.1 per cent. The cost will be about $210,000.

Durant, Miss.—The Illinois Central has given the contract to the George B. Swift Co., Chicago, for building a passenger and freight depot. It will be one-story high, of pressed brick and stone construction, and will have dimensions of 33 ft. x 178 ft. Electricity will be used for lighting. It will cost $25,000. Work is to be commenced at an early date.

Ellensburg, Wash.—The Northern Pacific will soon begin

building a new passenger station to cost $50,000. It will be of brick, with stone trimmings. The present depot will be converted into a freight station.

Hattiesburg, Miss.—The New Orleans & Northeastern is said to be asking bids until January 18 for building the proposed $125,000 passenger station. It is said that grading for the site is completed and that sidings are now being built. (July 24, p. 597.)

Keithsburg, Ill.—The contract for the construction of the new bridge of the Iowa Central has been given to the Union Bridge Construction Co., of Kansas City, Mo., the contract price being $800,000. The steel for this structure will be fabricated by the McClintic-Marshall Construction Co. The bridge will be a single-track structure and is to be completed by January 1, 1910. (Oct. 30, p. 1267.)

Lafayette, La.—Press reports say that about 200 acres of land were bought by the Southern Pacific (Morgan's Louisiana & Texas) east of the city limits as a site for shops. An officer is quoted as saying that a large passenger station is to be built at Lafayette as soon as pending negotiations for land are settled.

Lamy, N. Mex.—The Atchison, Topeka & Santa Fe has completed plans for a new passenger station to cost $12,000. Contract has not yet been awarded.

Natchez, Miss.—The Mississippi Central has awarded the general contract to the George B. Swift Co., Chicago, for a new passenger station. It will be a one and two-story structure, and of brick and stone. It will cost $60,000. Work will be commenced soon. (Sept. 4, p. 883.)

Oakmont, Pa.—See The Crane Co., under Supply Trade News.

Portland, Ore.—The United Railways, Portland, Ore., is preparing plans for new car shops and car barns and for 12 stations. The car barns will be of steel and wood construction and will have dimensions of 80 ft. x 120 ft. A new frame freight depot will also be built with dimensions of 50 ft. x 100 ft. Work on all these structures will be commenced within the next few weeks.

Seattle, Wash.—A slip 1,000 ft. long, 175 ft. wide and 30 ft. deep has been built here by the Chicago, Milwaukee & Puget Sound, for the accommodation of ocean steamships, in connection with which it will handle through Oriental traffic. A dock house 500 ft. long and 125 ft. wide is now in course of erection. See Tacoma, Wash.

Summit, Cal.—Plans are being prepared by the Southern Pacific for a large roundhouse and a 95-ft. turntable. This was made necessary by the recent order for two large Mallet locomotives which will be used for helper service in this district.

Tacoma, Wash.—The Federal government is dredging the Puyallup waterway along one side of the property of the Chicago, Milwaukee & Puget Sound. On the other side this road is building a slip about 1,200 ft. long and 250 ft. wide and 36 ft. deep, for the use of the ocean steamships in connection with which it will handle through traffic to the Orient. This slip will soon be completed. The Chicago, Milwaukee & Puget Sound is also building at this place a city freight house 550 ft. long and 50 ft. wide, and a grain house 500 ft. long and 175 ft. wide is in course of erection on the company's private slip. See Seattle, Wash.

Unusual Bridge Fire.

On the evening of December 11, the wooden forms being used in the construction of a 600-ft. concrete viaduct carrying a highway over the new Pennsylvania yards in Long Island City were burned. The forms had been packed with hay at the end of the day to protect the newly laid concrete from freezing, the hay being then encased in boards. A locomotive set fire to the hay, which smouldered some time before breaking into flames, so that finally fire broke out on a large part of the viaduct at once. It took more than two hours to put out the fire, and in doing so it was necessary to tear down much of the sheathing.

American Locomotive Plant at Gary.

The American Locomotive Co., New York, has bought 130 acres of land at Gary, Ind., from the Gary Land Company, a subsidiary company of the United States Steel Corporation, and plans are being drawn for a new plant which officers of the locomotive company say will be the most complete and best-equipped locomotive works in the world. The land purchased is twice the extent of that occupied by the largest of its present plants, and when fully occupied will give employment to from 12,000 to 15,000 workmen. The land adjoins that of the new plant of the United States Steel Corporation.

The American Locomotive Co. now operates plants in Schenectady, N. Y., and Dunkirk; Pittsburgh, Pa., and Scranton; Richmond, Va.; Paterson, N. J.; Manchester, N. H., and Montreal, Can. At present there is no large locomotive plant west of Pittsburgh, and the selection of a location in the Chicago district provides additional locomotive building capacity where it is most needed for prompt and direct delivery to a large number of railways. The new plant, it is said, is to cost some $10,000,000, and the output is to be about 1,000 engines a year. The report that steel will be manufactured by the locomotive company is denied.

Exhibits at the June Conventions.

Earl G. F. Smith, Secretary of the Railway Supply Manufacturers' Association, under date of January 8, has issued a circular regarding the exhibits at Atlantic City, N. J., on the occasion of the annual conventions of the Master Mechanics' and the Master Car Builders' Associations, which will be held in Convention Hall on Young's Million Dollar Pier, June 16-23.

The exhibits and the offices of the Railway Supply Manufacturers' Association will again be on this pier, except the track exhibits, which will be on the tracks of the Philadelphia & Reading on Mississippi avenue, adjoining the Boardwalk, about 200 yards from the convention pier, where they were last year.

Contract has been let for the building of the exhibit structures, which will be partly of a new design, and, it is expected, will exceed in beauty past structures. There will be 59,000 sq. ft. of exhibit space, exclusive of aisles, and 40 cents per sq. ft. will cover the cost of erecting the structures and providing other facilities. The color scheme will be white and green and the roofs will be water tight. Booths not in permanent buildings will be protected from the weather with canvas curtains. A telephone will be provided for every two exhibitors, with free local service, from June 14 to June 24. A reasonable amount of power for operating exhibits will be furnished without extra charge daily from 8.30 a.m. to 6 p.m. as follows: Electricity, direct-current, at 110 volts, 220 volts or 550 volts; steam at 100 lbs. pressure, and compressed air and illuminating gas.

This year the main convention entrance will open from the Boardwalk into the center of the Main Building, and the enrollment and other offices of the Supply Manufacturers' Association will be just inside this entrance. It is desired that exhibitors occupying booths in the Main Building make them as attractive as possible, and exhibitors accepting space here will do so with the understanding that their booths may be used on the nights of the balls for the convenience of members and guests.

Machinery Hall will be located as last year. Aquarium Court will be much as it was last year. The upper floor of Exhibition Building, known last year as Marine Hall, will not be used. The Annex will be used as heretofore.

Space will be assigned in Chicago on February 15 to exhibitors who have made application prior to that date. The procedure will be substantially the same as in 1908. If there are any exhibitors whose requirements, in the judgment of the Exhibit Committee, make it imperative that they shall be especially taken care of, they will be assigned space first. Lots will then be drawn to determine the order in which exhibitors may choose space. If a representative of the exhibitor is present he may choose, and if no representative is present the application will be used as a guide in assigning the best space possible. Application for space should be made to the Secretary, 345 Old Colony building, Chicago,

so as to reach his office not later than February 13. No application will be considered unless accompanied by St. Louis draft payable to R. H. Weatherly, Treasurer, fully covering membership dues ($25) and the space applied for at the rate of 40 cents per sq. ft.

The hotels belonging to the Atlantic City Hotel Men's Association have made special rates and reservations for the conventions, and a partial list of these hotels, together with their rates, is given in the circular. Members are urged to patronize only hotels belonging to the Atlantic City Hotel Men's Association, as they have contributed to the entertainment of the conventions.

Forest Conservation and Creosoting.

R. S. Manley, manager of the Gulfport Creosoting Company, Gulfport, Miss., has presented to the Congressional Committee a statement and argument for the retention on the free list of imported creosote oil. These importations have increased from 3¾ million gallons in 1902 to 22 million gollons in ten months of 1908, and the price has advanced from 6 cents to 8 cents a gallon.

The average life of untreated ties throughout the United States is seven years. In the case of treated ties, the average life has been found to be (conservatively estimated) 17 years. The total number of ties now in use is about 700,000,000. Annual replacement if none were treated, 100,000,000. If all were properly treated the annual replacement would be one seventeenth of 700,000,000, or 41,000,000, representing an annual saving of thousands of dollars to consumers, and of timber to posterity the equivalent of 59,000,000 ties, or nearly two billion feet board measure of timber, per year. This, at a reasonable estimate of value ($8 per 1,000 ft. board measure) shows a saving in money of $16,000,000 yearly, and to the extent of this saving in timber assists in the conservation of the forests. Following the same line of illustration for poles, piles, posts, lumber, timber, mine props, such as can be properly treated, it can be shown that a further annual saving of $49,000,000 may be effected by wood preservation, and forest conservation accomplished proportionately.

Westinghouse Financial Position.

The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., started the year with a cash balance of $10,902,338 as follows:

Bank balances January 4	$9,277,337
Deposits in New York, December 21, report received in Pittsburgh, January 2	89,880
Special deposit	1,536,120
Total cash balance Dec. 31, 1908	$10,902,337
Unpaid balance on stock subscriptions	2,346,339
Total cash balance Dec. 31, 1908, including unpaid balance on stock subscriptions	$13,248,677

The sinking fund payment due December 31, and all interest on funded debt due January 1, has been deducted from the above balances. The bank notes as of October 23, 1907, payable in cash and not yet presented amount to $25,000, and the accounts payable as of October 23, 1907, payable in cash and not yet paid, aggregate approximately $12,000. The Westinghouse Electric & Manufacturing Co. has sent out checks for $562,725, representing interest due January 8 on bonds, debentures, etc., set aside $500,000 due to the sinking fund on December 31, 1908, and paid $220,000 in settlement of sundry debts, preliminary to the opening of a new balance sheet.

The company is now in a very strong position, a great deal of the credit for which is due to George Westinghouse, who was largely instrumental in raising $17,785,000 necessary to the discharge of receivers.—*Wall Street Journal.*

Storage Battery Street Car.

An experimental car equipped with the storage battery perfected by Thomas A. Edison some years ago is to be tried out on the Third Avenue Railroad, New York, within a few months. The metal in the battery, which has not heretofore been thus used, is nickel with an alkali reaction, the advantages including lightness and longer life.

Supply Trade News.

The general offices of the Franklin Railway Supply Co., Franklin, Pa., have been moved to 30 Church street, New York.

Avery P. Eckert has gone into the railway and electrical supply business at 50 Church street, New York. Telephone, 4019 Cortland.

Alfred A. Pope is President of the Latrobe Steel & Coupler Co., Philadelphia, Pa., instead of Albert A. Pope, as erroneously stated in these columns last week.

Window design 13½-Dl of The O. M. Edwards Co., Syracuse, N. Y., is to be used on the 16 coaches being built for the Central of Georgia by the Pullman Company.

Alexander Thomas, Secretary of the Crucible Steel Co., Pittsburgh, Pa., died on January 8. Mr. Thomas was 59 years old and had been in the steel business for over 30 years.

The United States Engineering Corporation, Chicago, has been incorporated, with $2,500 capital, to conduct a general engineering and construction business. The incorporators include: J. B. Strauss, K. Hojaard and A. F. Bruss.

The Isthmian Canal Commission, Washington, D. C., is asking bids up to January 25 on sheet steel, angles, I-beams, channels, bars, springs, tool steel, billets, iron bars, castings, etc.; steam shovel hoisting chain and other chain, steel cable and blasting supplies.

The American Locomotive Co., New York, has been incorporated in Illinois, with $500,000 capital stock. The Atlantic Equipment Co., New York, has also been incorporated in Illinois, with $2,500 capital. The offices of both companies in Illinois will continue to be in Chicago.

The Chicago, Milwaukee & St. Paul has made a contract with the Westinghouse Air Brake Co., Pittsburgh, Pa., to hereafter purchase all its equipment from the Westinghouse company, the first order placed by the St. Paul being for equipment for 5,500 cars for its western lines.

J. E. Simons, Fisher building, Chicago, formerly of the firm of Lawson & Simons, Chicago, has been appointed Western Agent for the Damascus Bronze Co., Pittsburgh, Pa., and the Composite Board Co., Niagara Falls, N. Y. The latter company makes an inflammable board for the interior lining of steel cars.

Warren Webster & Co., Camden, N. J., announce that the business heretofore carried on by the American Engineering Specialty Co., Chicago, and by its branch offices and agents, will hereafter be conducted in the name of Warren Webster & Co. No change will be made in the personnel of the American company.

The Tennessee Steel Co. has been incorporated in Maine, with $20,000,000 capital stock. The incorporators named are employees of a promoting company. T. M. T. Raborg, 111 Broadway, New York, is quoted as saying that some information as to the plans of the new company may be given out within a week or two.

Bids will be received by Edmond Gunn, 25 Toronto street, Toronto, Ont., up to January 30 for the purchase of the mill, machinery, roadbed, marl deposits, etc., of the estate of the Western Ontario Portland Cement Co., Ltd. The plant is at Atwood, Perth county, and has been in operation for three years, with an estimated capacity of over 300 barrels a day.

The Kankakee Car Co., Kankakee, Ill., has been incorporated in Illinois, with $130,000 capital stock, for building and repairing cars and rolling stock of all kinds. The incorporators are: Leroy J. Vierson, W. J. Wesloh and Adolph Stankowitz. The Kankakee Car Co. will be the new name for the Kellogg Car & Equipment Co., the President of which is Leroy J. Vierson.

The Republic Iron & Steel Co., Pittsburgh, Pa., has just reequipped the spike department of its Youngstown plant with

another system of fuel oil. The system just installed is that manufactured by Tate, Jones & Co., Inc., Pittsburgh, Pa. The equipment consists of spike furnaces, pumping, heating and regulating systems.

Gulick-Henderson & Co., Pittsburgh, Pa., inspecting engineers, foundry specialists and chemists, have opened a western office and laboratory in the Manhattan building, Chicago, in charge of W. O. Collins, who is a new member of the firm. Mr. Collins was formerly a member of the firm of Collins & Stevens, Chicago, making a specialty of inspection and general engineering work.

McCord & Co., Chicago, announce that their automobile and machine supply business, heretofore conducted as a department, has been transferred to the McCord Manufacturing Co., with factory and headquarters at 2587-2637 Grand Boulevard, Detroit, Mich. The railway supply business will be conducted as heretofore from the Chicago offices in the Old Colony building and the New York offices at 50 Church street.

The McInnes Steel Co., Corry, Pa., makers of McInnes "Extra" high-speed steel and McInnes crucible tool steels, has just completed a large modern rolling mill for rolling squares and rounds from ¼ in. up to 1¼ in. There has been a substantial increase in the company's business, and it has appointed John Robinsteen representative at Pittsburgh, Pa., with office in the Diamond building. Other representatives of the company are: Schrock & Squires, 29 Pearl street, New York, and Lawson & Simons, Fisher building, Chicago.

The Crane Co., Chicago, reported in the *Railroad Age Gazette* of December 25 as being in the market for 2,700 tons of structural steel for a new plant at Oakmont, near Pittsburgh, Pa., has given the general contract for the erection of this plant to H. L. Kreusler, of Pittsburgh. Sub-contracts have been given to the American Bridge Co., for the erection of the machine shop, and to the Riter-Conley Manufacturing Co., for the erection of the foundry building. The company operating this plant will be known as the Crane-Best Co.

The Independent Pneumatic Tool Co., Chicago, has recently had a number of its Thor pneumatic hammers installed in a unique manner in Frederick Thompson's latest production, "Via Wireless," now running at the Liberty Theatre, New York. The plot of the play revolves about the over-tempering of a huge experimental gun so that it will explode under test, and throw a large government contract for patents on the second gun. The second act of the play discloses a reproduction of the forge room of one of the largest steel plants in the country. During the action of the scene the pneumatic hammers are conspicuous because of the rapid vibration caused by their operation.

George C. Smith, an executive officer and director in many auxiliary Westinghouse companies, has been appointed special representative of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., in connection with its interests in a large number of electric railway and electric power companies whose securities are held as investments. Among the companies are the Lackawanna & Wyoming Rapid Transit Co. and subsidiary companies, the Niagara, Lockport & Ontario Power Co., the Electric Power Securities Co. of Niagara Falls, the Grand Rapids, Grand Haven & Muskegon Railway and the Atlanta Water & Electric Power Co. Mr. Smith's headquarters will be in the City Investment building, New York.

Joseph Wharton, President of the American Iron & Steel Association, died on January 11 at his home in Philadelphia, Pa. Mr. Wharton was born in 1826. In 1853 he took charge of the Lehigh Zinc Company's business at Bethlehem, Pa. He established the Bethlehem Iron Co., now the Bethlehem Steel Co. Later he bought nickel ore lands in Lancaster county, Pennsylvania, and established a nickel refinery at Camden, N. J., said to be the first plant in this country which successfully produced nickel. He was owner, President and Director of the Andover Iron Co., Phillipsburg, N. J.; owner and President of the Wharton & Northern Railroad; President and Director of the Hibernia Mine Railroad, and was interested in a number of other companies.

Charles R. Herron, of Chattanooga, Tenn., late Southern Sales Manager of the American Brake Shoe & Foundry Co., Mahwah, N. J., died at his home in Chattanooga on December 6, 1908. Mr. Herron was a well known business man of Chattanooga, with a wide acquaintance throughout the south. He was born in Ireland in 1844. His parents came to America in 1848 and located in St. Louis, Mo. At the age of fifteen he became a foundry apprentice, and after serving his apprenticeship, became a journeyman moulder, traveling through the United States and Canada. In 1873 he started a stove factory in Indianapolis, Ind. He then became connected with the Eureka Foundry Co., Cincinnati, Ohio, and served a term as a member of the Board of Public Works of Cincinnati. His connection with the brake shoe business began in 1889, when he took charge of the Ross Meehan foundry at Chattanooga, making brake shoes and malleable iron castings. He then went to the American Brake Shoe Co., and in 1902 to the American Brake Shoe & Foundry Co., where he continued as Southern Sales Manager to the time of his death. He was also largely interested in the Herron Pump & Foundry Co, Chattanooga.

Joel Steven Coffin, recently elected Vice-President of the American Brake Shoe & Foundry Co., Mahwah, N. J., was born in Michigan in 1861. His first work was in the lumber district of northern Michigan, but when he was 17 years old he went into railway service as an apprentice in the shops of the Michigan Railroad, now part of the Grand Trunk Western. After completing his apprenticeship he was made a locomotive fireman, and about a year later became engineman. In 1885 he went to the Wisconsin Central as engineman, and in 1890 was appointed road foreman of engines. Two years later he went into the mechanical department of the Galena-Signal Oil Co., Franklin, Pa. He was made Manager of that department in 1896, and in 1907 was elected Vice-President of the company. In 1902 he organized the Franklin Railway Supply Co.; he has been President of this company ever since and will continue actively in that office. Mr. Coffin's present headquarters are at 30 Church street, New York, and the general offices of the Franklin company have been removed from Franklin, Pa., to this address in New York.

J S Coffin.

TRADE PUBLICATIONS.

High Duty Drill.—The Foote-Burt Co., Cleveland, Ohio, has just issued a folder which illutrates and describes its No. 24 high duty drill, which is said to be of very rigid construction, using high grade materials.

Oil vs. Coal.—Tate, Jones & Co., Inc., Pittsburgh, Pa., are just mailing copies of a new booklet on oil-burning appliances and furnaces. This booklet is well illustrated, showing installations of these oil burners and furnaces in various manufacturing and railway shops.

Foundry Machinery and Equipment.—Booklet No. 93 just issued by the Northern Engineering Works, Detroit, Mich., is as a reminder of the line of foundry machinery manufactured by this company, including the Newten cupola, elevators, electric hoists, chain blocks, traveling cranes, etc.

Belt Conveyors.—The Robins Belt Conveyor Co., New York and Chicago, has just issued Bulletin No. 1, which contains a reprint of an article, the Belt Conveyor, which was read before the American Society of Mechanical Engineers at Detroit, Mich., June, 1908, by C. Kemble Baldwin, M.E., Chief Engineer of the company.

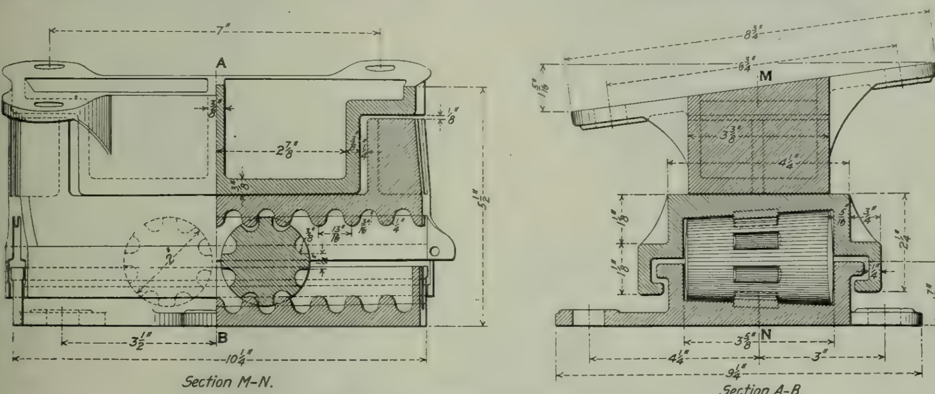
Convention Souvenir.—The Berger Manufacturing Co., Canton, Ohio, has issued a catalogue containing a program of the Berger sales convention for 1909, which was held from December 28 to January 2. The catalogue gives a brief history of the growth of the Berger company, with reproductions from photographs of the officers, executives of the sales and allied departments, branch office organizations and sales force.

Automatic Machines.—The National-Acme Manufacturing Co., Cleveland, Ohio, has just issued general Catalogue H, 5 in. x 9 in., printed on heavy paper, which illustrates and describes Acme Automatic multiple spindle screw machines and Acme Semi-Automatic screw slotting machines. This catalogue is intended to give a complete, but brief description of the mechanical construction of these machines in addition to their possibilities as producers of duplicate parts. A large number of full-page illustrations show the different machines and a number of transparencies supplement the descriptions of the various parts.

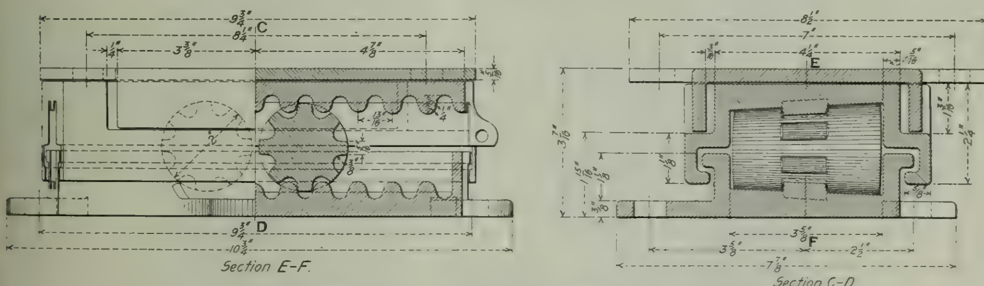
Carbonizing Coating.—The Goheen Manufacturing Co., Canton, Ohio, has issued literature descriptive of a number of bridges and viaducts protected by its carbonizing coating, including the Union Pacific bridge at Omaha, Neb., the Sixth street viaduct, which is two miles long, at Kansas City, Mo., and the Fourteenth street viaduct at Denver, Colo. The carbonizing coating and oxidized carbon cement manufactured by the Goheen Co. are sold under guarantee, the company assuming the responsibility for the results attained. The company is also distributing a bound pamphlet containing a report of tests made by William T. Magruder, M.E., Professor of Mechanical Engineering of the Ohio State University, and formerly Chief Chemist of the Baltimore & Ohio, on the spreading power of carbonizing coating, red lead and graphite paints, made at the Columbus shops of the Pennsylvania in 1906. In the detailed summary of these tests, carbonizing coating shows very satisfactory results. A copy of this pamphlet may be obtained by interested parties.

The Atlas Roller Side Bearing.

A new side bearing, which is manufactured by the National Patent Holding Co., Railway Exchange, Chicago, is here illustrated. The important principle embodied in the design is the use of toothed racks for moving the conical rollers and the provision for moving the top portion of the roller case and the rollers with each movement of the body bolster. The advantage obtained by this principle is that the rollers are always in proper position for service and the motion obtained by the use of the cogs prevents the formation of flat spots on the conical rollers by sliding. The method of driving the rollers by recessed cavities for the gear teeth is quite original and accomplishes the object simply. These rollers are made of malleable iron and are hardened on the outer surface by some method of tempering. In each side bearing there are two rollers, 2 in. mean diameter, and 3⅜ in. long. The roller case is arranged so that the top and bottom portions interlock, and while there is a free vertical and lateral motion of the body bolster to allow for tipping, the radial motion of the bolsters always causes the side bearing to move with it. One of the views shows the application to ordinary freight cars where there is ample space, while the other is adapted to passenger cars or tenders where the space is limited.



Atlas Roller Bearing for Freight Car.



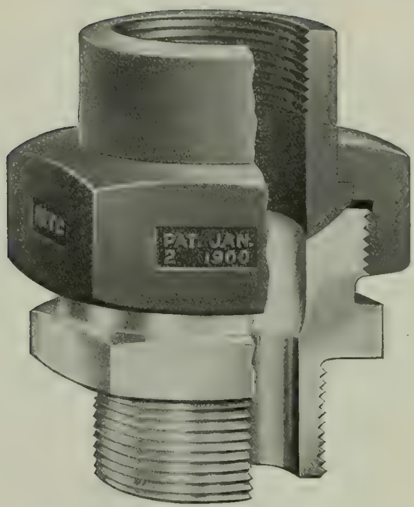
Atlas Roller Bearing as Applied to Passenger Car or Tender.

With this side bearing, the body bolster and bearings may be kept in contact at all times allowing the side bearing to carry a portion of the load. This new bearing is now in service where severe conditions are showing its merits, and it would seem that it will properly fill an important place in car construction. The inventor of the bearing is W. White, President of the National Patent Holding Company.

The Kewanee Air Pump Union.

The air pump union shown in the accompanying cut is one which has been recently put upon the market by the National Tube Co., Pittsburgh, Pa. This new union is similar in construction to other Kewanee unions, but is designed for use in connection with locomotive air pumps.

There are several advantages claimed for this union over other designs intended for the same purpose. The brass and iron connection at the ring permits this union to be connected and disconnected very often, as there is no corrosion between the brass and



Kewanee Air Pump Union.

iron. The brass and iron ball-joint seat makes it unnecessary to use a gasket as is the case in a great many of the unions now in service. Every union sent out by this company is tested with compressed air at 100 lbs. pressure. By placing the union under water, the slightest leak is easily detected. Special attention is paid to this test, as a leak in the joint of an air line is not as easily located in service as on a steam or water line. This union is said to be cheaper than an all-brass union.

Glidden Cement Dressing.

The Glidden Varnish Co., Cleveland, Ohio, has recently put on the market a waterproof and oilproof dressing or finish for cement and concrete surfaces, such as floors, walls, ceilings, etc. This dressing seals the pores or voids with a mineral pigment, preventing the absorption of water, oil, grease or germs. It arrests the formation of dust due to abrasion and makes a finish impervious to water and oils. This product is composed of elements distinctly waterproof in themselves and it has many uses in cement and concrete construction. It is applicable to tunnels, subways, aqueducts and retaining walls. It makes an excellent finish for concrete abutments at the approaches of railway stations, as it converts dingy, discolored and stained cement and concrete surfaces to a bright, clean, uniform color, sanitary and attractive in appearance and harmonizing with the neat surroundings of a modern station. It is also of use on floors of stations, roundhouses, storehouses, etc., because of its water and oilproof qualities. The Glidden company has made experiments and tests for the last year and a half before putting this on the market.

Anderson-Lacy Electric Headlight.

The accompanying illustrations show a new design of electric headlight for use on locomotives. The headlight is manufactured by the Anderson-Lacy Electric Headlight Co., Houston, Texas. This new design is said to incorporate both high power and efficiency, and to have proven in actual tests to be more economical than other electric headlights now in service. This fact is said to be due to the substitution of a valve-geared engine, shown in Fig. 1, for the steam turbine engines used in other types. This engine is built on the principle of a compound reciprocating engine and its two important features are slow speed and economy. Since high speeds shorten the life of machinery, the slow speed feature of this machine is regarded as a most important one. The normal speed of the steam turbine engine used with other types of headlights is said to be between 2,000 and 3,000 r.p.m., when operating at 100 lbs. steam pressure. The engine used with the Anderson-Lacy electric headlight runs at a normal speed of 800 r.p.m. at an average steam pressure of 75 lbs. This engine is said to have a low maintenance cost, due to the slow wearing of the parts. It is claimed that actual figures resulting from tests upon this engine have shown that there is a

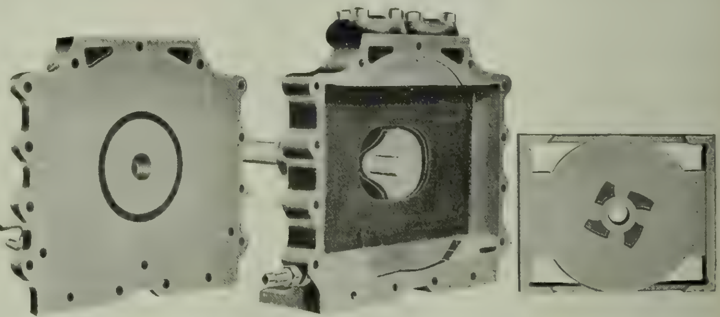


Fig. 1—Anderson-Lacy Engine.

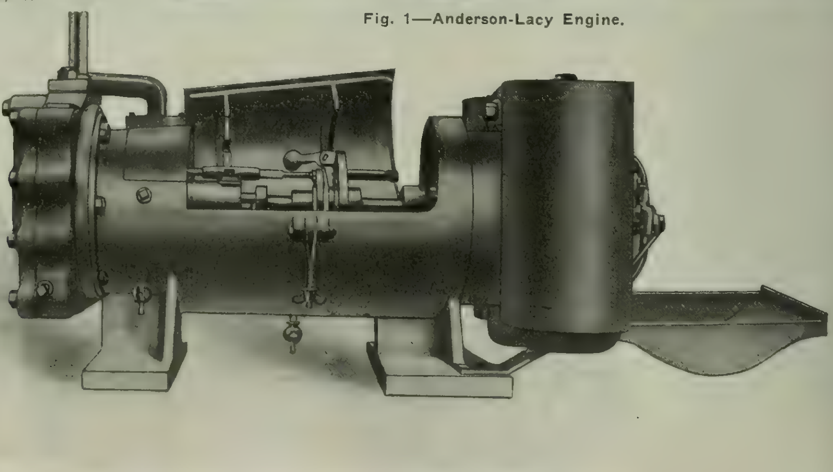


Fig. 2—Engine and Dynamo Showing Brush Holder and Governor.

saving of 50 per cent. in the steam consumption in comparison with other engines.

The dynamo used in this headlight has been especially designed for this work and is said to be of the latest and most efficient type of construction. One of its principal features is the manner in which the armature is contained within the machine. It is ring wound and the field coils are series wound. The armature core is built up of iron laminations and is keyed to the shaft rather than being pressed on. This permits its being easily removed. In removing and replacing an armature, all that is necessary is to let down the end plate of the dynamo and remove the nut and key from the shaft. Only about ten minutes' time is required to remove and replace an armature. It is important that an electric headlight should be so designed as to permit easy and quick repair and this point has received particular attention in the design of this headlight. The outboard bearing on the dynamo has been omitted, as seen in Fig. 2.

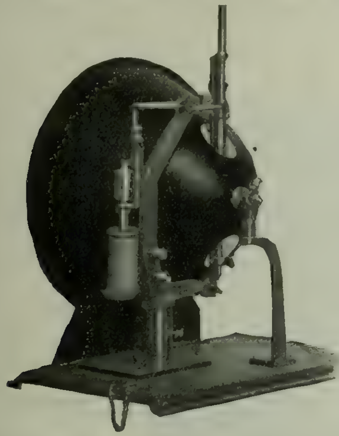


Fig. 3—Anderson-Lacy Electric Headlight Lamp.

If the current supplied to an electric headlight varies, the lamp will flicker and give a very imperfect light. This flickering is often due to poor brush contact, which in turn, is due to the design and quality of the brush holders. The brush holders and the rocker of the Anderson-Lacy outfit are so mounted as to be readily accessible and to give perfect contact at all times. They are, also, unaffected by the jarring which results when the locomotive is running at high speeds on uneven track. This construction of the brush holder guarantees perfect contact and allows for continued service. The governor is attached to the shaft, as shown in Fig. 2. This governor is said to be very sensitive and to respond quickly to any variation in speed.

Particular attention has been given to the design of the lamp, shown in Fig. 3. The mechanical movements of the carbon feeds have been minimized, there being but one joint between the dashpot and the carbon holder, which feature is an important one in the lamp feeding mechanism. The carbon holder and guide greatly simplifies this part of the lamp, and makes it very easy to insert and remove a carbon, at the same time giving constant contact which prevents flickering. The carbon is inserted in a brass tube and a brass thimble is attached to the carbon. In this thimble are two steel balls which project out on each side sufficiently to have contact with the tube in which the carbon is inserted. These balls are held in contact with the tube by a spring. The tube, together with the carbon, is removed from the lamp by loosening a thumb catch. By this method the clutch and guide ring remain rigid with the lamp and alinement of the carbons is not disturbed.

This lamp is said to be very economical, requiring but from 500 to 800 watts for a maximum of 3,000 candle power at the arc. It has been designed to be readily adaptable to old headlight housings and reflectors, such as are used with oil lamps. Special housings are supplied when desired. The generator and engine are 28 in. long, 14 in. wide and 13 in. high.

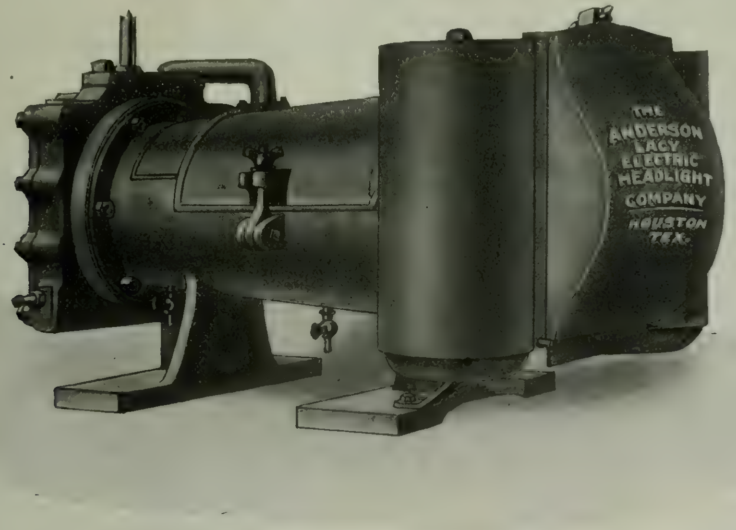


Fig. 4—Engine and Dynamo.

The Gill Selector.

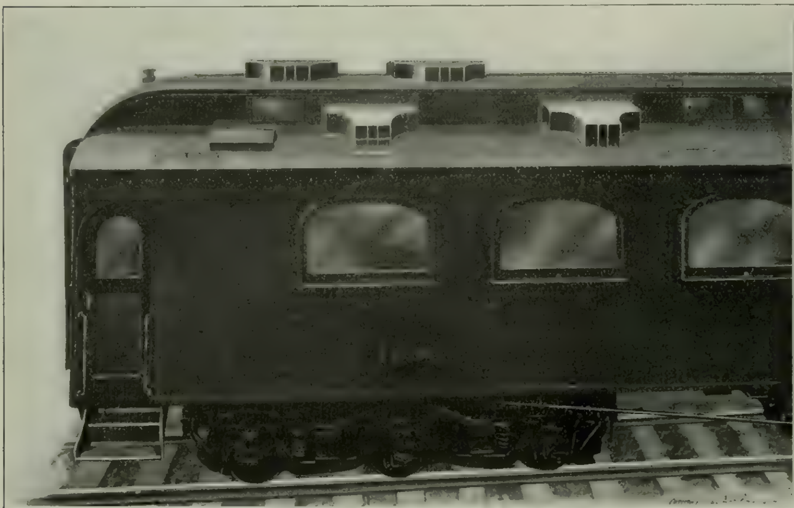
The Gill selector, used to call stations on telephone lines, has now been in use on the New York Central between Albany, N. Y., and Fonda, about 15 months, and a recent report showed that there had been no failure of a selector to work during a period of six months. The Postal Telegraph Co. uses a Gill selector at Boston to call Buffalo, 500 miles away. The Delaware, Lackawanna & Western uses Gill selectors on its train despatching telephone line of 203 miles from Binghamton to Buffalo. On this line there are 45 stations. On the Commercial telegraph lines of the Canadian Pacific there are, between Montreal and Vancouver, 75 testing points, at all of which the attendant is called by the Gill selector apparatus. As the selector has an automatic answer-back, the apparatus often affords a quick method of testing the line, even if the operator does not respond.

The United States Electric Co., New York City, which makes the Gill selector, reports that on a prominent railway the time of running freight trains has been reduced about 10 per cent. since the introduction of telephones for despatching, largely because of the time saved in getting the attention of station operators. The United States Electric Co. has a working sales arrangement with the Western Electric Co., New York and Chicago.

Garland Ventilators for Dining Cars.

Garland ventilators are being applied to dining cars to keep them free from smoke, cinders, dirt and odors from the kitchen. In order to keep out odors from the kitchen, the ventilation of the kitchen must be stronger than that of the dining room.

The dining room is equipped with six or eight ventilators applied to deck windows in the usual manner. The amount of air taken out by each ventilator at a speed of 45 miles an hour is 400 cu. ft. per minute, six ventilators, therefore, drawing out 2,400 cu. ft. per minute. Thus the air in the dining room is changed once each minute. The ventilation of the car increases with the speed of the train, of course.



Kitchen End of Dining Car Equipped with Garland Ventilators.

The kitchen is equipped with four of the side ventilators, two on each side. Two of these ventilators are connected to the hood over the range and carry off the heat and smoke. One is made double, the upper part drawing from the kitchen, while the lower part is connected to the refrigerator in the kitchen, and keeps a current of fresh air passing through it to carry off the odors from the contents. In addition to these four side ventilators two pairs of ventilators are placed over hatches in the center of the deck above the kitchen. Registers are placed on the under side of the hatch openings to regulate the ventilation. These extra ventilators increase the exhaust from the kitchen and produce a movement of air from the dining room towards the kitchen, instead of from the kitchen towards the dining room. The total exhaust of air from the kitchen at 45 miles an hour is 2,600 cu. ft. per minute. The air space in the kitchen being about 600 cu. ft., the air therein is changed four times a minute at this speed.

These ventilators can be applied readily to dining cars in the yards without withdrawing them from service. The side ventilators, as already mentioned, are applied to the deck sash openings, the screens being removed. The ventilators on top of the deck over the kitchen cover the hatch openings usually fitted with lid and screen. The height of the deck ventilators is 7 in., which is less than the height of the smoke jacks from the range, or the open hatch lids, and therefore well within the clearance limit.

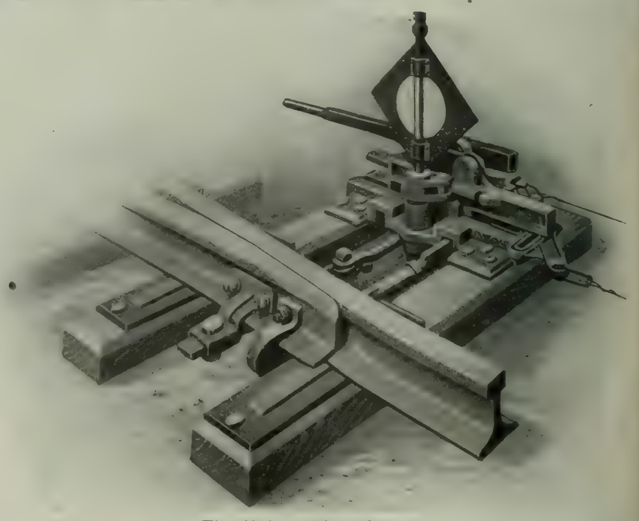
Garland ventilators are handled by the General Railway Supply Co., Chicago.

Plate Punching Performance.

The receivers of Milliken Bros., Inc., New York, report that 143 tons of plates were punched in one day of 8 hrs. 47 min., on a Hilles & Jones (Wilmington, Del.) multiple punch at their structural shops on Staten Island, New York City. The plates were 13-in. flange plates for girders 5/8 in. and 11/16 in. thick and of an average length of 32 ft. The average number of 15/16-in. holes was about 96 to the plate, staggered except at the ends. There were three sizes of plates and varieties of spacings; 52 of one kind, 168 of the second and 96 of the third. The total length of plate handled was 10,036 ft., the total weight being 285,850 lbs. and the total number of holes punched 30,384. In handling these plates, four were passed through the punch at a time. A few days previous one man punched 12,740 holes 9/16-in. in diameter, one at a time, in a day of 10 hrs. This work was done on light transmission line tower angles with a light single stroke quick acting punch. These punching performances are believed by the above company to be records in the line of rapid punching in a bridge shop.

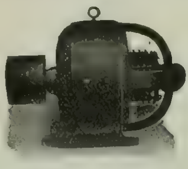
The Unity Switch Stand.

The Unity switch stand, recently brought out by the Morden Frog & Crossing Works, Chicago, is a single-lever ground-throw stand which operates the split switch, the distant signal and an independent lock rod providing a positive facing-point lock. The lever turns through 180 deg., in the first half of which it moves the distant signal and releases the point lock, the final movement throwing the switch. Returning the lever, the first movement closes and locks the switch before the signal can be set to safety. The switch can be operated to allow a train to drill into and out of a siding without disturbing the distant signal, which remains set and locked at danger and thus protects the movement.



The Unity Switch Stand.

By means of a very simple attachment, when desired, the target can be moved independently of the switch and with the distant signal. The stand is designed to operate either wire-connected or electrically-controlled distant signals. The mast is furnished in any height, and the targets of any size and shape required. A number of leading roads, including the Chicago & North Western, the Louisville & Nashville, the Grand Trunk, the Big Four and the Southern Pacific, are using these stands.



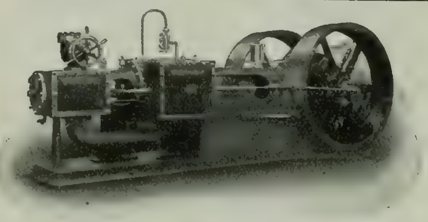
Form I Motor
5 to 45 H. P.

Motor-Drive for Railway Shops

has been the study of **C-W** *engineers for the past twenty years. We build motors specially adapted to all kinds of work in Railway Shops and equip whole shops with the* **C-W** *system of motor-drive. See Flyer 285 W.*

Crocker-Wheeler Company

Ampere, N. J.



Thorough tests of the finished machine insure the shipment of entirely satisfactory power producers.

Ask for descriptive matter.

RIDGWAY DYNAMO AND ENGINE CO.
RIDGWAY, PA.

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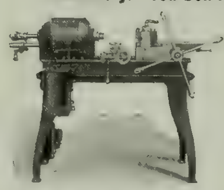
Buying Out-of-date Motors is Like Buying Out-of-date Machinery. You Don't Get Your Money's Worth.



Northern Type "S" Motor driving Pratt & Whitney Lathe

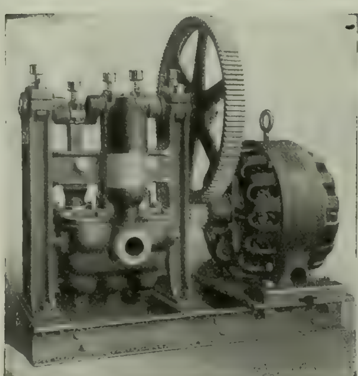
The new Northern Type "S" motor is entirely different from ordinary machines—fields and poles are made of soft sheet steel punchings so designed as to produce the following results—Perfect commutation, low temperature rise, increased radiating surface, great overload capacity, high efficiency, wide speed ranges and quick, positive response to field regulations. You get maximum results.

See these motors demonstrated at the Chicago Electrical Show—Section 7-E. If you can't, send for Bulletin 3659.

NORTHERN ELECTRICAL MFG. CO.

Standard and Special Electrical Machinery. Direct Current—Alternating Current.

District Offices in all principal cities. **Madison, Wisconsin.**



Westinghouse Motor Driving Aldrich Triplex Pump

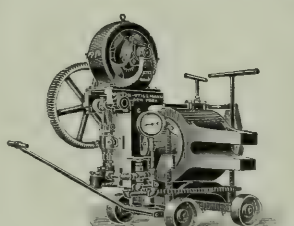
The operation of pumps with Westinghouse Motors

will in almost all cases, excepting in very large water works, show a far greater economy than with steam-driven units. The power delivered at the pump shaft by a Westinghouse motor is at the same economical rate as that of the highly efficient engines in the power house, less the small electrical losses.

Westinghouse Electric & Mfg. Co.

Sales Offices in all large Cities Pittsburg, Pa.

HYDRAULIC FORCING PRESSES



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POSITIONS WANTED.

WANTED—Operating man with 10 years' experience as superintendent and general superintendent is open for position as general manager or general superintendent on steam railroad. Can furnish best of references. Address Box 220, *Railroad Age Gazette,* 83 Fulton St., New York.

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POSITION of chief engineer or engineer maintenance of way. Eighteen years' experience in railway maintenance and construction. Nine years engineer maintenance of way of a busy railroad. Can get results. Address Box 251, care *Railroad Age Gazette,* 83 Fulton St., New York City.

NEW YORK, Jan. 4, 1909.
The annual meeting of the stockholders of *The Railroad Gazette,* for the election of three directors and for the transaction of any proper business, will be held at No. 83 Fulton St., New York, on Jan. 21, 1909, at 3 o'clock p. m.
RAY MORRIS, Secretary.

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WANTED—An experienced foundry foreman familiar with grey iron and wheel iron mixtures. Good salary and permanent position to the right man. Address Box 230, *Railroad Age Gazette,* 83 Fulton St., New York City.

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WANTED—An active, well-informed salesman familiar with locomotives and cars. Must be qualified to inspect and estimate accurately the values of equipment. Give references, age, past and present services. Address Box 215, *Railroad Age Gazette,* 160 Harrison St., Chicago, Ill.

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BOOKS AND PUBLICATIONS.

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83 Fulton St., New York City

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83 Fulton St., New York

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Write us for quotations and bids.
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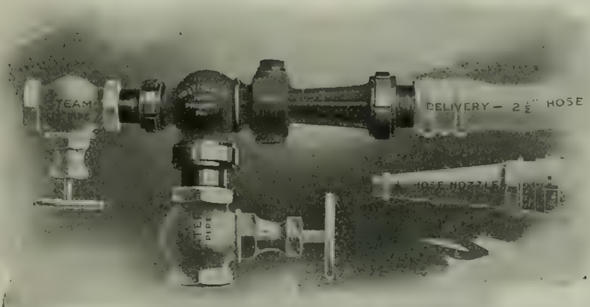
PHILADELPHIA, PA.

BOILER WASHER, FILLER AND FIRE EXTINGUISHER

For Round-Houses Boiler Sheds, Locomotive Works and Erecting Shops



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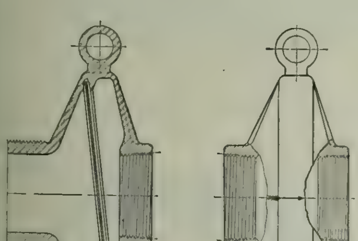
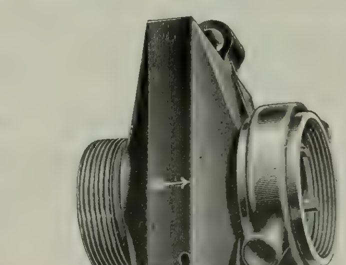
Removes fine particles of coal and cinder, which wear Injector Tubes and Check-Valve Seats. Insures full capacity of the Injector. Owing to large area of Straining Plate and size of Dirt Trap, seldom requires attention.



Can be cleaned easily and quickly without breaking pipe connections.

Straining Plate, Cap, Bolts and Nuts are so attached that they cannot be entirely removed.

Furnished to fit present Suction Connections.



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Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

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THE RAILROAD GAZETTE (INC.), 83 FULTON STREET, NEW YORK.

CHICAGO: 160 Harrison St. PITTSBURGH: Farmers' Bank Bldg.
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W. H. BOARDMAN, *President and Editor.*
E. A. SIMMONS, *Vice-President.* RAY MORRIS, *Sec'y and Man'g Editor.*
R. S. CHISOLM, *Treasurer.*
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CONTENTS

Three years of negotiation of Presidents Mellen and Newman over the question of joint occupancy and operation of the Grand Central Terminal have resulted in Mr. Mellen's securing his main object of a sliding scale of payments based upon car and locomotive entry of the terminal, including the Mott Haven yards. This leaves the New Haven Company free to secure, if it can, new entrances to New York City with payments for the Grand Central diminished in ratio to any future decrease of usage. It opens in a future not remote a large vista of probabilities. There is the New Haven's Boston and Westchester charter, with its line tapping the waxing region of the Bronx and connection with the projected Lexington avenue-Broadway subway. There is the Hell Gate Bridge entrance connecting with the Pennsylvania Terminal, and a potential route for through trains southward, westward and eastward. And northward there is the Mellen project outlined some weeks ago of the extension from Portchester, N. Y., to Danbury, opening a great suburban region and shortening distance and time to the Berkshires. Such costly plans throw in vivid perspective not merely the importance of the long look ahead when providing for the terminals of a great city but the vastness and speed of the growth of the Metropolis itself. Men who, as boys, saw nothing above Forty-second street but Shantytown—and not much of that—may live to see New York jostling the Connecticut border and the question of railway terminals in the Bronx hardly secondary to the problem in Manhattan. That large rural tract bought above Westchester which President C. P. Clark used to call his "cornfield" may yet bear its golden harvest.

Bad and indifferent men cannot stand close supervision. They can be easily weeded out, *regardless of any labor organization.* This declaration is made by the general superintendent of a prominent road, and he is a man of wide experience. He is too modest to publish his name, but his letter, signed "Vidi," and printed on another page, is well worth reading. And by "close supervision" he means keeping such a constant and intelligent watch of the men's work that their merits and their demerits shall always be recorded with strict and judicious equity. The superintendent who gets a good quality of service out of his men without this kind of supervision has to thank the self-training and the good motives of his men, not his own efficiency as a superintendent. "Vidi" points out as one of the main weaknesses of railway management a fault which has often been denounced in these columns—assigning to superintendents and trainmasters too much territory or too many men. When this is the case important duties are delegated to inexperienced assistants. As to *why* labor unions are able sometimes to overawe the superintendent, our correspondent uses plain language: either the superintendent is inexperienced—is not fit for his job—or he lacks the courage to go to the bottom of the matter, get all the facts, and, in blaming an employee, take the time necessary to induce him to admit the reasonableness of the censure. Will any superintendent say that this is not a correct judgment? Finally, one of the best things in the letter of "Vidi" is his assertion that careless employees may be restored to the careful class. And he seems to imply that most "accidents" are chargeable to these men whose dulness or carelessness is due neither to a reckless disposition nor to the influence of a malicious brotherhood leader, but to "slack habits," which are curable.

By the collision at Dotsero, Colorado, last Friday night, killing 21 passengers, the public is once more reminded that the considerable progress which has been made during the past few years by the railways of the country in the use of the block system has not been uniform. On a large proportion of our principal railways the space interval has now been in use long enough to reduce appreciably the collision record, even as judged by the public, which is superficial and not exact in its judgments. Well-informed passengers now have a confidence which would have been unfounded five years ago. But here is a railway company running heavy through passenger trains which has no block signals at all. The line of its chief competitor is completely equipped with automatic block signals throughout its length of 1,000 miles. From the standpoint of the public the cause of the Dotsero collision calls for absolutely no comment, except that it is of a class so well known that every railway officer who cares knows the remedy. For over a year now the collision record, thanks to the dulness of traffic, has been less exciting than during the previous five years, and the superficial observer might almost conclude that there had been a universal improvement in methods of train management; but it needed only a glance at the records to show that the real problem of prevention still remained to be settled; or had been settled only in spots, here and there. The lists of prominent collisions, as given each month in the *Railroad Age Gazette* have, indeed, been short for many months; but in these records the degree of "prominence" is measured by the number of persons killed and injured, which often seems to be increased or diminished by pure luck. The government records tell a different story.

Those reports show a pretty accurate comparative record of the real danger; and a study of the facts shows that the danger to passengers and employees from collisions has not been reduced so much as the newspaper records would indicate. *Every month* there is a considerable number of collisions due to the same class of mistakes as that which figured at Dotsero. It may be that only one in ten, or twenty, or even a hundred, of such mistakes results in killing a lot of passengers; but the warning is there, just as plain as the sun in the sky. Moreover, the records of 1908, the year of light traffic, when examined in detail, are seen to be not without notable cases. In the three months ending with September there were five disasters to passenger trains, which killed in the aggregate 49 persons, and all but one of them were on lines where the block system was not in use. The fifth (Oakland) was a crossing collision. The five cases were: Boonville, N. Y.; Knobnoster, Mo., Oakland, Cal.; Plains, Mont., and Young's Point, Mont.

THE REPORT OF THE PUBLIC SERVICE COMMISSION FOR NEW YORK CITY.

The first two chapters of the report of the Public Service Commission, First District, have been submitted to the legislature. The first chapter summarizes the work of the commission during the past year and describes the routes for proposed new subways in Greater New York. The subject of adequate service is then discussed. "In transportation there is no unit of service other than that a passenger upon payment of a fare is entitled to a ride." While the commission recognizes that during the worst of the rush hours it is physically impossible to prevent crowding of cars, it takes as an ideal of adequate service, the provision, both by surface lines and subway and elevated roads, of a seat for every passenger who desires to ride. The orders for increase in service, increased equipment and new type of equipment issued in 1908 were framed with this ideal in mind.

This definition of adequate service is itself wholly inadequate. What might be considered adequate service rendered to a man who pays $4.65 to travel from New York to Boston is not adequate service for the man who pays $2 extra for a fast train and a parlor-car seat. If the commission should try to define what is adequate service *for five cents* it would approach the question in a much fairer manner. It is possible that compared with other transportation service rendered for the same money in, say, London or Berlin, space enough to stand in and a strap to cling to, with transportation from Two Hundred and Fiftieth street, Manhattan, to Atlantic avenue, Brooklyn, a distance of over 16 miles, is rather more than a passenger has a right to demand in return for his nickel. As long as a ride is charged for at a fixed rate, regardless of its length, the only fair standard of service is the average service rendered to the average passenger. Some figures for the average length of ride should be arrived at and for the average distance the ordinary man has to stand during his average ride; then the question should be asked, is he getting adequate service for his money?

The second chapter of the report makes suggestions for the amendment of the law which at present prevents the issue of bonds by the city beyond a certain limit for corporate purposes, including the issue of bonds for the construction of rapid transit facilities—subways, elevated structures, etc. The law also provides that the construction of subways may be paid for by the city, but the city has the right to lease tne newly constructed subway to a private corporation for operation. The present subway was built in this manner. The contractors who built it are at present operating it and were given a 50-year lease. They are paying the interest on the construction cost, that is on the $40,000,000 bonds issued by the city and a certain part of their earnings in addition, to be used as a sinking fund to retire the city's construction bonds in 50 years. Since 1904 the law has been amended, so that the city cannot grant a lease to an operating company for longer than 20 years. The city is now in the position where it cannot build subways that are needed with its own credit, since its debt is approaching the limit, and it cannot induce private capital to invest in the building of subways, because the law does not leave it enough discretion in fixing terms of operation so that it can hold out any attractive inducement for the investment of privte capital. The commission suggests that greater latitude be permitted in the making of contracts between the city and companies which desire to operate rapid transit property, and also that bonds issued to build rapid transit facilities, on which the interest is being paid not by the taxpayer, but by the operating company, be exempt from the provisions of the debt limit law.

There are three types of routes that demand subways: 1. Routes connecting business and transportation centers. The operation of subways with this route should more than pay interest on construction cost. 2. Routes performing a service analogous to bridges. The operation of the rapid transit facilities with these routes may be unprofitable, or at a loss, but the loss should be borne by the whole community. 3. Routes into undeveloped parts of the city. The operation of rapid transit facilities with these routes may be at a loss, but the loss should be divided, part to be sustained by the city and part to be raised by assessment on the property directly benefited by the new subway or elevated. The recommendation that property holders who were benefited by a new subway should pay something toward its construction is eminently fair. The recommendation that bonds issued for the construction of a subway, the interest upon which is not a burden to the taxpayer, and the profits from the operation of which will at the end of a certain period of years pay off the principal of the bonds, leaving the city the owner of the subway, if adopted should go far toward solving the transportation problem in New York without having any of the bad moral effects of a removal of the debt limit by arbitrary legislation.

A NEW PLAN OF OPERATING ORGANIZATION ON THE HARRIMAN LINES.

An interesting and important experiment with a new form of maintenance and operating organization was begun on the Nebraska Division of the Union Pacific on January 14. On that date the following order was issued:

"Union Pacific Railroad Company. Nebraska Division. Office of Superintendent. Omaha, Neb., January 12, 1909. Circular No. 1. Effective January 14, 1909, the Nebraska Division discontinues among its officers the use of titles, Superintendent of Terminals, Master Mechanic, Division Engineer, Trainmaster, Traveling Engineer and Assistant Division Engineer. The following named officers are designated:

1. Thomas J. Foley, Assistant Superintendent.
2. George H. Likert, Assistant Superintendent.
3. Augustus D. Schermerhorn, Assistant Superintendent.
4. J. Walter Adams, Assistant Superintendent.
5. James P. Carey, Assistant Superintendent.
6. Chauncey C. Cornell, Assistant Superintendent.
7. John L. Allavie, Assistant Superintendent.
8. William H. Putcamp, Assistant Superintendent. They will be obeyed and respected accordingly.

"Each of the above named officers continues charged with the responsibilities heretofore devolving upon him, and in addition assumes such other duties as may from time to time be assigned. Such of the above as are located in the same building have one consolidated office file in common with the superintendent.

"All communications on the company's business, originating on this division, intended for the Superintendent, or for any Assistant Superintendent, should be addressed simply 'Assistant Superintendent' (telegrams 'A. S.'), no name being used unless the communication is intended to be personal rather than official, in which case it will be held unopened for the person addressed. It is intended that an Assistant Superintendent shall always be on duty in charge of the division headquarters offices during office hours. The designation of a particular Assistant Superintendent to handle specified classes of correspondence and telegrams is a matter concerning only this office. No officer should sign the name or initials of another.

The principle to guide subordinate officers and employees is to be governed by the latest instructions issued and received.

"Train orders will be given over the initials of the Chief Despatcher.

"The modification of pre-existing organization and methods herein ordered have been carefully worked out to expedite the company's business by the reduction and simplification of correspondence and records. It is expected and believed that officers and employees will insure a successful outcome by lending their usual intelligent co-operation and hearty support.

"Officers and other persons outside the jurisdiction of this division are requested to address official communications, 'Superintendent, Nebraska Division, Omaha, Nebraska,' (telegrams, 'Supt.'), without using the name of the Superintendent except for personal matter. William R. Cahill, Acting Superintendent. Approved: Charles Ware, Acting General Superintendent."

The change is not merely titular, but, as the circular shows, is functional; it involves a modification and broadening of the duties of all affected. If the experiment works well it may be the forerunner of an important reorganization of the entire maintenance and operation department of the Harriman system.

William Cahill, Assistant Superintendent of the division, who is now Acting Superintendent, will resume the title of Assistant Superintendent when Charles Ware, now Acting General Superintendent, resumes his regular duties as Superintendent of the Nebraska division. There will then be nine Assistant Superintendents.

The purpose of this change, and of others more extensive that are contemplated, is both to strengthen the existing operating and maintenance department, and to make it a better school for developing capable, resourceful, all-around operating officers. The operating department has three sub-divisions, the transportation, the engineering, or roadway, and the mechanical. The hardest problem railway managers have is to get a simple and satisfactory correlation between these sub-divisions, and men competent to preside over all of them in the offices of superintendent, general superintendent, general manager and operating vice-president. Mr. Kruttschnitt, Director of Maintenance and Operation, and the Vice-Presidents and General Managers of the Harriman Lines, have given hard study to the subject; and Mr. Kruttschnitt hopes that in the plan referred to it has been found a solution of this vital problem.

In the way of strengthening the present organization, it will be noted that one of the effects of the change will be to destroy what has been facetiously but aptly termed, "government by chief clerks." Ordinarily when the superintendent of a division—or, for that matter, the general superintendent or a higher officer—is away from his office, his chief clerk writes letters and orders to which he signs his superior's name. As superintendents on the Harriman Lines are required to be on the road at least 15 days in every month, their chief clerks are practically acting superintendents one-half the time. Now, the chief clerk usually is a very faithful, experienced and competent employee, but he seldom has the equipment to perform the duties of superintendent. Under the plan being experimented with the work of the chief clerk will be confined to the supervision of the office force and the handling of statistics. The senior assistant superintendent will have no expense account; he will be in charge at headquarters throughout every working day. All communications on the company's business originating on the division and addressed to headquarters will be received and answered by him. In the absence of the superintendent, he instead of the chief clerk, will be acting superintendent.

There is always danger that a railway operative who is kept long at a desk will develop the academic tendencies of office government. For this reason, the senior assistant superintendent, after being kept at headquarters four or six months, will be assigned to other duties for which he is fitted, and some other assistant superintendent will take charge at headquarters and while there will be senior assistant. Thus each of the assistant superintendents, who formerly had the various titles of division engineer, master mechanic, trainmaster, etc., may perhaps serve in rotation at headquarters, and get experience in supervising the operation of the entire division. Each will know all about either the transportation, or the mechanical or the engineering departments of the division, according to his special training, and something about each of the other departments.

Each assistant superintendent has an office at headquarters, but is forbidden to keep a separate office file. He is permitted to write only a few letters to subordinates in his particular branch of the work, for which he still retains full responsibility. He may not write letters to his fellow heads of departments next door; all letters for them must be addressed to the senior assistant superintendent. He may not write letters to superior authority direct, but must submit them for the signature of the superintendent. Duplication of letters and instructions is prevented by the major portion being dictated by the senior assistant at headquarters. It is believed that by this system the number of letters written will be reduced 40 to 50 per cent.; and that, relieved from the care of a bureau of papers, and from handling a great deal of correspondence, each officer will be able to spend much more time on the road or in the shops, and in thinking about and intelligently planning his work.

It is expected that discipline will be improved by the fact that each officer, like the officer of a vessel, has the authority indicated by his title. Each assistant superintendent, regardless of his special work, will have authority over every officer or employee of lower rank, whether locomotive engineer, conductor or mechanic. The former master mechanic, now assistant superintedent, can tell the young brakeman that the safety of the public will be increased by prompter flagging next time without being "sassed." The late division engineer can help do missionary work along the line of careful stoking. The former traveling engineer can advise the conductor as well as the engineman how better to get trains over the road. Each assistant superintendent, having general jurisdiction over all departments, each will naturally begin to note and suggest defective appliances and methods and possible improvements outside as well as inside his special line. If a blockade or an accident occurs the superintendent can scatter his assistants to the crucial points. On arrival each has authority over all available forces instead of over only a part. Back at the headquarters is the senior assistant controlling all the interlocking levers of administration. The new system of organization is based on the conception of all-around administrative usefulness to supplement the necessary specialization of the individual officer in his particular branch.

While A. L. Mohler, Vice-President and General Manager of the Union Pacific, and his staff were the first to ask for an opportunity to try the new scheme, it will be tried on other parts of the Harriman Lines as fast as details can be worked out to meet local conditions; and it is expected that the same principle of organization will be applied to other operating units, both above and below the division. Already it is being arranged on some small terminals to have the roundhouse foreman become also yardmaster. Where the volume of business is too heavy for such a dual position the one officer may be appointed the assistant of another. It is desired to bury the old post-mortem question of whether the train or the engine was ready first. An extension upward of the same principle of organization would make the general superintendent, the general superintendent of motive power and the chief engineer all assistant general managers, with general and special authority and duties similar to those of the assistant superintendents of a division.

The foregoing indicates some of the ways in which it is expected the new scheme of organization will tend immediately to strengthen the maintenance and operating department. But it is being tried more for ultimate than for immediate results. Its keynote is, "Education." The best criterion of the perfection of any organization is whether it is self-

perpetuating. It was said of Napoleon's army that every private carried a marshal's baton in his knapsack. This was one way of saying that no rule, precedent or custom barred an able fighter, no matter what his rank or training, from aspiring to the highest commands. The result was that every man was stimulated to attain the highest efficiency, and that when an officer fell there was always present someone fitted to take his place. Now, something like this, it is conceived, should be true of railway operating and maintenance organization. The railway operating department is a great army; at high-water mark in 1907 there were 118,000 men on the payrolls of the Harriman Lines. An army is divided into cavalry, infantry and artillery; it has staff as well as line officers. Similarly, a railway operating department has its transportation, mechanical and engineering sub-divisions. That most of the fighting of an army is done by infantry, does not prevent an artillery or engineer officer from rising to the rank of marshal or lieutenant-general. Napoleon was an artillery officer; Robert E. Lee, one of the greatest military geniuses of American history, was an engineer officer. It is well-known that few American railway operating departments are self-perpetuating. When the office of general superintendent, or general manager or vice-president becomes vacant the management is apt to go to some other road for a man of enough ability and breadth of experience to fill it. It is well-known also that on all but a few roads only transportation officers can hopefully aspire to the highest places. Except on the Pennsylvania, the civil engineer seldom gets higher than chief engineer; the mechanical man seldom gets higher than superintendent of motive power. Such railway presidents as Marvin Hughitt, A. J. Earling, W. C. Brown, Milton H. Smith, T. M. Emerson, A. J. Davidson and H. I. Miller rose through the transportation department from telegraph operators; and a legion of vice-presidents has come up the same way. The number of civil engineers who have risen to the top is relatively very small, and the number of mechanical employees and officers still smaller. Scattered far apart, indeed, are the former locomotive enginemen, like Daniel Willard of the Burlington, whose native ability and indomitable energy have enabled them to climb to the top; and perhaps Mr. Willard would not have gone so high if he had not been transferred to the transportation department by being promoted from locomotive engineer to trainmaster.

Mr. Kruttschnitt,—himself an engineer,—thinks the facts, that railway organizations are often not self-perpetuating, and that engineering and mechanical officers so seldom rise to the highest positions, are related. He believes that with over 100,000 men in their employ, the Harriman Lines, with the right kind of organization, should be able to train and develop plenty of men as able and as broad in experience as can be found elsewhere, and who will have the additional advantage of close familiarity with the methods, equipment, etc., of these lines. But he also believes that in order to develop plenty of men from whom to select officers to preside over the various grades and sub-divisions of the operating department, something must be done to open wider the door or opportunity to the engineering and mechanical officers, and to broaden their training and experience, as well as those of the transportation officers. Under present conditions on most roads it is natural that only transportation men should rise to superintendents, general managers and vice-presidents. The primary work of the railway is to furnish transportation, keeping motive power and roadway in good condition being auxiliary to this. The main work of the superintendent, therefore, is to get trains over the road. When he looks about for an assistant superintendent he may find no one who has had experience in this work but the trainmaster, usually a former despatcher; so the trainmaster becomes assistant superintendent. Just as naturally, when the office of superintendent becomes vacant the assistant superintendent gets it; and so it usually goes clear up the line. But suppose the superintendent had on his staff a man of much natural ability who was a mechanical or engineering expert and also had had some experience and had developed skill in getting trains over the road. In such a case, when the superintendent was promoted he would be apt to recommend the former master mechanic or division engineer as his successor.

Now, the main object of making assistant superintendents of the former division engineers, master mechanics, traveling engineers, etc., is to give to each of them broader training and opportunity so that not merely the transportation man, but the man, whatever his special work, who has shown the most ability, can be advanced. Similarly, the object of making assistant general managers of general superintendents, superintendents of motive power and chief engineers would be to give them all a broad training and experience so that the management would not be forced either to promote a transportation specialist to general manager or go off the road for a man to fill that office, but could choose for it the assistant general manager who, regardless of his special line of work, had shown the greatest capacity for supervising the work of all the departments. The change, it is believed, would make officers more capable, both by broadening the experience of all, and by stimulating the energies of many through greater opportunitiy, and would give the management about three times as many capable men to select from in filling the more important offices.

The foregoing describes the plan and aims of the officers of the Harriman Lines. The scheme, avowedly, is in a tentative stage. That the ordinary operating and maintenance organization has imperfections is recognized by all thoughtful railway operatives. Many may doubt if the experimental, quasi military method being tried on the Harriman Lines will prove the cure for those imperfections. But all, at least, will be glad a new scheme is being tried by such capable hands, and will study the results with the greatest interest.

THE BEAD ENDS OF LOCOMOTIVE TUBES.

One of the most frequent causes of locomotive failures is leaky tubes and the use of high-pressure steam in recent years has greatly agravated this and other boiler failures. On some roads in the West conditions were so bad that it was necessary to reduce boiler pressure; on others the use of water purification and the intelligent care of the boiler in maintaining more uniform temperatures have greatly improved conditions and materially reduced tube leakages. These efforts have been directed largely to matters connected with steam and water and not to the tube itself in its mechanical and chemical relations.

Two recent papers on tubes have to do principally with the causes of leaks, one as due to the failure of the bead end and the other to slipping of the joint, and, though from far distant sources, these two papers have an important connection which will be here briefly outlined. In his paper on "Locomotive Flues—Endurance of Material," read at the October meeting of the Richmond Railroad Club, Alexander Kearney said that modern service makes greater demands, and locomotive boilers and fireboxes had been changed and improved in many ways in order to adapt them to high pressures. But though the tube length has been greatly increased, the thickness and the methods of securing them in the tube sheet remained the same.

The constant and excessive rolling of the tube end in the effort to stop leaking makes it and the copper ferrules thinner and the latter are driven inward by the rolling. On account of this abuse the more general use of the tube expander is favored as a substitute for rolling. The tube sheets are also deeply guttered by the use of the beading tool, and on the Norfolk & Western Railway they have had unusual trouble

from the gradual burning off of the beads, some of them being entirely destroyed in eight months' service. This condition led to an interesting investigation of the bead end of tubes as affected by the mechanical working in setting and by the chemical composition of the tube material, all of which is fully described in Mr. Kearney's paper.

Retightening a tube has a tendency to draw the bead, and while this result is not pronounced with a good expander it is decidedly so with the roller. The destructive effect thus produced by rapidly thinning the tube under the roller is serious and materially reduces its life. When by excessive rolling the beads are abnormally drawn and become larger this stock added to the bead is distorted, unduly punishing the fiber and materially hastening certain destruction. When the expander is followed by the beading tool the tube sheet is guttered, but by careful manipulation this can be so controlled as to make the general use of the expander profitable and desirable.

The investigation of the failure of tube beads under mechanical punishment led to a study of the chemical composition of tubes and the effect of gases on them, when in a highly heated condition. It is well known that metals when heated to the higher temperatures and exposed to certain gases will absorb them to some extent, holding them by mechanical occlusion, also by direct combination, thus forming new and deleterious impurities. An analysis of portions of metal removed from beads worn by exposure to the furnace gases and sparks showed that they had a high content of sulphur. The amount of sulphur at the extreme end of the bead after the deterioration had reached an advanced stage, was as high as 0.137 per cent., decreasing to 0.04 per cent. at the fire side of the tube sheet and to 0.025 on the water side.

It was concluded that this excess sulphur hastens deterioration, also that some other elements have a bad effect. Nitrogen is present in iron and steel from a mere trace to 0.03 per cent. and nitrogen in unstable combination is a dangerous impurity. It might be doubted whether the beads can become red hot when exposed to hot gases having a temperature of nearly 2,000 deg. F. but with water circulating on the ½-in. tube sheet. There is a seam between the bead and the sheet, and often an actual air space where the bead is not solid against the sheet. At such points the resistance to the transmission of heat is far greater than that of the solid sheet and it is easily possible for the bead to become overheated.

The original quality of the tube metal when new is affected by the content of manganese and carbon, each increasing the strength and the former counteracting the influence of sulphur by diminishing the fusibility of the metal and decreasing the tendency toward lamination. The Master Mechanics' specification for cold drawn steel tubes gives the desired limits for carbon 0.15 to 0.20 and for manganese 0.45 to 0.55, but these limits were probably fixed with respect to the effect of these elements on the mechanical working by rolling and beading and had no reference to the subsequent deterioration of the tube from the effects of heat and the furnace gases. Mr. Kearney suggests that small circumferential cracks in the tube ends may be due to the larger amount of manganese in proportion to carbon, also that as manganese increases the melting point of steel it decreases the solubility of the gases in the metal and may have a direct bearing on the extent of the absorption of sulphur and nitrogen.

It is a common opinion that low carbon in steel improves the resistances to high temperatures. The condition of combined carbon and the annealing of the tube ends make the initial working incident to application less destructive, but it is a fact that many railways have abandoned the practice of annealing without apparently affecting the life of the tube. The effect of annealing is so small that it is soon lost under the high temperature to which the tube end is subjected in the firebox. There is ample opportunity here for an investigation by railway laboratories to determine the proper chemical specification for steel tubes. The work done by the chemist of the Norfolk & Western has led Mr. Kearney to suggest that the proportions for carbon and manganese in the present Master Mechanics' specification should be materially modified; combined carbon should be 0.08 and manganese as low as 0.20 to 0.30.

In connection with this investigation on the Norfolk & Western some experiments have been made by dispensing entirely with the beads and placing the tube ends flush with the firebox side of the tube sheet. Several locomotives have been fitted up in this way, leaving the beads off all the tubes in the firebox end, and one engine was fitted with a portion of the lower tubes beaded, and others flush. On this engine while all of the tubes required a certain amount of attention it was found that the beaded tubes were worked upon 2.3 times as often as those without beads. In the discussion of the paper one member reported an engine without beads on the tube ends as having been in service ten years, probably under low boiler pressure.

The beading of tubes is not intended primarily to assist in bracing the tube sheet against internal pressure, as the same pressure is exerted against the front tube sheet and there the tubes are seldom if ever beaded. The bead is used as a means of making a tight joint and supplements the joint of the rolled tube against the sides of the holes in the tube sheet. If this is imperfect the leak may be prevented by a tight bead but a very slight slip will loosen both joints, and if the bead leaks the joint is caulked by the beading tool. The whole system fails because the tube has not been properly fixed in the tube sheet and beading is resorted to in order to patch up a poor job of rolling or expanding or other careful fitting of the tube to the sheet. It seems important therefore that more accurate investigation should be made on the improvements of the joint in the tube sheet in order to make it tight and reliable, so that it will not be necessary to resort to beading.

The relation of leakage to the slipping of the tube in the sheet and the shape of the joint has been made the subject of some careful experiments by Professors O. P. Hood and G. L. Christensen, of Houghton, Mich. The results of their investigation are given in a paper read at the recent meeting of the American Society of Mechanical Engineers under the title, "The Slipping Point of Rolled Boiler Tube Joints." The paper contains a number of diagrams, tables and drawings, which should be referred to by those particularly interested in the subject. As the result of their investigation the authors reach the important conclusions that "(a) the frictional resistance of a 3-in., 12-gage, cold drawn steel tube in a ⅝-in. tube sheet is 750 lbs. per sq. in. of tube area when the tube is rolled into a straight, smooth machined hole. (b) Serrating the tube seat by cutting square edged grooves about $^1/_{100}$ in. deep and ten pitch will raise the slipping point to three or four times that in a smooth hole. (c) It is possible to make a rolled joint that will offer a resistance beyond the elastic limit of the tube and remain tight." An abstract of this interesting paper will be found on another page of this issue.

NEW PUBLICATIONS.

Proceedings of the Traveling Engineers' Association.—Sixteenth Annual Convention. Published by the Secretary at Buffalo, N. Y. 346 pages; 6 in. by 9 in.; illustrated. Leather.

The subjects presented to the convention, which was held in Detroit in August, 1908, are as follows: The Electric Locomotive; Influence of Education on the Work of the Engineer and Fireman; Steam Reversing Gear; Air Pump Exhaust Pipe; Steam Heat Operation in Train Service; The Territory to be Covered by the Road Foreman of Engines; Terminal Tests of New Types of Locomotive Brakes; Superheated Steam and the Best Method of Getting Good Results; Good Practice for Traveling Engineers in the Matter of Coaching Fire-

men and Method of Interesting Engineers and Foremen to Keep Themselves Posted on the Progress of Events.

These subjects are all well handled and are in some respects interesting and indicative of the attitude of the members towards new and old locomotive appliances. For example, it seemed to be the opinion that the steam reversing gear, while interesting as a piece of mechanism is of no practical value on the ordinary locomotive as the valves can be handled more readily by hand. But in the case of the Mallet compound locomotive, where two sets of valve gears are to be moved, it is a necessity. A portion of the papers were descriptive of the various types of apparatus that are used.

Proceedings of the Fifteenth Annual Convention of The Air Brake Association. 294 pages; 6 in. by 8½ in.; 21 illustrations; flexible leather cover.

The fifteenth annual convention of the Air Brake Association was held in St. Paul in June, 1908, and the proceedings are just out in the book under consideration. It is presented in the usual form and is typographically attractive but it has one decided defect in that it is printed without any index or table of contents so that the only way in which to obtain any idea at all of its contents is to turn the leaves, one at a time. By doing this it will be found that the subjects treated include: Brake Pipe Leakage, Its Cause and Prevention: Test for Brake Cylinder Leakage; Breaking-in-two of Heavy Modern Passenger Trains, Their Cause, Remedies and Avoidance; Brake Beam Release Springs, Their Beneficial and Detrimental Effects, with Suggestions for Modification; Triple Valve Lubrication; Report on Recommended Practice; Introduction to the Study of Air Brakes, with Special Reference to Questions and Answers on E. T. Equipment. These subjects were usually presented very briefly and were then very fully discussed.

Cement Laboratory Manual. By L. A. Waterbury, C.E. New York: John Wiley & Sons. 122 pages; 5 in. by 7 in.; 28 illustrations. Cloth. Price, $1.00.

The author of this book is at present professor of civil engineering in the University of Arizona, and it was prepared especially for the use of students in the University of Illinois, with the dictinct disclaimer in the preface that the book was "intended to serve as instructions for the testing of cements for commercial purposes." But it is quite evident that any student who shall have successfully completed the problems that are given, would be able to do testing for such purposes.

The work is very systematically arranged and is divided into descriptions of a series of tests that are to be made. In the first chapter there are the general instructions governing the laboratory work, such as the assignment of lockers, distribution of apparatus, cleanliness, responsibility for breakages, etc. Then follows a brief but clearly detailed description of the various tools and pieces of apparatus to be used, accompanied by illustrations that make the text readily comprehensible. Then follows the real essence of the work in the third chapter which consists of the statement of the series of tests that are to be made. They start in with the simple determination of fineness, and pass on through that of weight, specific gravity, plasticity, soundness, the time of setting, tensile strength at different ages and with various methods of molding, with a final problem on compressive strength.

The statement of these problems is complete in every detail. First is given a list of the pieces of apparatus required, then the material, then careful instructions of the methods to be employed, taking up each consecutive step, even to the cautions against the danger of breakages of the apparatus, and finally an outline of the report that is to be rendered. So fully and thoroughly has this been done that it ought to be quite possible for a student of a degree of intelligence that is far below what we are pleased to call the average, to take up this work, and by following the instructions of the manual, bring it to a successful conclusion without the necessity of an instructor at all. The writer has evidently taken it for granted that the student has not even the most elementary glimmering of an idea on the subject and must be told everything, and then proceeds to tell him that everything in a clear, concise manner following a logical sequence of events that reaches the goal in the briefest possible time.

So while the book is ostensibly intended for student work only, it will be a most valuable manual to be placed at the elbow of the man who has to do with commercial work, and this value is increased by the insertion as appendices, of the tests, specifications and methods of chemical analysis suggested by the American Society of Civil Engineers, the American Society for Testing Materials and the New York Section of the Society for Chemical Industry.

Letters to the Editor.

PRIVATE CARS.

Pittsburgh, Pa., January 6, 1909.

To the Editor of the Railroad Age Gazette:

In your issue of January 1st you have an article on the subject of "Private Cars" from an unknown writer from Chicago who signs himself, "Statistics." The article appearing over his signature in your paper is, of course, a voucher as to the reality of this personage, but when a question of veracity is raised on a statement of facts the identity of the writer is always desirable.

The matter contained in the paper read by the writer at the meeting in Cincinnati was prepared with the idea in view of giving meat enough with which to prove the question at issue. Further facts were also prepared for presentation in order that they might be incorporated in the minutes of the proceedings of the meeting of the Association.

Having been unable to obtain such an adversary at the meeting in Cincinnati, as is in every way desirable and who is not afraid to fight his fight in the open, I shall, Mr. Editor, with your permission (and good-will, I know) answer "Statistics."

In the paper read at Cincinnati it was intended by the writer as an argument showing the cause for, and necessary existence of privately-owned cars. By using such figures as were then obtainable from reports of the Association of Transportation and Car Accounting Officers, demonstration was made of the inability of the railways, members of that Association, to properly handle the business of the country between the years 1904 and 1908. The private car owner was not the result of any desire on his part to "Come to the rescue of the suffering public," to quote from "Statistics," but is the result of a lack of willingness or business foresight on the part of railway management to properly care for the business interests of the country, which the law says are committed to their keeping.

In a further discussion at the meeting in Cincinnati the next day after reading the paper in question, it was then shown by the writer that the increase in freight car equipment among the 60 railways referred to in the paper, members of the Association, was only 13 per cent. This percentage proportion of these 60 roads was obtained by eliminating from the total number given in paper all cars other than those used for freight service, such as passenger, baggage, maintenance of way, and all other equipment to the number of over 103,000 cars, which were used to make up the 20.5 per cent. increase. This percentage of increase did not apply to the railways of the United States, as is claimed by "Statistics" in his article, but only to 60 of the railways of the Association above referred to, who were members continuously during the period named, and whose total equipment of freight, passenger and all other kinds of equipment was each equal to 10,000 cars or over.

In an open letter to the American Mining Congress, which

met in Pittsburgh last December, E. H. Harriman, of New York City, makes a plea for fair treatment for the railways of the country. He gives in this article contained in over two columns of a daily paper the tonnage statistics, the comparative cost and return from railway investment of capital, and in conclusion asks that the laws passed may not become too burdensome as to cause loss of revenue or demoralization of the service required.

On the subject of mineral products, Mr. Harriman has this to say:

"The total tonnage reported by the Interstate Commerce Commission as originating on American railways in 1906 was 820,000,000 tons. Of this the crude products of the mine aggregated more than 435,000,000 tons, or 53 per cent. of the total tonnage. Add to this 89,000,000 tons of manufactured mineral products, such as cement, lime, steel, etc., and we have a total mineral production transported by the railways of approximately 525,000,000 tons, or 64 per cent. of the entire freight business of the country. In addition to this the railways hauled for their own use about 100,000,000 tons of coal during the year, or 275,000 tons each day. Of other freights during the year, the products of the forest, agriculture, merchandise, animals and manufactures (excluding the 89,000,000 tons of manufactured mineral products) make 36 per cent. of this total haulage."

In the paper read by the writer to which exception was taken by "Statistics" the partial list of the mineral production of the United States was given as 544,159,710 tons in 1906, and he wants to know who handled the surplus tonnage. In reply to his question, it is quite evident that he has forgotten the existence of the Great Lakes, the rivers and other inland means of water transportation, as well as the various coastwise trade of the eastern, southern and western part of our country. At the present time the company employing the writer has over 1,000,000 tons of bituminous coal loaded in barges and awaiting a rise in the Ohio river in order to be sent to southern markets.

Mr. Statistics does not seem to be such a bad hand in manipulating figures himself. From his name, I presume years of experience has given him certain tactful knowledge as to the manner in which the truth can be so clothed as to tell only one-half the truth, and yet appear to be the real thing itself, as for instance:

He gives the number of coal cars in railway service in 1904, based on an average of 33 tons, assumes an increase of 38 per cent. in the total number and the average increase in capacity as 39 tons per car, deducing therefrom an increase in capacity equal to 42.2 per cent.—which looks good on paper.

The most strenuous objection which could be raised to this sort of figuring is that the statistician starts out on a wrong assumption. The per cent. of increase should first be determined by elimination of all the old cars of small capacity, and which were destroyed in order to give place to those built of an increased capacity. If "Statistics" can get at the exact figures on this subject, he can do more than other well versed gentlemen we know. One railway man at Cincinnati informed me their road had 120,000 50-ton steel hopper cars at present in service. The records of this road show 72,000 wooden box and gondola cars of 30-tons capacity or less, which have been sent to other roads because their life would be endangered by actual service on the owning roads because of their age and disability when used in train service containing the heavier equipment of later build.

In the November number of the Register this road referred to is credited with a total of 166,130 cars of all kinds, of which about 11,000 were passenger and other than that used in freight service. The 120,000 50-ton cars, as given by this gentleman, added to the 72,000 used on foreign roads makes a total of about 192,000 freight cars credited to this road. This would make a difference of about 37,000 cars more of freight equipment than this road actually owned. It is indeed true that "figures won't lie," except under certain well-known conditions.

Objection is made by "Statistics" to the statement contained in the paper read at Cincinnati by the writer that $30 per car was the net earnings of a road hauling coal from Pittsburgh to the lakes. The figure named was given as it came from one of the officials of the railway in question. This road is a feeder of one of the trunk lines of our country, and from his past experience "Statistics" can doubtless solve the problem of 70 per cent. expense or more as operating cost on a long haul, and about 20 per cent. operating cost on one of its branch lines.

In concluding his letter previously referred to, Mr. Harriman has this to say:

"In conclusion, let me impress on you the fact that the interests of producers, of consumers and of the transportation agencies that bring them together in the markets of this country and of the world are mutual and interdependent. We cannot afford to so adjust our rates as to place undue burdens on your businesses, for that would arrest the development of our traffic. You cannot afford to cause lawmakers and railway commissions to continue unduly to increase our operating expenses and reduce our earnings, and thereby hinder the expansion of our facilities: for that will arrest the growth of your business and the increase in the value of your properties. As our interests are mutual and interdependent, we will all gain by recognizing frankly one another's legal and moral rights and cooperate in the broad and intelligent spirit for the promotion of the development and progress of this marvelously promising country."

To all of this, the writer gives a most hearty and energetic "Amen," as supplying the sentiments expressed by Mr. Harriman to the cost of operation and repairs to cars of private ownership on the railways of the United States.

ROBERT J. BAILEY,
Secretary, Individual Car Owners' Association of the U. S.

PREVENTION OF ACCIDENTS DUE TO DISOBEDIENCE OF RULES.

St. Louis, December 4, 1908.

To the Editor of the Railroad Age Gazette:

In the *Railroad Age Gazette* of November 20, page 1,407, I note an article in regard to a convention held in Indiana under the auspices of the State Railroad Commission to discuss the best means to prevent accidents. Representatives from the commission and railroad officials, as well as train and enginemen, were present. Certain speakers intimated that investigations as to causes of accidents were sometimes avoided because officials were timid about clashing with labor organizations.

I cannot but believe (if it is a fact that such conditions exist) that it is largely due either to lack of experience upon the part of the person conducting the investigation or to the fact that the investigation was not thorough enough. If, after an accident occurs, the investigation is conducted in a thorough manner and the persons at fault are properly disciplined, no one need fear any railroad labor organization. I say this after much experience with salaried committeemen representing the various organizations on a large railroad.

If care had been exercised in the past to properly administer discipline to those who violated rules, and the necessary time had been taken by superintendents to carry their investigations far enough to make it clear to those at fault wherein they erred, labor organizations would not be as prominent to-day as they are.

In the *Railway Age* about two years ago I gave briefly my views with respect to methods that would aid in preventing

a large percentage of the accidents occurring from causes chargeable to the transportation department. From careful study of the subject since then, I am still of the opinion that on many roads not enough care is taken to require the rules to be obeyed when accidents do not occur. It seems to be the rule, rather, to wait until an accident occurs and then take action with those at fault, without ascertaining to what extent the rules violated (which caused the accident) had been disobeyed by other employees without any question ever being raised.

To my mind nothing will do more to prevent accidents due to causes controlled by the transportation department than to require the rules to be obeyed, and to take the necessary action to bring about this result, without waiting for accidents to occur. To do this, however, it will be necessary to have closer supervision than most roads provide. The trainmaster's territory should be short enough to enable him to cover it easily each day. The superintendent's territory should be short enough to enable him to know all the train and enginemen personally, and to be so well acquainted with each one that he will know his habits and disposition.

I am aware that on some roads the men are given demerit marks before accidents occur, but is the supervision close enough so that this is judiciously done? Is it close enough to insure all being dealt with equitably? And is it close enough to get records of the good acts, as well as the bad ones? Unless it is, there is a weakness that will never be overcome by waiting until an accident occurs, even if severe action is then taken with those at fault.

Bad and indifferent men cannot stand close supervision. They can be easily weeded out, regardless of any labor organization. On the other hand, men who are naturally good, but who may have drifted into slack habits through lack of proper education or the right kind of supervision, will be gradually led back to proper ways and they will retain their positions. Many a man who would have been a good conductor, brakeman or engineman, with proper training, has been dismissed after an accident occurs, when with the right kind of education he would have prevented the accident and saved his position. He had gradually drifted into careless ways because of improper supervision.

Not only should the territory of a superintendent or a trainmaster be short enough to permit of their frequently visiting all parts; they should be able to spend a reasonable time at division terminals and other places where employes congregate, and to give more attention to that feature of their work than is usually done. Too often, particularly during busy seasons, the work of employing men is delegated to yardmen and even clerks, and thus undesirable men creep into the service. It is true that these undesirables can be got rid of, but much good can be accomplished by exercising additional care in employing men.

There is another point in connection with accidents that I have not seen much discussed; accidents that have been caused by some infraction of the rules upon the part of the trainmen or enginemen, but which would have been prevented by proper care upon the part of the train despatcher. The standard rules are rather silent on safe practices pertaining to train dispatching, but the old time despatchers maintained many precautions under what we might call unwritten rules, which were of much value. But as the requirements of the office became more burdensome the younger men gradually dropped these safeguards until now they are often lost sight of. The chief train despatcher should frequently check the order book and also the train orders turned in by train and enginemen at the end of their trip. This should be arranged for by lessening their other work and giving them more time to properly attend to the duties of a chief despatcher. Where the territory of superintendents and trainmasters has been long, it has caused both of these officials to unload a large amount of work on the chief despatcher. This is unfair.

VIDI.

VERTICAL PLAY AT RAIL JOINTS.

Nice-Cimiez (France), Palais Buisine, December 6th, 1908.

To the Editor of the Railroad Age Gazette:

The recent reduction of the maximum width of rail head indicates that the Pennsylvania and the Canadian Pacific are not considering the use of supported lapped joints, but that they have come to the same conclusion the Saxony and Bavarian State Railways had come to some ten years ago, when facing fishplates were used.

These fishplates and the fishrails with vertical play, as illustrated on page 1103 of the Bulletin of the International Railway Congress, October, 1908, also belong to the "Growth of the Angle Bar" (your issue Nov. 6, 1908).

It remains to be seen which growth will outgrow the other, provided the cultivators care to find out what they don't know, namely, what vertical play will do!

MAX BARSCHALL.

FLAT SPOTS ON CAR WHEELS.

Woodside, Hexham, England, December 21, 1908.

To the Editor of the Railroad Age Gazette:

A printer's error in the formula given by E. E. Stetson in your issue of Dec. 4 requires correction by the substitution of t^2 for t and of g for 9.

It is desirable to note that the result given is correct only when no spring is interposed between the car and the sale; the reaction of a spring under a loaded car will increase the acceleration to say $16 \times g$, and the limit of speed for possible bounding of the wheel will be raised from 4.55 to 18.2 miles per hour.

J. D. TWINBERROW,
Assoc. M. Inst. C. E., M. I. Mech. Eng.

Montreal, December 30, 1908.

To the Editor of the Railroad Age Gazette:

I have just noticed letter by E. E. Stetson in the *Railroad Age Gazette* of December 4, 1908, criticizing the letter written by Prof. Chas. H. Benjamin, published in your issue of Nov. 27, 1908, regarding flat spots on car wheels. To quote Mr. Stetson, "Consequently Prof. Hancock's formula is incorrect for all speeds greater than 'X'" and in an assumed case he makes this speed 4.55 miles per hour. To quote Mr. Stetson further: "The absolute value of the results obtained by applying a mathematical formula to conditions so far outside its limitations is questioned." It would appear to me that Mr. Stetson should have written this first, studied it well and I do not think he would then have written the criticism. In his analysis of this problem he has entirely ignored the action of the springs with which our modern rolling stock is almost universally equipped.

J. G. SULLIVAN,
Assistant Chief Engineer, Canadian Pacific Railway.

New York, January 11, 1909.

To the Editor of the Railroad Age Gazette:

In the discussion of "Flat spots on car wheels" by Messrs. Benjamin, Stetson and Fowler in various issues of your paper, and of Messrs. Vaughn and Spilsburg in the *American Engineer*, it will be noted that such mathematical treatment as the subject there receives can apply only to an absolutely rigid rail surface, and would, I believe, be untrue under actual operating conditions.

In actual operation the wheels are always running up hill, due to the vertical curvature of the rail against the wheel contact, and the recoil of the rail counters against any decrease of wheel pressure by following the wheel in any upward movement; in other words, the rail will not allow the wheel to get away from it; the conserved energy of the body-carrying springs assists the rail in maintaining this contact.

The upward curvature of the rail is also influenced by the other pair of wheels in the same truck, whether they lead or trail, and doubtlessly also by the wheels of the next leading or trailing truck (reference is here had to the short wheel base of freight car equipment), for the rail practically acts as a continuous girder, except when the wheels under discussion are near the rail joints, and are subject to the vertical wave movement of such girder. Any one who has ever stood as close as possible to a railway track during the passage of either high-speed or slow-moving traffic will have noted the perceptible vertical movement not only of the rail and tie (the elasticity of the different tie woods may materially affect this) but also of the rail flange under the spike heads; the relation of the rail surface to the wheel contact is to all intents a combination of cycloidal and sine curve movements. Of one thing we are quite certain that once a flat spot, always a flat spot; it will round off somewhat at the ends but never disappear. If the wheel left the rail during the period of flat spot contact, the subsequent contact shock of the trailing edge of the spot would most likely lead to badly shelled out conditions at that point—conditions which as a rule do not prevail to a very great extent in practice.

The proof or disproof of the mathematical treatment this subject has received could perhaps be arrived at by some sort of electric indicator attached to the pair of wheels in question, which would indicate an open circuit when wheel-rail contact was broken. The testing machine as proposed by Prof. Benjamin in your November 27th issue would hardly meet the actual operating condition for the reasons herein stated.

S. F. PRINCE, JR.

Contributed Papers.

THE SLIPPING POINT OF ROLLED BOILER TUBE JOINTS.*

When a tube has started from its original seat the fit may be no longer continuous at all points and a leak may result, although the ultimate holding power of the tube may not be impaired. A small movement of the tube under stress is then the preliminary to a possible leak, and it becomes of interest to know at what stress this slipping begins. A knowledge of the slipping point of a tube in its relation to the ultimate holding power is somewhat analogous to a knowledge of the elastic limit of materials in relation to their ultimate strength, in that working stresses should be kept within the smaller values. There is then a considerable field for improvement in which to raise the slipping point to a higher per cent. of the ultimate strength of the joint or of the elastic limit of the tube. The usual design seems sufficient for most cases, but where high pressures are used or where the stresses due to temperature variations are large, a joint with a higher initial slipping point seems necessary. In attempting to strengthen the usual joint it might appear that harder rolling of the tube would raise this slipping point, but experiment does not show this. Harder rolling within certain limits will raise the ultimate holding power, but has little effect on the initial slip. The recommendation to flare the projecting end of the tube has high authority and is of value, but while this raises the ultimate holding power it does not alter the original slipping point. It seems evident that this flared portion would have to be moved into the hold before its metal could come into play, and this initial movement might be the cause of leakage. Evidently the point of initial slip has not been greatly influenced by the flaring of the ends, though it is probable that a tube drawn into a hole would be less likely to leak if flared. To discover a more rigid type several forms of tube openings were tested. If the holes into which the tubes are rolled are tapered $^1/_{10}$ in. in diameter per inch in thickness of the plate, the first slipping point is hardly affected, but the joint is more rigid after a slip of $^1/_{100}$ in. and the ultimate strength is increased.

During the progress of these experiments a form seemed wanted, to put the rolled metal under an initial stress in the direction of the axis of the tube, thus reinforcing the frictional resistance and making movement unnecessary to develop a larger resistance to the first slip.

In Fig. 3 Nos. 36, 44, 26, 25, 38 and 37 had double taper. Compared with the straight holes, the general effect was to lower the slipping point somewhat, but increase the rigidity. Two such tubes were tested by fluid pressure, the tubes having

Form of Joint.	Taper per inch	Test No.	Load in pounds at point of Initial Slip	Slip = $\frac{1}{100}$ inch	Ultimate Load	Slip in inches at point of Ult. Load
Tube Sheet 1" thick						
Straight and Tapered.		1	7800	8000	8400	.02
		2	7800	9500	11400	.05
	.06	7			17200	.12
Flared, Straight, and Tapered.	.06	4	6000	10300	11300	.07
Flared, Chamfered, Straight, and Tapered.	.06	5	4000	7600	15000	.06
Tapered and Straight.	.06	3	7000	7800	26000	.112
Double Taper		8	15000	17500	30000	.04
	.10	9	14500	15500	21000	
Tube Sheet $\frac{5}{8}$" thick.						
Straight.		11	5000	6100	6400	.03
		15	4500	7000	9500	.04
		16	3700	5900	17000	.088
Punched.		18	8000	14700	17000	.044
Double Taper.	.10	23	6500	12000	16000	.04
Tube Sheet $\frac{1}{2}$" thick.						
Straight.		10	2000	5600	7400	.03
		14	2000	6800	9500	.035
		17	3000	6000	20000	.06
Punched.		19	10000	17200	17500	.022
		20	3500	17000	23000	.036
Double Taper.	.10	22	7000	15000	27000	.048
Tube Sheet $\frac{3}{8}$" thick.						
Straight.		13	1300	7000	18000	.045
Punched		21	8000	15200	16500	.027

Fig. 1—Results from Tests of 3-in., 12-Gage Cold-Drawn Boiler Tubes Rolled Into Various Forms of Tube Openings.

1 in. bearing in malleable boxes of the form used in the Parker boiler. The combination of tubes, with closed ends, and the box were filled with oil and an accurately ground plunger forced in under the testing machine.

A study of the several tests made shows that in the usual machined joint the resistance to the first slipping comes from friction only. The friction is dependent on the normal pressure of the expanded tube against the sheet, and this will be a maximum when the rolled metal of the tube is stressed to its elastic limit. The rolling of the metal elevates the elastic limit, but it takes a small amount of rolling to reach this maximum value. Further rolling reduces the thickness of the metal in play as fast as the elastic limit is exalted.

Assuming the elastic limit of the rolled metal at from 30,000

*Abstract of paper by Professors O. P. Hood and G. L. Christensen, Houghton, Mich., presented at the December, 1908, meeting of the American Society of Mechanical Engineers.

to 40,000 lbs., the observed slipping point shows that the coefficient of friction must have been 35 to 26 per cent. The total friction per square inch of tube-bearing area seems to be about 750 lbs. in the tube plates ⅝ and 1 in. thick. It was observed that in straight and tapered holes wherever a high final strength was attained the metal of the tube was in some way abraded. Sometimes the sharp edge of the tube plate would shear a small ring from the metal of the tube and in other cases patches of the metal had apparently seized and sheared. Computing the probable frictional resistance of these joints and adding the resistance of the sheared area shown on the tube gave a result agreeing closely with the observed ultimate strength of the joint as tested.

Most of these joints also showed a relatively high slipping

Form of Joint	Serrations: Number per inch	Serrations: Depth in inches	Test No.	Load in pounds at point of: Initial Slip	Slip = 1/100 inch	Ultimate Load	Slip in inches at point of Ult. Load
Tube Sheet 1" thick							
Straight Machined Hole.			12	7000	11500	17700	.085
			24	6000	7000	20000	.12
			27	9000	9500	21000	.10
			32	6400	6000	6400	–
			34	6800	10500	11500	.035
			35	8800	11200	18400	.105
Average				7333	9283	15833	.089
Double Taper. Taper 1/16" in diam. per inch			25	3500	14000	23000	.08
			26	5500	12800	19700	.047
			36	8200	12600	16500	.042
			37	7500	8900	23000	.178
			38	7000	10300	25000	.124
			44	7500	14400	33000	.069
Single Taper			6	8500	12200	32000	.133
			39	13500	17500	22600	.354
Average				7650	12837	24350	.128
Serrated.	10	005	45	10000	15500	15800	.015
	10	010	46	22000	27500	27500	.008
	10	015	47	45000	50000	50000	.012
	10	020	48	43000	45000	45000	.003
Serrated.	10	015	33	28000	37500	37700	.012
	10	015	40	25000	35000	35000	.01
	10	007	41	16500	23800	24200	.015
	16	007	43	21000	27200	27200	.006
	64	002	42	15000	16000	16000	.010

Fig. 2—Results from Tests of 3-in., 12-Gage Cold-Drawn Boiler Tubes Rolled Into Various Forms of Tube Openings.

point, suggesting the necessity of providing shearing resistance in addition to frictional resistance in order to obtain a high resistance to initial slip. Several forms were therefore made which provided square shoulders in the tube sheet for the tube to be rolled against, with the object of making these several edges abrade the tube when it started to move. This serrating of the holes amounts to but little more than "a rough cut" in machining. Figs. 1 and 2 give the significant results obtained in several series of tests. Fig. 3 shows the behavior of the tubes of each type up to a slight slip, thus showing the raising of the slipping point by the several methods.

To discover how much roughening was desirable a series of tests were made with straight holes, in which a shallow square thread was cut with a pitch of ten threads to the inch and from 0.005 to 0.020 in. deep. The tube ends were not flared. Nos. 45, 46, 47 and 48, Fig. 3, show the results from these serrated holes, in which it appears that the slipping point may be very greatly elevated by this means.

With serrations 0.005 in. deep the surface is barely roughened, and the slipping occurs at 10,000 lbs. This is increased successively to 16,200, 22,000 and 45,000 lbs. by increasing the depth of the grooves to 0.007, 0.010 and 0.015, in., respectively.

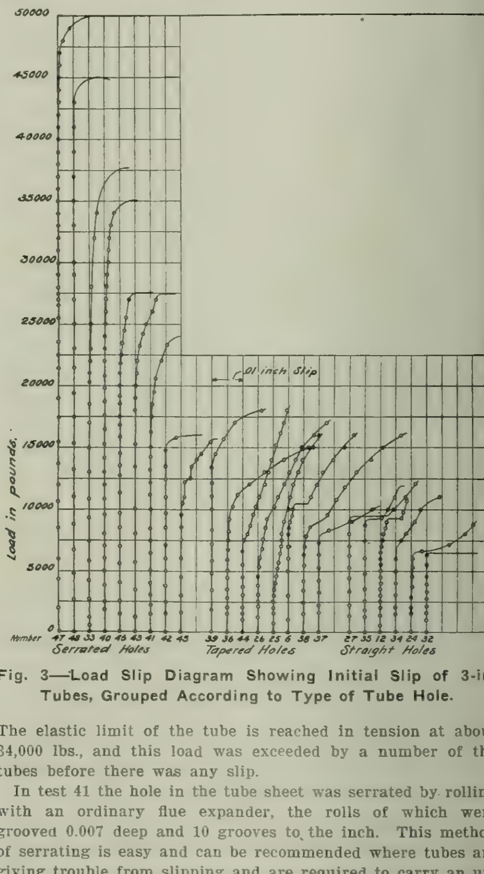


Fig. 3—Load Slip Diagram Showing Initial Slip of 3-in. Tubes, Grouped According to Type of Tube Hole.

The elastic limit of the tube is reached in tension at about 34,000 lbs., and this load was exceeded by a number of the tubes before there was any slip.

In test 41 the hole in the tube sheet was serrated by rolling with an ordinary flue expander, the rolls of which were grooved 0.007 deep and 10 grooves to the inch. This method of serrating is easy and can be recommended where tubes are giving trouble from slipping and are required to carry an unusual load. This tube has the slipping point raised to three or four times the usual value. It appears that with serrations about 0.015 in. deep, giving an abutting area of about 1.4 sq. in. in a seat 1 in. wide, that the maximum strength is reached, as shown in tube 47.

ANNUAL GOVERNMENT REPORT OF RAILROAD RECEIPTS AND EXPENSES.

The accompanying table, issued with the annual report of the Interstate Commerce Commission (which was given in our last issue), shows the annual financial satement more in detail; and, for the first time, gives the figures for each month separately.

The reader is reminded that the classification of accounts prescribed by the commission embraces changes from the previous practice of carriers in keeping their accounts which

RECEIPTS AND EXPENSES OF STEAM RAILWAYS IN THE UNITED STATES, YEAR ENDING JUNE 30, 1908.

Item	Number of roads represented.	Mileage operated at end of month.	Operating revenues.					Operating expenses.						Net operating revenue.	Taxes.	Operating income.	Ratio of operating expenses to operating revenues.
			Freight revenue.	Passenger revenue.	All other revenue from transportation.	Revenue from operations other than transportation.	Total.	Maintenance of way and structures.	Maintenance of equipment.	Traffic expenses.	Transportation expenses.	General expenses.	Total.				
		Miles.															Per cent.
July, 1907, total	794	223,958.86	$155,015,717.17	$56,740,755.49	$14,836,104.48	[a] $228,966,408.67		$33,281,446.71	$35,771,157.20	$4,317,565.65	$75,575,139.49	$4,464,193.89	[b] $154,020,066.35	$74,946,342.54	$6,795,641.97	$68,150,700.57	67.27
Per mile of line			692.16	253.35	66.24	10.57	1,022.36	148.61	159.72	19.28	337.45	19.93	687.72	334.04	30.34	304.30	
August, 1907, total	790	224,560.17	163,054,966.03	61,879,018.36	14,641,115.29	2,346,424.11	[c] 241,927,308.35	34,832,507.21	36,590,736.15	4,176,798.83	77,110,862.38	4,462,225.10	[d] 157,761,701.12	84,165,607.23	6,881,616.94	77,283,990.29	68.21
Per mile of line			726.11	275.55	65.20	10.45	1,077.34	155.11	162.97	18.60	343.43	19.87	702.54	374.80	30.64	344.16	
September, 1907, total	782	224,744.90	160,684,225.12	57,534,215.26	14,256,161.83	2,126,842.62	[e] 234,607,549.18	34,155,840.58	36,001,023.70	4,238,658.00	77,734,092.92	4,595,803.47	[f] 157,266,042.50	77,341,506.68	6,805,872.14	70,535,634.54	67.03
Per mile of line			714.96	256.00	63.43	9.46	1,043.88	151.98	160.19	18.86	345.88	20.45	699.75	344.13	30.28	313.85	
October, 1907, total	776	225,216.74	180,467,548.15	52,957,046.65	15,308,241.84	2,235,866.50	[g] 250,976,430.78	35,488,005.91	38,958,319.83	4,408,922.29	83,708,710.20	4,738,650.53	[h] 167,945,936.80	83,030,499.98	7,088,825.19	75,941,674.79	66.92
Per mile of line			801.31	235.14	67.97	9.93	1,114.38	157.57	172.98	19.58	371.68	21.04	745.71	368.67	31.48	337.19	
November, 1907, total	772	225,658.28	158,116,000.82	45,787,730.60	14,671,177.80	2,237,626.92	[i] 220,818,038.58	29,377,922.45	35,460,888.31	4,020,319.07	80,896,966.61	4,680,492.39	[j] 155,117,131.17	65,701,507.41	6,912,708.77	58,788,798.64	70.25
Per mile of line			700.69	202.91	65.01	9.92	978.55	130.19	157.14	17.82	358.49	20.74	687.40	291.15	30.63	260.52	
December, 1907, total	776	226,359.12	132,482,712.43	45,720,431.55	14,257,852.41	2,276,258.64	194,737,255.03	23,744,672.49	32,795,372.44	3,985,491.08	77,237,805.39	5,156,975.53	[k] 143,515,038.37	51,222,216.66	6,849,013.71	44,373,202.95	73.70
Per mile of line			585.28	201.98	62.99	10.06	860.30	104.90	144.88	17.61	341.22	22.78	634.01	226.29	30.26	196.03	
January, 1908, total	783	226,779.94	118,501,201.00	40,231,491.66	12,086,848.41	2,154,753.52	173,874,294.59	21,180,267.96	29,736,214.92	3,951,686.79	72,730,908.65	4,830,214.46	[l] 132,998,391.55	40,875,903.04	6,752,058.63	34,123,844.41	76.49
Per mile of line			522.54	177.40	57.27	9.50	766.71	93.42	131.12	17.43	320.71	21.30	586.47	180.24	29.77	150.47	
February, 1908, total	779	227,017.43	110,867,622.36	36,105,055.93	12,507,968.16	1,787,328.45	161,268,574.90	19,020,725.67	27,486,414.66	3,807,322.50	68,931,928.01	4,590,960.20	[m] 124,391,195.80	36,877,379.10	6,816,363.39	30,061,015.71	77.13
Per mile of line			488.37	159.04	55.10	7.87	710.38	83.79	121.08	16.77	303.04	20.22	547.94	162.44	30.03	132.41	
March, 1908, total	774	226,858.46	128,314,998.93	40,195,956.53	13,453,215.45	1,831,515.52	183,795,686.43	20,878,254.51	28,186,274.85	3,820,058.32	70,002,543.48	4,693,273.58	[n] 128,994,034.16	54,801,652.27	6,860,995.64	47,940,656.63	70.18
Per mile of line			565.62	177.19	59.30	8.07	810.18	92.03	124.25	16.84	312.54	20.69	568.61	241.57	30.24	211.33	
April, 1908, total	774	227,382.07	119,127,234.18	41,013,075.04	13,351,617.09	1,597,563.67	[o] 175,096,037.49	24,200,357.32	26,041,154.01	3,845,220.24	65,784,772.94	4,535,574.09	[p] 124,913,605.98	50,182,431.51	7,074,027.07	43,108,404.44	71.34
Per mile of line			523.91	180.37	58.72	7.03	770.05	106.43	114.53	16.87	289.31	19.94	549.35	220.70	31.11	189.59	
May, 1908, total	776	227,239.16	116,638,371.25	42,750,378.05	13,478,440.82	1,679,101.91	[q] 174,554,216.03	20,387,874.50	24,012,508.64	3,819,931.97	64,657,539.42	4,594,256.81	[r] 124,562,818.32	49,991,397.71	7,101,518.89	42,889,878.82	71.36
Per mile of line			513.28	188.13	59.31	7.39	768.15	110.12	108.31	16.81	284.54	20.22	548.16	219.99	31.25	188.74	
June, 1908, total	769	227,678.06	121,840,184.45	45,989,353.57	14,125,051.19	2,047,594.01	[s] 184,018,230.78	29,297,668.56	20,573,907.83	4,018,681.18	64,477,978.12	4,749,448.88	[t] 123,615,916.43	60,402,314.35	7,921,874.07	52,480,440.28	67.18
Per mile of line			535.18	201.99	62.04	9.00	808.24	128.08	90.36	17.65	283.20	20.86	542.94	265.30	34.80	230.50	
Total for the year			1,665,119,841.89	566,905,108.78	167,873,794.77	24,687,932.37	[u] 2,424,040,637.01	331,851,543.87	372,220,062.54	48,400,635.92	879,757,247.61	56,092,068.93	[v] 1,695,101,878.53	729,538,758.48	83,860,510.41	645,678,242.07	69.91
Per mile of line [w]			7,363.84	2,507.09	742.40	109.18	10,722.75	1,467.58	1,646.11	214.05	3,890.65	248.06	7,496.43	3,226.32	370.87	2,855.45	
Ratio to total operating revenues (per cent)			68.68	23.38	6.92	1.02	100.00	13.69	15.35	2.00	36.28	2.31	69.91	30.09	3.46	26.63	

[a] Includes $6,775 23 unclassified.
[b] Includes $610,563 39 unclassified.
[c] Includes $5,784 56 unclassified.
[d] Includes $573,571 45 unclassified.
[e] Includes $6,104 35 unclassified.
[f] Includes $540,623 83 unclassified.
[g] Includes $7,733 64 unclassified.
[h] Includes $643,328 04 unclassified.
[i] Includes $6,042 35 unclassified.
[j] Includes $680,542 34 unclassified.
[k] Includes $594,721 44 unclassified.
[l] Includes $563,098.77 unclassified.
[m] Includes $553,844 76 unclassified.
[n] Includes $513,629 42 unclassified.
[o] Includes $6,547 51 unclassified.
[p] Includes $517,527 38 unclassified.
[q] Includes $7,924 00 unclassified.
[r] Includes $490,706 98 unclassified.
[s] Includes $7,047 56 unclassified.
[t] Includes $408,161 86 unclassified.
[u] Includes $53,959 20 unclassified.
[v] Includes $6,780,319 66 unclassified.
[w] Based on 226,121 10 miles, average mileage operated during year.

impair the basis of comparison between the reports made for the year ending June 30, 1908, and the reports of previous years. The principal changes were the exclusion from operating expenses of charges for additions and betterments to way and structures and the inclusion in operating expenses of formal depreciation charges. It is necessary in making comparisons to make proper allowance for these differences in classification.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

X.

The distribution of energy from the sub-stations to the motors on the trains will be by means of a contact, or conductor, rail, the circuit being completed by the track rails which will be rendered electrically continuous for the purpose by bonding at the joints. The conductor rail itself should be of a special composition of steel in order to reduce the electrical resistance to a minimum.

The specifications cover the supply and delivery of material only, as in my opinion all the work on the ground can be carried out with advantage by the railway department.

The collection of current from the conductor rail is by means of a contact shoe attached to the bogie trucks, and this may be of either the under, over, or side contact type. The decision as to which of these alternatives should be adopted depends on the exact design of protection. On the accompanying drawing two of the rails shown are for under contact shoes and one for top contact shoes. Whilst I was in Melbourne some samples of typical forms of protection were made and erected on the track and it was decided to leave these exposed to the atmosphere for a considerable time before coming to a final decision as to the best form of protection and kind of wood to adopt. I also had sent here, for tests in my laboratory, samples of various woods, which it would be possible to use for this protection and, although it seems certain that "messmate" gives the best result electrically, I withhold my decision as to the exact design of protection for the time being until I hear how the samples erected in Melbourne have stood the effect of sun and weather and also until the laboratory tests being made here are completed. The estimates, however, allow for the adoption of any of the types shown, and the specifications provide for the supply of rails, insulators, and bonds of such design that the conductor rail may be completely protected throughout its length.

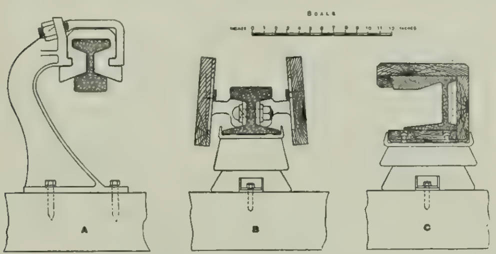
On double track roads the conductor rails for both tracks will be laid in the six-foot way, thus leaving the tracks themselves, and the outside of the tracks, free from obstruction. Where there are level road crossings or special track work, such as cross-over roads or junctions, the conductor rail will be discontinued and the gap bridged by lengths of low tension cable laid underground, the supply and delivery of which is included in Specification No. 8 covering all cable work. An accompanying drawing shows the normal position of the conductor rail relative to the track rails.

The bonds will be placed under the existing fishplates, firstly to reduce the length and, therefore the cost as much as possible, and secondly, to protect the bonds against mechanical injury. For the 100-lb. rails, and for a large portion of the 80-lb. rails, this arrangement of joint bonding can be adopted without alteration to the standard fishplate. In the case of some of the lighter fishplates, however, some machining of the plates will be necessary and has been allowed for in the estimates. Cross bonds will also be provided at intervals between the two rails of the same track and between different tracks.

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

so that, in the event of any repairs being carried out, there may be no danger of the electrical circuit being broken; this also provides against open-circuiting in the event of failure of the bonding in one or more lines of rail.

In order to give the operating staff complete control of the track circuits, it is proposed to instal section switches in the signal boxes at all junctions and, where the length between junctions justifies it, at intermediate boxes. These switches will be operated by the signalmen on duty. The telephone circuits provided for throughout the route will be looped in at all signal cabins so as to place the signalmen in direct communication with the sub-stations supplying the power to the particular sections which they control. It is, of course, only necessary for the signalman to operate these switches occasionally.



Types of Protected Conductor Rail.

The supply and erection of these switchboards is covered by the specification for sub-station equipment.

The laying of the conductor rail in the position shown will necessitate the reconstruction of a certain number of bridges in order that there may be ample clearance between the rail and these structures. I have obtained from the engineer of way and works an estimate of the cost of this work, and this estimate is included in the cost of the electrical equipment. The bridges which have to be altered are largely of an old pattern, and a proportion of them will have to be replaced if steam working be continued, as they are hardly suitable for carrying as heavy locomotives as you will require in the near future for country service on some of the lines in question. I have also included an ample allowance for the extension of those sleepers on which insulators will be placed for supporting the conductor rail, and any moving of signal rods and wires that may be necessary; my estimates are based on Australian conditions and on prices obtained while in Melbourne.

The accompanying table gives my estimates of the capital cost of the track equipment, the permanent way alterations, and the low tension cables necessary to connect up the sub-stations and section switches to the conductor rail and track.

The estimates include freight tariff, engineering and contingencies.

Capital Cost of Track.

	Pt. Melbourne & St. Kilda branches.	Stages 1.	II.	III.
1. Conductor rail*	£22,370	£102,045	£211,225	£400,515
2. Track bonding	2,523	11,580	23,514	44,989
3. Section switchgear and all low tension cables	8,355	12,510	18,030	25,689
4. Alterations to fishplates, sleepers, signal gear and bridges	19,656	43,397	57,087	95,429
5. Spare material.†	426	796	1,179	1,526
Total	£53,330	£170,328	£311,035	£568,139

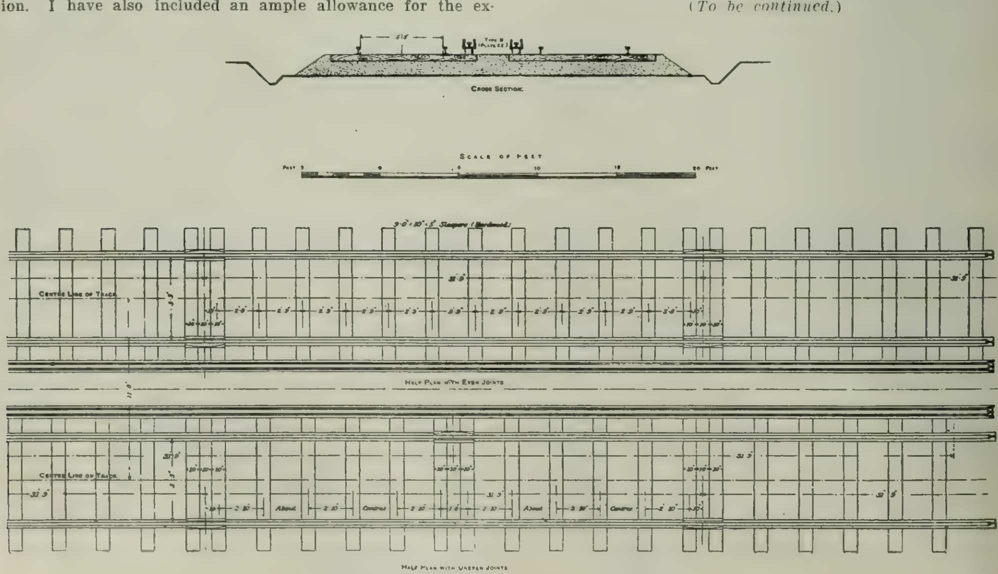
*Including all "special work," bonding, protection and cable work.

†As the material required in connection with the track work can all be standardized, and as the different items themselves include a considerable margin, I have not allowed for any very large amount of spare material.

As already mentioned when discussing the choice of system, the inspection and maintenance of the track equipment can be efficiently dealt with by the present permanent-way inspectors. The renewal of bonds and insulators can be carried out by the existing staff, but in order to deal with cable work, it will be necessary to keep one or more cable jointers, according to the number of lines in operation. I have allowed in my estimates for the additional labor and material based on my experience of the cost of similar maintenance work elsewhere, but increased to cover the higher cost of labor in Victoria. The following figures for annual cost of maintenance of electrical track equipment, including material, are based on the mileage proposed to be equipped under each stage, being practically independent of the number of train-miles operated over the section.

Port Melbourne and St. Kilda Branches	£720
Stage I.	3,300
" II.	6,700
" III	12,800

(To be continued.)



Proposed Location of Conductor Rail.

RIO CONCHOS BRIDGE OF THE KANSAS CITY, MEXICO & ORIENT.

BY W. W. COLPITTS, M. A. S. C. E.
Assistant Chief Engineer, K. C., M. & O. Ry.

The main line of the Kansas City, Mexico & Orient Railway crosses the Conchos river, the principal stream of Northern Mexico, at a point 141 kilometers east of Chihuahua. The head waters of the stream are in the Sierra Madre mountains and above the site of the Orient's crossing. It drains a watershed of about 20,000 square miles. This watershed varies from mountainous to hilly and the run-off during the rainy season is very rapid, the water sometimes rising ten feet in a few hours, at such times flowing at the rate of about ten miles an hour. The railway bridges the stream at a point where the channel is about 650 ft. wide and about three feet deep at low water.

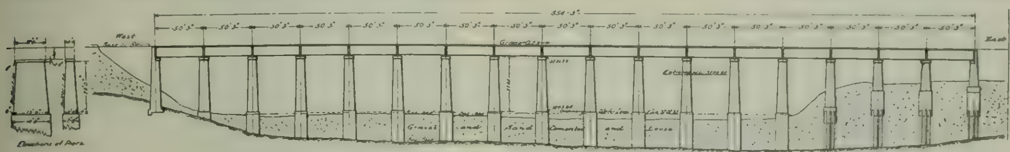


Fig. 1—Kansas City, Mexico and Orient, Conchos River Bridge.

The piers and abutments of the bridge are founded on a comparatively hard gypsum rock, varying in depth below low water from zero at the west side to 19 ft. at the east side. Overlying the rock, in the order named, are strata of clay, cemented gravel, and gravel of varying thicknesses. An opening of 850 ft. was decided upon as necessary to provide sufficient water way during the flood stage, and in consequence, 200 ft. of the bridge extends over the flat on the east side of the river.

The bridge consists of 17 spans of 50 ft. deck-plate girders, supported on plain concrete piers and reinforced concrete abutments. In the case of the west abutment and the channel piers, the foundation was carried to rock. The three piers on the flat on the east side of the river and the east abutment are afforded good natural protection. They are supported on piles driven to rock, and cut off at the low water line, the concrete extending about 2 ft. below the tops of the piles.

The dimensions of the piers and the cross section of the river are shown in Fig. 1. The east abutment, Fig. 2, was originally planned to be similar to that of the west abutment, but the fact that more than half the bridge was built after the rainy season had began, and the probability of a flood occurring before its completion, made it imperative that a simpler type that could be more rapidly built be adopted.

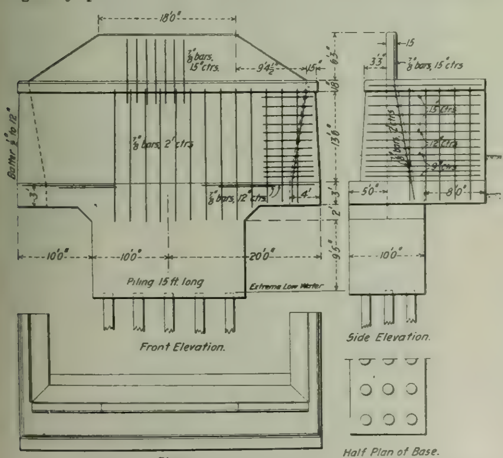


Fig. 2—Plan for Reinforced Concrete; East Abutment.

The west abutment, Fig. 3, is one of the standard forms of reinforced concrete abutments adopted by the railway company. The general characteristics of this type of abutment are given in a series of articles, by the writer, published in *The Railway Age* August 16 and August 23, 1907.

The construction of the bridge was begun from the west side on April 20, 1907. The foundation of the west abutment was above water and its construction was attended with no unusual difficulties. In the cofferdams for the foundations of the first eight piers, 12-in. steel sheet piling was used of the pattern manufactured by the United States Steel Piling Company. The pile driver was supported on heavy horses, and a two way cast iron follower block permitted of driving the piles in either direction. A 60-ft. x 20-ft. x 4-ft. barge supported a hoisting engine and a stiff-legged derrick. The engine furnished power for driving the sheet piles and also for operating a clam shell dredge suspended from the boom of the derrick. Upon the completion of a cofferdam the interior was dredged clean and an inside form of one inch lumber, of the neat dimensions of the base of the pier, was placed in position and braced against the sheet piling. The concrete was mixed on the river bank, by a Chicago cube mixer of ½ cu. yd. capacity, and carried to the cofferdam in dump buckets on push cars over a temporary track in the river bottom, which was extended as successive piers were completed. The buckets were lowered into the cofferdam by means of a mast and cross-head, and dumped upon reaching the bottom. The barge derrick was also utilized in placing the form for the shaft, and the same means were employed in

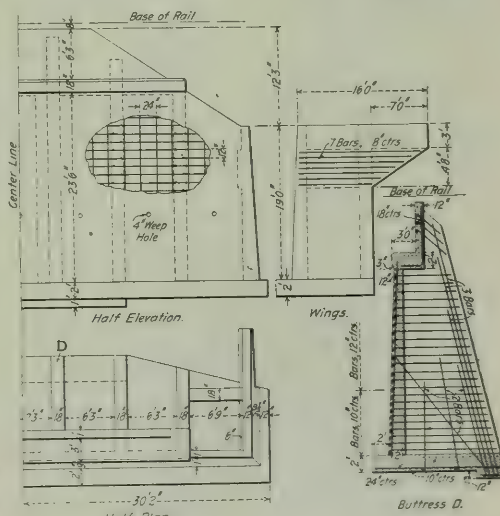


Fig. 3—Plan for Reinforced Concrete; West Abutment.

placing the concrete in the shaft form that had been used in the base.

The sand and gravel, both of which required screening, were obtained from a near by cutting and transported to the mixer on cars. Upon the completion of a pier the girders were set by means of a 15-ton derrick car, the bracing temporarily bolted in place, and the ties and rails placed on the span.

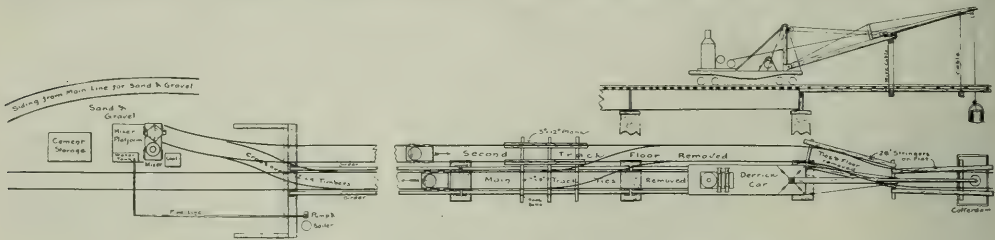


Fig. 4—Conchos River Bridge, Illustrating Method of Placing Concrete.

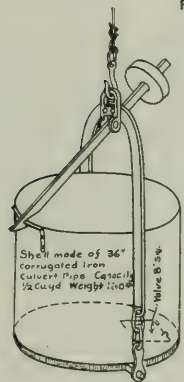


Fig. 5—Single Line Bucket for Depositing Concrete Under Water.

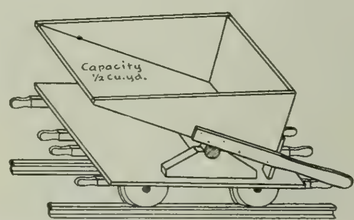


Fig. 6—Dump Boxes for Placing Concrete in Shafts of Piers.

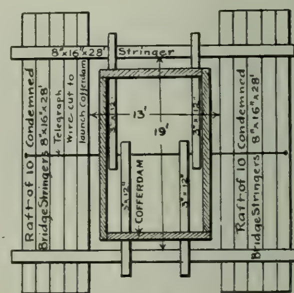


Fig. 8—Method of Erecting and Launching Cofferdams.

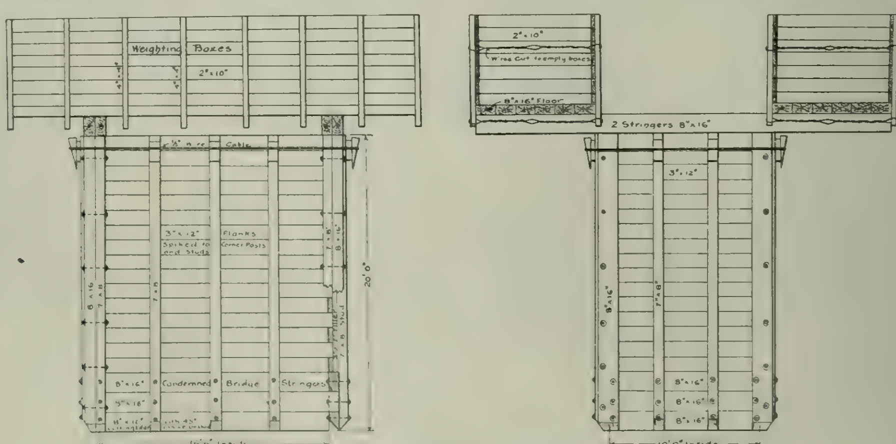


Fig. 7—Side and End Elevations of Cofferdam and Weighing Boxes.

The work was handled in this manner until May 1, 1908, at which time the west abutement and six piers were completed. The rainy season in Northern Mexico begins about the latter part of June, and minor floods may be expected in the larger streams at any time subsequently, and serious floods about the latter part of August. In order to handle the fall crops and other freight originating east of the river, it was important to the Railway Company that the bridge be completed before the water rose and stopped operations.

It was evident from the rate of progress already made that unless some more rapid methods of construction were devised the work would be overtaken by freshets and the completion of the bridge delayed indefinitely. At this point the writer took personal charge of the work and it is the methods used in completing the structure in advance of high water and the statement of cost that will be of special interest to construction engineers.

Some apology is necessary for the crudeness of some of the methods employed. On account of the distance of the work from a source of supply, machinery and materials could not be obtained in less than from four to six weeks. Skilled labor

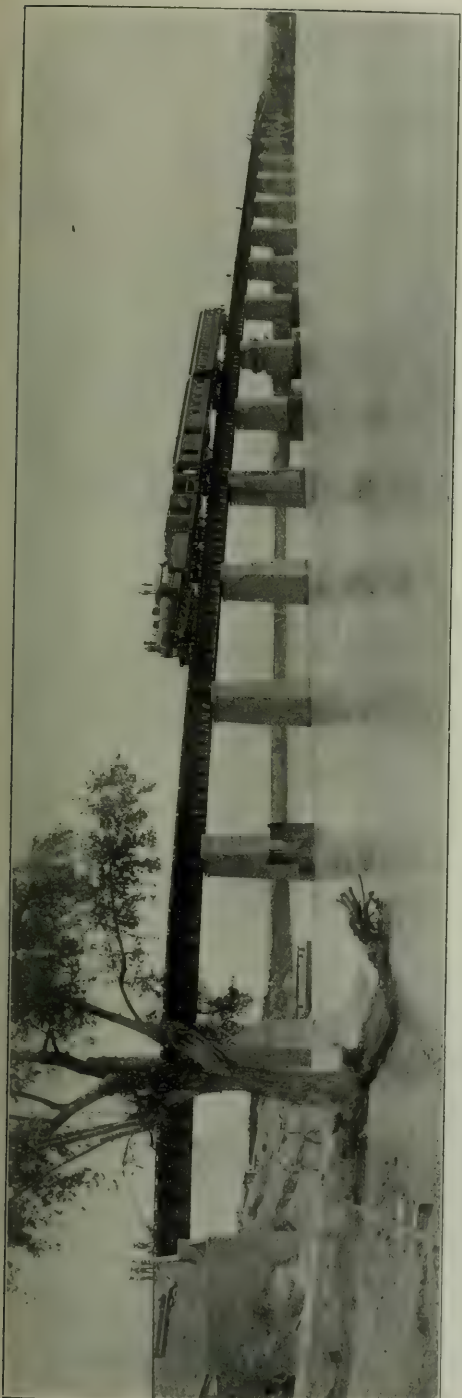


Fig. 9—General View of the Conchos River Bridge; Kansas City, Mexico and Orient.

of any kind was also difficult to obtain in a reasonable time. Consequently, any changes in construction methods, that involved the purchase of new machinery or other materials that must be obtained from the United States, would retard rather than advance the time of completion. The problem was one of reorganization and of the utilization of the machinery, materials, and labor available, to the best advantage. The existing organization was such that one part of the work had to await the completion of another, so that no two operations could be carried on at once. The driving of the sheet

Fig. 10—Method of Placing Concrete in Shafts.

piling for one cofferdam occupied from a week to ten days, after which it was dredged out—an operation that consumed about two days more. The cemented gravel, through which the sheet piles were driven, was very hard and the piles were often badly battered and bent and their removal for use again after the completion of a pier frequently occupied more time than the driving.

The various changes in methods of construction were designed to minimize the time required for each operation and to permit several to be carried on simultaneously, and also to insure against loss or damage in case of premature high water. To guard against the latter, the temporary track in the river bottom was removed at once, and the following plan for placing the concrete put into effect, which proved both economical and rapid.

A second track, 8 ft. centres with the main line, was laid

Fig. 11—Removing Extension Track.

on the bridge, as shown in Fig. 4. Twenty foot guard-rail timbers, 8 ft. centres, were placed between the main line ties and secured with hook bolts to the flanges of the girders. On the overhanging ends were placed two lines of 3 x 12 planks, 5 ft. centres, and on these the rails for the second track were laid. The concrete mixer was removed from its former position in the river bottom, and placed at the west end of the bridge in such a position that the second track on the bridge led directly from the spout of the mixer. A siding was laid to the mixer and the sand and gravel brought from the cutting on cars and unloaded near by. The cement was also stored

immediately behind the mixer. Water was provided by a pump on the river bank and piped to a tank at the side of the mixer. The boom of the derrick car was lengthened about 25 ft. and trussed with wire cables to support a load of four tons at its extreme end. From the boom was suspended, by wire cables, an extension to the second track, 60 ft. in length. This extension track was supported on four 28 ft. stringers with a reverse curve, which brought the centre line, at its outer end, concentric with that of the bridge and directly over the pier site. The extension track was supported from the boom at its outer end and at the middle, and upon a bent on the pier at the inner end. It was so arranged that when the concrete had been placed in the pier forms the boom could be raised and with it the track extension, and the whole taken off the bridge and the track extension detached from the boom by lowering it on to a side track and throwing off the cable supports. The derrick car was then ready for use in setting the girders. The track extension was as easily attached again for placing concrete in the next pier.

For depositing concrete below water, a bucket was devised to operate with a single line, as illustrated in Fig. 5. It was built of a 3-ft. section of 36 in. corrugated iron culvert pipe, having a capacity of ½ cu. yd. In the bottom, which was of wood, was a clap valve 8 in. square, opening upward. A 1 in. iron trunnion set 6 in. off centre, was secured to the bottom. A bale with chain hooks at its extremities was attached to the pile line of the derrick car which was led through a block at the end of the boom directly over the centre of the pier. To the top of the bale was pivoted a counter-weighted trip, engaging a lip on the side of the bucket. The bucket was carried on a push car and the mixer discharged directly into it. It was then run out to the end of the extension, the hooks of the bale slipped over the trunnions, the trip caught on the lip, the bucket raised, and the car pushed from under it. The bucket was then lowered and upon its weight being taken on the bottom the trip automatically released. As the bucket was slowly raised from the bottom it upset, the valve in the bottom opened and the concrete poured out without disturbance; its construction being such that it discharged toward the lowest point. Three buckets were used, one being dumped while two others were on their way to and from the mixer; the loaded car using the second track, the empty car returning on the main track.

The concrete for the shafts was carried in dump boxes on push cars, Fig. 6. The forms were securely wired to prevent distortion from the falling concrete and baffle boards were used to distribute the concrete uniformly.

It was found that detachable cast steel teeth on the lips of the clam shell greatly increased the daily capacity of the dredge and this fact suggested the advisability of doing away entirely with the steel sheet piling which had proven both expensive and slow. The greatest depth to rock was 19 ft. below the low water surface and was practically level over the

Fig. 12—Method of Sinking Wooden Cofferdams.

area of a pier. It was decided to sink open wooden cofferdams (Fig. 7), first dredging as deep as practicable in the open water at the pier site, the limit of which proved to be about 12 ft. In the meantime, the timber for the cofferdams was being framed on the bank. They were built as follows: The three bottom courses were composed of condemned bridge stringers, the lower one having a 45 deg. cutting edge, unshod. Above the stringers the sides were composed of 3-in. x 12-in. plank, spiked to corner posts and studs.

During construction the cofferdam was supported on a raft also composed of condemned bridge stringers, as shown in Fig. 8. The raft was built with an open bay, about a foot

Fig. 13—Conchos River Bridge; Method of Depositing Concrete in Bases.

larger on all sides than the cofferdam. Across the center of the opening was stretched a heavy telegraph wire supporting the ends of four planks, the other ends resting on the raft. The lower courses of timbers of the cofferdam were then set in position on these planks and drift-bolted together. The position of the cofferdam on the planks was such that only a small percentage of its weight came upon the wire. The two other courses of stringers were then laid and bolted and the corner posts and studs bolted to these, after which the 3-in. planks comprising the balance of the sides of the cofferdam were spiked to the corner posts and studs. When completed, the wire was cut and the cofferdam launched into the water below, which, as stated above, had previously been dredged to a depth of about 12 ft. It was then guyed to its exact position and held level by lines from the boom of the barge derrick. Four posts or legs, with the lower ends resting on the bottom of the excavation, were spiked to the outside corners and all the guys removed, allowing the cofferdam to rest entirely upon these legs. To make provision for weighting the cofferdam while being sunk, stringers were placed across its ends and on the portions projecting beyond the sides, a floor of other stringers was laid and boxed up to a height sufficient to carry a load of about 75 tons of gravel each. The dredging operations were then begun and the material taken from the interior of the cofferdam placed in the boxes until they were filled. When the dredging had continued to a point where the bearing was uniform on the cutting edge of the bottom, the legs detached themselves from the sides and floated to the surface.

By carefully sounding the bottom and loading the boxes uniformly as the dredging proceeded, the cofferdam sank uniformly to the rock. The load was not removed from the boxes until the concrete had been placed, when by cutting the wires supporting the sides the gravel dropped into the water. The cofferdam was prevented from bulging when the concrete was being deposited, by means of a wire cable strung around the top and wedged taut at each of the studs. The derrick car was not removed from its position supporting the extension track until the concrete in both the base and shaft had been placed. The pile line of the derrick car was, therefore, available in removing the form on the shaft of the pier behind and erecting it on the recently completed base. The operation of filling it with concrete was then begun. While the work of placing the concrete in the base, erecting the form for the shaft, filling it and setting the girders was going on, the barge was employed in dredging for and sinking the next cofferdam, and in this manner the work proceeded until the thirteenth pier was completed.

The piles in the foundations of the three piers on the east bank of the river were driven with rail leads suspended loosely from the boom of the stiff-legged derrick, which had been removed and placed on skids on the bank. The forms were set and filled in the manner described.

The method of building the west abutment was as follows: Upon the completion of the excavation, the form was built up to a point 3 ft. above the bottom of the overhang. The piles were then driven and the back-filling completed up to the level to which the form had been built and care taken to tamp the filling solidly under the form for the overhang. The form was then filled with concrete to the top and the overhanging slab, which was 3 ft. thick, reinforced with steel to enable it to support the load of green concrete that would later come upon it. The form for the upper portion was then completed and the whole filled with concrete up to the bridge seat in two day's run. The west abutment was completed and the last span set on August 27, 1908, an average, after May 1, of one pier and span about every nine working days.

The statement of cost will be especially interesting to those who are familiar with conditions in the Republic of Mexico. Generally speaking, machinery, materials and supplies of all kinds are much more costly than in the United States, but this disadvantage is partly offset by cheap labor. The scale of wages (in U. S. currency) that prevailed on the work are given below:

General foreman	$150.00	per month
Sub foremen	4.00	per day
Hoisting engineers	4.00	"
Firemen	1.50	"
Carpenters	1.50	"
Blacksmiths	2.00	"
Laborers (Peons)	.75	"

The cost of materials delivered at the work was as follows: Cement, $3.73 per barrel; form lumber, $23.33 per m.b.m.; steel reinforcement, $79.20 per ton; steel sheet piling, $54.15 per ton; bridge steel, $69.98 per ton; bridge timber, $36.65 per m.b.m.

In the statement below a proportion of the cost of all machinery and tools is charged against the bridge depending upon their condition and availability for future work.

STATEMENT OF COST.

SUBSTRUCTURE.

Abutments

Contain 586.2 cu. yds.

Material:	U. S. currency.	Per cu. yd. concrete.
Cement, 694.4 bbls., at $3.73	$2,590.11	$4.42
Sand, 263 cu. yds., at $0.50½	132.81	.23
Gravel, 526 cu. yds., at $0.50½	265.62	.45
Lumber, 22,232 ft., B.M., at $23.33	518.66	.88
Piles, 240 lin. ft., at $0.22	52.80	.09
Reinforcement, 41,730 lbs., at $3.96	1,632.51	2.79
Machinery, proportionate cost	59.21	.10
Wire and nails	101.50	.18
Lubricating oil	6.50	.01
Fuel	109.00	.18
Total material	$5,468.72	$9.33
Labor:		
Excavation for foundation	$199.66	$0.34
Building and removing forms	331.01	.57
Driving piles in foundation	67.77	.11
Placing steel reinforcement	92.55	.16
Mixing concrete	220.53	.38
Placing concrete	96.39	.17
Pumping water	18.74	.03
Cleaning and storing machines, etc	61.00	.10
Total labor	$1,087.65	$1.86
Total material and labor	$6,556.37	$11.19

Bases of Piers 1 to 16, Inclusive.

Bases 1 to 6 contain 373.0 cu. yds.
Bases 7 to 16 contain 887.7 cu. yds.

Total 1,260.7 cu. yds.

				Per cu. yd. concrete.
Material:				
Cement, 1,233 bbls., at $3.73			$4,599.09	$3.65
Sand, 591 cu. yds., at $0.50½			298.46	.24
Gravel, 1,182 cu. yds., at $0.50½			596.92	.47
Cofferdams of piers 1 to 6.				
Lumber, 3 M., B.M., at $23.33	$69.99			
Steel sheet piling	924.72			
Wire nails and oil	53.00			
Machinery	817.00			
Fuel	700.00			
Material in cofferdams 1 to 6.		$2,564.71		
Per C. Y. concrete in bases 1 to 6, $6.88.				
Cofferdams of piers 7 to 16.				
Lumber, 26 M., B.M., at $23.33	$606.58			
Piles in foundation	198.00			
Wire nails and oil	210.25			
Machinery	1,353.66			
Fuel	1,200.00			
Material in cofferdams 7 to 16		$3,568.49	6,133.20	4.86
Per C. Y. concrete in bases 7 to 16, $4.02.				
Total material			$11,627.67	$9.22
Labor:				
Mixing concrete			580.33	.46
Placing concrete			662.26	.52
Pumping water			38.00	.03
Cleaning and storing machines, etc			122.01	.10
Cofferdams of piers 1 to 6.				
Excavation	$857.22			
Driving sheet piling	1,653.19			
Pulling sheet piling	371.60			
Building inside forms	214.21			
Labor on cofferdams 1 to 6.		$3,096.22		
Per C. Y. concrete in bases 1 to 6, $8.30.				
Cofferdams of piers 7 to 16.				
Excavation	$1,010.05			
Piles in foundation	313.23			
Building and sinking C. dams	870.89			
Labor on cofferdams 7 to 16		$2,194.17	5,290.39	4.20
Per C. Y. concrete in bases 7 to 16, $2.47.				
Total labor			$6,692.99	$5.31
Total material and labor			$18,320.66	$14.53

Labor and material of cofferdams, 1 to 6 per cu. yd. concrete, $15.18
Labor and material of cofferdams, 7 to 16 per cu. yd., concrete, 6.49

Shafts of Piers 1 to 16, Inclusive.

Contain 1,357.2 cu. yds.

(The shafts of the piers did not differ appreciably in cost, and the statement is not divided as in the case of the bases.)

		Per cu. yd. concrete.
Cement, 482 bbls., at \$3.73	\$4,617.74	\$3.41
Sand, 257 cu. yds., at $50\frac{1}{2}$ cts.	321.69	.24
Gravel, 514 cu. yds., at $50\frac{1}{2}$ cts.	643.38	.47
Lumber, 3,000 ft., B. M., at \$23.33	163.31	.12
Machinery, proportionate cost	155.00	.11
Wire and nails	101.50	.07
Lubricating oil	28.50	.02
Fuel	919.00	.68
Total material	\$6,950.12	\$5.12
Labor:		
Building and removing forms	\$582.55	\$0.43
Mixing concrete	602.45	.45
Placing concrete	652.79	.48
Pumping water	39.00	.03
Cleaning and storing machinery	122.01	.09
Total labor	\$1,998.80	\$1.48
Total material and labor	\$8,948.92	\$6.60
Total cost of substructure	\$33,825.95	\$10.56

SUPERSTRUCTURE.

Steel Spans. 17 50-ft. Deck Plate Girders.

		Per ton steel.
Material:		
Steel, 611,734 lbs. f. o. b., New York	\$16,822.68	\$55.00
Freight and brokerage	4,582.08	14.98
Fuel, setting and riveting girders	181.36	.59
Total material	\$21,586.12	\$70.57
Labor:		
Unloading and setting girders	\$294.45	\$0.96
Riveting girders	640.35	2.09
Setting anchor bolts	105.00	.34
Machinery, proportionate cost	253.70	.83
Total labor	\$1,293.50	\$4.22
Total material and labor	\$22,879.62	\$74.79

Deck.—Ties L. L. P. 8-in. x 10-in. x 10-ft., spaced 13 in. centers; Guard rails L. L. P., 7-in. x 9-in. x 20-ft

		Per M.B.M.
Material:		
62,401 ft., B.M., f. o. b., Safton, La.	\$1,123.22	\$18.00
Freight and brokerage	1,163.78	18.65
Fuel	25.50	.40
Total material	\$2.312.50	\$37.05
Labor:		
Framing and placing	\$561.68	\$9.00
Machinery, proportionate cost	60.63	.97
Total labor	\$622.31	\$9.97
Total material and labor	\$2,934.81	\$47.02
Total cost of superstructure	\$25.814.43	.....
Total cost of bridge	\$59,640.38	.....
The estimated cost of the bridge was	\$63,015.00	.....

M. P. Paret was chief engineer and Geo. C. Maguire, resident engineer and general foreman.

WORK OF THE AMERICAN RAILWAY ASSOCIATION.*

BY W. F. ALLEN,
Secretary of the Association.

Unlike most of the others, this organization is not composed of persons, but of railway companies, who are represented at its meetings by any officer from president down. The only restriction is that no officer below the grade of division superintendent shall cast a vote without written authority from the ranking operating officer of the company. This association affords an opportunity for the officials of all branches of the operating department to meet together for the discussion of subjects of common interest. Any of them can address the chair or may be selected to serve on committees.

The facts relating to the formation of this organization are also quite different from those of the other railway associations, and present an interesting history of gradual, but constant, development from small beginnings.

When the practice of selling through tickets and running through cars over more than one road was first established, the necessity immediately arose for conferences, between the general managers or the superintendents of the connecting roads, about questions concerning the time-tables of these trains, and other subjects of mutual interest related thereto. When the officials of one important road desired to change its time-table, which they generally did each spring and fall, they would suggest to the officers of the other roads that a meeting for consultation should be held. Then, sometimes what were called "speed wars" would occur. A road running between two competing points would, without notice to the others, quicken the speed of one or more of its trains. Its rivals would retaliate by putting on still faster trains, when the first road would respond by still further increasing its speed, and so on. Having finally reached the limit of what was then considered safety, a convention would be called and articles of peace agreed upon. Finally, a general arrangement was entered into by the roads known as the "trunk lines" by which they agreed not to change time, nor to run any additional trains between competing points, without first conferring with each other. These conferences were known as "Time Conventions."

The earliest records of the meetings of these "Time Conventions," which I have been able to obtain any trace of, were those of May, 1872; although more or less sessions must have been held previous to that date. In April, 1875, a permanent secretary was elected. Since that date the records have been preserved and publishd in regular form. There were 36 delegates, representing 24 roads, present at the April, 1875, session.

The first organization embraced the roads from Boston, New York, Philadelphia, Baltimore and Washington, extending westward to Chicago, St. Louis, Cincinnati and Louisville.

In October, 1877, another "Time Convention" was organized, which included the lines leading southward from New York, Baltimore and Washington to New Orleans, to Jacksonville, Fla., and other intermediate points.

This convention chose the permanent secretary of the other organization as its secretary; and was called for want of a better name, "The Southern Time Convention."

These two conventions were consolidated in 1886, but that is anticipating. The event which directly led to this consolidation and to the subsequent career of the American Railway Association occurred in 1883. Prior to that date no subject had been acted upon by either convention, except the formation of the through time-tables and fixing the dates when they should take effect.

In 1881 a communication had been received by the General Time Convention, calling attention to the advisability of adopting a general standard of time-keeping in this country, but this was immediately referred without comment.

At that epoch the times of 53 different cities were used by the railways on their time-tables, and these times varied by all sorts of odd numbers of minutes.

A passenger between Boston and New York found that the published time-table referred to one time, as far as Providence, to another between Providence and Stonington, and to still another between Stonington and New York, the total difference being 12 minutes. The Fall River boats used New York time, and the Old Colony Railway trains, Boston time. Passengers coming from New York, who left the boat 10 minutes, by New York time, before the train was advertised to leave Fall River, found that it had gone two minutes before.

Similar conditions prevailed all over the country. This caused annoying confusion at points where roads running by different times connected with each other, and there were over three hundred such points.

Various suggestions had been made to remedy this situation, among others the divisions into zones, 15 minutes, half an hour, and one hour apart, but up to the time of the meeting of the General Time Convention in April, 1883, no definite plan had been proposed for putting any of these suggestions into effect, which the operating railway officials felt it was practicable to adopt.

At that meeting which was attended by the representatives of 30 companies, a detailed plan was presented, accompanied by an argument illustrated by maps, which led to its unani-

*From an address on "Railway Operating Associations," delivered before the Harvard School of Business Administration, January 11, 1909.

mous endorsement. One week later the same plan was presented to the Southern Time Convention, where 23 additional companies were represented, with the same result.

Arrangements were then made for the purpose of securing the assent of the other railways of the country to the proposed reform, and the result was to be reported at the next meeting of the Convention. When this time arrived, that is October, 1883, the managers of 78,000 miles of road had agreed to adopt "Standard Time," as proposed, and to put it into effect at the next change of time tables.

The new system was successfully inaugurated on Nov. 18, 1883. It is noteworthy that the reform thus accomplished was not preceded by executive or legislative action on the part of either National or State Governments. It was adopted by the people under the leadership of the railways and confirmative legislation followed in due course.

The success of this movement revealed to the railway managers the possibility of bringing about other reforms by the same methods, and of this they were quick to avail themselves.

The signals then used in handling trains, known as whistle signals, hand and lamp signals, and bell cord signals, had developed upon each road for itself without any semblance of uniformity, with one singular exception. Three whistles in all cases meant to back the train.

In 1881 a table was compiled showing the different whistle signals then in use and their number was found to be no less than forty. Again, motions made by the hand, or by lamp, conveyed one meaning on one road and another meaning on another road, and yet sometimes the trains of these roads used the same track for considerable distances and even occupied the same terminal station. So directly opposite were the meanings of the same signals on different roads, such, for instance, as the Pennsylvania and the Reading, that the officials of one road would not take into its service a man who had been employed on the other, for fear that he might at some time give the signal as used in his former employ and an accident follow.

This condition had existed from the time railways were first operated until April, 1883, when it was decided to appoint a committee of the "General Time Convention" to compile a code of uniform train signals. The report of this committee was finally acted upon at the session of October, 1884. It reduced the number of whistle signals from forty to twelve, and greatly simplified all the other signals.

In directing the movement of trains, rules for the government of employes are necessary. Those first compiled were crude and some of them quite curious, considered from the standpoint of to-day. For instance, on one of the early timetables of the Baltimore & Ohio Railroad, provision was made for two trains to meet, when one was behind time, a certain number of hours. The other train had to remain at the scheduled meeting point until the specified hour arrived. Then each train was directed to send a brakeman ahead to confer and arrange between themselves how the trains were to proceed and pass each other. Naturally, the biggest and burliest brakeman secured the right of way for his train.

On another road there were, at one time, certain posts planted halfway between turnouts. Extra freight trains were instructed to proceed, looking for each other until they met. The one that had gone beyond the halfway post had the right of way, and the other one was obliged to go back to the siding it had just passed. That was simple. But men are ambitious, and sometimes in a hurry. So it frequently happened that one engineman would run his train at full speed so as to reach the halfway post first; so would the other one. It was not very long, therefore, before piles of wreckage marked the halfway points between stations, and that method of operating was abandoned.

That was before the time when the telegraph was introduced to direct the running of trains, and long before the necessities of the service had developed any form of block signal system.

The adoption of the Uniform Code of Signals led to another step forward. In October, 1884, a committee was appointed to compile a "Standard Code of Train Rules." Commenting upon this at the time the distinguished president of one of our most important railway companies said to me that he considered this proposition to be absolutely impracticable. Yet it has been since accomplished.

In the meantime, however, the desirability of a union of the two "Time Convention" organizations began to be mooted, and this was consummated in April, 1886. At that meeting definite Rules of Order were adopted and the form of organization of what is now known as the American Railway Association came into existence. The name of "General Time Convention" was retained, however, for five years, but in April, 1891, the present name was adopted.

A new committee on the subject of Uniform Train Rules, composed of representatives of both former conventions, was then formed. This committee took up its work most vigorously, and from the badly constructed and often discordant rules that preceded it formed an excellent Standard Code of Train Rules which each road could adopt, and which practically all have since adopted. This Code was first approved in April, 1887, and has frequently been revised and improved since that date. In fact the work of the Committee has been continuous, and it now sits as a sort of court to decide questions arising in practice under the Code, which are submitted to it by the officers of the members of the Association; and also to consider and propose such amendments as improved practice may have made advisable. The last revision was made in 1906 and the Code now contains 61 rules for the general operation of trains, with 23 additional for their operation under telegraphic orders, together with prescribed forms in which all such orders must be transmitted. These forms of train orders, it may be said here, are as well adapted for transmission by telephone as by telegraph and are being so transmitted to-day on a number of roads. The original code was for single track roads only, but this has since been supplemented by rules for the operation of roads with double tracks and with three, four or more tracks.

It was necessary to use a number of technical terms in the Standard Code, and railway operating terms were formerly rather indefinite. For instance, an extra train was called on many roads a "wild train," and on some roads a "wild-cat train." This term, after the fashion of railway men, was soon shortened; and it was simply called a "wild cat." From this noun was formed the verb "to wild cat." I remember seeing printed on the time-table of the Delaware, Lackawanna & Western Railroad, in the early eighties, a foot note to this effect, "Train No. —, on arrival at Summit will wild-cat to Morristown."

This expression, however, was not very widely used. A story is told that when the West Shore Railway was about to be opened the superintendent was examining men who had applied for positions as conductors. One man who had had experience in that position was asked, "What would you do if you should meet a wild cat on a side track?" He looked curiously at his questioner for a moment and then replied, "Well, if I hadn't a gun with me, I'd climb a tree." He had never heard the expression before.

There are also a number of arbitrary terms now used in the service, as, for instance, the words "empty" or "light" as applied to engines. An engine may be fully loaded with fuel and yet may be technically called "empty." So also a light engine may be much heavier than one that is not called light. The terms are synonymous and mean an engine not attached to a train. On French railways the term used to express the same idea is "une machine, haut le pied." The term "haut le pied" meaning "high the foot" is equally arbitrary, and is derived from its original application to a burden bearer, who,

when walking without a load, is supposed to lift his foot high.

In connection with the publication of the Standard Code, it was, therefore, found necessary to prepare and embody in it a number of definitions of terms, which are presented immediately preceding the rules. The work of this Committee on Train Rules has been and still is of great value. Its history in detail is long and interesting, but it is not possible to devote more time to its consideration this evening.

(*To be continued.*)

THE CANADIAN PACIFIC'S ENTRANCE INTO CHICAGO.

The Minneapolis, St. Paul & Sault Ste. Marie, shown on the accompanying map, has gained control of the Wisconsin Central. This means, since the Soo is controlled by the Canadian Pacific, that the Canadian Pacific has gained an entrance over its own rails into Chicago. It is a move comparable to the purchase of the Chicago, Burlington & Quincy by the Northern Pacific; but it is unlikely that the Canadian Pacific paid anything like the amount for the Wisconsin Central that the Hill interests paid for the Burlington. Neither has the Canadian Pacific got as good a property.

The Wisconsin Central and the Minneapolis, St. Paul & Sault Ste. Marie.

Ten or a dozen years ago the Northern Pacific gained control of the Wisconsin Central and thought that it had solved the problem of an entrance into Chicago, but it found the Wisconsin Central unprofitable. That was the Wisconsin Central of a dozen years ago. Since then the road has been rebuilt. Moreover, the competitive conditions are quite different. The St. Paul had not at that time an extension to the Pacific coast. The North Western, the Burlington and other roads competing with the Wisconsin Central between St. Paul and Chicago when the Northern Pacific gained control of it, promptly made an alliance with the Union Pacific and shipped traffic that they had previously been sending over their own lines to St. Paul and then via the Northern Pacific to the coast, to Omaha over their own lines and then via the Union Pacific to the coast. To a certain extent they can make this same answer to the move of the Canadian Pacific, but it is obvious that the purchase of the Burlington by the Hill interests gave them their own line to Denver and was not open therefore to the same objection.

The Soo, itself, originates a great deal of traffic and twenty per cent., roughly, of its tonnage is grain, but ending at St. Paul, it could not deal directly with eastern trunk lines in the bargaining for a return haul.

The Wisconsin Central originates traffic especially in the region around Fond Du Lac, where large paper manufacturing plants are located, but this traffic shipped to Chicago gives a comparatively short haul. Now the Wisconsin Central freight agent can solicit traffic bound from Chicago to the coast, as can also the Soo and the Canadian Pacific freight agent. The advantages of shipping oriental bound freight from Vancouver rather than any port in the United States are many. The route via the Wisconsin Central to St. Paul, the Soo to Winnipeg, or more probably to Portal, almost in the northwestern corner of North Dakota, and from there over the Canadian Pacific to Vancouver, is so simple and direct that comment on it is unnecessary.

The Canadian Pacific did not need the Wisconsin Central for its Duluth extension. The Soo has the best of harbors on the lakes at Gladstone, on the northwestern shore of Lake Michigan, but shipping from here is possible only during about seven months of the year. It is not, therefore, apparent that the shipping routes and division of traffic on the Great Lakes will be much affected by the Canadian Pacific's entrance into Chicago. As regards changed relations with the rail connections it seems probable that the coast extension of the Chicago, Milwaukee & St. Paul will have a more direct effect than the purchase of the Wisconsin Central, and that each of these transactions will emphasize the other. The St. Paul extension made a competitor out of a traffic friend; the purchase of the Wisconsin Central makes the competition complete instead of partial.

In some ways the deal will be an advantage to the Hill lines. The Wisconsin Central has been more or less of a disturbing element in its territory. Any road that is not making much money and has to meet the competition of stronger lines is apt to cause more or less trouble by making in-

dependent reductions of rates and otherwise refusing to conform to the wishes of the stronger lines, the object, of course, being to get business that could not be obtained by perfectly legitimate methods and to force concessions from competing roads. The Wisconsin Central having passed to the control of a stronger property like the Canadian Pacific, its career as an independent trouble-maker is ended. The Soo has been a stronger road and part of a big system, but its location has made it heretofore a source of as much trouble to competing lines as the Wisconsin Central. As it does not reach Chicago, it has always been its interest, in order to get the long haul, to so adjust its rates so as to move traffic via other gateways. For example, it is to the interest of the Burlington to move traffic from the West to the Atlantic seaboard via St. Paul and Chicago, because that way it gets the long haul. It is just as much to the advantage of the Soo to move it via St. Paul and Sault Ste. Marie; in other words, to move it around north of the Great Lakes rather than south, because in that way it got the long haul. Now that the Canadian Pacific System reaches Chicago via the Wisconsin Central, it will not have exactly the same motive for moving traffic around north of the Great Lakes as it has had before, and the Burlington and other Chicago-St. Paul lines should find it easier to reach agreements with it regarding rates on traffic both eastbound to and westbound from the Atlantic seaboard. In these ways it is believed that the acquisition of the Wisconsin Central by the Canadian Pacific will be of benefit to competing roads.

In handling traffic east or west via Chicago, the Canadian Pacific has heretofore delivered traffic to the North Western, the St. Paul and the Burlington as well as to the Wisconsin Central, and in return has received traffic from these roads. Naturally, in the future the Canadian Pacific, in order to strengthen the Wisconsin Central, will deliver all or practically all of its traffic to Chicago to the Wisconsin Central, and of course will receive all in return that the Wisconsin Central has to give.

The Hill roads will be exposed to much more severe competition than heretofore through this consolidation, and when the St. Paul's extension is completed and the St. Paul is able to move traffic direct over its own lines from Chicago to the coast, the Hill lines, with the St. Paul's through line on one side of them and the Canadian Pacific with a through line on the other side of them, will have a good deal harder battle to hold and develop their through traffic than they have had in the past. Hitherto they have had something like a monopoly of business moving from Chicago via the northern route. They at least have had complete control of the situation. Now they will at once have one competitor all the way as strong as they are, and when the St. Paul is finished they will have two competitors all the way as strong as they are.

With reference to through traffic to and from the Orient, the Canadian Pacific already has through rates in connection with the North Western, the St. Paul and other roads. But of course now that it will own its own line from Chicago to the coast and its own steamships from the coast to Asia, it will be in a much better position to control this traffic than it has been while handling it in connection with other lines. This arrangement gives the Canadian Pacific a much better chance to fight for traffic between points in foreign countries and points in the United States and between points in the United States. For example, it gives it an all-rail line in connection with the New Haven from New England points to Chicago for the handling of all-rail traffic.

As regards the destination of Wisconsin Central local traffic, it is not so much further from Fond du Lac over the Wisconsin Central to its connection with the Soo, and over the Soo round the northern end of Lake Michigan, and by way of the Canadian Pacific to the Atlantic coast, than it is from Fond du Lac to Chicago, circling the southern end of Lake Michigan, and thence to the coast over foreign lines. In the one case of shipment by way of Chicago the system lines get only the comparatively few miles haul to Chicago over the Wisconsin Central, in the other case the system lines get the haul from Fond du Lac all the way to the Atlantic seaboard.

What the Canadian Pacific paid for the Wisconsin Central, or rather what the Soo paid for it, is impossible even to guess at. It was bought from nobody knows who, probably not at an exorbitant price. It is well known that the Canadian Pacific has been flirting with the Chicago Great Western. It evidently found the Wisconsin Central more to its taste, and possibly cheaper.

The acquisition of the Wisconsin Central is practically an accomplished fact, but there are further possibilities in the future. The Wisconsin Central has a fine terminal port at Manitowoc, and it is about 60 miles directly across Lake Michigan to Ludington, where the Pere Marquette has a fine terminal port, and these ports are open, if not all the year, certainly nearly all of it. The Pere Marquette stretches across Michigan to Detroit and from there to Buffalo, where it connects with the Canadian Pacific's good friend, the New York Central.

In the past the freight agent of the Canadian Pacific at New York, to get a long haul over its own rails, had to route the freight through Montreal to Vancouver, giving such lines as the Northern Pacific and the St. Paul an advantage, since they routed more directly through Chicago; but if the Canadian Pacific can pick up the freight from the New York Central at Buffalo, ship it to Detroit, across Michigan, ferry it over the lake, and from there ship almost directly to Vancouver, the disadvantages of a roundabout route have been eliminated. The routing of freight from Detroit to Ludington and across the lake to Manitowoc eliminates the use of tremendously expensive terminals at Chicago, and the consequent delay to freight in that city, while the terminals at Ludington and at Manitowoc are first class, but are not congested and are not expensive.

The map at least suggests that the acquisition of the Pere Marquette would be a logical next step for the Canadian Pacific in its steadily progressing advance into the United States. Its interesting relations with the New Haven, bearing many possibilities for the future, were somewhat fully described in the *Railroad Age Gazette* last week, page 98.

SHOP NOTES AT TOPEKA.

H. W. Jacobs, Assistant Superintendent of Motive Power of the Santa Fe, has designed a new smokebox superheater which is of the two-stage type and consists of cylindric drums fitted with smoke tubes. One of these is close to the front tube sheet and the other next to the smokebox front, the space between being left for the exhaust nozzle, and there is an annular opening left in the front drum large enough for a man to get in this space.

The steam from the boiler is taken first to the front drum and from there to the back drum where it is more highly heated and passes from there to the cylinder. The superheater has been in operation on one of the large freight engines, and its performance is now being measured up carefully by the testing department. An interesting thing about these drums is the fact that the tubes were welded in by the oxy-acetylene process. The railway company has a small plant fitted up in an outside building where the gases necessary for the process are generated, and they are able to weld and cut metal in this way quite successfully. The plant was designed by the testing department and is largely a home product.

At the new freight car shops at Topeka there is an open shed with special arrangements for repairing steel freight cars, especially those which have been badly damaged in wrecks. This shed is fitted with a large iron base plate with stanchions upon which the steel frames are placed and held

rigidly by chains and braces. The bent portions are then heated by an oil burner and gradually brought into position and straightened without being taken apart. It is surprising how skilful a good boilermaker can become in this kind of work and what a small expense is required to restore a steel underframe which is badly twisted by wreck or fire. Some bad cases of this kind have been completely straightened out at a cost of only $30 per frame.

At the planing mill they have a good labor-saving device used in connection with lumber delivered from the dry kiln, especially siding, sheeting and roofing for box cars. Instead of handling each board and piling it up from the dry kiln cars, the whole carload is transferred by air jacks to another car which remains in the planing mill and is run alongside the machine which is to finish the lumber. In this way only one handling of the lumber is required instead of two in the ordinary way.

Locomotive boiler checks for the Santa Fe are made with a cast steel case or body and they are fitted with brass side and top plug. This has been found necessary in order to prevent the abuse and destruction of the softer brass checks as ordinarily used, and the life of the steel checks is very much longer.

The work of the betterment department has completely standardized the various small tools used at the different shops of the Santa Fe and these are now all made at Topeka in a tool room which is regularly operated as a manufacturing shop; and lathe tools, reamers and other small tools are supplied to the storehouse for distribution to other shops. A large saving in expense for small tools has been effected in this way. This process of standardizing has also been extended to the small bolts for locomotives so that they are able to employ four automatic machines, made by the National Acme Company, Cleveland, Ohio. These four machines are attended by one man and may turn out large quantities of bolts, studs, set screws, brakeshoe bolts and other similar parts at a much smaller cost that when made by the ordinary machines. Automatic machines are seldom used by railways, but it is possible to use them to advantage on a large road where these small details are standardized and the work concentrated at one shop.

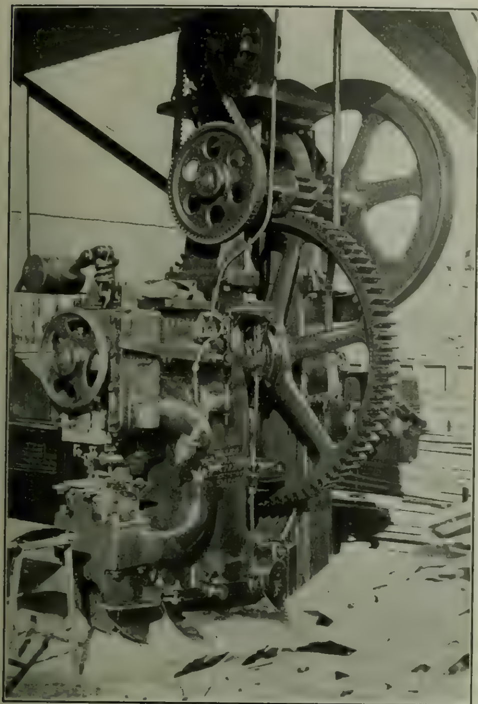
Among the interesting tools found here is a high speed drill 1¼ in. in diameter, which is driven at a speed of 450 r.p.m. and a small drill with clamps operated by air pressure. A small brass lathe is also fitted with an air cylinder for closing the chuck.

According to statistics relating to the use of material, which are kept by Mr. Rice, the storekeeper, an interesting fact that we have not before seen stated is, that 70 per cent. of the brass used by a railway should be paid for by scrap returned, and for ordinary iron castings 75 per cent. of the new work should be paid for by scrap returned. In the case of wrought iron this percentage is 60 to 65 per cent. In addition to all material used by the railway, Mr. Rice has charge of the fuel, and he has been able to develop a series of reports which show the daily consumption of fuel by each locomotive, and such reports are delivered at his office very promptly so that a profitable survey of fuel consumption by locomotives can be made and remedies applied for excessive consumption at the very time it exists and before it is forgotten, as is usually the case with delayed fuel reports.

SOUTHERN PACIFIC ROLLING MILLS AT SACRAMENTO, CAL.

In 1876 the first set of rolls were completed and set up in the rolling mills of the Southern Pacific at Sacramento, Cal. These consisted of a single set of 13-in. rolls, three high, driven by a 12-in. x 18-in. vertical engine, which latter was built at the Sacramento shops of the company. The idea in making this installation was to demonstrate what was considered a possibility, the manufacture of bar iron from scrap at less cost than the market rates. The experimental mill proved a financial success from the outset, and it was decided to build a large size train of rolls equipped with suitable furnaces. The large rolls were made 18 in. in diameter, in three tiers, three high, driven by a 32-in. x 36-in. vertical engine. With these rolls it was possible to make all kinds of merchant bar iron, also iron for making track bolts, nuts, spikes, plain and angle connecting plates, tie plates, angle and channel irons and I-beams. In 1901 it was found necessary to build another mill about the same size and capacity as the one then in use. The rolls of this mill, with the engine driving them and the furnaces and boilers, were all built in the Sacramento shops.

Three-Door Oil Reverberatory Furnace.
Size: 5 ft. x 12 ft. 6 in. x 3 ft. 1 in. Average charge of scrap per heat, 4,800 lbs.



Tie Plate Punch.

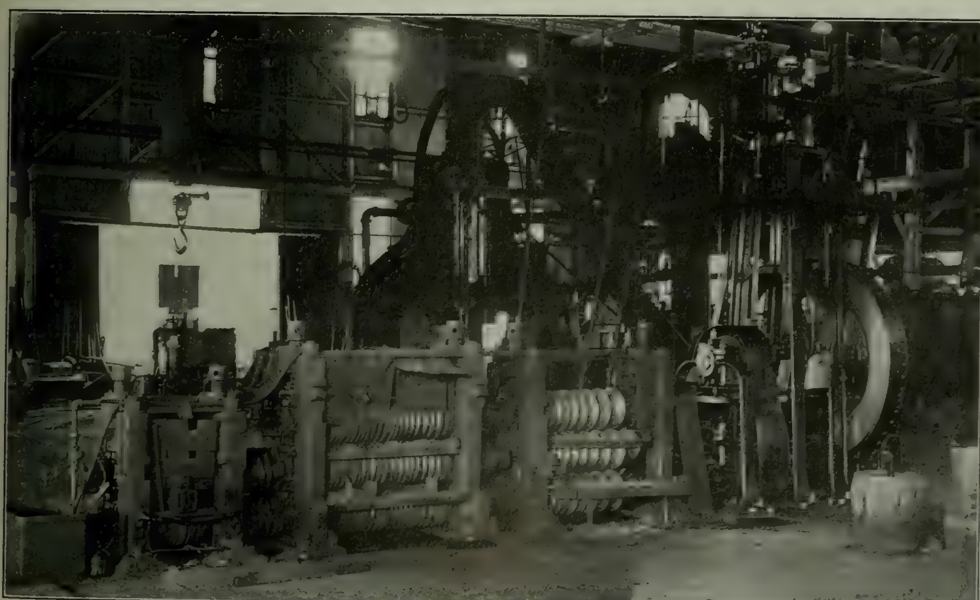
The heating furnaces in these mills, as well as those for use in connection with the steam hammers in the blacksmith shop, are fitted up for using crude oil fuel. The oil is used in furnaces of the return flame reverberatory type, the air being supplied by a Sturdevant blower at about 8 ounces pressure. This method, in conjunction with a special patented low-pressure burner, completely atomizes the oil and produces excellent results in heating. The use of crude oil for fuel has effected a substantial reduction in the cost of the product. The 20-ton hydraulic crane, the hoist for the charging rollers, the shears, punches and hot saw were all made in the Sacramento shops.

The average yearly output of the mill is 17,000 tons, mostly wrought iron. Some mild steel bars have been rolled from scrap, axles and billets. So far no attempt has been made to handle scrap steel. This feature of the work is now being considered and the manufacture of steel bars, as well as steel castings, will be undertaken in the near future. These mills were designed by H. J. Small, General Superintendent of Motive Power, of the Pacific System of the Southern Pacific Company, to whom we are indebted for the information and illustrations given herewith.

ELECTRIC HEADLIGHTS.

At the last quarterly meeting of the Southern and Southwestern Railway Club, held at Atlanta, Ga., November 19, the principal discussion was on "Headlights and Signals." J. W. Johnson, of the Pyle-National Electric Headlight Company, with a stereopticon, described and explained the Pyle-National Light and its generator, going into the subject in great detail.

The first experiments in the use of electricity for locomotive headlights were made by Leonidas Woolley about 1883, at Dayton, Ohio; but he does not seem to have carried his experiments to a successful conclusion. Charles J. Jenney, in 1885, put an electric headlight on an engine of the Cleveland, Cincinnati, Chicago & St. Louis, but this did not succeed. In



No. 1 Rolling Mill; Southern Pacific Shops at Sacramento, Cal.

Built in 1876. Additional set of rolls added in 1879.

1887 Mr. Woolley reappeared as the patentee of a few lights which were used on the Cleveland, Akron & Columbus. In 1888 the National Electric Headlight Company was organized by R. B. F. Pierce, George B. Pyle and others. This company produced the first electric headlight that made a complete successful trip, but on the death of Mr. Pierce, in 1898, the company went out of business. E. A. Edwards, of Cincinnati, invented an electric arc lamp and his company was in the field from 1889 until February, 1907. In 1897 Mr. Pyle, having designed a turbine engine and a better lamp, sold his patents to R. C. Vilas, who organized the Pyle-National Company. Continuing, Mr. Johnson said:

Until 1898, less than 175 electric headlights had been manufactured in this country. After the organization of the Pyle-National the electric headlight was soon developed to such a state of perfection that in the year following, 472 electric headlights were manufactured and sold by this company. A large portion of these were published by roads in your Southern States. The track, at that time, was not in the good condition it is found to be in at this time, and wrecks were of an almost every night occurrence, coupled with the loss of life and destruction of property. This was partly due to cattle lying down on the track at night. With the old headlight, it was not possible for the engineer to observe the animals until almost upon them. As soon as the electric headlight was applied to a locomotive, it was noted immediately that this particular engine did not strike any more stock after night. I was in Shreveport, La., at the time the Kansas City Southern equipped its first passenger locomotive with an electric headlight, and on this first trip the electric headlight pointed out to the engineer five big mules that had run on to a bridge and were down. The engineer stopped his train and with the aid of the train crew and passengers, got the mules out with little delay to train and no injury to the animals. The Pyle-National Company now has ever 10,000 equipments in service on 295 railroads in this and foreign countries. There are no railroads that ever try this device that do not extend the number very fast. There is one large railroad in this country that is using over 900 and several that are using 500 and more.

Mr. Johnson read letters from railroad officers in different parts of the country testifying to their satisfaction with electric headlights. On roads where many animals had been killed by trains at night a marked saving resulted in the use of the electric lights. In a period of seven months on the Oregon Railroad & Navigation Company's line the average cost of maintenance of electric headlights was $1.30 each. Officers of the company believe it to be cheaper than either acetylene, gas or oil. On the Rock Island road the cost of operating electric headlights was calculated at 85 cents each per month.

Following Mr. Johnson's address, E. T. Sawyer briefly described the acetylene headlight. He said that the maintenance of headlights for one year would cost about as follows: Electric, $230; oil, $40; acetylene, $30. Acetylene has been used with marked success for the lamps in fixed signals. At a signal bridge carrying eight semaphore lights a tank containing 2,200 cu. ft. kept all of the lights burning night and day for over five months with no attention. Each light had a ⅛-ft. burner.

The state of Georgia now has a law making the use of electric headlights cumpulsory, and in the discussion of the subject it came out that the statute specifies the size of the reflector as 23 in. in diameter.

Georgia is the only state that has specified a diameter of 23 in. Texas, Oklahoma and Arkansas have laws which require the reflector to be not less than 18 in. in diameter.

Mr. Johnson said that a 23-in. reflector was unnecessary; one 18 in. in diameter is entirely satisfactory. With a clean reflector, this diameter will light up the road 20 to 25 telegraph poles ahead, and will furnish 135,000 candle-power. A larger reflector will light up a wider path, but will not throw light any farther ahead. Replying to criticisms concerning the large amount of steam required to energize the Pyle-National light, Mr. Johnson said that no engine or motor using less steam would give satisfactory service.

REMARKABLE REDUCTION IN BOILER FAILURES ON THE "SOO" LINE.

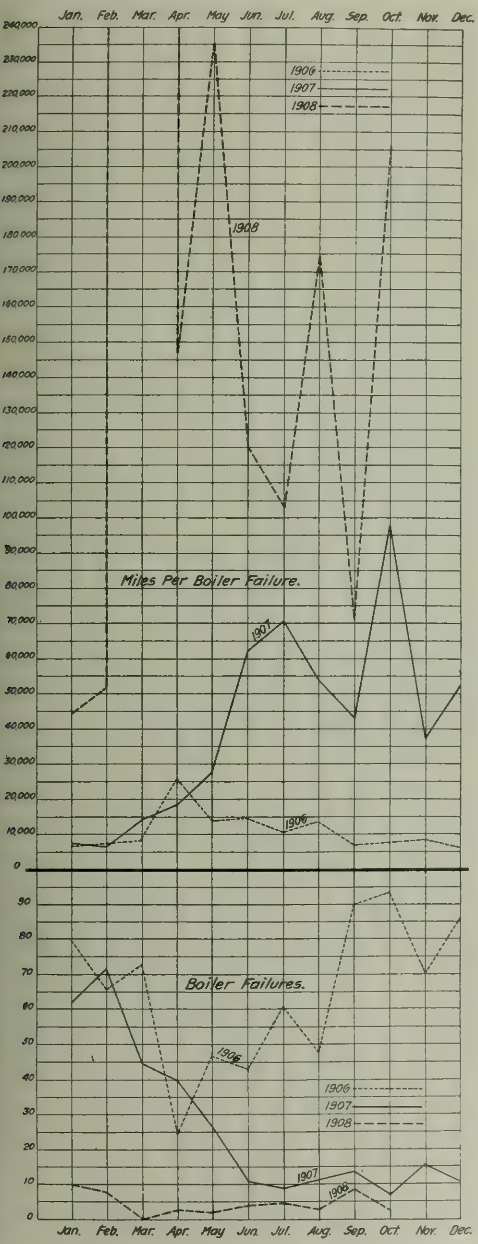
The accompanying chart shows graphically the record of boiler failures on the Minneapolis, St. Paul & Sault Ste. Marie Railway for the last three years—or to be exact, for 1906 and 1907 and for ten months of 1908. The chart is in two parts, one of which shows the total number of boiler failures for each month of the year, and the other the number of miles made per failure per month. It will be noticed that each chart falls into two parts, the division being at June, 1907, when there was a marked reduction in failures as compared with preceding months that has continued ever since. The low point was reached in March of the present year, when no failures occurred. This, of course, throws the peak of the "miles per boiler failure" for that month at infinity. It should be mentioned that these results were attained in spite of a boilermakers' strike which occurred last fall and the filling of the places of the striking union boilermakers with non-union men, who on the average were less skilful and experienced than the men they supplanted.

We are informed by Mechanical Superintendent T. A. Foque that these results are due entirely to the use of a boiler compound which was begun experimentally in the spring of 1907. It was unknown in railway service prior to that time, and the trial on the "Soo" Line was authorized with rather more than the usual amount of skepticism. A heavy decapod locomotive which was running in the worst of the bad-water districts and giving more trouble than any other engine on the road was assigned for the trial. The results were immediate and pronounced. Whereas this locomotive under the old conditions was costing several hundred dollars a year for boiler work, the expenditure for this purpose at the end of a year with the compound was just 26 cents, and the boiler was clean and in excellent condition.

The use of the compound was soon extended to all engines in bad-water districts with equally gratifying results in all cases. Fast passenger engines which had been sent to the shop for new fireboxes shortly after the use of the compound was begun were treated with it instead of being repaired and gave no further trouble, the fireboxes being still in service. In the bad-water districts the firebox mileage for passenger engines formerly averaged from 35,000 to 60,000 miles, and there was constant trouble on the road from the boilers, causing frequent delays to trains. Recently, on the hardest run, an engine had a credit of 125,000 miles, or about three times what it made under the old conditions. A number of new engines bought last year have made 80,000 miles, where ordinarily they would have made half this mileage, and from present indications a mileage of 100,000 to 125,000 is expected from the fireboxes. In freight service, on one division the heavy engines had a boiler failure for every 900 miles in September, 1906. In September, 1907, there was a mileage of 20,000 per boiler failure, and this year the same class of engines made 40,000 miles in September without a boiler failure. September, by the way, was the heaviest month in the history of the road; yet not only was the business handled promptly, but there was surplus motive power, repaired and ready for service, which was not needed. As might be expected, the roundhouse boiler work per engine has been considerably reduced and the back-shop work has benefited likewise.

There was at the start the usual prejudice on the part of employees against a boiler compound, and considerable work was required to get it properly used, but as soon as they realized fully what it was doing objections ceased and they

co-operated willingly to get the best results. Enginemen are as careful now to see whether the engine has its supply of compound before going out as they are to note whether it has water. The use of the compound has long passed the experimental stage, the permanency of the results on the "Soo" Line being well shown by the chart.



Record of Boiler Failures for Three Years on the Soo Line.

THE VALUATION OF RAILWAYS.

The valuation of railways, although in a relative sense neglected, has not been least conspicuous among the questions which have engaged the attention of the thoughtful contingent of the public in the recent past. Its inherent importance and its intimate relation to other things amply justify both the measure of interest attracted and the degree of caution which its contemplation inspires. The subject is so complex in its nature, the factors entering into it are so intricate,, and in its consideration so many points arise concerning which honest and intelligent opinion may reasonably differ, that any precise conclusions reached pending searching inquiry and mature deliberation might be premature and essentially erroneous. But, for reasons which will appear hereafter, the problem promises to press for solution until its claims to recognition shall have been met by definite and appropriate action. The present effort is directed to the consideration of some of the varying phases which the topic assumes, the benefits which may reasonably be expected to result from valuation, and some of the difficulties which must be encountered and overcome before the matter can be finally disposed of; to the suggestion and discussion of questions rather than an attempt finally to answer them.

The Republican National Convention, held at Chicago in June, failed to commit itself to the valuation of railroads. The Democratic National Convention, held in Denver in July, did so commit itself. It would be hasty to assume that the Republican party does not favor a valuation, or to criticise its failure in this respect. Giving both parties credit for entire good faith and sincerity of purpose, the action of their respective conventions is apt to approve itself to the thoughtful judgment of a conservative advocate of valuation. Had the Republicans pledged themselves in the premises, they might have found it necessary in order to redeem the pledge to hurry legislation through the next session of Congress. On the other hand, conceding to the Democrats their claim to success in the approaching national campaign, if not their expectation of it,* some years must elapse before any partisan legislation could be enacted. The subject is of too great and far-reaching importance to every interest in the country, and fraught with too many dangers, to admit of specific legislation respecting it except after the most thorough investigation of all its details, and the most mature deliberation. The problem as it presents itself will call for the best skill and the highest integrity that can be brought to bear upon it, and as the work progresses new difficulties will naturally arise. It is not certain that the co-operation of the states must not be enlisted in order to render the result complete and effective. These things will require time.

Mr. Taft, the Republican candidate for the presidency, referred in part to the subject of railroad valuation in his speech of acceptance delivered at Cincinnati on July 29 in this language:

"I have discussed this, with some degree of detail, merely to point out that the valuation by the Interstate Commerce Commission of the tangible property of a railroad is proper and may from time to time be necessary in settling certain issues which may come before them, and that no evil or injustice can come from valuation in such cases, if it be understood that the result is to be used for a just purpose and the right to a fair profit under all the circumstances of the investment is recognized. The Interstate Commerce Commission has now power to ascertain the value of the physical railroad property, if necessary, in determining the reasonableness of rates. If the machinery for doing so is not adequate, as is probable, it should be made so.

"The Republican platform recommends legislation forbidding the issue in the future of interstate railway stocks and bonds

*This paper was written before the national election.—EDITOR.

without Federal authority. It may occur in such cases that the full value of the railway, and, as an element thereof, the value of the tangible property of the railway, would be a relevant and important factor in assisting the proper authority to determine whether the stocks and bonds to be issued were to have proper security behind them, and in such case, therefore, there should be the right and the machinery to make a valuation of the physical property."

Moreover, since the passage of the Act of June 29, 1906, the administration through its appointed agencies has been prosecuting a systematic line of work which may very naturally find its consummation in a physical valuation. At all events, the integrity of the capital accounts of railroads and the line of demarcation between operating expense and capital investment is receiving special attention at the hands of the Interstate Commerce Commission. Finally, it is no doubt true that the effectual regulation of the railroads, apart from abuses and violations of law, can be effected with least injury to the railroads themselves and the interests of the people generally through the formulation of a well-considered and comprehensive plan and the inauguration of it by a gradual and logical progression.

What is the reason, and what the supposed necessity for a valuation of the railways? Answer, the promotion of the ends of justice; not justice to the railroads, not to investors, nor yet to the shipping and traveling community; but mere abstract justice, let it affect whom it will. The country has just passed through a cycle of commercial and industrial activity and of material growth such as hitherto has been unknown in our national history. Facilities for transportation, taxed to the utmost, were inadequate. At the crest of the wave and at a time when the wheels of industry were in motion for 24 hours a day; when the tradesman's profits were scarcely limited except by his capacity for transacting business; when labor was better employed and better paid than ever before; when the average of commodity prices was higher by 42 per cent. than in the previous decade; and when the monetary standard was depreciated and depreciating—there sprang up from a score of states in various parts of the country an insistent demand for cheaper transportation, improved transportation service, or both. Revenues of the railroads were curtailed in one State after another, by legislative enactment or the action of local regulating bodies. The expense of operation, already out of proportion with revenues and with the records of previous years, was further augmented by the same authority. From what treasury of resource the resulting burden was to be borne, few asked and none volunteered to make answer. Levies for taxation have been increased, and net revenues minimized. The treasuries of the railroad companies are depleted, and their credit is impaired at home and abroad; for confidence is the basis of credit, and confidence depends upon ability to pay.

With traffic in plenty, it was difficult to earn a profit; with a plethora of it, poverty increased. After the crisis in the recent depression the struggle of some of the lines ceased to be for gain and became one for continued existence. Whether or not this extreme was reached, the effect on all the railroads, with a possible few unimportant exceptions, was alike. Within a year twelve companies, with an aggregate mileage of 7,242 miles and securities amounting to $582,903,904, passed into receivership. The announcements of insolvency suggested the early 90's; however different the responsible causes, the effect was the same.

To state these things is to prove maladjustment and to establish the urgent need of a remedy. This may take the form (1) of increased revenues, (2) of diminished expense of operation, or (3) of increased operating efficiency.

As payrolls amount to more than one-half of the total of operating expenses, it is difficult to see how any great reduction can be made in this respect without affecting the salaries of employees and entailing a long train of immediately adverse consequences. Until recently this course was not possible; when the demand for labor is restored it will again be impossible.

It is not improbable that more or less substantial economies could be effected in the dispensing and use of supplies, and elsewhere in operation. There is little doubt that there has been waste; it would be nothing less than miraculous if there had not been, ranging from the necessary through the careless to the criminal; and it is equally certain not only that there still is, but that there will continue to be. Kept within reasonable bounds, waste is a necessary part of the legitimate operating expense of such an enterprise. But it is unlikely in the extreme that the aggregate of the possible economies in this direction would afford more than partial relief.

Some means to economy or to added efficiency, not now thought of, may develop. The introduction of an essentially non-frictional bearing, whose merits have been subjected to the tests of actual use and which it is claimed is now ready for manufacture commercially, may hold great possibilities and go far towards relieving the tension. If a locomotive with a capacity of thirty cars can be made to haul forty-five cars, with the same fixed train expenses and with little increase in fluctuating expenses, the effect on the expense of operation and on net revenues would be summary.

Failing in one of these directions, disaster must follow. The carriers will suffer first, but they will not long suffer alone; for the activities of the country are so bound up in one common cause, that, but injure one and the injury reacts upon all the rest, it may be with accumulated force.

Analytical examination of the constitutions and laws creating and empowering the several state railroad commissions discloses the fact that the commissions of thirty-four states are authorized either to establish or regulate rates. The remaining six commissions are advisory in their nature.

The powers of thirty-seven state commissions to supervise and regulate transportation service extend to necessary control over operating expenses or capital expenditures, or both.

The laws of nine states direct that a valuation of railroad property shall be made. This is unquestionably a step in the right direction; but there is no reason to infer that the amount of invested capital has received general acceptance as a basis for governmental rate making or rate regulation; nor, having in mind the limited progress made in this direction and the separation of the interstate and intrastate uses of such invested capital, does it appear that this basis could have been so accepted.

Enactments of some of the states provide for a court review, and this right is held to exist whether specifically provided for or not; but, apart from the conservatism of the courts, and their readiness to protect property rights, this does not affect the situation materially. In the present state of affairs the courts are necessarily under the same disability in the ascertainment of the reciprocal rights and obligations involved as are the legislatures and railroad commissions.

There is given below a brief and necessarily imperfect account of the regulative measures adopted within the past one or two years, either by legislative act or by order of state commissions which have the sanction and effect of law.

States which have ordered the adoption of 2-cent passenger fares for all or principal lines of road—Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Ohio, Oklahoma, Pennsylvania, Virginia, West Virginia and Wisconsin.

States which have ordered the adoption of 2½-cent passenger fares for all or principal lines of road—Alabama, Montana, North Carolina, South Dakota and Tennessee.

States which have ordered material and more or less general reductions in freight rates—Alabama, Georgia, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Nevada, North Carolina, Oklahoma, South Dakota, Texas, Virginia and Wisconsin.

In one state alone it has been estimated that the reductions

ordered in freight rates will amount to $1,000,000 annually. At not a few points interstate rates are shown to be affected by the changes.

States which have ordered the limitation of working hours of employees—Connecticut, Indiana, Kansas, Maryland, Minnesota, Missouri, Montana, Nebraska, New York, North Carolina, South Carolina, South Dakota, Texas and West Virginia.

States which have ordered minimum train crews—Arkansas, Indiana, Kansas, South Dakota and Texas.

States which have enacted employers' liability laws—Iowa, Kansas, Michigan, Nebraska, Oklahoma, Pennsylvania, South Dakota and Wisconsin.

The characteristic of these laws is that an employer is made legally liable for injury sustained by an employee within the scope of his employment, through the non-feasance or misfeasance of a fellow-servant.

States which have ordered a reciprocal demurrage arrangement—Alabama, Colorado, Indiana, Kansas, Minnesota, Missouri, Oregon, South Dakota, Texas, Vermont and Washington.

In some instances penalties as high as five dollars per car per day are imposed.

In addition to numerous orders, it is probable that not fewer than 200 laws restricting revenues or regulating the operations of carriers have been enacted by the several states within the past two years. The duties enjoined and the things prohibited, by law or order, include the following:

Acts required—improvements to roadway and structures; the establishment of terminals; the establishment of stations at state lines and elsewhere; the fencing of tracks; the construction of private side-tracks; the installation of a block system of train movement; the acquisition of additional equipment; the use of caboose cars of a specified type; the installation of electric head lights; the introduction or extension of the use of safety appliances; the establishment of telephone pay stations in railroad stations; the running of passenger trains on time; the running of extra passenger trains when regular trains are one hour late or more; the transportation of freight traffic at a specified minimum speed; the carriage of passengers on freight trains; the seating of passengers before collection of fares; an extra seat for women passengers accompanied by an infant or young child. Acts prohibited—the confiscation of coal, under penalty of from 25 to 100 per cent. of its value; transfer to federal courts of actions brought in state courts, on pain of forfeiture of license, etc.

The penalties imposed are perhaps fairly illustrated by the excerpts which follow:

". . . Any common carrier, railroad corporation or street railroad corporation which shall violate any provision of this act, or which fails, omits or neglects to obey, observe or comply with any order or any direction or requirement of the commission, shall forfeit to the people of the state of New York not to exceed the sum of five thousand dollars for each and every offense; every violation of any such order or direction or requirement, or of this act, shall be a separate and distinct offense, and, in case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense." (Laws of New York, 1907, Chap. 429, Art. III., Sec. 56, Subsec. 1.)

"Any railroad of other corporation which violates any of the provisions of this chapter or refuses to conform to or obey any rule, order or regulation of the corporation commission shall, in addition to the other penalties prescribed in this chapter, forfeit and pay the sum of five hundred dollars for each offense, to be recovered in an action to be instituted in the superior court of Wake county, in the name of the state of North Carolina, on the relation of the corporation commission; and each day such company continues to violate any provision of this chapter or continues to refuse to obey or perform any rule, order or regulation prescribed by the corporation commission shall be a separate offense." (Reference: Laws (1905, revised) of the state of North Carolina, Chapter 20, Article VI., Section 1087.)

"If any railroad company, subject to this chapter, or its agent or officer, shall hereafter charge, collect, demand or receive from any person, company, firm or corporation a greater rate, charge or compensation than that fixed and established by the railroad commission for the transportation of freight, passengers or cars, or for the use of any car on the line of its railroad, or any line operated by it, or for receiving, forwarding, handling or storing any such freight or cars, or for any other service performed or to be performed by it, such railroad company and its said agent and officer shall be deemed guilty of extortion and shall forfeit and pay to the state of Texas a sum not less than $100 nor more than $5,000." (Reference: Revised Statutes of Texas, 1895, Article 4573.)

" . . . Any railroad corporation or transportation company which shall fail or refuse to conform to such rates as shall be established by such commissioners, or shall charge rates in excess thereof, . . . shall be fined not exceeding twenty thousand dollars for each offense; and any officer, agent, or employee of any such corporation or company, who shall demand or receive rates in excess thereof, or who shall in any manner violate the provisions of this section, shall be fined not exceeding five thousand dollars, or be imprisoned in the county jail not exceeding one year. In all controversies, civil or criminal, the rates of fares and freights established by said commission shall be deemed conclusively just and reasonable; and in any action against such corporation or company for damages sustained by charging excessive rates, the plaintiff, in addition to the actual damage, may, in the discretion of the judge or jury, recover examplary damages. . . . The legislature may, in addition to any penalties herein prescribed, enforce this article by forfeiture of charter or otherwise, and may confer such further powers on the commissioners as shall be necessary to enable them to perform the duties enjoined on them in this and the foregoing section." (Reference: Constitution of the state of California, Article XII., Section 22.)

In the spring of 1907 the legislature of New York passed a bill establishing 2 cents, with certain qualifications, as the legal rate of passenger fare. Without necessarily passing upon the merits of the case and referring to the power conferred upon the public service commissions (created at the same session) to deal with the subject, Governor Hughes vetoed the measure on June 11 of that year, remarking:

"The passage of the bill was not preceded by legislative investigation or suitable inquiry under the authority of the state. Nor is the fixing of this rate predicated on reports or statistics officially collated which would permit a fair conclusion as to the justice of its operation with reference to the railroads within its purview. It plainly reflects dissatisfaction with existing conditions and an effort to provide a remedy through arbitrary action.

"The bill represents a policy seriously mistaken and pregnant with disaster.

" . . . In dealing with these questions democracy must demonstrate its capacity to act upon deliberation and to deal justly.

"It is of the greatest importance not only that railroad corporations should be compelled to respect their public obligations, but also that they should be permitted to operate under conditions which will give a fair return for their service. Upon this depends not simply the security of investors, but the security of their employees and the protection of every form of industry and commerce through the maintenance and extension of necessary transportation facilities. Nothing could be more opposed to the interests of the community as a whole than to cripple transportation corporations by arbitrary reduction of earnings."

In the opinion by JJ. Audenried and Willson, sitting in the Court of Common Pleas at Philadelphia September 10, 1907,

declaring the Pennsylvania 2-cent fare law unconstitutional, the court said 'That there is no evidence that the legislature investigated the matter before enacting the law."

Of neither of these lines of regulation, affecting revenues and expenses respectively, is there cause for just criticism, so long as the action taken is done advisedly; so long as the rights of the people are not submerged in those of the carriers, and so long as the interests of the carriers are not made to wait upon unreasoning demands on the part of the public. Indeed, any act of regulation that is reasonably adapted to secure a performance of the proper functions of common carriers in a proper manner, without exceeding these limitations, is in the highest degree commendable. Persons should be transported with safety, comfort and expedition, and property with safety and despatch; at equitable fares and rates, and upon equal terms to all.

The reasonableness of a given rate depends upon its relation to other rates; the reasonableness of a system of rates is determined by its relation, together with the volume of traffic moving, to capital invested in the enterprise rendering the service. In no case of general reduction in rates or fares is there conclusive proof, or serious effort to adduce it, that the action taken was appropriate either in kind or degree. There is lack of convincing evidence that the subject matter in any case has been referred to any intelligent criterion, or even that there exists at the present time any test which can be relied upon to determine where the rights of the shipper and traveler end and those of the transportation agency begin; save, however, the vague indication afforded by the fact of payment or non-payment of interest or dividends on a nominal capitalization which may be either greater or less than actual invested capital, and which perhaps in no single instance is coextensive with it. The railroads may have been oppressing the people through the imposition of excessive rates for service, and that condition may still obtain; the people may have been oppressing the railroads by withholding from them an equitable return upon their bona fide investment and the equal protection of the laws, and that condition may still remin uncorrected. The probabilities in this respect will be alluded to in a subsequent paragraph.

It is a maxim in equity that there is no right without a remedy; but here are correlating rights and obligations without an adequate remedy for their enforcement, and without so much as a reliable means of ascertaining their extent or defining their limitations—rights involving billions of dollars of capital and more than a billion and a half of annual revenue; rights whose adequate enforcement lies at the foundation of business confidence, credit, commerce, and our material well being; and whose protection or invasion will determine the ultimate success or failure of American institutions.

A carrier is not necessarily entitled of right to earn dividends upon its stock issues, or even to earn interest on its funded obligations; nor is it so entitled in law. But it is entitled both of right and in law to realize a reasonable and just profit upon the capital appropriated to public use in the carriage of persons and property; and if the law governing the case is sound, the logic of it is equally so. Witness the following:

"It cannot be said that a corporation is entitled, as of right, without reference to the interests of the public, to realize a given per cent. upon its capital stock. When a question arises whether the legislature has exceeded its constitutional power in prescribing rates to be charged by a corporation controlling a public highway, stockholders are not the only persons whose rights or interests are to be considered. The rights of the public are not to be ignored. It is alleged here that the rates prescribed are unreasonable and unjust to the company and its stockholders. But that involves an inquiry as to what is reasonable and just for the public. . . . The public cannot properly be subjected to unreasonable rates in order simply that stockholders may earn dividends. The legislature has the authority, in every case, where its power has not been restrained by contract, to proceed upon the ground that the public may not rightfully be required to submit to unreasonable exactions for the use of a public highway established and maintained under legislative authority. If a corporation cannot maintain such a highway and earn dividends for stockholders, it is a misfortune for it and them which the constitution does not require to be remedied by imposing unjust burdens upon the public." (Reference: Covington & Lexington Turnpike Road Co. v. Sandford, 164 U. S., 578.)

"If a railroad corporation has bonded its property for an amount that exceeds its fair value, or if its capitalization is largely fictitious, it may not impose upon the public the burden of such increased rates as may be required for the purpose of realizing profits upon such excessive valuation or fictitious capitalization; and the apparent value of the property and franchises used by the corporation, as represented by its stocks, bonds and obligations, is not alone to be considered when determining the rates that may be reasonably charged." (Reference: Smyth v. Ames, 169 U. S., 466.)

"We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public. And in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, (a) the amount and market value of its bonds and stock, the present as compared with the original cost of construction, (b) the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth." (Reference: Smyth v. Ames, 169 U. S., 466.)

NOTE.—The writer does not concur in the opinion that phrases (a) and (b) are pertinent to an inquiry as to value for the purpose of determining the reasonableness of rates, for reasons elsewhere expressed.

"From what has thus been said, it is not to be inferred that the power of limitation or regulation is itself without limit. This power to regulate is not a power to destroy, and limitation is not the equivalent of confiscation. Under pretence of regulating fares and freights, the state cannot require a railroad corporation to carry persons or property without reward; neither can it do that which in law amounts to a taking of private property for public use without just compensation, or without due process of law." (Reference: Stone, et al., *v.* Farmers' Loan & Trust Company, 116 U. S., 307.)

"The question of the reasonableness of a rate of charge for transportation by a railroad company, involving as it does the element of reasonableness both as regards the company and as regards the public, is eminently a question for judicial investigation requiring due process of law for its determination. If the company is deprived of the power of charging reasonable rates for the use of its property, and that deprivation takes place in the absence of an investigation by judicial machinery, it is deprived of the lawful use of its property, and thus in substance and effect, of the property itself, without due process of law and in violation of the Constitution of the United States; and in so far as it is thus deprived while other persons are permitted to receive reasonable profits upon their invested capital the company is deprived of the equal protection of the laws." (Chicago, etc., R. Co. *v.* Minnesota, 134 U. S., 418.)

(*To be continued.*)

General News Section.

Reports that the Michigan Central will use electric motive power except in the tunnel and terminals in and around Detroit are authoritatively denied.

According to the Portland (Oregon) *Express*, the " A B C" despatching rules, now in extensive use on the Northern Pacific, are to be introduced on a division of the Great Northern.

Jared Barker, of Larwill, Ind., a boy of 15 years, is to be taught telegraphy and given a position on the Pennsylvania lines as a reward for having given prompt notice of a log which he found on the track.

The first of a series of matinee smokers, with a vaudeville program, arranged by the Machinery Club, New York City, was held on Saturday afternoon, January 16, at 50 Church street. The attendance was very large.

The strike of the shop employees of the Denver & Rio Grande, which began in March, 1908, was ended on January 11, after a conference between officers of the road and representatives of the labor organizations. It is stated that the settlement was a compromise, both sides making concessions.

It is announced that suit is to be instituted in Texas, at the instance of the Railroad Commission, against the International & Great Northern, on the ground of insolvency, to forfeit its charter and to compel it to put its property in safe physical condition; also to cancel the receivers' certificates issued to secure proceeds to be used in paying interest on the funded debt. The suit to forfeit the road's charter will be brought in a Texas state court, while the proceeding to cancel the receivership certificates will probably be brought in the Federal court which appointed the receiver.

The Illinois Central will appeal from the decision of Judge St. Paul at New Orleans in favor of the St. Louis & San Francisco in its contention with the Illinois Central and Yazoo & Mississippi Valley for the carrying out of the contract permitting the trains of the Colorado Southern, New Orleans & Pacific road to be run over the Yazoo & Mississippi from Baton Rouge to New Orleans. In the meantime the refusal of the I. C. will prevent the Colorado Southern, New Orleans & Pacific from running its trains from Houston into New Orleans, although its line is completed and ready.

The Central Railroad of New Jersey has within the past week or two dropped from the maintenance of way department upwards of 100 track watchmen, whose duty it was to patrol the road nights between Jersey City and Scranton, 190 miles. An unexpected trip made over the road a few nights ago by officers, who had reason to suspect that all of these men were not attending to their duties, resulted in the discovery that the officers' suspicions were well founded. The trip was made on an engine whose headlight was kept dark. But four men were found on duty over the 30-mile run between Jersey City and Bound Brook. These four were retained and 100 discharged. The company employs a large force of watchmen on the Lehigh and Susquehanna division, between Easton and Scranton, where the road runs close to the Lehigh river and at the base of steep mountains, where floods and loose rocks are liable to obstruct the tracks. No track watchmen on the latter division have been charged with neglect of duty.

The Voices of the Governors.

Governor Fort, of New Jersey, in his first annual message to the legislature of that state recommends the passage of a public utilities law similar to that which is now in effect in New York. As heretofore reported in the *Railroad Age Gazette*, the railroad commission of New Jersey was divided on this question, two members being in favor of more stringent regulation of railways and a third member, the chairman, favoring the continuance of the present law in New Jersey.

Governor Marshall, of Indiana, in his inaugural address, recommends the repeal of the law under which the state railroad commission was organized, and the enactment of a new law providing for a new commission. The law (passed in 1905), and amendments passed in 1907, are inconsistent, vague and uncertain. The Governor would have on the commission an attorney, with railway knowledge and experience, and a man familiar with the mechanical part of railroading. He would make more stringent the law forbidding trespassing on railways.

In his annual message to the Iowa legislature Governor Garst recommended that the members of the State Railroad Commission be made appointive by the Governor instead of elective; that their salaries be increased to at least $3,500 a year; that they be required to devote their entire time to their work, and that their term of office be extended to six years. Governor Garst said that the prosecuting and administrative functions of the commission should be separated and recommended that to this end an attorney to represent the state before the commission be appointed with a salary of not less than $3,000 a year.

Governor Campbell, of Texas, in his message to the legislature says that local freight rates upon Texas traffic are higher than those applying upon the local traffic of almost any state in the Union. The effort of the railroad commission to give the people needed relief has been resisted by every means that could be devised by corporate cunning. Seventeen states have reduced passenger rates to 2 cents a mile, and not one of them has given the railways enough land in value equal to all the railways in such states; but this Texas has done. During the last legislature I recommended that the passenger rates be reduced to 2 cents a mile, but the measure failed mainly as a result of the promise of the railways to give the people better service and relief from burdens imposed by freight rates. In this the people have been grievously disappointed. Railways have increased the rates applying on interstate traffic having origin or destination in Texas an average of nearly 10 per cent. I, therefore, again earnestly urge upon the legislature the enactment of a law reducing passenger rates to 2 cents a mile.

Prizes on Oregon Short Line and Southern Pacific

General Superintendent J. M. Davis, of the Oregon Short Line, reports the following prizes as having been awarded, as a result of the annual inspection of roadway, stations, shops and pump houses, on the Oregon Short Line and the lines of the Southern Pacific, east of Sparks, Nev., which are also under Mr. Davis' authority. For the best district, J. E. Toombs, Roadmaster, gold medal; for the best section, Patrick Brennan, Foreman, gold medal; for the best section on each roadmaster's district, silver medals to E. Delahunty, W. P. Stewart, Mike Rush, J. Gildea, T. Leonard, M. Moran, Walter Read, J. C. Patterson, F. Sheridan, A. Quilici, J. A. Collins, Tom Fox, M. Harte. For perfect stations, gold medals to Mrs. M. P. Kalb, J. L. Kosta, Mrs. J. R. Hague, Mrs. M. E. Collins, L. A. Fulkerson. For perfect pumping stations, silver medals to C. A. Manning, F. Eads, James Whalen and Ephraim Hull.

The first named gold medal for a perfect station goes to Midlake, which is in the middle of Great Salt Lake, 10 or 15 miles from shore. We do not wish to detract from the honor due to Mrs. Kalb, but probably it will be only fair to some of the other agents to observe that very likely she had a minimum of trouble from untidy loafers.

Disastrous Collision at Dotsero, Colorado.

In a butting collision between a westbound passenger train and an eastbound freight on the Denver & Rio Grande, near Dotsero, Colo., on the night of January 15 at 9.47 o'clock, 21 passengers were killed and 40 passengers and several trainmen were injured. The passenger train had an order to wait at Dotsero until 9.55, but, in violation of the order, passed

there at 9.46 and met the freight about 80 rods west of the west switch. The passenger train consisted of engine, tender, baggage car, two coaches, tourist sleeping car and three or four standard sleeping cars. The freight was drawn by two engines. The passenger train was running down grade at high speed, and the collision was unusually violent, two of the engines, minus their wheels, being left standing locked together in a vertical position. Most of the persons killed were in the chair car and the tourist car, both of which were completely wrecked. The collision occurred on a curve where a high bluff made the view very short. The passenger engineman and conductor are said to have been experienced men.

Safety Appliance Law on the Panama Railroad.

President Roosevelt has issued an order, to go into effect not later than July 6, extending the Federal safety appliance laws—requiring the use of automatic couplers, automatic brakes, driving wheel brakes, drawbars of standard height, etc.—to the Canal Zone, and in particular to the Panama Railroad; and also to the railroads and cars operated by the United States government in navy yards, arsenals, government wharves, etc. Secretary Moseley, always alert to see that the safety appliance laws shall have the utmost possible influence, called the President's attention to the lack of safety appliances on the Panama Railroad, and in government establishments, and the thing was done; Mr. Roosevelt at once issued his order. The order also directs that in the territory mentioned all carriers shall make the ladders, running boards, sill steps, roof hand holds and brake shafts conform to the standards of the Master Car Builders' Association.

Hearings in Suit to Restrain Union Pacific.

The suit begun by the government some months since to dissolve the ownership by the Union Pacific of stock in the Southern Pacific and other lines as illegal under the Anti-trust law, has long been in abeyance because of the illness of the chief counsel for the roads; but the taking of testimony was resumed in New York January 5 before Special Examiner Williams.

The first witness was Paul Morton, who was Vice-President of the Atchison, Topeka & Santa Fe for eight years up to 1904. Mr. Morton testified to the relations of his road with the Union Pacific and the Southern Pacific before the Union controlled the Southern.

Edwin Hawley, who was the New York agent of the Southern Pacific for many years, testified that before the control of the S. P. by the U. P. there was actual competition between the Union Pacific, taking passengers and freight westward from Omaha, and the Southern Pacific taking traffic westward from New Orleans; but the Union Pacific could not make transcontinental rates without consulting the Southern Pacific.

Frank M. Murphy, President of the Santa Fe, Prescott & Phoenix, testified that the Phoenix & Eastern was projected in the interest of the Atchison, Topeka & Santa Fe, with a view to making a through line on a favorable location to the Pacific coast, but that after the work had progressed some time the Southern Pacific had bought the Phoenix & Eastern and thus prevented the Atchison from building an independent line westward. According to the newspaper reports of the testimony, Mr. Harriman and his associates forced the Atchison to sell out the Phoenix & Eastern in 1906. The Harriman interests had bought $30,000,000 worth of stock of the Atchison road, without the knowledge of the Atchison directors. Then, getting a representation in the Atchison board, an agreement was made for co-operation between the Southern Pacific and the Atchison in northern California, where the two companies had projected competing lines. The questions asked by the government seemed designed to show that since the Harriman purchase of the Atchison stock, the Union Pacific and the Atchison have become practically a combination, but the testimony was inconclusive.

Jacob H. Schiff, a member of Kuhn, Loeb & Company, which firm is one of the defendants in the suit, testified that he, with Mr. Harriman, tried to prevent the acquisition of the Chicago, Burlington & Quincy by the Great Northern and the Northern Pacific. In this they were unsuccessful. Then they tried to have the Union Pacific admitted to a participation in the purchase; but this was also unsuccessful. But Kuhn, Loeb & Company thereafter acquired a majority of the stock of the Northern Pacific and sold it to the Harriman interests, and the Burlington was kept from falling into the complete control of the Hill interests. Asked if the object of controlling the Northern Pacific was to control the Burlington, and thus eliminate a competitor, Mr. Schiff replied that it was not.

Stuyvesant Fish, formerly President of the Illinois Central, said that up to 1901 the Union Pacific and the Southern Pacific were active competitors for westbound transcontinental traffic—the Union at Omaha and the Southern at New Orleans.

E. T. Jefferey, President of the Denver & Rio Grande and the Western Pacific, testified that before the Union Pacific controlled the Southern Pacific the Rio Grande had enjoyed a free interchange of traffic with the Southern Pacific at Ogden, but that since then the Union Pacific is always favored on eastbound business at the expense of the Rio Grande.

Victor Morawetz gave testimony showing how Mr. Harriman and his associates demanded and secured representation on the board of directors of the Atchison, Topeka & Santa Fe, after which they were able to thwart the efforts of the Atchison to secure an independent line to all parts of California. Mr. Morawetz was called by the defense and his testimony was evidently designed to show that the friendly relations which were established between the Southern Pacific and the Atchison were not inimical to the public interest.

James Douglas, President of the El Paso & Southwestern, gave testimony confirming that of Mr. Murphy, tending to show that the Southern Pacific hampered the construction of the railway in the San Pedro valley.

Anti-Railway Agitation in Texas.

In spite of the fact that railway development in Texas is at a dead stand, agitation against the railways by the politicians and shippers of that state continues. Governor Campbell has recommended the passage of a 2-cent fare law and a so-called Galveston differential bill has been introduced in the legislature, which would operate largely to reduce the freight earnings of the Texas lines. Meantime the State Railway Commission is considering a motion by Chairman Mayfield for a reduction in cotton rates.

A conference of operating officers and representatives of employees of the railways in Texas was held at Ft. Worth on January 15. W. B. Drake, Vice-President and General Superintendent of the St. Louis, San Francisco & Texas, who presided at the meeting, said that no combination of employers and employees had been formed to resist hostile legislation. It was a meeting of general managers, he said, to discuss the oppressive measures which confront the roads in Texas, and representatives of the employees were invited to meet with the general managers that they might be better acquainted with conditions. The proposed 2-cent fare bill, the Galveston differential bill and reduction in cotton rates in Texas would reduce earnings of Texas lines about $5,500,000 a year, Mr. Drake said, and it was easy to see that employees would suffer as well as employers.

Fine of $1,549,500 Upheld by Supreme Court.

On Monday last the United States Supreme Court affirmed the decision of the Texas courts in the Waters-Pierce Oil Company case, which resulted in the imposition of a fine of $1,549,500 upon the company for violation of the state anti-trust law. This puts the court on record as in favor of a stringent and literal interpretation of anti-trust legislation, and as disposed to recognize a great scope of authority in the states in their attempts to control combinations by an application of the general powers of the federal constitution. Discussing the claim that the acts complained of are vague, indefinite and uncertain, the court refers to the decision in the Northern Securities case, in which it was said "that to vitiate a combination such as the act of Congress condemns, it need not be shown that the combination in fact results or will result in a total suppression of trade or in a complete monopoly; it is only essential to show that by its necessary operation it tends to restrain interstate or international trade or commerce or tends to create a monopoly in such trade

or commerce and to deprive the public of the advantages that flow from free competition."

The court finds that there was not sufficient evidence to show that there had been a deprivation of property without due process of law. As to the alleged excessive character of the fines, this is said to be entirely within the police power of the state unless large enough to amount to confiscation. That such is not the case is said to appear from the highly profitable character of the business done in the state.

Steam and Electric Mergers in Massachusetts.

The Massachusetts State Railroad Commission, replying to an order of the Senate of June 12 last regarding the general proposition of consolidation of the steam and electric transportation interests of the state, the consolidation of the steam and electric interests in Berkshire county alone, and the absorption of the Bennington & North Adams street railway by the Berkshire Street Railway Company, on January 18 gave a decision favorable to the last named proposition, but against the other two. As to the general relations between steam roads and street railways it is impossible to forecast the future, but a careful study of the past and present leads to the conclusion that the present policy of keeping the two separate is entirely consistent with the public interest. There is no occasion for a law to forbid a railway chartered in Massachusetts to hold stock in the Berkshire Street Railway Company for the reason that there is no legal authority for such holding. No occasion exists for passing a special law to permit it. It has been argued that a steam road, in control of this street railway, would help its finances; but on that theory all the street railways in the state ought to be put into the hands of the steam roads.

The policy of the state in the past in permitting consolidations of street railways appears to have been justified by experience, and, therefore, the board approves the purchase of the B. & N. A. by the Berkshire company.

Railway Business Association.

At the annual convention of the National Boot & Shoe Manufacturers Association, recently held at the Hotel Astor, New York City, the following resolutions were adopted:

"Whereas, It is evident that holders of capital, abroad and at home, are apprehensive that public hostility to railroads will result in legislation dangerous to the safety of railroad investments, and enormous sums of money must be borrowed by our railroads if they are to put themselves in shape to handle the growing traffic of the country; and

"Whereas, The restoration of prosperity to all lines of manufacture and trade would be greatly promoted if railroads could find a market for their securities and resume the construction of trackage and the purchase of equipment; therefore be it

"Resolved, That the National Association of Boot and Shoe Manufacturers, while deprecating many practices of the railroads, and insisting that regulation should continue to assure obedience to the laws and equitable treatment of all citizens, urges Congress and the State Legislatures to make the most careful investigation before imposing restrictions upon railroads, and to consider railroad problems in a calm and judicial spirit which shall reassure investors and promote the development of transportation facilities to keep pace with the growth of business."

The action of this association is important, because it shows a feeling which is growing entirely outside of those lines of business which are intimately connected with the supplies which the railways themselves use. Other associations which have passed similar resolutions include the National Shoe Wholesalers' Association of the United States; Chicago Board of Trade; Battle Creek, Mich., Board of Control; Merchants Association of York, Pa., and the Board of Trade of Bristol, Va.-Tenn.

Tariff Commission Convention.

A call has been issued for a National Tariff Commission Convention, to be held in Chicago on February 16-18. The purpose will be to give expression to the public demand for the creation of a "permanent, non-partisan, semi-judicial tariff commission."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.: June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.: Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Central and Western Association of Car Service Officers.

The thirty-eighth annual meeting will be held at Chicago, Thursday, February 18, 1909, at the Great Northern hotel. Members are requested to send to the Secretary any subjects considered worthy of consideration. It is intended, in addition to the reports of the committees, to outline a programme. W. E. Beecham, Secretary, 194 Fullerton avenue.

Local Freight Agents' Association of Chicago.

At the annual meeting, held on January 8, officers for the ensuing year were elected as follows: President, N. W. Pierce, Local Freight Agent, Chicago, Milwaukee & St. Paul; Vice-President, E. D. Casey, Local Freight Agent, Chicago & Alton; Secretary and Treasurer, C. B. Strohm, Local Freight Agent, Atchison, Topeka & Santa Fe.

Southern & Southwestern Railway Club.

At a meeting held at the Piedmont hotel, Atlanta, Ga., on January 21, the subject of headlights was concluded.

Wood Preservers' Association.

The United States Wood Preservers' Association held its annual meeting this week at the Auditorium Hotel in Chicago.

There were no committee reports or prepared papers, the programme, instead, consisting of topical discussions and addresses on subjects of interest to the members.

Railway Storekeepers' Association.

The sixth annual meeting will be held at the Auditorium hotel, Chicago, May 17, 18 and 19, 1909.

Northwestern Cement Products Association.

The fifth annual convention will be held in the Armory, Minneapolis, Minn., on March 2, 3 and 4. The association has been incorporated in Minnesota by Martin T. Roche and D. L. Bell, of St. Paul, C. A. P. Turner, O. U. Miracle and J. C. Van Doorn, of Minneapolis. Mr. Van Doorn is the secretary of the association.

Traffic News.

The United States Shippers' Protective Association has been organized at Nashville, Ill., to collect claims for its members and to "protect shippers against unjust discriminations."

The annual dinner of the Traffic Club of Chicago will be given on the evening of January 26 at 7 o'clock at the Congress Hotel. The dinner will be preceded by a reception at 6.30.

The Interstate Commerce Commission has granted the petition of the Atchison, Topeka & Santa Fe for a re-hearing in the matter of free transportation of commodities for the use of hotels.

The South Dakota Senate has passed a 2-cent fare bill. It is said that this bill will be hurried through the House and signed by the governor. The railways are now contesting the validity of the 2½-cent fare that is in effect in that state.

At the annual dinner of the Calgary (Alberta) Board of Trade, A. Price, General Superintendent of the Canadian Pacific, announced that outgoing freight in 1908 showed an increase of 13 per cent. over 1907 and was three times that of 1903.

The St. Louis Southwestern having applied to the Railroad Commission of Louisiana for permission to use on intrastate shipments the uniform bill of lading recommended by the Interstate Commerce Commission, the Louisiana Commission has announced it will hold a general hearing on this subject at Baton Rouge on January 27.

Hermann, Aukam & Co., dry goods merchants, pleaded guilty in the United States Circuit Court at New York January 13 to violating the law by false billing of linens as calico to secure cheaper freight rates. Judge Chatfield imposed a fine of $1,000, which was paid. The prosecution was conducted by the Interstate Commerce Commission, and the indictment was returned October 31.

The railways have decided to equalize grain rates from the Northwest and West to the Southeast via Chicago with rates via other gateways, such as Peoria, Memphis, St. Louis and Louisville. Grain moving via Chicago from the West and Northwest to the Southeast has heretofore been charged a rate from 2½ to 4 cents per 100 lbs. higher than when moving through other gateways. Grain from the territory in northern Iowa and from points north and west of Omaha is affected. The new rates will be checked in as rapidly as possible.

Evidence is being taken at Chicago by J. L. Bennett, Special Master of the Federal court, in the suit brought by the railways to restrain the Interstate Commerce Commission from enforcing its order for a reduction of proportional rates between the Mississippi and Missouri rivers on classified commodities moving from New York to the Missouri river. Representatives of the railways have given testimony to show that the order of the Commission will if enforced cause a discrimination against Chicago, St. Louis and other intermediate points, in favor of the shippers on the Atlantic seaboard and at Missouri river points.

Suit has been brought in a state court at Louisville, Ky., by M. Sabel & Son against the Pennsylvania, the real purpose of which is to compel this road to load carload shipments of goods. Sabel & Son delivered a carload of green hides to the Pennsylvania for shipment to Olean, N. Y., dumping them on the station platform and demanding the carload rate. The road refused to issue a bill of lading unless the shipper loaded the goods into a car, and the shipper got a temporary mandatory injunction to compel issuance of the bill of lading. The case will test in the courts the legality of the recent action of roads in various parts of the country in making a rule that they will not load and unload shipments hauled at carload rates.

Counsel for the Chicago & Alton and for John N. Faithorn and F. A. Wann filed a petition in the United States Supreme Court at Washington on January 19, for a rehearing in the case in which these defendants were fined for the alleged granting of rebates to the Schwarzschild & Sulzberger Co. at Kansas City. The following extracts give the substance of the petition: "Within the past few years the carrier companies have been overwhelmed with a mass of new legislation creating new crimes. In the very nature of things competent and painstaking men are confronted with doubtful conditions on which judgment and decision must be quickly exercised. Sane though they be, they sometimes err. But in any event the very fact that this court was evenly divided on the question of the petitioners' guilt or innocence, demonstrates that they could not have known in advance that their acts were crimes. In fact, they do not now know what the law is on the questions involved. In fact, it seems that the law is so uncertain that the court itself has not up to the present time succeeded in interpreting it. It may well be asked, if eight of the justices of the Supreme Court of the United States are equally divided as to the interpretation of a criminal statute of Congress, how can the layman, be he traffic man or shipper, and be he ever so earnest in wishing to obey the law, avoid its traps and pitfalls?"

The Pennsylvania Railroad, on January 11, announced that all interstate school tickets would be withdrawn February 10, in compliance with the ruling of the Interstate Commerce Commission. The notice said that the company took this action with regret. On the following day the president of the road received a letter from Chairman Knapp telling him that the notice did not fairly state the case. The commission had condemned the issue of school tickets which were without an age limit but were limited to schools of a certain kind or class, but had not "required the withdrawal of reduced rates for school children." Where school tickets have been withdrawn by the railways, the action has been voluntary, the carriers apparently preferring to do this rather than remove the "glaring discriminations." To this letter Vice-President Thayer, of the Pennsylvania, replied, through the newspapers, that the essential point in the ruling of the commission—that persons not attending school must have the same privilege as those attending—still remained in effect. The commission had suggested that reduced rate tickets, if issued, should be limited to certain ages, but the road could not afford to grant the school-rate reduction to everybody, and it would be impossible to check the age of the user. Such tickets would place a premium on dishonesty. Furthermore, the New York State authorities had recommended the continuation of the sale of school tickets between points within that state. The Pennsylvania regrets that the commission should assume that any disrespect or criticism was intended by its action.

INTERSTATE COMMERCE COMMISSION.

In defining its meaning in a recent meeting in regard to reduced rates to clergymen the Interstate Commerce Commission says that a clergyman does not lose his ministerial standing because he leaves the pastorate for some other field of religious activity. A minister who becomes editor of a church paper, instructor in a theological seminary, financial agent for a church or other religious institution, or who engages in other work which may fairly be regarded as religious

in character, and who does not abandon his ministerial work, may legally be accorded special transportation privileges. The courts have been consistently liberal in giving construction to the words "charitable" and "eleemosynary," and the commission sees no reason for being unduly narrow in interpreting these words as found in the act. A charitable institution is one which is administered in the public interest, and in which the element of private gain is wanting. This definition is broad enough to include hospitals, almshouses, orphanages, asylums, and missionary societies. This enumeration is not intended to be exclusive—it is only representative. It is important to note that such an institution does not necessarily lose its charitable character because it is under the management of a particular denomination or sect, or because a charge is collected from some or all of those who enjoy its privileges. It is only necessary that it be conducted in the public interest and not for private gain.

STATE COMMISSIONS.

The California Railroad Commission on January 12 handed down a decision fining the Atchison, Topeka & Santa Fe $5,000 for failure to conform to the rates fixed by the Commission. It also held that several of the rates of the Santa Fe and Southern Pacific were unjustly discriminatory and exonerated the San Pedro, Los Angeles & Salt Lake from charges of having in effect similar rates. The offense for which the Santa Fe was fined was the alleged refunding to the Associated Oil Company of $30,750 on shipments of oil from Bakersfield to San Francisco, Stockton, and other places. The Commission had fixed a rate of 37.8 cents a barrel and it was alleged that the Santa Fe gave the Associated Oil Company a rate of 25 cents.

COURT DECISIONS.

Authority of State Court Over Interstate Commerce.

The Supreme Court of the United States last week, in the case of the Missouri Pacific, plaintiff in error, against the Larabee Flour Mills, sustained the Supreme Court of Kansas in a decision regulating interstate commerce; that is to say, in issuing a peremptory mandamus compelling the road to perform its duty as a common carrier, the traffic being interstate. The decision was by Justice Brewer, but Justices Moody and White dissented.

The mill company had disputed a demurrage bill, contending that the delay in handling the cars in question was due to the fault of the road. The road thereupon discontinued its previous practice of hauling cars between the spur track of the mill and the Santa Fé road, about a mile distant. The mill company applied to the Supreme Court of Kansas for relief and that court under the common law ordered the railway to resume the transfer of cars as before. The railway appealed.

The mill company has for more than four years been operating a flouring mill of 1,000 barrels daily capacity. About three-fifths of its product is shipped out of the state of Kansas into other states and the remaining two-fifths to points within the state. It receives a large portion of its grain in carload lots over the two roads.

No express contract existed between the two railway companies requiring either to use or to permit the other to use the transfer track, or requiring either to place empty or loaded cars thereon to be taken away or returned by the other. Whenever the Santa Fe placed its empty cars for the mill company on the transfer track, the Missouri Pacific, upon notice thereof, hauled and delivered them at the mill. The Santa Fe and the Missouri Pacific both held themselves out as ready to do such and like transferring, and continued to do so after the controversy arose in this case for all industries located on the Missouri Pacific at that place (Stafford), making carload shipments in or out over the Santa Fe, except the mill company. But the Missouri Pacific, for a failure to pay the demurrage, ceased and refused to make further delivery to the mill company of empty cars from the Santa Fe, in consequence of which the mill company, when desiring to ship any of its products from Stafford by the Santa Fe, was compelled to haul the same in wagons from its mill to the station of the Santa Fe and there load into cars. The refusal of the Missouri Pacific was based solely upon the ground above stated, and not on any claim that the compensation paid for the service was unsatisfactory, or that the service constituted a part of interstate commerce, or that the Missouri Pacific did not undertake to perform services of such character.

The commissioner appointed by the court found that the detention of the cars on account of which the demurrage charge was refused payment by the mill company was caused as much by the defective motive power and insufficient train service of the Missouri Pacific as from any fault or omission on the part of the mill company.

The Supreme Court of the state ordered the Missouri Pacific to immediately resume the transfer and return of cars loaded and unloaded from the line of the Santa Fe to and from the mill.

Justice Brewer says: "Counsel for plaintiff in error contend that no duty was imposed on the railway company by act of the legislature or mandate of commission or other administrative board. Conceding this, it is also true that the Missouri Pacific was a common carrier, and as such after this controversy arose continued transferring for all industries except the mill company. So long as it engaged in such transfer it was bound to treat all industries at Stafford alike. No legislative enactment, no special mandate from any commission, or other administrative board was necessary, for the duty arose from the fact that it was a common carrier. This lies at the foundation of the law of common carriers. Neither is there any significance in the absence of a special contract between the Missouri Pacific and the mill company. It appears that the practice theretofore had been for the Missouri Pacific to charge the Santa Fe for the transfer.

"But the main contention on the part of the Missouri Pacific runs along an entirely different line. It is that the Missouri Pacific and the Santa Fe are common carriers, engaged in interstate commerce, and as such are subject to the control of Congress, and, therefore, in these respects not amenable to the power of the state. It appears from the findings that about three-fifths of the flour of the mill company is shipped out of the state, while the other two-fifths is shipped to points within the state. In addition, the hauling of the empty cars from the Santa Fe track to the mill was, if commerce at all, commerce within the state.

"The roads are, therefore, engaged in both interstate commerce and that within the state. In the former they are subject to the regulation of Congress; in the latter to that of the state, and to enforce the proper relation between Congress and the state the full control of each over the commerce subject to its dominion must be preserved. How the separateness of control is to be accomplished it is unnecessary to determine. * * * This case does not rest upon any distinction between interstate commerce and that wholly within the state. It is the contention of counsel for the mill company that it comes within the oft-repeated rule that the state, in the absence of express action by Congress, may regulate many matters which indirectly affect interstate commerce, but which are for the comfort and convenience of its citizens. Of the existence of such a rule there can be no question. It is settled and illustrated by many cases. (Cooley v. Board of Wardens of Port of Philadelphia, 12 How. 299; Sturges v. Crowinshield, 4 Wheat. 193; Houston v. Moore, 5 Wheat. 1; Wilson v. Blackbird Creek Company, 2 Pet. 251; Cleveland, etc., Ry. Co. v. Illinois, 177 U. S. 514.)

"On the other hand, it is said that Congress has already acted, has created the Interstate Commerce Commission, and given to it a large measure of control over interstate commerce. But the fact that Congress has entrusted power to that commission does not, in the absence of action by it, change the rule which existed prior to the creation of the commission. A mere delegation by Congress to the commission has no greater effect, and does not of itself disturb the authority of the state. It is not contended that the commission has taken any action in respect to the particular matters involved. It may never do so, and no one can in advance anticipate what it will do when it acts. Until then the authority of the state in merely incidental matters remains undisturbed. In other words, the mere grant by Con-

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1908.
(See also issues of January 8 and 15.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$94,778	$40,397	$145,627	$17,569	$32,393	$3,298	$44,238	$4,978	$102,476	$43,151	$1,844	$4,760	$40,235	$449
Alabama Great Southern	309	193,981	70,655	295,712	40,172	58,207	7,422	98,796	7,946	212,543	83,169	1,653*	11,490	70,026	34,500
Ann Arbor	301	107,668	36,947	153,802	17,829	18,157	3,180	63,277	3,907	106,350	47,452	3,450	11,369	39,533	16,129
Bangor & Aroostook	515	172,761	45,222	227,403	43,514	26,495	2,830	70,399	11,593	154,831	72,572	.....	1,500	71,072	29,140
Buffalo, Rochester & Pittsburgh	568	463,356	66,128	547,945	63,375	133,936	7,909	174,991	17,002	397,213	150,732	181	15,000	135,913	‡42,118
Central Branch	388	103,200	25,049	137,991	20,592	21,730	3,515	49,897	4,256	99,991	38,000	.....	9,500	28,500	20,005
Central Vermont	411	194,153	67,467	283,958	50,535	51,360	6,637	137,949	6,774	253,255	30,703	150	9,025	21,828	‡21,388
Chicago Great Western	818	487,888	142,255	685,151	107,352	130,695	35,519	329,971	28,935	632,472	52,679	2,060*	20,790	29,829	‡65,844
Chicago, Indianapolis & Louisville	616	290,683	103,972	433,785	57,568	66,667	13,218	148,277	13,493	299,223	134,562	.....	21,500	113,062	50,322
Cincinnati, N. Orleans & Texas Pacific	337	483,954	109,599	625,509	70,522	102,990	16,431	199,335	17,838	407,116	218,393	191	19,612	198,942	74,877
Detroit, Toledo & Ironton	486	122,834	13,158	142,824	24,383	25,366	2,632	69,982	3,965	126,328	16,496	27*	6,979	9,490	9,855
Duluth, South Shore & Atlantic	593	143,204	74,720	232,191	29,038	28,064	7,274	88,399	5,980	158,755	73,436	652	15,000	59,088	11,481
Florida East Coast	584	119,436	54,657	200,063	36,311	35,129	7,345	78,130	12,103	169,018	31,045	.....	11,000	20,045	23,261
Georgia Southern & Florida	395	90,028	45,452	156,677	16,065	23,022	4,973	61,827	8,676	114,563	42,114	1,345	9,951	33,508	12,352
Grand Trunk Western in U. S.	336	287,445	128,784	440,984	42,839	50,844	18,452	189,759	9,937	311,831	129,153	1,982*	32,000	95,171	‡7,083
Hocking Valley	347	477,431	66,052	560,601	50,962	139,071	7,593	172,254	11,818	381,698	178,903	12,865	20,106	171,662	2,775
International & Great Northern	1,159	641,060	147,422	834,642	148,574	113,834	16,496	314,977	19,935	613,816	220,826	.....	23,000	197,826	165,913
Iowa Central	558	184,741	37,170	233,686	21,049	65,020	8,060	120,036	8,783	222,948	10,738	.....	7,359	3,379	‡68,601
Lake Erie & Western	724	279,273	52,427	350,854	50,175	63,605	9,134	141,366	9,573	273,853	77,001	.....	17,380	59,621	9,215
Lehigh Valley	1,446	2,526,917	275,954	2,901,677	294,359	533,221	66,852	906,910	45,291	1,846,633	1,055,044	3,298	94,600	963,742	‡93,114
Long Island	391	225,142	323,085	565,914	62,806	100,336	15,184	302,631	20,283	501,240	64,674	56,638	21,713	99,599	53,543
Minneapolis & St. Louis	1,027	261,001	76,255	363,531	27,745	45,512	8,443	136,390	17,122	235,212	128,319	.....	13,776	114,543	8,359
Minneapolis, St. P. & Sault Ste. Marie	2,308	840,433	254,473	1,143,496	89,589	111,937	18,174	332,478	27,448	579,626	563,870	21,415	82,613	505,672	154,766
Missouri Pacific	3,492	1,294,348	291,908	1,765,878	255,803	314,159	45,853	792,806	62,462	1,471,083	294,795	2,523*	77,105	215,167	17,455
New York, Ontario & Western	546	520,425	80,374	640,987	66,646	118,756	9,643	258,696	17,491	471,232	169,755	15,293*	15,417	139,045	‡24,532
Norfolk & Southern	582	137,059	45,046	195,490	22,714	20,527	3,181	63,116	15,404	124,942	70,548	736*	6,800	63,012	28,770
Northern Central	473	779,722	156,490	995,221	54,880	253,698	10,608	140,409	19,062	778,657	216,264	567	19,515	197,616	‡23,915
Northwestern Pacific	373	92,264	109,331	221,464	56,402	31,697	1,811	88,809	9,205	187,924	33,540	.....	8,955	24,585	9,183
Rutland	468	142,225	72,358	241,698	29,215	32,090	5,855	90,606	5,182	162,948	78,750	.....	11,907	66,843	28,252
St. Louis, Brownsville & Mexico	456	66,508	28,425	101,822	17,884	11,151	2,670	39,122	6,844	77,671	24,151	1*	3,000	21,150	4,966
St. Louis, Iron Mountain & Southern	2,609	1,564,215	364,272	2,102,204	275,379	287,178	40,839	681,344	60,679	1,345,419	756,786	3,345*	63,161	690,280	153,521
Southern Pacific Co.—Pacific System	5,583	4,623,226	2,157,044	7,230,431	771,741	949,702	122,726	1,857,832	191,324	3,893,325	3,337,106	38,230*	245,176	3,053,700	373,198
Texas & New Orleans	450	231,582	71,020	324,197	56,363	49,639	5,482	133,084	8,357	252,925	71,272	4,485*	7,405	59,382	16,235
Toledo & Ohio Central	441	311,900	49,154	372,156	55,264	68,707	5,227	126,784	4,655	260,637	111,519	2,709	14,696	99,532	†38,961
West Jersey & Seashore	371	120,143	160,971	304,985	48,451	50,978	7,942	166,787	7,974	282,132	22,853	2,369	17,112	8,110	‡48,633
Wheeling & Lake Erie	442	377,766	42,337	458,275	87,880	131,040	4,450	169,920	15,031	408,321	49,954	375	21,583	28,747	‡44,888
FIVE MONTHS OF FISCAL YEAR.															
Alabama & Vicksburg	143	$403,209	$192,647	$640,380	$100,769	$137,911	$16,016	$211,541	$24,154	$490,391	$149,989	.....	$19,160	$130,829	‡$18,782
Alabama Great Southern	309	934,199	420,233	1,494,784	193,407	299,238	37,268	493,381	43,231	1,066,525	428,259	$3,557*	57,328	367,374	92,816
Ann Arbor	301	500,343	222,617	774,837	111,271	102,685	15,699	281,268	20,316	531,239	243,598	15,462	56,844	202,216	‡28,380
Bangor & Aroostook	515	848,334	274,015	1,180,511	223,572	135,263	14,289	347,761	50,555	771,440	409,071	.....	7,500	401,571	125,611
Buffalo, Rochester & Pittsburgh	568	2,599,104	417,414	3,166,175	471,030	730,274	42,440	911,862	69,695	2,225,301	940,874	110	75,000	865,984	‡349,917
Central Branch	388	570,987	150,412	776,209	110,302	89,787	14,720	243,233	18,776	476,818	299,391	.....	47,500	251,891	86,045
Central Vermont	411	930,667*	512,605	1,556,780	253,504	244,319	40,060	675,690	33,248	1,246,821	309,959	5,461	45,125	270,295	‡64,494
Chicago Great Western	818	2,490,676	903,463	3,664,173	544,342	597,092	182,485	1,508,637	148,600	2,981,156	683,017	1,187*	92,241	586,589	‡83,534
Chicago, Indianapolis & Louisville	616	1,527,240	615,990	2,355,029	386,676	337,744	62,978	726,491	66,216	1,580,105	774,924	.....	107,500	667,424	‡88,595
Cincinnati, N. Orleans & Texas Pacific	337	2,476,088	601,972	3,243,158	382,592	663,977	80,951	973,128	86,243	2,186,891	1,056,267	8,825*	98,210	949,232	177,202
Detroit, Toledo & Ironton	486	627,608	74,815	741,840	119,137	161,847	12,316	298,258	23,078	614,637	127,203	224*	34,894	92,085	68,069
Duluth, South Shore & Atlantic	593	674,599	425,342	1,170,629	193,588	132,473	47,398	415,509	34,956	823,924	346,705	9,461	75,000	281,166	‡75,881
Florida East Coast	584	437,282	250,370	809,379	223,411	206,242	23,262	393,609	43,987	890,511	81,132*	.....	55,000	136,132†	‡34,324
Georgia Southern & Florida	395	432,803	249,628	774,547	56,234	138,646	25,093	286,089	43,658	549,721	224,826	7,173	40,157	191,842	74,121
Grand Trunk Western in U. S.	336	1,484,515	803,139	2,416,494	216,014	340,941	106,155	878,008	65,228	1,606,346	810,148	3,825*	160,000	646,323	189,124
Hocking Valley	347	2,535,349	397,838	3,016,051	297,412	670,544	37,939	818,621	58,811	1,883,327	1,132,724	50,794	102,660	1,080,858	27,810
International & Great Northern	1,159	2,589,355	748,718	3,558,326	532,608	526,718	74,996	1,340,150	101,940	2,576,412	981,914	.....	115,000	866,914	694,217
Iowa Central	558	972,248	239,284	1,272,458	126,967	217,518	43,475	537,233	42,932	968,125	304,333	.....	37,033	267,300	†172,502
Lake Erie & Western	724	1,428,363	385,388	1,912,773	280,858	341,482	57,334	713,603	50,523	1,443,800	468,973	.....	85,380	383,593	‡157,394
Lehigh Valley	1,446	12,095,315	1,864,730	14,416,341	1,480,319	2,660,260	321,230	4,203,616	254,907	8,920,332	5,496,009	3,015	437,000	5,062,024	‡1,126,761
Long Island	391	1,128,647	2,576,261	3,867,554	445,375	497,675	78,666	1,579,551	91,762	2,693,029	1,174,525	475,291	108,568	1,541,248	242,671
Minneapolis & St. Louis	1,027	1,258,592	528,392	1,909,061	186,860	217,112	48,811	639,744	60,747	1,153,274	755,787	41*	76,962	678,784	40,499
Minneapolis, St. P. & Sault Ste. Marie	2,308	4,218,656	1,418,781	5,889,634	576,647	582,408	85,413	1,655,595	116,501	3,016,564	2,873,070	147,549	418,025	2,602,594	661,788
Missouri Pacific	3,492	6,859,528	1,792,194	9,535,333	1,221,996	1,332,216	227,663	3,718,632	307,712	6,808,219	2,727,114	6,790*	385,525	2,334,799	262,862
New York, Ontario & Western	546	2,679,359	873,873	3,705,237	423,348	599,649	48,919	1,262,389	72,318	2,406,623	1,298,614	16,321*	77,083	1,205,210	‡94,871
Norfolk & Southern	582	586,916	279,786	940,870	158,338	106,554	21,741	305,527	78,659	670,819	270,051	2,214	34,000	238,265	72,490
Northern Central	473	3,761,766	900,354	4,938,333	323,834	991,178	63,582	2,118,018	95,089	3,591,701	1,346,632	4,221	97,573	1,253,280	‡198,059
Northwestern Pacific	373	598,578	794,595	1,497,196	310,092	181,873	11,269	478,971	45,969	1,028,174	469,022	.....	45,875	423,147	‡69,476
Rutland	468	677,941	503,619	1,313,761	180,742	158,958	31,445	476,120	28,294	875,559	438,202	.....	48,014	390,188	55,323
St. Louis, Brownsville & Mexico	456	288,507	134,685	455,920	83,636	60,121	13,607	167,952	24,979	350,295	105,625	72	15,000	90,697	100
St. Louis, Iron Mountain & Southern	2,609	6,953,805	1,864,741	9,624,267	1,339,028	1,227,654	210,102	3,193,348	291,104	6,261,236	3,363,031	11,179*	318,250	3,033,602	187,173
Southern Pacific Co.—Pacific System	5,583	21,781,653	11,337,258	35,356,660	4,354,793	4,182,106	537,447	9,181,189	950,149	19,205,684	16,150,976	28,491*	1,133,163	14,989,322	1,980,935
Texas & New Orleans	450	1,088,438	337,206	1,516,663	237,824	207,386	26,155	617,674	41,115	1,130,154	386,509	5,598*	44,568	336,343	42,603
Toledo & Ohio Central	441	1,830,037	301,389	2,197,607	292,790	317,792	29,005	630,950	27,243	1,297,780	899,827	24,544	69,751	854,620	122,268
West Jersey & Seashore	371	650,778	1,729,490	2,491,201	324,036	266,176	62,335	928,557	38,274	1,619,398	871,803	52,060	85,562	838,301	‡185,443
Wheeling & Lake Erie	442	2,167,908	236,712	2,573,580	378,883	583,154	25,477	834,572	70,139	1,892,225	681,355	3,062	110,736	573,681	‡65,431

*Deficit. †Loss. ‡Decrease.

gress to the commission of certain national powers in respect to interstate commerce does not of itself and in the absence of action by the commission interfere with the authority of the state to make those regulations conducive to the welfare and convenience of its citizens. Running through the entire argument of counsel for the Missouri Pacific is the thought that the control of Congress over interstate commerce and a delegation of that control to a commission necessarily withdraws from the state all power in respect to regulations of a local character. This proposition cannot be sustained. Until specific action by Congress or the commission the control of the state over these incidental matters remains undisturbed. But it is further contended that this is not a mere incidental matter, indirectly affecting interstate commerce, but directly a part of such commerce, and therefore beyond the power of the state to control, and in support of that McNeill v. Southern Railway, 202 U. S. 543, is referred to. There are many points of resemblance between that case and this, but there is this substantial distinction: In that was presented and determined solely the power of a state commission to make orders respecting the delivery of cars engaged in interstate commerce beyond the right of way of the carrier and to a private siding—an order which affected the movement of the cars prior to the completion of the transportation, while here is presented, as heretofore indicated, the question of the power of the state to prevent discrimination between shippers, and the common law duty resting upon a carrier was enforced. This common law duty the state, in a case like the present, may, at least in the absence of Congressional action, compel a carrier to discharge."

Mr. Justice Holmes concurs in the judgment on the ground that the cars had not yet been appropriated to interstate commerce, and so were subject to state control. but is inclined to agree with the views of Justice Moody.

Mr. Justice Moody says: Upon the peculiar facts of this case, it is possible to say that the cars, whose transfer was directed, did not become the subjects of interstate commerce until they had been selected as such after their delivery upon the tracks of the Santa Fe Railroad. If the decision were put upon that ground, I should be silent.

But it is assumed that three-fifths of them were interstate shipments, and with respect to such shipments, I am constrained to believe that the judgment of the court below exceeded the power of the state. The division of the governmental power over commerce made by the Constitution, by which the control of interstate commerce is vested in the nation and the control of intrastate commerce is vested in the states, together with the fact that both kinds of commerce are often conducted by the same persons and corporations through the same agencies gives rise to highly perplexing questions in practice. The regulation of carriers and other instrumentalities of commerce is constantly undertaken both by the nation and the states, and the extent and limit of the respective powers vested in each government, as far as possible, ought to be accurately ascertained and declared. This is demanded imperatively by the orderly conduct of the vast transportation agencies which are engaged in both kinds of commerce. They ought not to be left uncertain as to the power to which they are responsible.

I venture to think that the weight of authority establishes the following principles: The commerce clause of the Constitution vests the power to regulate interstate commerce exclusively in the Congress and leaves the power to regulate intrastate commerce exclusively in the states. Both powers being exclusive, neither can be directly exercised except by the government in which it is vested. Though the state may not directly control interstate commerce, it may often indirectly affect that commerce by the exercise of other governmental powers with which it is undoubtedly clothed. And this indirect effect may be allowed to operate until the Congress enacts legislation conflicting with it, to which it must yield as the paramount power.

In the case at bar, upon the facts as they are assumed to exist, it seems to me that the judgment of the court below directly regulated interstate commerce. If this is so, it is unimportant that the Congress has been silent. A power clearly withdrawn from the state and vested in the nation, can no longer be exercised by the states, even though the Congress is silent. Where the Congress fails to act, the subject enjoys freedom from direct control.

The principles which I have stated have been recently applied by this court in the case of McNeill v. Southern Railway Company, 202 U. S. 543. I cannot escape from the conviction that that case requires a reversal of the judgment of the court below, so far as it assumes to direct the conduct of interstate commerce. In that case the place of business of a private corporation was reached by a spur track connecting with the main track of the railway. It had been the custom of the railway to deliver cars consigned to this corporation from the main track to the spur track. In consequence of a dispute concerning demurrage, the railway refused to continue thus to deliver cars. The state commission made an order requiring the railway to deliver certain cars engaged in interstate commerce upon the spur track on payment of freight charges. The order was held to be a regulation of such commerce, and repugnant to the commerce clause of the Constitution. In that case the regulation affected the last stages of the interstate journey. In this case it affects the first stages of the interstate journey. But in each case the commerce which was regulated was interstate. In that case the order was issued by a commission and in this case by a court. But nothing turns upon that distinction, for by whatever state agency the power is exercised it is void, because it exceeds the authority which may rightfully be conferred by the state upon any agency.

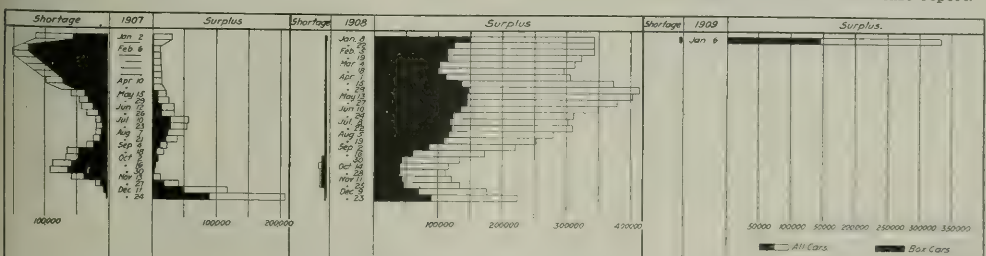
I am not ready to assent to the proposition that although the Congress has vested in the Interstate Commerce Commission the authority to deal with the exact situation presented to us, that fact is immaterial, because the commission has taken no action. If the commission has the authority to deal with a question of this kind, those who have grievances ought to resort to that body for relief. It is a very great hardship to subject the carriers to possibly conflicting regulations and leave them uncertain which government may rightfully assert its controlling authority.

Mr. Justice White joins in this opinion.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 39, giving a summary of surpluses and shortages by groups from December 24, 1907, to January 6, 1909, says:

"This report shows a total of 333,019 surplus cars, an increase of 110,942 in the two weeks since our last report. It



Car Surpluses and Shortages in 1907, 1908 and 1909.

will be noted that there was a similar increase shown in the corresponding report for 1908 and it is accounted for by the usual holiday recession. There was a further slight decrease in the number of shop cars, but as this item is now rather close to normal, large decreases cannot be expected. Taken by groups, the increase seems to be general. The large increase in group 11 (Canadian) is partly due to the addition of 5,000 cars reported by a line that had no report for several previous periods."

The accompanying chart shows the surpluses and shortages in 1907, 1908 and 1909. The table shows the surpluses and shortages in the period covered by the report.

CAR SURPLUSES AND SHORTAGES, FROM DECEMBER 24, 1907, TO JANUARY 6, 1909, INCLUSIVE.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. M. Huffington has been appointed General Claim Agent of the Trinity & Brazos Valley, succeeding Ewing Boyd, resigned.

A. C. Goodyear, Purchasing Agent of the New Orleans Great Northern, has been elected to the new office of Third Vice-President.

John D. Caldwell, Secretary to the President of the Chicago & North Western, has been elected Secretary of that road, succeeding E. E. Osborn.

L. M. Buie, of Stamford, Tex., has been elected President of the Stamford & Northwestern; R. V. Colbert, Vice-President; L. B. Priton, Secretary, and S. M. Hudson, Treasurer.

L. E. Stafford has been appointed Auditor of the Orange & Northwestern, with office at Orange, Tex., succeeding J. J. McEwen, resigned to accept service with another road. J. W. McCullough has been appointed Assistant Auditor, with office at Beaumont, Tex.

W. C. Brown, President-elect of the New York Central & Hudson River, has been elected also President of the Michigan Central, succeeding W. H. Newman, effective February 1. Mr. Brown has been elected also President of the Rutland Railroad, succeeding Mr. Newman, effective at once.

Horace G. Burt will be elected President of the Chicago Great Western upon the reorganization of the road, which it is hoped will be arranged soon. This announcement was made by L. S. Cass, General Traffic Manager, at a hearing before the Iowa Railroad Commission on January 18. It was also stated by Mr. Cass that the other officers would be men now in the service of the road.

Operating Officers.

W. J. O'Brien has been appointed Superintendent of the Chicago Junction, with office in the Exchange building, Union Stock Yards, Chicago.

D. Woodring has been appointed Superintendent of Dining Car Service of the Wheeling & Lake Erie and the Wabash-Pittsburgh Terminal, with office at Canton, Ohio, succeeding J. B. Fox, resigned.

C. G. Dimmock, chief clerk in the office of the Assistant General Superintendent of the Chicago, Milwaukee & St. Paul, has been appointed Trainmaster of the Rocky Mountain division of the Chicago, Milwaukee & Puget Sound, at Butte, Mont.

L. M. Shipley, Superintendent of the Ft. Dodge division of the Chicago Great Western, has been appointed Superintendent of the Southwest division, with office at Des Moines, Iowa, succeeding C. S. Weston, resigned. A. E. Harvey succeeds Mr. Shipley.

Chester P. Wilson, Superintendent of the Lackawanna & Wyoming Valley, has resigned. W. E. Higgins has been appointed assistant to the General Manager, and J. H. Murray has been appointed Superintendent of Transportation. Heads of departments heretofore reporting to the Superintendent should hereafter report to the Vice-President and General Manager.

Alexander M. Keppel, a well-known signal engineer, and for two years (1899-1900) President of the Railway Signal Association, has been appointed Superintendent of the Washington Terminal Co., as has already been announced in these columns. Mr. Keppel was born January 6, 1865, at Edgewood Park, Pa. After attending the Pittsburgh public schools he went to Duff's Business College, and in 1882 began railway work as telegraph operator on the Pittsburgh division of the Pennsylvania. Two years later he became clerk in the Pittsburgh car shops, and in 1886 was made a clerk at the Pittsburgh transfer station. A few months later he was made telegraph operator in the Superintendent's office at Pittsburgh, and in September, 1887, was appointed manager of the Superintendent's telegraph office. By June, 1892, he had become Supervisor of Signals and Fire Marshal, and on January 1, 1902, was made Assistant Trainmaster in charge of passenger and freight business from Swissvale to Pittsburgh, including Brilliant branch. In 1906 he became Superintendent of the Potomac yard of the Washington Southern, and on January 1, 1909, was appointed Superintendent of the Washington Terminal Co.

Photograph by G. V. Buck.

A. M. Keppel.

The titles of T. J. Foley, Superintendent of Terminals of the Union Pacific and now Acting Assistant Superintendent of the Nebraska division, at Omaha, Neb.; George H. Likert, Master Mechanic, at Omaha; Augustus D. Schermerhorn, Division Engineer, at Omaha; William H. Putcamp, Assistant Division Engineer, at Omaha; J. Walter Adams, chief clerk to

the Superintendent and now Acting Superintendent of Terminals of the Nebraska division, at Omaha; James P. Carey, Trainmaster, at Omaha; Chauncey C. Cornell, Trainmaster, at Grand Island, Neb., and John L. Allavie, Traveling Engineer, at Omaha, have been discontinued and each given the title of Assistant Superintendent, with office at Omaha. The officers will continue to perform their present duties, and in addition will assume such other duties as may be assigned to them. An article in another part of this issue gives the reasons for this change.

Frank Ree, Chief Goods Manager of the London & North-Western Railway of England, has been appointed General Manager, succeeding Sir Frederick Harrison, retired. Mr. Ree was born in 1851, and began his railway career with Lebeau & Co., continental carriers. He later went into the service of the London & North-Western, and after a short time became a clerk in the continental office at Euston Station, London, England. In 1878 the London & North-Western took over the business of Chaplin & Horn, continental carriers, and Mr. Ree became assistant to the London Traffic Superintendent. In 1889 he became Manager of the Liverpool & Birkenhead district, and in June, 1893, was appointed Chief Goods Manager, succeeding Sir Frederick Harrison, who became General Manager.

Frank Ree.

Traffic Officers.

Harry P. Bronson, General Passenger Agent of the Trinity & Brazos Valley, has resigned.

M. Clarke has been appointed General Agent of the Tonopah & Goldfield, at San Francisco, Cal.

E. E. Carter has been appointed Division Freight Agent of the St. Louis & San Francisco, with office at Wichita, Kan.

A. B. Walmsley has been appointed Division Freight Agent of the Lehigh Valley at Newark, N. J., succeeding C. E. Crane, resigned.

G. M. Rowell has been appointed Traveling Freight Agent of the Chicago, Peoria & St. Louis, succeeding N. E. Mann, promoted.

Charles T. Mandel has been appointed Traveling Passenger Agent of the Carolina, Clinchfield & Ohio, with office at Johnson City, Tenn.

E. F. Blomeyer, General Agent of the Pere Marquette, at Milwaukee, Wis., has been appointed Assistant General Freight Agent, with office at Milwaukee.

R. M. Jenks has been appointed Commercial Agent of the Iowa Central and the Minneapolis & St. Louis, at Indianapolis, Ind., succeeding F. B. Townsend, promoted.

J. E. Graves, for eight years connected with the Freight Department of the Kansas City Southern, has been appointed General Agent of the El Paso & Southwestern, at Bisbee, Ariz.

E. B. Hooser, Division Freight Agent of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, at Wichita, Kan., will hereafter act for the Chicago, Rock Island & Pacific only.

Clarence M. Booth, Assistant General Freight Agent of the Pere Marquette, with office at Chicago, has been appointed First Assistant General Freight Agent, with office at Detroit, Mich.

J. H. Garrity, chief clerk in the freight department of the Buffalo, Rochester & Pittsburgh of Pittsburgh, has been appointed Soliciting Freight Agent at Pittsburgh, succeeding H. M. Lesher.

F. W. Birchnett, Jr., Traveling Freight Agent of the Chicago & Alton and the Toledo, St. Louis & Western, at New Orleans, La., has been appointed General Agent, Freight Department, at New Orleans.

C. D. Fortney has been appointed Traveling Freight Agent of the Chicago & Alton and the Toledo, St. Louis & Western, at Pittsburgh, Pa., succeeding W. E. Zirckel, resigned to go with another road.

H. H. Kilpatrick, Commercial Agent of the Clyde-Charleston Fast Freight Line at Macon, Ga., has been appointed Commercial Agent at Nashville, Tenn., succeeding A. S. McAlexander, resigned. W. E. Streyer succeeds Mr. Kilpatrick.

Samuel J. Cooke has been appointed General Agent, Freight Department, of the Chicago, Indianapolis & Louisville, at Chicago, succeeding M. Hunter, resigned to become General Manager of the California Butte Valley Land Co. at Macdoel, Cal.

E. F. Edgecomb has been appointed General Agent of the St. Louis & San Francisco, at Kansas City, Mo. Fred Smith, Commercial Agent of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, at Kansas City, Mo., will hereafter act for the Chicago, Rock Island & Pacific only.

John M. Gross, Freight Agent of the Eastern and Western Pennsylvania divisions of the Pennsylvania, has been appointed Division Freight Agent of the Philadelphia, Baltimore & Washington at Baltimore, succeeding G. H. Cobb, whose appointment on the Pennsylvania has been announced in these columns. William G. Spangle, Agent of the Pennsylvania at Milton, Pa., succeeds Mr. Gross.

Engineering and Rolling Stock Officers.

P. G. Burns has been appointed Chief Engineer of the Stamford & Northwestern, with office at Stamford, Tex.

L. W. Stubbs has been appointed Resident Engineer of the Houston & Texas Central, at Ennis, Tex., succeeding R. D. Parker, resigned.

W. A. Reid, Roadmaster of the Gulf, Colorado & Santa Fe, at Temple, Tex., has been transferred to Paul's Valley, Okla. M. Curran succeeds Mr. Reid.

W. C. Taylor, Assistant Chief Engineer of the Spokane, Portland & Seattle, has been appointed Engineer of Maintenance of Way of this road and of the Astoria & Columbia River, with office at Portland, Ore.

The office of Superintendent of Motive Power, Second division, of the Atlantic Coast Line, has been moved from Savannah, Ga., to Waycross. N. E. Sprowl, Master Mechanic at Savannah, has been appointed Shop Superintendent at Waycross, and W. J. Pamplin has been appointed Master Mechanic of the Savannah and Waycross districts, with office at Waycross, and jurisdiction over the forces at Savannah, Ga., Jesup, Brunswick, Thomasville, Albany and Waycross, including enginemen and firemen assigned to these districts.

Edgar B. Thompson, Assistant Superintendent Motive Power and Machinery of the Chicago & North Western, has been appointed Superintendent of Motive Power and Machinery of the Chicago, St. Paul, Minneapolis & Omaha, succeeding John J. Ellis, retired on account of having reached the age limit provided for in the pension system of the company. E. W. Pratt, Master Mechanic of the Lines West of the Missouri river, at Missouri Valley, Iowa, succeeds Mr. Thompson. S. C. Graham, Master Mechanic of the Ashland division, at Kaukauna, Wis., succeeds Mr. Pratt. William Hutchinson, Master Mechanic of the Iowa and Minnesota division, at Mason City, Iowa, succeeds Mr. Graham and F. C. Fosdick, Assistant Division Master Mechanic, at Chicago, succeeds Mr. Hutchinson.

Purchasing Officers.

H. B. Siebe has been appointed Storekeeper of the Trinity & Brazos Valley, with office at Teague, Tex., succeeding W. F. Duane, resigned.

OBITUARY.

W. C. Whitcome, Chief Despatcher of the Texas & Pacific at Fort Worth, Tex., died from rheumatism of the heart at Marshall, Tex., on January 6.

Donald Morrison, for a number of years President and General Manager of the Chicago & West Michigan, now a part of the Pere Marquette, died at New Orleans, La., on January 14.

Thomas D. Healy, an attorney for the Illinois Central, and formerly a United States Senator from Iowa, died of pneumonia at Ft. Dodge, Iowa, on January 15.

George L. Douglass, Vice-President and General Manager of the Western Transit Co., died on January 15 at his home in Buffalo, N. Y. He entered the employ of the Western Transit Co. as a clerk at Troy, N. Y., and in 1865 became Agent at Troy. He held this position for 15 years, during part of which time he was also Agent for the Blue Line. In 1881 he was appointed General Freight Agent of the Western Transit Co., and in January, 1897, was elected Vice-President and General Manager.

Henry Prosper Booth, for many years a shipping merchant in New York, died on January 16 at his home. He was born in New York in 1836; was educated at the Mechanics' Institute. He was president and a director of James E. Ward & Co., shipping agents, and of the New York & Cuba Mail Steamship Co., known as the Ward Line; also vice-president and a director of the International Coal Co. and the Commercial Investing Co. of Porto Rico, and a director of the American Mail Steamship Co., Federal Insurance Co., International Express Co., New Niquero Sugar Co., New York & Porto Rico Steamship Co., and United States & Porto Rico Navigation Co.

Railroad Construction.

New Incorporations, Surveys, Etc.

Abbeville & Northwestern.—This company expects to have its charter renewed soon. Surveys made for a line from Abbeville, Ga., northwest via Pine View, Unadilla and Emerich to Fort Valley, 58 miles, with a branch from Emerich west to Montezuma, 17 miles. J. L. Bankston, President, Abbeville.

Abilene & Southern.—This company, organized by the Colorado & Southern interests, recently filed its charter in Texas. The plans call for a line to be built from Abilene, Tex., south to Sonora, about 160 miles, with a branch from the main line near Ballinger southwest to San Angelo, 40 miles. Morgan Jones, President of the Wichita Valley, of Seymour, Tex., is at the head of the company. (Nov. 13, p. 1375.)

Acme, Red River & Northern.—This company, operating a line from Acme, Tex., east, via Quanah for 9.43 miles, will build a 45-mile extension this year, it is said, from Acme west into Cottle county.

Beaver, Penrose & Northern.—Incorporated in Colorado to build a railway from Beaver, Colo., 22 miles west of Pueblo, northwest to Penrose. The incorporators include C. M. MacNeill and Spencer Penrose, of Colorado Springs, and J. Q. McDonald, of Florence.

Canadian Northern.—An officer is quoted as having said that this company will make arrangements at once for building a line from Port Arthur, Ont., west to Parry Sound. (July 17, p. 554.)

Canadian Pacific.—Reports from Winnipeg, Can., indicate that this company is having surveys made for another line around Lake Superior from Port Arthur, Ont., east to North Bay.

Charleston & Western Carolina.—Work is to be carried out by this company's men, it is said, rebuilding yard tracks along the Savannah river at Augusta, Ga., which were carried away by high water. The improvements will include a total of 6,000 ft. of trestle work.

Chicago, Milwaukee & Puget Sound.—Track is laid from Maplevalley, Wash., to Seattle and Tacoma and is now being ballasted. From Maplevalley east there is about 18 miles of track to be laid. From Maplevalley to Johnson creek tunnel, east of Ellensburg, track is laid and almost ballasted. Johnson creek tunnel, 1,985 ft. long, will be completed about March 1. Track will then be laid to the Columbia river, about 24 miles, and the Columbia river bridge will be completed soon. Track is laid and partly ballasted from the Columbia river to the west end of the St. Paul Pass tunnel in the Bitter Root mountains, which latter will be completed in April. Track is laid from the east portal of the tunnel to Missoula. Track laying between Missoula and Garrison will begin about February 1. Track is laid and ballasted from Garrison, Wash., to Durant. Mixed trains are now being run for the transportation of material, passengers and commercial freight business between Beverly, Wash., and Rosalia. This train service will be extended through to St. Joe within 30 days. This will be all the train service provided until some time in the early summer, when probably local passenger trains will be put on first between St. Joe and Seattle and between Butte and Missoula. The entire line will be ready for freight traffic July 1. No through passenger trains will be run for a year after that date.

Chicago, Milwaukee & St. Paul.—See Chicago, Milwaukee & Puget Sound.

Eastland, Rising Star & Southern.—W. R. Coon, of Detroit, Mich., associated with capitalists of that city, is said to have made arrangements to build a line from Eastland, Tex., south to Rising Star, about 30 miles. Surveys made and work will be begun about April 1.

El Paso & Kansas City Short Line.—An officer writes that the route of this proposed line is from the southern boundary of New Mexico at the Texas state line east under the Guadalupe mountains along the Pecos valley, crossing the Pecos river at Malaga, thence northeast into the Panhandle of Texas. As surveyed the line in Texas will pass through the counties of Yoakum, Gaines, Terry, Lynn, Lubbock, Crosby, Floyd, Motley, Cottle and Hardeman to Quanah, where connection is to be made with the St. Louis & San Francisco. Bonuses have been granted amounting to $797,000 and right of way secured for about 480 miles. Col. J. L. Bell, of El Paso, Tex., and 25 Broad street, New York, is the principal promoter. (July 10, p. 505.)

Grand Trunk Pacific.—An officer is quoted as having said that construction will be started this year on the branch lines from Brandon, Man., east to Regina, Sask.; from Regina, northeast to Yorkton; from Biggar, Sask., north to Battleford, and from Wainwright, Alb., south, via Calgary, to the international boundary.

Great Northern.—An officer writes regarding reports that a large amount of money is to be spent for improvements in and about Great Falls, Mont., that nothing definite has as yet been decided upon. It is said that the improvements will include the enlargement of the yards at Great Falls and the construction of a new line from Great Falls east to Belt, to be used in conjunction with the Billings & Northern.

See Midland of Manitoba.

Gulf, Texas & Western Railroad.—See Gulf, Texas & Western Railway.

Gulf, Texas & Western Railway.—The Gulf, Texas & Western Railroad Co. has been incorporated in New Jersey, with a capital of $12,500,000, by Joseph J. Jermyn and George B. Jermyn, of Scranton, Pa., and Samuel S. Moore as a holding company for the Gulf, Texas & Western Railway Co. of Texas, which was incorporated in November to operate a line from Burrs Ferry, on the Sabine river, in eastern Texas, to the town of Benjamin, about 500 miles. The company owns coal lands in Jack and Young counties, Texas, which would be opened by the railway. West of Dallas the company has an old right of way for 250 miles, of which 60 miles is graded. Construction work is under way from Jacksboro west to the company's mines about 20 miles, and it is expected that coal will be hauled over this section of the line within six months. All the money necessary to carry out the work has been furnished, it is said, by the parties interested in the project. The officers of the operating company, which has a nominal capital of $500,000, are

R. C. Megargel, President, of Megargel & Co., No. 5 Nassau street, New York; Ben B. Cain, Tyler, Tex., Vice-President; W. F. Knox, Treasurer, and J. W. Pinson, Secretary, all of Texas. (Jan. 8, p. 89.)

LOUISVILLE & NASHVILLE.—The new branch of the Cumberland Valley division from Orby, Ky., southward to Chenoa, 12 miles, and a new branch of the same division from Pennington, Va., to Pocket, two miles, has been opened for business.

MIDLAND OF MANITOBA.—A report from Winnipeg, Can., indicates that both the Great Northern and the Northern Pacific will operate in Manitoba under the charter of the Midland of Manitoba, and that the company has applied for permission to build from Portage la Prairie, Man., west to Elkhorn, near the Saskatchewan boundary.

MOUNTAIN VALLEY & PLAIN.—This company is said to have made final arrangements to build a section of about 170 miles of railway through the Panhandle of Texas. The company was organized with a capital of $1,000,000 to build from Cimarron, N. Mex., east through Texas to Oklahoma City, Okla., 400 miles, and filed its charter recently in Texas. D. W. Herrington, of Dalhart, Tex., is interested. (Jan. 8, p. 89.)

NEW YORK CITY SUBWAY.—The Appellate division of the Supreme Court granted recently the application of the Public Service Commission for an extension of time until October 15, 1911, to begin work on the Broadway-Lexington avenue subway. The previous ruling made it necessary to begin work before January 25 to make valid the consent for the construction of the subway. The proposed route is from the Battery at the southern end of Manhattan Island, north through Greenwich and Vesey streets and Broadway to Ninth street, thence under private property and streets to Irving place, following that street and Lexington avenue to the Harlem river to 138th street, where it divides into two branches; one going north through Mott, River and Jerome avenues and the other northeast through 138th street, Southern Boulevard and Westchester avenue to Pelham Bay Park.

NORTHERN PACIFIC.—See Midland of Manitoba.

OHIO NORTHERN & MICHIGAN (ELECTRIC).—An officer writes that this company proposes to build lines as follows: Toledo and Ann Arbor branch, to run north connecting Lambertville, Mich., Petersburg, Dundee, Milan and Ann Arbor; extension from Petersburg northwest to Jackson via Britton, Ridgeway, Tecumseh, Brooklyn and the chain of lakes south of Jackson. The company has working connections with the electric lines at Jackson, Ann Arbor and Toledo. Track has been laid from Toledo, Ohio, north to Petersburg, and trains are now in operation on this part of the line, and grading has been finished from Petersburg to Ann Arbor. The company expects to build the section from Petersburg to Jackson as soon as the weather permits. A number of bridges are yet to be put in place, including one 125-ft. bridge, one of 100 ft., one of 80 ft. and three of 54 ft. The company is only capitalized for $1,000,000 and not for $17,000,000 as reported, and is not offering stock for sale. W. E. Niles, Secretary, 122 Monroe street, Chicago, Ill.

PENNSYLVANIA ROADS.—John H. Burns, of Pittsburgh, Pa., associated with capitalists of that place, is reported to have organized a company to build an electric line from Altoona, Pa., south to Bedford, about 40 miles. Rights of way secured, and work on the line is to be started in March.

PRESCOTT, READER & FORDYCE.—An officer writes that surveys are being made by this company, which now operates a line from Reader, Ark., on the St. L., I. M. & S., west to Lyda, six miles, to continue the line further west to another line of the St. L., I. M. & S., at Prescott, 24 miles from Reader. The company last year built one mile of this extension.

QUEENSTOWN COMPANY.—Reports from Birmingham, Ala., indicate that this company intends to build a belt line connecting the new town of Queenstown, Ala., on the main line of the Seaboard Air Line, about 12 miles east of Birmingham, with the Mineral Branch of the Louisville & Nashville. At Trussville, Ala., connection will be made with the Alabama Great Southern and at Leeds, Ala., with the Central of Georgia and the Southern. It is also understood that N. F. Thompson, Vice-President and General Manager, 2113 First avenue, Birmingham, Ala., is receiving bids for this work.

ROYALTON & ELIZABETHTOWN STREET RAILWAY.—This company, which has headquarters in Philadelphia, Pa., will begin construction this spring, it is said, on a line from Middletown, Pa., southeast via Royalton, Elizabethtown and Florin to Mount Joy. A branch is also to be built north to Lebanon, a total of 40 miles. The plans of the company include new shops, to be put up at Elizabethtown.

SASKATCHEWAN CENTRAL.—Balfour, Martin & Casey, Regina, Sask., are said to be attorneys for this company, which is seeking a charter to build five branch lines of railway in the province of Saskatchewan. The total length of these lines is said to be about 1,000 miles.

TEXAS ROADS (ELECTRIC).—Work is to be started in March, it is said, on an electric line to be built from Palestine, Tex., northwest via Corsicana to Waxahachie, thence north to Dallas, 117 miles, with a branch from Waxahachie east to Ennis, 10 miles. J. B. Watkins and G. A. Dureen, both of Corsicana, are interested.

Railroad Financial News.

BOSTON & MAINE.—Wm. A. Read & Co., New York, are offering the unsold portion of $11,700,000 4½ per cent. bonds of 1909-1929 at 105½, yielding 4.10 per cent.

CHESAPEAKE & OHIO.—In a circular announcing the meeting of stockholders for February 9 to act on the proposed issue of $30,000,000 bonds, G. W. Stevens, President, says that the result of the success of the plan to issue bonds will mean that "the company will be able to distribute to stockholders a more satisfactory share of its future surplus earnings."

This company has bought from Potter, Choate & Prentice and Clark, Dodge & Co., both of New York, all the preferred and common stock of the Virginia Air Line. The road of the Virginia Air Line forms a connecting link between the James River division and the Richmond & Allegheny division of the Chesapeake & Ohio, and is about 30 miles long.

CHICAGO & NORTH WESTERN.—Kuhn, Loeb & Co., New York, have bought $10,000,000 general mortgage 3½ per cent. bonds of 1897-1987, and the Chicago & North Western has sold in addition, to the same bankers, $3,750,000 first mortgage 3½ per cent. bonds of the Manitowac, Green Bay & Northwestern, and $2,500,000 first mortgage 3½ per cent. bonds of the Milwaukee & State Line Railroad. Principal and interest on these additional bonds are unconditionally guaranteed by the Chicago & North Western.

CHICAGO, BURLINGTON & QUINCY.—Bonds to bear 4 per cent. interest and amounting to $20,000,000 are to be sold shortly through J. P. Morgan & Co., New York, the proceeds of the sale to be used to finance the purchase by the Burlington of the Colorado & Southern.

GEORGIA RAILWAY & ELECTRIC.—Stockholders are to vote January 26 on a proposal to make a new blanket mortgage securing $20,000,000 bonds, of which $11,000,000 are to be reserved to retire underlying bonds and $9,000,000 to be issued from time to time for extensions and additions.

NEW YORK CENTRAL & HUDSON RIVER.—The directors have formally designated J. P. Morgan & Co., New York, who have been the company's bankers in the past, as its bankers. This is apparently an answer to the rumors that if E. H. Harriman were elected to the board of directors the company's bankers might be changed.

TARRYTOWN, WHITE PLAINS & MAMARONECK.—J. Addison Young, temporary receiver, has been appointed permanent receiver. (Jan. 1, p. 37.)

TEXAS MIDLAND.—The application made to the Texas Railroad Commission to issue $2,000,000 4½ per cent. bonds has been amended, making the rate 4 per cent., and the amended application has been granted by the commission. The road runs from Paris, Tex., to Ennis, 124 miles.

TOLEDO RAILWAYS & LIGHT.—Albian E. Land, who, in Novem-

ber, 1902, resigned as president in favor of Henry A. Everett, has again been re-elected president.

The committee, representing $4,400,000 of the outstanding $4,800,000 first mortgage 4 per cent. bonds, interest on which has been in default since July 1, 1908, has provided about $150,000 required to meet the January interest on underlying bonds.

Virginia Air Line.—See Chesapeake & Ohio.

Wisconsin Central.—A majority of the stock was transferred to Newman Erb at the directors' meeting held January 20. This is in accordance with the plan of the Minneapolis, St. Paul & Sault Ste. Marie to take over control. (See page 168 of this issue.) It is said that William A. Bradford, President, W. A. Chadbourne, Jr., Chairman of the Board of Directors and General Counsel, and F. T. Gates and George J. Gould, Directors, are to retire soon.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Iowa Central is said to be in the market for from 15 to 30 locomotives.

The Minneapolis & St. Louis will later be in the market for from 10 to 14 locomotives.

The Great Northern has ordered 20 locomotives from the Baldwin Locomotive Works.

The Minneapolis, St. Paul & Sault Ste. Marie is asking prices on eight locomotives.

The Florida Land Co. has ordered one locomotive from the Baldwin Locomotive Works.

Arnhold, Karberg & Co. have ordered two locomotives from the Baldwin Locomotive Works.

The Sorocabana Railway has ordered four locomotives from the Baldwin Locomotive Works.

The Mahoning Ore & Steel Co. has ordered one locomotive from the American Locomotive Co.

The Latrobe-Connellsville Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Wichita Falls & Southern has ordered one locomotive from the Baldwin Locomotive Works.

The Atlanta & St. Andrews Bay has ordered one locomotive from the Baldwin Locomotive Works.

The Escanaba & Lake Superior has ordered one 10-wheel locomotive from the Baldwin Locomotive Works.

Winston & Co. have ordered three locomotives from the Richmond works of the American Locomotive Co.

The Ohio & Michigan Southern, Chicago, expects to be in the market for electric motive power about March 1.

The Lake Shore & Michigan Southern is said to be in the market for a number of locomotives. This item is not confirmed.

The Carnegie Steel Co., Pittsburgh, Pa., has ordered five locomotives from the Pittsburgh works of the American Locomotive Co.

The Grand Trunk is said to have ordered 25 locomotives from the Locomotive & Machine Co. of Montreal. This item is not yet confirmed.

The Canadian Pacific is said to have ordered 30 locomotives from the Locomotive & Machine Co., of Montreal. This item is not yet confirmed.

The Oliver Iron Mining Co. (U. S. Steel Corporation) has ordered 15 locomotives from the Pittsburgh works of the American Locomotive Co.

The Michigan Central is contemplating the purchase of new locomotive equipment, but we are advised that no definite arrangement has been decided upon.

The Central of Brazil, reported in the *Railroad Age Gazette* of January 15 as having ordered nine locomotives from the Baldwin Locomotive Works, has increased this order to 15 locomotives.

The Maine Central, as reported in the *Railroad Age Gazette* of January 8, has ordered three Pacific and two 8-wheel simple passenger locomotives from the American Locomotive Co., for delivery in April, 1909.

General Dimensions.

	Pacific.	Eight-wheel.
Weight on drivers	138,000 lbs.	82,000 lbs.
Weight, total	214,000 "	126,000 "
Cylinders	22 in. x 28 in.	18 in. x 24 in.
Diameter of drivers	73 in.	69 in.
Boiler, type	Wide. radial.	Wgn. top, radial.
" wkg. stm. pres.	200 lbs.	190 lbs.
Heating surface:		
Tubes	3,259 sq. ft.	1,614 sq. ft.
Firebox	186 "	138 "
Total	3,445 "	1,752 "
Tubes, number	285	267
" outside diam.	$2\frac{1}{4}$ in.	2 in.
" length	19 ft. 6 in.	11 ft. $7\frac{1}{2}$ in.
Firebox, type	Wide.	Shallow.
" length	96 in.	90 in.
" width	75 "	$41\frac{1}{2}$"
" material	Steel.	Steel.
Grate area	50 sq. ft.	26 sq. ft.
Water capacity	6,500 gals.	5,000 gals.
Coal capacity	12 tons.	9 tons.
Tractive effort	31,600 lbs.	19,200 lbs.

Special Equipment.

	Pacific.	Eight-wheel.
Axles	Steel.	Steel.
Boiler lagging	Magnesia.	Magnesia.
Brakes	Westinghouse.	Westinghouse.
Headlight	Electric.	Oil.
Valve gear	Walschaerts.	Stephenson.
Wheel centers	Cast steel.	Cast steel.

CAR BUILDING.

The Ohio & Michigan Southern, Chicago, expects to be in the market for electric cars about March 1.

The East Indian Railway received bids until January 13 on a number of coal and box cars and cabooses.

The Newburgh & South Shore is said to be in the market for 200 ore cars. This item is not yet confirmed.

The Chesapeake & Ohio has ordered three dining cars from the Pullman Company and 500 fifty-ton freight cars from the Standard Steel Car Co.

Morris & Co., Chicago, have ordered 53 forty-ton, 8,000-gal., steel tank cars from the Chicago Steel Car Co., First National Bank building, Chicago.

The Seaboard Air Line is said to have ordered from the Barney & Smith Car Co. the 15 passenger cars mentioned in the *Railroad Age Gazette* of December 18. This item is not yet confirmed.

The Omaha & Council Bluffs Street Railway, Omaha, Neb., at its annual meeting of stockholders, announced that specifications are being prepared for 25 large cars, a portion of which will be built in its own shops.

The Aurora, Elgin & Chicago, as reported in the *Railroad Age Gazette* of June 5, is having 25 trucks built by the Pullman Co. These will be delivered about February 1. The center plates for these equipments will be of the ball-bearing type, made by the T. H. Symington Co.

The Seaboard Air Line is said to have ordered 500 thirty-ton steel underframe box cars from the South Baltimore Steel Car & Foundry Co.; 200 fifty-ton steel phosphate cars from the Barney & Smith Car Co., and 50 fifty-ton ballast cars from the Rodger Ballast Car Co. This item is not yet confirmed. The equipment was mentioned in the *Railroad Age Gazette* of December 4.

IRON AND STEEL.

The Great Northern is said to be in the market for 8,000 tons of rails.

The Boston & Maine is said to be in the market for about 8,000 tons of rails.

The New York, New Haven & Hartford is said to be preparing specifications for 25,000 tons of rails.

The Louisville & Nashville is said to be in the market for from 50,000 to 65,000 tons of open hearth rails.

The Bettendorf Axle Co., Davenport, Iowa, is in the market for 1,300 tons of structural steel for use in building a new foundry.

The Michigan Central will ask prices soon on steel work for a new bridge at Joliet, Ill. (See Joliet, under Railroad Structures.)

The Royal Siamese State Railways, L. Weiler, Director General, Bangkok, will receive bids until April 15 on 20,000 tons of rails.

The Cincinnati, New Orleans & Texas Pacific is in the market for 3,000 tons of structural steel for a new bridge across the Kentucky river.

The New York Central Lines are believed to be about to place orders for 1909 rail requirements. The tonnage will probably be about 80,000 tons.

The International & Great Northern, reported in the *Railroad Age Gazette* of January 8 as requiring 85-lb. rails to equip about 165 miles of road, is said to be in the market for 22,000 tons.

The Chicago, Milwaukee & St. Paul, reported in the *Railroad Age Gazette* of January 15 as being in the market for 500 tons of structural steel, has ordered 483 tons from the Wisconsin Bridge Co.

The Pittsburgh & Lake Erie, reported in the *Railroad Age Gazette* of January 1 as soon to place a contract for 10,000 tons of rails for delivery early in 1909, is said to be in the market for 9,000 tons.

The Crane Co., Chicago, is in the market for 500 tons of structural steel for a new warehouse at San Francisco, Cal. Prices have been asked, but no contract yet awarded, for 2,500 tons of structural steel for this company's proposed warehouse at Chicago.

The South Australia Government Railways, through the Supply and Tender Board Office, Adelaide, is asking bids on 4,200 tons of 80-lb. rails and 286 tons of steel fishplates; 1,500 tons of 60-lb. rails and 100 tons of fishplates for same, and 1,900 tons of 50-lb. rails and 120 tons of steel fishplates.

RAILROAD STRUCTURES.

AUGUSTA, GA.—See Charleston & Western Carolina under Railroad Construction.

BRISTOL, N. B.—Local reports say that the Canadian Pacific will rebuild its passenger station at an estimated cost of $3,000.

BURLINGTON, WASH.—The Great Northern has prepared plans for additional improvements to cost $50,000, including the building of a new station, four miles of additional sidings, two water tanks and a coal chute. The new station will be 40 ft. x 100 ft., with a 600-ft. platform.

CALGARY, ALBERTA, CAN.—The Grand Trunk Pacific and the Canadian Northern are negotiating with the Dominion Government for the purchase of a tract of land at the foot of Eighth avenue, as a site for a union passenger station. It is expected that the depot will be erected this year. The extensions of the Canadian Northern from Saskatoon, Sask., and Vegreville, Alb., and of the Grand Trunk Pacific from Hardisty, Alb., will probably be built into Calgary this year.

According to a despatch credited to General Manager Bury, of the Canadian Pacific, new shops will be built at Calgary within the year. They will be designed to employ about 1,500 men and will be about the same size as the present shops at Winnipeg, Man.

ERWIN, TENN.—The initial capacity of the shops of the Carolina, Clinchfield & Ohio will be 100 locomotives, but all construction and building is being done with a view to increasing the capacity to 500 locomotives. (Jan. 1, p. 38.)

HATTIESBURG, MISS.—The New Orleans & Northeastern received bids until January 18 for the erection of a new passenger station, boiler house, express room and cement platforms. The station is to be 36 ft. x 215 ft. and of brick and stone. The express room will be 36 ft. x 75 ft. The cost of these improvements is estimated at $50,000. (July 24, p. 597.)

HAYDEN, COLO.—The Denver, Northwestern & Pacific has given the contract for building machine shops. Hayden is situated 23 miles west of Steamboat Springs, Colo., the present terminus of the road.

JERSEY CITY, N. J.—A new building for the use of the Pennsylvania Railroad Y. M. C. A., to cost about $15,000, is to be built at Montgomery and Green streets.

JOLIET, ILL.—The contract for concrete work for a bridge to be built jointly by the Michigan Central and the Chicago, Rock Island & Pacific, has been given to the Keltie Construction Co., Joliet. Bids for the steel work will be asked by the Chief Engineer of the Michigan Central.

ST. LOUIS, MO.—The St. Louis Transfer Co. is preparing plans for a one-story freight depot, 400 ft. x 125 ft. It will cost $40,000.

TACOMA, WASH.—Press reports say that the City Council of Tacoma, Wash., has passed an ordinance granting vacations of city lands asked for, and giving the Great Northern a franchise to cross Twenty-first street and River street with freight tracks. An officer of the company is quoted as saying that work will be started on the terminal buildings and tracks at once. Final surveys are being made for the track work and plans for the freight sheds, a roundhouse and other terminal buildings are made. As soon as contracts can be let and the material assembled, work is to be started. (Dec. 18, p. 1612.)

TEMPLE, TEX.—The Gulf, Colorado & Santa Fe has given the contract for a part of its improvements at this point to J. C. Scott. Sons & Co., St. Louis, Mo. (Dec. 25, p. 1666.)

TORONTO, ONT.—The order of the Railway Commission in connection with the projected viaduct is said to provide for a structure from York to Cherry streets, or from the Union station to the east end of the city, with overhead bridges in the western portion of the water front; also that the city will bear one-third of the cost of construction and the railways two-thirds. (R. R. G., Feb. 7, p. 199.)

Ties Bought in 1907.

The total purchases of ties in 1907 exceeded those of 1906 by 50,865,578, or nearly 50 per cent. The increase in hewed ties was 40,889,543, or 52.8 per cent., while the increase in sawed ties amounted to 9,976,035, or 39.4 per cent. Hewed ties formed 77 per cent. of the total in 1907.

In 1907 about 23,557,000 ties were reported as purchased for new tracks. This item includes spurs, switches and sidings, as well as actual extensions of roads. Nearly 19,722,000 ties were used for this purpose by steam roads, amounting to 13.7 per cent. of the total purchases by these roads. The balance, or over 3,835,000 ties, or nearly 40 per cent. of the total number of ties purchased by electric railways, were for new tracks.—*Forest Products Bulletin.*

Reservoir Dam Contract.

The MacArthur Brothers Co., New York, has been given a contract by the Eastern Colorado Power Co. for building the Barker reservoir dam near Boulder, Colo. The dam is to be of cyclopean concrete masonry, resting on a solid rock bottom and sides. It is on Middle Boulder creek at a point about 17 miles west of Boulder, and 1½ miles east of Nederland. The length of the dam at the surface of the creek is to be about 250 ft., the length of crest is to be about 625 ft., and the height above bed rock is about 180 ft. There will be about 140,000 cu. yds. of cyclopean masonry.

The power company has done considerable preliminary work and has built a railway about 2½ miles long from a siding on the Chicago & North Western up to the dam site. The contractors expect to begin work about February 1 and will finish it before January 1, 1910.

This company built the Wachusett dam (Boston water supply) and the Cross river dam (New York water supply).

It also has the contract for the main dam of the Ashokan reservoir for the new Catskill water supply of New York.

Groton Shipyard Sold.

The plant of the Eastern Ship Building Co. at Groton, Conn., opposite New London, has been sold in separate lots to various buyers. It was at this plant that the steamships Minnesota and Dakota were built.

Supply Trade News.

F. E. Place, General Superintendent of the Buda Foundry & Manufacturing Co., Chicago, has been appointed General Manager, with jurisdiction over the selling and manufacturing departments.

The Northwestern Railway Supply Co., Chicago, has been incorporated to manufacture and sell railway supplies and equipment. The incorporators are: William S. Barbee, Thomas A. Barbee and C. R. Murray.

The Metallic Railroad Tie Co., Shirley, Ind., has been incorporated to manufacture and sell metallic railway ties. Capital stock, $10,000. The incorporators include: George Williams, Frank Gordon, James McCune and others.

The Bureau of Manufactures, Washington, D. C., has a communication (inquiry No. 2992) from a city in Latin-America to the effect that a horse car line there is to be electrified. The name of the general manager is on file at the Bureau of Manufactures.

Bids will be received until February 1 by the Isthmian Canal Commission on electric motors, refrigerators, hose, packing, belting, manila rope, cotton waste, valves, flue cleaners, chain blocks, tackle blocks, rivets, nuts, nails, wire netting, wrenches, hammers and other tools and supplies. (Circular No. 488.)

The Gisholt Machine Co., Madison, Wis., has opened an office and display rooms at Washington Boulevard and Desplaines street, Chicago, in charge of Charles Spalding. A full line of Gisholt machines will be carried in stock and the different types of the machines will be arranged so that a practical demonstration of their operation may be seen.

The Interstate Cement Tile Manufacturers' Association will hold its third annual convention at the Armory, Minneapolis, Minn., on March 2. This meeting will be in conjunction with the annual meeting of the Northwestern Cement Products Association. The Interstate Cement Tile Manufacturers' Association represents an invested capital of over $1,000,000 and is represented in eight states.

Robert Mather, President of the Rock Island Company, the holding company for the Rock Island and Frisco lines, has been elected Chairman of the Board of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., succeeding E. C. Converse, who has been temporary Chairman since the reorganization. Charles A. Terry, Secretary and Attorney of the company, has been elected a Vice-President. He will remain Attorney, but will continue as Secretary only until the directors can choose a successor.

J. M. Duntley, President of the Chicago Pneumatic Tool Co., Chicago, will retire from that position at the time of the next annual meeting, February 15, and his brother, W. O. Duntley, will succeed him. J. M. Duntley will become President of the Duntley Manufacturing Co., recently organized, and will also give his attention to the foreign business of the Chicago Pneumatic Tool Co., with a view to reorganizing and expanding that department. Another change to be made at the annual meeting of the Chicago Pneumatic Tool Co. is the election of John R. McGinley, of Pittsburgh, Pa., as Chairman of the Board, succeeding Charles M. Schwab.

The Carborundum Company, Niagara Falls, N. Y., is to increase its plant by the addition of a four-story brick and steel structure, 225 ft. x 60 ft. One entire floor is to be given over to the manufacture of carborundum sharpening stones, hones, scythe stones and other specialties. The other floors will be used for the mixing and wheel molding departments and for storage room. During the past year the company has added several new lines to its manufactured products. These include garnet paper and cloth, used in the wood and furniture trade, and emery paper and cloth, used in finishing metal and machinery parts. The addition of these lines and the development of the regular sharpening stone and grinding wheel business has made the addition to the plant necessary. The company expects later to make abrasives for every use.

The Independent Pneumatic Tool Co., Chicago, at its annual meeting of stockholders held at Jersey City, N. J., elected the following directors: James B. Brady, W. O. Jacquette, John P. Hopkins, James J. McCarthy, M. S. Rosenwald, S. Florsheim, John M. Glenn, John D. Hurley and John R. Turner. At the annual meeting of the directors held in Chicago, the following officers were elected: President, James B. Brady; First Vice-President, W. O. Jacquette; Second Vice-President, John D. Hurley; Secretary and Treasurer, A. B. Holmes. The annual report shows that the company is in good financial condition, and that during the quarter ending December 31, 1908, 40 per cent. more business was transacted than during the corresponding period of 1907. The company has enough orders booked to keep its plant at Aurora, Ill., running full capacity for several months, and its export as well as its domestic business is gradually improving.

The American Blower Co., Detroit, Mich., has consolidated with the Sirocco Engineering Co., New York. S. C. Davidson, of the Sirocco Engineering Co., Belfast, Ireland, the parent company, is financially interested in the consolidation. The factory of the Sirocco company at Troy, N. Y., and the plants of the American Blower Co. will continue in full operation under one management, the general offices being at Detroit. All business of the consolidated companies will hereafter be transacted under the name American Blower Co. James Inglis remains President of the American Blower Co.; William C. Redfield, President of the Sirocco company, becomes Vice-President of the American Blower Co.; Charles H. Gifford, the Treasurer, was until about a year ago General Manager of the B. F. Sturtevant Co., Hyde Park, Mass.; Mr. Still, the Secretary, is Chief Engineer of the American Blower Co. The Sirocco centrifugal fan was invented about 1897 by Mr. Davidson. It was patented in England in 1898; in the United States in 1900, and in 1903 was put on the American market by the New York company. Infringement suits now pending will be continued.

Walter H. Cottingham was elected President of the Sherwin-Williams Co., Cleveland, Ohio, at the recent meeting of the Board of Directors, succeeding H. A. Sherwin. Mr. Sherwin remains with the company as Chairman of the Board. S. P. Fenn was elected Vice-President and Treasurer, and A. W. Frank, Assistant Treasurer and Secretary. Mr. Cottingham, whose portrait we reproduce herewith, is 43 years old and for over 20 years has been prominently associated with the Sherwin-Williams Co. For ten years he was connected in different capacities with the Canadian branch, and the details of the business he represented were then so thoroughly mastered and his ability to devise and successfully adopt new methods became so conspicuous that in December, 1898, he was appointed General Manager, with headquarters at Cleveland. After the death of E. P. Williams, Vice-President, Mr. Cottingham was elected Vice-President and General Manager. This office he held until his election as President. He is the author of a book for

W. H. Cottingham.

salesmen, the general distribution of which by many large manufacturing concerns to their employees sufficiently attests the theoretical as well as practical ability of its author Mr. Cottingham sailed for London on Wednesday last in the interest of the company.

W. H. Hooper, who for the past ten years has been with the Safety Car Heating & Lighting Co., New York, as General Agent at Chicago, has been appointed Assistant to the President of the Chicago Car Heating Co., Chicago. He was born in Wales on September 1, 1860. He was educated at the public schools at Grand Island, Neb., after which he entered the foundry and machine business at Grand Island, remaining in this work until 1890. In 1891 he was appointed Assistant Superintendent of the Freight Department of the St. Charles Car Co., St. Charles, Mo., now a part of the American Car & Foundry Co., New York. In 1892 he went to St. Louis, Mo., as Assistant Engineer of the Safety Car Heating & Lighting Co. From 1898 until his recent appointment he was the General Agent of the Safety Car Heating & Lighting Co., in charge of the Chicago office. Mr. Hooper will make his headquarters in the main offices of the company, Railway Exchange building, Chicago.

W. H. Hooper.

TRADE PUBLICATIONS.

Brake Beams.—The Buffalo Brake Beam Co., New York, has just issued a leaflet which is descriptive of brake beam forgings, including heads, fulcrums, chain clips, wheel guards and hangers.

Rail Joints.—The Rail Joint Co., New York, has just issued catalogue No. 3, which includes a number of full-page halftone illustrations showing the various rail joints manufactured by this company; also a number of references to the advantages resulting in the use of these rail joints.

Pipe and Boiler Insulation.—The H. W. Johns-Manville Co., New York, has just issued Catalogue No. 100, which is devoted to a presentation of the problems of insulating all kinds of heated and cooled surfaces, such as pipes, boilers, furnaces, flues, ducts, etc., and for refrigerating and cold storage work.

Center Crank Engines.—The Ridgway Dynamo & Engine Co., Ridgway, Pa., has just issued Bulletin No. 19, which describes, with a number of half-tone and line cuts, the Ridgway single valve center crank engines. Two full-page tables cover the specifications of Ridgway simple and compound engines.

Blowers and Engines.—The American Blower Co., Detroit, Mich., has just issued a number of catalogues, including Circular No. 242, on A. B. C. electric forge blower; No. 244, on variable speed engines for driving paper making machines; No. 247, on Detroit steam traps, and No. 246, which contains a treatise on shop heating by F. R. Still, Vice-President and Chief Engineer of the American Blower Co.

Locomotive Finished Material.—A catalogue just issued by the Locomotive Finished Material Co., Atchison, Kan., describes a line of business which is new in connection with locomotive repair work, that of manufacturing and finishing locomotive parts for the market so that a railway may keep on hand and ready for use a stock of finished parts. Illustrations show interior views of the company's shops and also various locomotive parts which are manufactured.

Telephone Switchboard Installation.

The Western Electric Co., Chicago, recently made a rapid telephone switchboard installation at Franklin, Pa. The exchange was destroyed by fire on November 17. The Pittsburgh branch of the Western Electric Co. was telegraphed to while the fire was still burning, and emergency boards, which the company keeps on hand, at its branch offices, were set up in Franklin in about 48 hours. At about the same time, a carload of switchboard material was received at Franklin from the Western Electric plant at Hawthorne, Ill. The next morning the electrical company's men began installing this material, and on November 29, twelve days after the fire, the new switchboard was completed and in service.

Dallett Air Compressors.

A line of air compressors as built by Thos. H. Dallett & Co., Philadelphia, Pa., show many excellent and unique ideas in air compressor design. These compressors are designed so that all parts requiring adjustment or renewal are readily accessible and by using a liberal amount of metal, rigidity in operation is insured. The capacity of any compressor may be increased by replacing its air cylinder by that of the next larger size compressor.

The frame is of the open fork center crank type and especially massive in design. The duplex belt, duplex steam and single steam machines are supported on a deep rigid sub-base, thus making the entire machine self contained, which maintains perfect alinement and insures satisfactory operation on either a rough, temporary foundation of timbers or on a permanent concrete or brick foundation. An oil gutter is provided entirely around the lower base flange on all sub-bases. This is a particular feature as it insures a clean foundation and a floor free from oil or stains. The main bearings are lined with a high grade of babbit metal, which is poured into dove-tailed recesses and well piened in to prevent shrinkage. Lubrication is effected by sight-feed devices, gravity or a force feed system, drainage being provided for all drips from the guides, stuffing boxes and the crank pit.

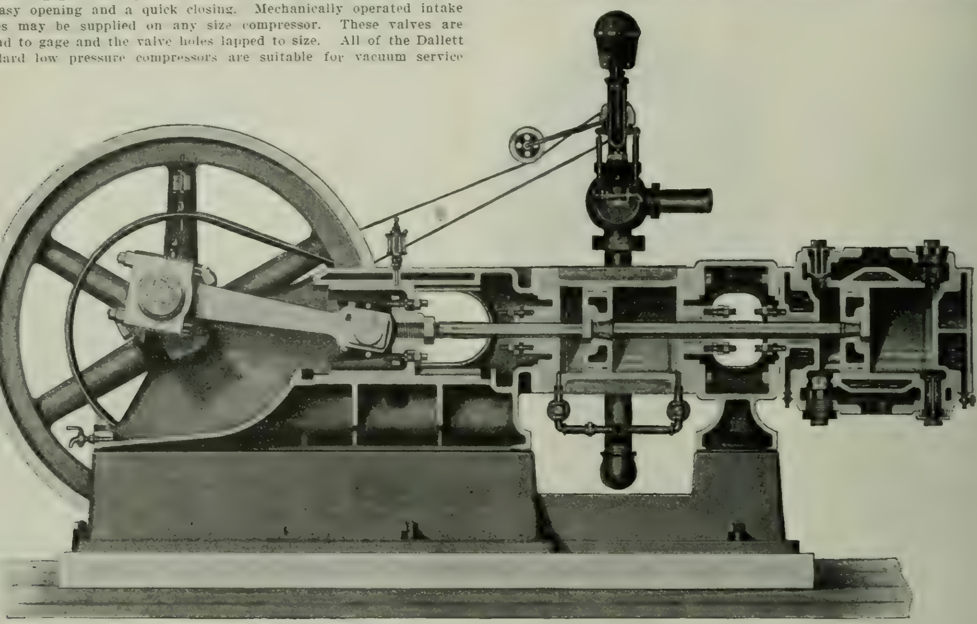
The steam cylinder and valve gear of the steam-driven machines are well suited to the operation of compressors, giving high efficiency with little attention. All steam ports are short and direct. The clearance has been reduced to a minimum to provide appreciable saving in steam consumption. A plain D, balanced slide valve is used on the small and medium sized machines, while the Meyer balanced, adjustable, cut-off valve is used on the larger machines. To provide sufficient heat insulation, all steam cylinders are lagged with mineral wool and neatly jacketed. The rocker arms on all valve gears are adjustable to compensate for wear. On the steam-driven machines, the governor is equipped with a safety stop device which stops the machine on a breaking of the governor belt. The governor pulley is placed on the end of the shaft outside of the flywheel on the single machine, thus bringing the flywheel as close to the bearing as possible, and also preventing oil or grease, thrown by the eccentric, from getting on the governor belt. A reducing valve is used on the duplex compressors with compound steam cylinders, which reduces the live steam pressure for use in the low pressure cylinder. If the high pressure side stops on the dead center, live steam is fed to the low pressure cylinder through th reducing valve for starting the pressure. The live steam is taken into the low pressure side only when starting, otherwise the operation is identical with any compound machine.

The air and steam cylinders are tied together and held in position by an internally-flanged tie or distance piece. On the smaller sizes, this piece supports the air cylinders, but on the larger sizes, the air cylinder is supported on a pedestal, while the tie piece is of circular design without the foot piece. Ample openings are provided on each side of the tie piece to allow adjustment of the stuffing boxes and tightening the cylinder stud nuts. The air cylinders are of special hard, close grained iron, and each is thoroughly tested under hydraulic pressure of 200 lbs. before assembling. The clearance space is reduced to a minimum and all heads and cylinder walls are thoroughly water jacketed to obtain the highest possible efficiency. Means are provided for draining the water from the cylinder-head and cylinder jackets. Oil is fed directly into the intake passage and the suction carries it into the cylinder in the form of a fine spray. This method of lubrication has been thoroughly tried and is said to give efficient and equal lubrication to all working parts.

The cross head is a new type box pattern, made of semi steel. The shoes are adjustable and have large bearing surfaces. The upper shoe is lubricated by a sight-feed lubricator and the lower one runs in oil. One of the features of this design is the side openings, which allow easy access to the binder nuts. The cross head pin, of hardened and ground tool steel, is fitted to taper seats in the cross head and secured by a nut. Wearing is compensated for by provision for turning the pin a one-quarter revolution. The intake valve, of the automatic poppet type, is contained in a malleable iron cage. The cage is one piece and combines both seat for the valve and guide for the valve stem. The cage is threaded and screws into the wall of the air intake chamber only and is simply seated in a recess on the main

cylinder wall using thin corrugated copper gaskets. A hexagonal recess is cast in the cage to accommodate a special wrench for use in removing and replacing the valve cages. The valve cage cap acts as a lock nut for holding the cage in place after it has been screwed down on its seat in the cylinder. In the case of a compound machine, corrugated copper gaskets are placed under the valve cage caps on the high pressure cylinder to prevent leakage, as the discharge pressure from the low pressure cylinder acts constantly at these joints. The valve proper is a special alloy hardened steel with seat and stem ground to gage. The phosphor bronze valve spring gives the valve an easy opening and a quick closing. Mechanically operated intake valves may be supplied on any size compressor. These valves are ground to gage and the valve holes lapped to size. All of the Dallett standard low pressure compressors are suitable for vacuum service and in the case of belt machines, the face is very wide. The flywheels on all machines have square cored holes in the rim to facilitate turning over by hand.

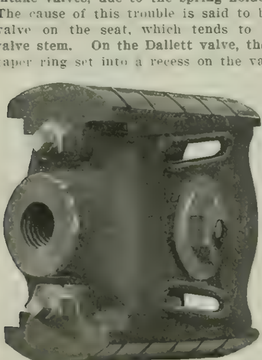
The Dallett inter-cooler has a large cooling area, employing the return flow type of water circulation, using baffle plates to deflect the flow of air and aid in its effectual contact with the cooling tubes. This method is said to be very efficient in reducing the temperature of air between the stages to approximately the original temperature, thus tending to reduce the final air discharge temperature and also the horse-power required for a given capacity. Unions have been



Sectional Elevation of Dallett Single Steam Machine.

and are furnished with mechanically-operated intake valves for high vacuum.

Much trouble is claimed to have been caused on certain makes of intake valves, due to the spring holder shearing off or breaking loose. The cause of this trouble is said to be due to the sudden stop of the valve on the seat, which tends to drive the spring holder off the valve stem. On the Dallett valve, the spring holder comprises a split taper ring set into a recess on the valve stem and held together tight to the stem by a taper ring which slips down over it. The hammering of the valve on a seat should tend to tighten the spring holder on the stem instead of driving it off.



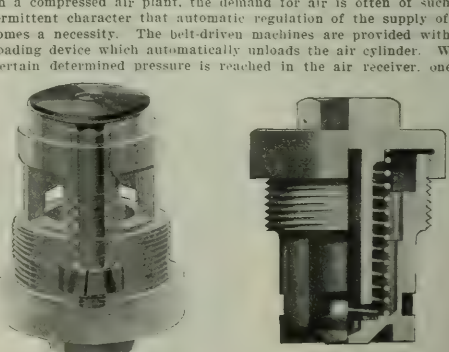
Cross Head.

The alloy hardened steel discharge valve is of the automatic poppet type contained in a malleable iron valve cage. The method of seating in the cylinder and locking to its seat is the same as that of the intake valve. The boss on the valve cap acts as a positive stop for the valve when it has reached a lift of full opening, and is said to prevent fluttering. This boss also serves as a spring guide for the valve spring.

The connecting rod, of the marine type, is made of a crucible steel and both crank pin and cross head boxes are made of phosphor bronze. Adjustment is obtained at the cross head by wedge and split box. The crank pin end is adjustable and both bearing surfaces, of liberal proportions, are lubricated by wick wipers. The crank shaft on both single and duplex machines is massive and forged from a solid billet of mild open hearth steel. On a duplex shaft, the portion in the center is enlarged to connect the heavy flywheel. The wheels on all machines are heavy and of large diameter for smooth operation.

supplied to permit the removal, intact, of the nest of cooling tubes, from the inter-cooler box, without discharging any of the piping. The inter-cooler is supplied with a pop safety valve, pressure gage and drain valve.

In a compressed air plant, the demand for air is often of such an intermittent character that automatic regulation of the supply of air becomes a necessity. The belt-driven machines are provided with an unloading device which automatically unloads the air cylinder. When a certain determined pressure is reached in the air receiver, one or



Dallett Intake and Discharge Valves.

more inlet valves at both ends of the air cylinder are held open and the load is taken off the compressor, allowing it to run light until the pressure drops in the receiver, when the valves are released and air compression is resumed. On the steam machines, a combined speed and pressure governor is used. This governor unloads the air cylinder exactly the same as on a belt-driven machine and at the same time it controls the speed, allowing a single steam machine to just turn over when unloaded and bringing a duplex or compound machine to a dead stop. By this means a great saving in steam is said to be

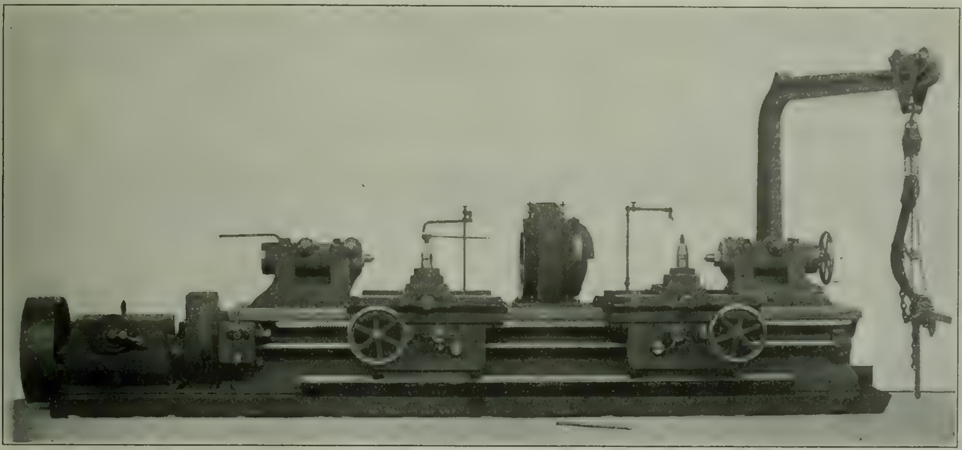
effected and the wear and tear on the working parts, as in the case of a continuous running machine, is reduced.

The compressors described are built in sizes from 8-in. stroke up to and including 16-in. stroke and give a range of capacity from 79 cu. ft. of free air per min., to 1,200 cu. ft.

Heavy Axle Lathe.

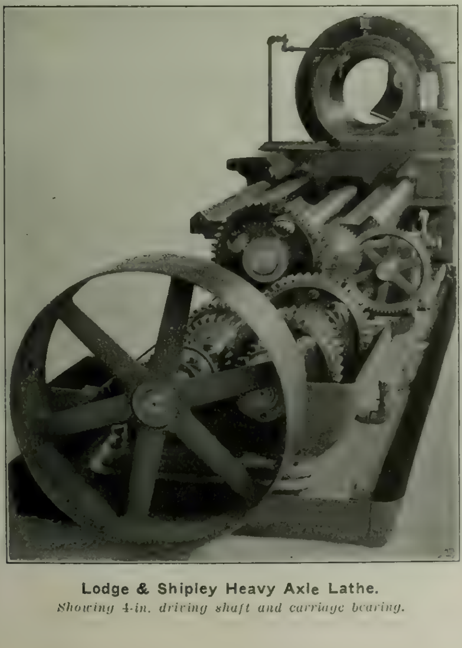
The accompanying illustrations show an extra heavy axle lathe of rigid construction, with a powerful drive and all the conveniences that the character of the work demands. Under ordinary conditions this lathe will finish 26 car axles in 10 hours. The bed is massive, the reasonable overhang of the same when necessary. In addition to the front and rear V's and the inner flat tracks, a 45 deg. plain surface is machined on the bed to increase the bearing of the carriage.

Simplicity in design and unusual ability to deliver power to the cut are claimed for the drive. Power is applied to a constant-speed pulley of large diameter and wide face, running at high speed. Variation in speed is obtained by sliding gears which run in an oil bath. All shafts are carried in bushed, positive, ring oiled bearings. All gearing is of steel. The 4 in. driving shaft is held in alinement by a number of journal blocks bolted to the bed. There is no overhang on the pinion of the main driving gear, since the shaft is supported on each side of it in long bearings. The large gear meshing with this pinion is placed in the center of the driving head, and, as with the pinion,



Lodge & Shipley Heavy Axle Lathe.

cross-girths being of box section. A longitudinal member, of box section, is cast in the center of the bed and extending its full length parallel to the outer walls, further stiffening the cross-girths. The walls of the bed are heavy and the metal dovetails on the upper and lower edges are as nearly equal as possible. The ends of the bed are cut away to facilitate the removal of the tailstock or to permit a

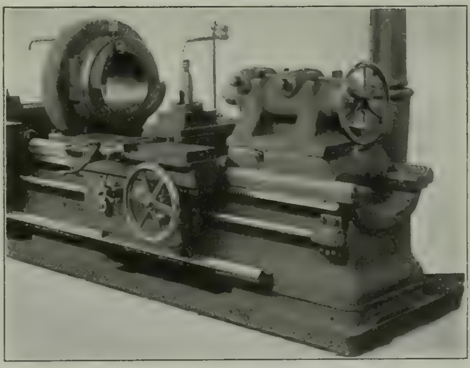


Lodge & Shipley Heavy Axle Lathe.
Showing 4-in. driving shaft and carriage bearing.

has a double bearing. All feed gears are steel. The splined feed rod is driven from the main shaft through a change gear box, giving three feeds which may be changed while the lathe is running.

The apron is of compact box construction, and is tongued and grooved into the carriage. It is further supported by a third V, cast in the bed, directly under the apron. This construction supports the apron at the bottom for both vertical and transverse stress, and overcomes any spring of the apron due to the thrust from the rack pinion.

In addition to the bearing on V's on the front and back shear of



View Showing V Support for Apron.

the bed, the carriage also has a flat bearing or track on the inside of the front shear. A further angular bearing of 45 deg. tends to secure a permanent alinement of carriage with bed. The character of the carriage-bearing upon the bed is of importance on account of the great thrust upon the burnisher as well as from heavy cutting. Water troughs are provided around the tool slide and wings of the carriage. The tool post is arranged with hardened toothed plates interlocking with the tool and effectively preventing any possible

swiveling or slipping of the tool under the heaviest cuts.

The tailstocks are of massive construction and firmly bolted to the bed. The clamps are brought to the top of the spindle barrel. A pawl, engaging with a rack cast in the bed, is attached to each tail stock, this design tending to relieve the stress on the clamping bolts and overcome the thrust of heavy cutting when blunt cutting tool angles are used. The tailstock at the driving end has a stationary spindle with no transverse adjustment, the necessary adjustment being obtained from the spindle of the second tailstock, which is also provided with a transverse adjustment. The plug clamps for binding the tail spindle are of improved design, there being two for each tailstock, placed at the top of the spindle barrel.

This lathe is made by The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.

Parkesburg Iron Tube Mill.

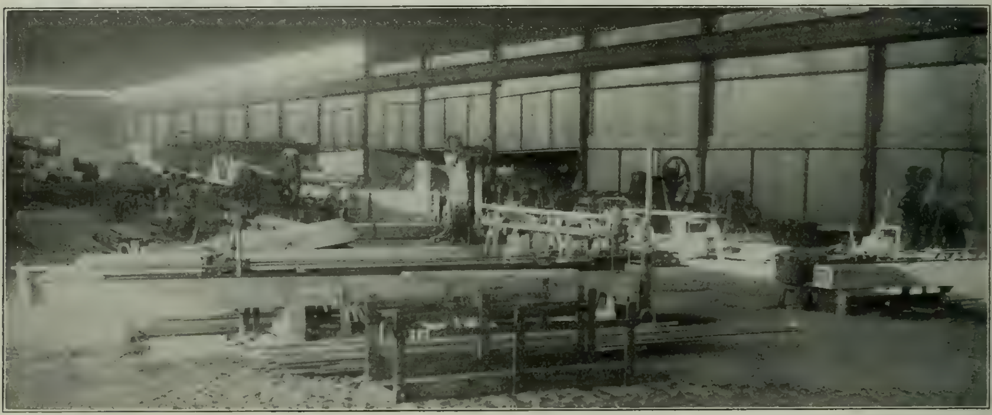
The new tube mill of the Parkesburg Iron Company, at Parkesburg, Pa., recently built and equipped with improved appliances, is illustrated herewith. This company claims the unique record, that of the charcoal iron forges and plate mills of half a century ago, it is the only one in existence to-day that has preserved and improved the old methods of manufacture and has confined its business exclusively to the production of charcoal iron.

The original mill has 26 forge fires for sinking knobbled hammered charcoal iron blooms, two bar mills for rolling the blooms into 7-inch bars, and four plate mills for rolling the bars into skelp for tubes. This plant is self-contained, having a power plant and machine shop, together with chemical and physical laboratories where the output, which in recent years has amounted to 20,000 tons annually, is daily subjected to exhaustive physical and chemical tests.

Ground was broken for the tube mill on March 11, 1908, and on November 9, of the same year, the first tube was rolled. The main tube mill building, erected by the Phoenix Iron Co., Philadelphia, Pa., is 85 ft. by 625 ft., being served in all parts by a 10-ton crane, made by Wm. Sellers & Co., Inc., Philadelphia, Pa. The one bending furnace and two welding furnaces were erected by the S. R. Smythe Co., Pittsburgh, Pa., who also had the contract for the gas producers, mains and stacks. These furnaces are giving excellent results, making tubes up to 22 ft. long. The stacks, being 4 ft. by 125 ft., afford draft which enables the furnaces to work quickly and economically. The machinery, built by the United Engineering & Foundry Co., Pittsburgh, Pa., includes cold and hot scarfing appliances, bending bench, welding rolls, finishing and cross rolls with a cooling rack, arranged with the necessary tables whereby the tubes from the time they leave the welding furnace until they are delivered into baskets in front of the straightening press and cutting off saws are not touched by hand.

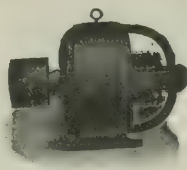
The power plant, lying between the main building and the trestle, which latter conveys coal to the gas producers, consists of a battery of three 240-h. p. Maxim boilers. A compound Buckeye engine, which, with 125 lbs. pressure at 150 r. p. m., develops about 800-h. p. A 500-kw. Westinghouse generator furnishes the power necessary to turn the mill machinery which is motor driven. The necessary pumps for testing tubes and operating the few hydraulic appliances, with a small generator for lighting, complete the equipment.

A rigid system of inspection allows only such tubes to be shipped as will meet all tests required. The aim throughout has been to avoid unnecessary handling, and to facilitate as rapid work as is consistent with the best practice.



Tube Mill; Parkesburg Iron Company.

One End of Tube Mill.



Form I Motor
5 to 45 H. P.

Motor-Drive for Railway Shops

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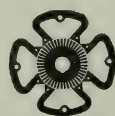

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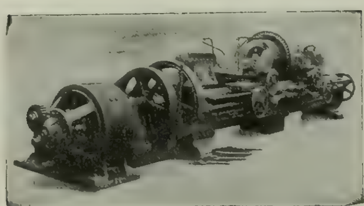

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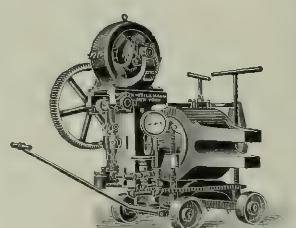

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CONTENTS

The Houston (Tex.) *Post* sarcastically proposes "rate-making by convention" as the future railway policy of Texas. It suggests this would be a better plan than the present one, of maintaining a commission, and having the legislature constantly interfere with the work delegated to it. The criticism is just. Regulation by commission, hampered and thwarted by regulation by legislatures, leads to the worst evils of both systems. The commissions seem naturally prone to deal rather hardly with the railways. They usually can be relied on to use as drastic methods as are required. In the course of their work, however, commissioners get knowledge and experience that warns them there are limits beyond which restrictions and burdens on the carriers should not go. If they know the legislature is apt to interfere they may overstep these bounds. If they do not overstep them, and the legislature, whose members usually know next to nothing about any phase of the transportation business, comes in and undertakes what the commission has refused to do, the results may be worse than if the commission had been less conservative. There is only one wise course, and that is for the legislature to confer on the commission such constitutional authority as the public desires to be exercised, and then leave it a free hand, under the control of the courts, to exercise its powers. The most ill-equipped, inexperienced and even unfair commission, representing the entire state, is pretty sure to handle more wisely and justly the hard, complicated problem of railway regulation than perhaps 200 men, each representing only a small part of the people, and each log-rolling for his little constituency, regardless of the interests and rights, either of the concerns regulated, or of the rest of the public. The bane of railway regulation is the ignorant, selfish, petty views of those who seek it, of those who exercise it and often of those who oppose it. It is a big subject that ought to be handled in a broad way by big men having the people of not less than a state, and preferably of the entire nation, for their constituents.

LISTENING TO INVENTORS.

The annual report of the Block Signal and Train Control board, printed in these columns January 15, shows no direct good results from its conscientious labor. Its indirect results and advantages are material and may be considered later. The board examined 371 devices; concluded the examination of 184; found only 12 of enough merit to warrant even an inquiry; and of these only four which were in the hands of proprietors who had the knowledge and the energy to install their apparatus. Reducing still further, only one was ready for a test.

This tells effectually the old story with which railway officers are familiar. Less than three-tenths of one per cent. of the block signaling devices submitted last year were ready for experiment.

The Signal Board might have gone farther and reported the truth, that the principles involved in every device submitted to them were either:

1. Of a class already well-known; and which has been examined by many practical railway men and virtually rejected as not promising any substantial improvement in the safety of railway traveling generally.

Or, 2, those embodying "wireless" and other chimerical schemes which, while very interesting from a mechanical or electrical standpoint, do not offer any practical advantage over the simple devices already in use in connection with automatic block signaling on all our principal railways, or over plans already well enough known but known to be useless.

Although the direct result is a "water haul," catching no fish, the lesson to inventors, who spend money and time in attempting to improve arts with which they have no practical acquaintance, should be an effective one. The Board is competent and dispassionate; it has been painstaking and judicial; after a year's work it has found nothing to recommend. And yet, the strongest reason for its establishment was the long-continued charge and accusation that railway officers refused to investigate new and valuable inventions, and that signal companies belittled them, bought them up cheaply and suppressed them.

Another indirect result of the Board's existence is the time saved by railway men. These 371 inventors would have cost many officers both time and stress in more or less painful interviews. The Board reports that: "Inventors often are exceedingly persistent, and some of them, sorely disappointed at the unfavorable decision, return again and again." The chance of the railway officer to refer these applications to an expert organization is not simply a relief of his burden, it is to the money advantage of the inventor who can get a quick, unbiased, and probably in all cases a final judgment.

Government interference is not sought by earnest and capable workers; scientific investigation by government boards is of the highest value to inventors, manufacturers and users, as is shown by this report of the Signal Board, by the Ordnance Department tests of steel, and by the work of the agricultural and other departments.

The work may well be extended to other railway safety appliances.

WANTED A DIPLOMATIC CORPS.

We had occasion, week before last, to pay our editorial respects to what we called the claim-department type of relations between a railway and its customers; the characteristic claim department idea, simply expressed, being to pay the man who has a loud voice, and to weary and harass the man who has not a loud voice. We made the point that the kind of public feeling which this sort of thing engenders costs money, and that it is always going to cost money. We are inclined to think that the supposed difficulty of getting public relations on a really friendly and constructive basis is very much exaggerated. We believe that the experiment has never really been tried in a broad and efficient manner.

Even the least of governments, the smallest of principalities, has an army to invade and to repel invasion, and a diplomatic corps to economize the use of the army. Now, a railway has a good many points of analogy to a government in its public relations, except that its governing is considerably more real and tangible to the citizens than that of the average principality, and that it is a government which the people at the present time are singularly prone to overthrow.

The railway also has its army to invade and repel invasion, with an operating division, an engineering division and a law division, of which the claim department is a brigade. It has need especially of defensive forces, because it is a very curiously shaped kingdom, being 1,000 miles long, let us say, and 100 ft. wide, and wholly surrounded by other principalities which may or may not be friendly. The internal affairs of this railway kingdom are very ably conducted, but it has also external affairs constantly to consider. Strange to relate, it has no diplomatic corps to cope with these affairs.

The principality of Monaco, surrounded by the French department of the Alpes Maritimes, excepting on the side towards the sea, contains about eight square miles of territory. It has an army of 126 men and a well organized diplomatic corps. The railway principality, 1,000 miles long and 100 ft. wide, occupies about 19 square miles of territory; it has a strong army, but no diplomatic corps whatever. Does not everybody recognize that the tendency of armies is to get governments into trouble, and that the function of diplomatic corps is to prevent them from doing so? Yet the railway principality provides itself with the army but neglects the diplomatic corps—has been doing so, in fact, for a great many years. Do the results need any explanation?

It is fair to say that the railway principality does a good deal of diplomatic adjusting in an informal way. When W. J. Harahan was assistant manager of the Illinois Central Railroad he made frequent trips over the line in his car and at all times paid the closest attention to the popular murmurs or rumblings which he heard along the route. If the division superintendent at Mattoon, Ill., brought in a local paper with sarcastic comment about late passenger trains or about slow delivery of shippers' freight, Mr. Harahan would conduct a first-class investigation of the situation and would try to correct the difficulty at once, and thus to stop complaints by removing the cause of them. This kind of work is being done, more or less spasmodically, all over the country. In a similar way the traffic department is constantly straightening out minor tangles which occur, but its ability to prevent the same causes of dissatisfaction from arising again is none too great.

Suppose, for the purpose of illustration, that a great railway should appoint a vice-president in charge of public relations; a man of mature years and judgment, skilled in railway affairs and human affairs as well, and carrying enough weight in the councils of his company so that his suggestions would be apt to be carried out. Suppose he were to devote his entire time to a first-hand study of local conditions in every community directly served by the railway, with a view to heading off causes of unpopularity as fast as they might appear, and to discovering, from a point of view a little less obscured by official duties than that of the president or the general manager, the kind of service which the railway was really giving its patrons, and the way in which that service could be performed better and existing friction removed. Such a man would be neither a traffic officer, a legal officer nor an operating officer, but would be in some measure a combination of the three in his active work.

Would not such a vice-president earn his pay? We believe that he would, and we shall welcome comment and discussion on this subject from our readers.

RECUPERATIVE POWER OF RAILWAYS.

Analyzing a table compiled by the *Wall Street Journal* of prices of stocks during 1907 and 1908 it will be found, in round numbers, taking highest and lowest quotations, that during the panic year 1907 the stocks of 119 railway companies which on their "high" mark stood for $6,480,000,000 lost in depreciation during 1907 the sum of $2,470,000,000 and in 1908 recovered all but $19,000,000 of it, or $2,451,000,000. On 140 stocks not railway representing at high mark $4,792,000,000 the loss in 1907 was $2,287,000,000 and the recovery in 1908 was $1,872,000,000, thus lacking $415,000,000 of complete recovery as contrasted with only $19,000,000 in the case of the railways. Wall street returns in such compilations are, of course, to be taken with salt and a speculative potential is to be remembered though it cannot be accurately reckoned in. Still the truism is to be recalled that the average guess of "the street" as to average stock values extending over a moderate period of time is a surer credential of actual value than that of the individual unless he happens to be an insider of a particular stock or group of stocks; and so far as upward speculation bears on prices it is apt to affect the shares of the railways less than those of other corporations, and the same is true of bonds.

As indexed by prices this high recuperative power of the railways of the country—a recuperation both absolute and relative—is extremely significant and cheering, and the more so as it is holding its own against some obstructive forces. Even the optimist need not hesitate to name them. In the immediate foreground is tariff revision. Legislative railway baiting by new law is probably near its end, but we have yet to see what the administration of recent laws is to be at the hands of commissions clothed with fresh powers. There is a residuum of uncertainty as to the attitude of the next administration toward the railways. General business of the country as reflected in railway earnings has improved steadily but it has also improved very slowly, and prices of railway stocks have outrun earnings gross and net. The optimistic—by which adjective we do not mean the speculative—sentiment of "the street" is thus ahead of conditions immediate and visible. Why then have the railways by the test of pretty firm prices so made good?

In the first place there has been the deepening belief of the investing public in the stability of railway property attested, for one thing, by the great increment during the last twelvemonth of the number of stockholders especially in the dividend paying lines. Hard times bowl over a particular group of investments and shake confidence in them; but if they survive the hard knocks investment confidence reacts very strongly in their favor and proportionally to the severity of the ordeal through which they have passed or seem likely to pass. This, essentially, has been the "panic" history of the American railways with the last panic repeating, with variations of its own, the story of earlier panics. Some weaker lines, as was sure to be the case, have had to go to receiverships. But as a whole the railways of the land have adapted themselves wonderfully to adverse conditions and have demonstrated flexibility—the investment that can bend but does not break. The drop in gross earnings a year ago was dramatic and startling; but not less impressive, although slower, has

been the reduction of operating charges by which the companies have met the storm. Nor, probably, does investment opinion go astray when it finds in the lower basis of operating charges the easier adjustment to conditions when business fully revives; when it finds that, with all its misjudgments, the anti-railway law-making of the past two years has trended in at least one sane direction—publicity; and that, coupled with exposures, it has made high finance in railways, if not impossible, at least much more difficult and perilous.

With such reasonings fixed in the mind of the average railway investor of the conservative or moderately conservative type and through him reflected on market valuations one does not have to seek ulterior causes—such as basic resources of the country and her industries, "cheap money" on good crops sold high—to understand how, by the test of price, the recuperation of the railways has been so striking. The test figures may be too high and may recede. That depends upon concrete returns of traffic, which are a better touchstone of value than the ups and downs of the street. But the street's valuation, the consensus of opinion of a host of investors reduced to its average has its own deep meaning, is the standard to which the ordinary railway investor must perforce appeal and which, if it does nothing else, with its enhancement of railway values enhances also railway credit, the upward movement of which has been so impressively shown by the increased sales of railway bonds.

HIGH POWER MILLING MACHINES AND CUTTERS.

The power consumed by an efficient machine tool is a fair measure of the work accomplished in removing metal, and the total power used in a machine shop may be taken as a rough indication of the shop's output, so far as the machining of metal is concerned. The great progress which has been made in locomotive shops by the use of direct-driven motors, improved designs of machine tools and high-speed cutters may be indicated by the fact that twenty years ago a belt-driven shop 300 ft. long and 60 ft. wide, equipped with all necessary tools for locomotive repairs, could be operated by two line shafts, each transmitting 75 h.p., while some modern locomotive shops have individual tools driven by 75 h.p. motors, and the consumption of power by some of them is as high as 100 h.p. In other words, two high-power machine tools are now using as much power as was formerly sufficient to drive all the tools in a good-sized locomotive machine shop, and the weight of metal removed per hour by the two tools is equal to that from all the tools in the old shop.

Some recent tests of slab milling show a consumption of 96 h.p. in driving one cutter, and the amount of metal removed is so far in excess of previous performance that it calls for radical improvement in the design of milling machines. The milling machine has not been used extensively in locomotive shops because the amount of metal removed was limited by the low efficiency of the cutters, and milling machines could not compete with planers, even with their disadvantage of cutting only on the forward stroke. The efficiency of the milling cutter has been so improved recently that it is now possible to force it to large output, and this gives new and large possibilities in the development of milling machines which will make them more active and successful competitors with planers; and they will find a larger field for usefulness in the regular equipment of locomotive shops.

The shape of the cutting edge of lathe and planer tools has been in the past five years the subject of elaborate experiment and scientific investigation, and this has resulted in a large increase in the efficiency of these tools. The milling cutter, especially that intended for heavy slabbing and using an inserted blade, has been working under the difficulty of wrong design, and the output of heavy milling machines has been limited by this inadequate capacity of the cutters. The mistake appears to have been made in using a straight blade, which can have a correct cutting edge at one point only, but the irregularity of the front slope causes the cutter as it advances to drag on one side and gouge on the other, causing a chattering which soon limits its capacity.

It required such a modification in the shape of the blade as would throughout the whole revolution present an efficient cutting edge similar to that obtained in lathe and planer tools when correctly formed. To maintain the proper slope and lip angle throughout its entire length the blade must be bent to form a helix, and there is then obtained a continuous cutting edge with a constant lip angle throughout any length of cutter.

In 1905 C. D. Peck at the Pittsburgh Locomotive Works developed a milling cutter with inserted blades made of high-speed steel and helical in shape. The amount of metal removed in a given time by this cutter in heavy slab milling was far in excess of those in general use, and the power consumed per cubic inch was reduced. Mr. Peck also demonstrated that the capacity of the inserted helical cutter made of high-speed steel was in excess of the high-power milling machine as made at that time. The further development of this cutter was described in a paper presented at the December, 1908, meeting of the American Society of Mechanical Engineers by Wilfred Lewis and William H. Taylor. In addition to the consideration of the correct form of the cutter, the paper describes the details of manufacture and method of fastening the blades by an alloy which cools without shrinkage and will resist heavy crushing loads without crumbling. By compressing the alloy in the slots the blades are secured to an anchorage so rigid that they may be broken off by sheer force without affecting the fastening. This method of securing the blades permits of the use of a large number of blades in a cutter of moderate diameter, a milling cutter of 8 in. in diameter having 18 blades. The paper contains a report of tests made to determine the capacity of the improved helical cutter and the power consumed per cubic inch of metal removed. It calls attention to the importance of the cooling liquid, or lubricant, as it is there called. The heat generated by the pressure of the chip is the chief cause of wear, and if allowed to become too great it will soften the lip surface of the blades and make them crumble off. An ample supply of liquid during the milling operation carries off the heat and materially lessens the dulling of the cutting edges. The stream should fall at slow velocity and be thrown directly on the chip at the point of removal.

The tests reported show, in results obtained in slab milling a cast iron block 15 in. wide with the Taylor-Newbold high-speed steel milling cutter, 8 in. in diameter and 18 in. face, in taking a cut ½ in. deep and 15 in. wide, the table advancing 7¾ in. per minute and the cutter speed 53½ ft. per minute, that 58 cu. in. of metal was removed per minute with a consumption of 1 h.p. per cu. in. With a cut on the same block 1 in. deep, 105 cu. in. were removed per minute with a consumption of .85 h.p. per cu. in.

In slab milling .30 carbon steel, with the same size cutter, the average amount of metal removed was 45 cu. in., and the maximum 63 cu. in. per minute. In a cut ⅜ in. deep and 18 in. wide, with a speed of cutter 75½ ft. per minute, the rate was 47¼ cu. in., and the total power consumed 96.5 h.p., at the rate of 2.04 h.p. per cu. in. removed. In channel milling, like the fluting of locomotive side rods, made of .35 carbon steel, tests were made with a cutter 4⅝ in. face and 8 in. in diameter. With a cut of 1$\frac{3}{16}$ in. deep the rate was 28.7 cu. in. metal per minute, with 1.77 h.p. per cu. in.

For heavy slab milling of locomotive rods machines are now built which are driven by 65 h.p. motors and remove metal at the rate of 70 cu. in. per minute, and this may be taken as the best performance thus far obtained in the finishing of steel forgings for locomotives.

In the improvement of milling machines accurate tests made by electrical devices show that the efficiency of the

driving mechanism has been increased to 75 per cent., the feed efficiency to 20 per cent., and the efficiency of the cutters as above described is now such as to require the removal of 1 cu. in. forged steel per h.p. as a regular performance.

THE FULTON BILL.

On December 4, 1907, Senator Fulton, of Oregon, introduced the bill now well known, providing an amendment to Section 6 of the Act to Regulate Commerce, to the effect that no change should be made in the rates, fare and charges published by any common carrier, except after 30 days' notice to the commission and to the public, and that at any time during the 30 days any shipper might file with the Interstate Commerce Commission a protest against the increase, in whole or in part, the effect of this protest being to continue in force the existing rates until the reasonableness of the rate proposed to be substituted for the existing one should have been determined by the commission. Briefly, this meant that a single protest would defer a change for an uncertain and protracted period of time, regardless of the rights of the case, and that the rate-making power would be taken away from the railways. The protest custom, once well established and generally understood, it is hardly conceivable that any rate could be raised without finding the single objection needed to block the action.

It will be remembered that this bill slumbered a long time in committee, in spite of the earnest efforts of its sponsor to get it out, and that on January 6, 1909, largely through the efforts of the Railway Business Association, Mr. Elkins reported the bill adversely, and it was placed on the calendar.

On January 18, 1909, Senator Fulton reintroduced the bill in amended form, the amendment providing that the commission shall have discretion to postpone an increase in rates pending a final adjudication of the protests, rather than that such postponement shall be automatic.

The important objection to this bill in the public interest as well as in the interest of the railways, can readily be set forth. After a protest to an increased rate, the commission would have to do two things; it would have to make enough of a preliminary investigation of the case to decide whether or not to issue a restraining order pending full investigation; and it would have to make the full investigation to decide whether or not the protested rate should be restrained perpetually from being put into effect. Recognizing these facts as incontrovertible, it will be seen that there are again two ways in which the commission could do this work. It could make a real investigation prior to the first restraining order, or it could issue the order on a very superficial examination of conditions, supplemented by its knowledge of existing conditions. This latter process, which we have taken some words to explain, may better be described by the five-lettered word "guess." In view of the fact that the commission is notoriously swamped with work at the present time, we see little reason to doubt that its action in the multitude of such cases which would come before it would have to be characterized by the shorter and easier way. Yet to restrain a rate from going into effect is just as important a judicial act during the period of restraint as a final decision on the rate would be. Changes in the rate fabric have often to be made quickly; in point of fact they are more or less constant. It is certainly fair to assume that few of these changes would escape protest, and that the commission would soon be far in arrears in its determinings and have little time left for any other duties. If this turned out to be the case, the railway would be left without recourse during the long period intervening between the preliminary hearing and the final hearing, regardless of the ultimate decision. This amounts to loss of the rate making power, and it would react just as strongly on the shipper and on the community as on the railway. By far the most important of all discriminations in American railway service are the discriminations between localities; the offsets which give one board or one district or one industry an advantage over another. The failure to advance a rate, or a group of rates, under certain conditions would inevitably bring about discrimination of this sort, and the discrimination would be of long duration, if determination of the case were to be held up to await the convenience of an overworked commission.

But the harm of Mr. Fulton's amendment to the Interstate Commerce law goes further than this. If railways are to be estopped from raising their rates without great formality, delay and hazard, they are not likely to be quick to reduce them to meet temporary conditions. A single example of this will suffice. Several years ago, at the time of a trade depression which was sharply felt, although much less acute than the present one, it was pointed out by the steel manufacturers that, given a very low export rate to tidewater, they could dispose of their surplus products in certain foreign countries at a small margin of profit and keep the plants running. The fairness of this was apparent and an extraordinary low rate on export steel was given them, which moved an enormous tonnage to tidewater and kept the mills open. It is safe to say that it would not have been given them under the conditions which would exist if the Fulton bill became a law. Great Britain has suffered for many years from the inflexibility of its rate structure; in this wide country of ours, the hurtfulness of rate inflexibility would be almost proportionate to the area, and all persons interested in our best commercial welfare would oppose with all their mights this easy kind of law making, the importance of which is probably grasped only by the smallest fraction of the legislators who enact it, while the harm of it continues unchecked for long years.

NEW PUBLICATIONS.

Die Dampflocomotive der Gegenwart. Von Rovert Garbe, Geheimem Baurat, Mitglied der Kgl. Eisenbahndirection Berlin. 500 pages, 388 illustrations and 24 plates. Berlin, 1907. Julius Springer. Price, $6.

In the preface the author of this valuable work on the present status of locomotive construction clearly states the object of his book. This object is to set forth the advantages to be attained by the use of highly superheated steam in locomotives, in simplicity of construction as well as economy of operation, as compared with locomotives using saturated steam. While his general theme is the locomotive of to-day, his particular topic is the locomotive using highly superheated steam.

Trials with this type of locomotive were taken up by the Prussian State Railways in 1898, largely on the recommendation of Garbe. In collaboration with Wilhelm Schmidt he has been actively engaged in remedying the defects brought out by actual operation, and the success of their joint work is shown by the number of superheated steam locomotives in use at the present time—upward of 2,700.

In recent years the increasing demands of traffic on the power of locomotives has led to a great increase of boiler dimensions, and this in turn to weights of the entire machine in excess of those necessary to secure the adhesion required. For heavy and fast service the compound engine has in many cases taken the place of the simple engine, the increased economy offsetting the more expensive complex construction and costlier maintenance. These were the conditions that obtained at the time of the introduction of the superheated-steam locomotive.

In view of the economies resulting from compounding high pressure saturated steam, it was natural that similar results should be aimed at by applying this principle to superheated steam. In the author's opinion this is not to be recommended in connection with the locomotive; he considers it a mistake, and besides devoting a chapter to its discussion, frequently recurs to it in other parts of his book to point out the lack of satisfactory results.

Based on numerous experiments and on extended experience, Garbe gives 100 deg. C. (180 deg. F.) as the lowest

degree of superheat that will approximately superheat each particle of steam and impart to the body of the steam the properties of a true gas. For steam of this and of higher temperatures he uses the term "hot steam." Using hot steam in the properly proportioned cylinders of a simple engine, a cut-off of 20 per cent. with 45 lbs. initial pressure still gives excellent indicator cards, and with 40 per cent. cut-off the engine exerts its maximum hauling power at the average speed for which it was designed. The economy of the compound over the simple engine, both using saturated steam, lies in the better utilization of high pressure in the former and the smaller steam condensation, which is reduced from 35 per cent. to 25 per cent.-20 per cent. The economy of the hot-steam locomotive is not dependent principally on high steam pressures, it is due to the fact that highly superheated steam is a thinly fluid gas, a poor conductor of heat, behaves in the cylinders, even under much throttling and with short cut-offs, like a permament gas, and that in a simple engine there is no condensation. To secure the advantages inherent in hot steam by using it in a compound locomotive, it would be necessary to avoid steam condensation in the second cylinder as well as in the first. To achieve this it would be necessary to lengthen the cut-off of the high-pressure cylinder to 60 per cent. to 70 per cent., which would result in raising the mean temperature of the walls of the cylinder to such a degree that lubrication would be difficult and the cylinder endangered. Moreover, highly superheated steam would enter the low-pressure cylinder, which that cylinder would not be able to stand. Even with its greater efficiency the compound locomotive has not prevailed over the simple, both using saturated steam. The increased efficiency of the hot steam as applied to locomotive is an established fact, and by its use the means are furnished to entirely abandon the principle of compounding in connection with locomotives and to return to the simple construction. Trials have shown that to develop the same power it consumes from 25 per cent. to 20 per cent less coal and 50 per cent. to 30 per cent. less water, according as the comparison is made with an ordinary simple or a compound. In comparative tests with three locomotives, a simple hot steam, a simple and a compound using saturated steam, all three burning the same amount of coal on the grates, the first shows an increase of hauling power of 70 per cent. over the second and of 40 per cent. over the third. High superheating therefore furnishes the means of satisfying the increasing demands for higher speeds and greater hauling power by the use of a simple engine, without enlarging the boiler dimensions or those of the locomotive. The bearing of these economies on increasing the length of run of an engine without taking on coal or water is evident.

From the foregoing it will be seen that the author champions the exclusive use of the simple engine in connection with hot steam. To establish this contention he devotes an entire chapter, besides referring to it repeatedly. It is hardly necessary to say that not all designers are in accord with him. This is shown by the hot steam compounds that have been built during the last years in Europe. These have been designed for special services, and in course of time their records will show whether they have a reason for existing.

The subject matter is divided into two parts: I. Locomotives using saturated steam, 180 pp. II. Locomotives using hot steam, 312 pp. The diagrams, plates and tables of tests, etc., are excellent and valuable.

Part. I A general description of the characteristics of the construction, dimensions and efficiency of American locomotives precedes a detailed description of some of the most noteworthy examples. This is followed by a similar description of prominent and characteristic European locomotives. A chapter is devoted to the salient features of recent constructions, and this part ends with an account of American methods of building locomotives based on the author's observation during a three months' visit in 1904. His criticisms in this connection are of interest.

Part II. Attention is called to a use of superheated steam for power in 1832 and to the unsatisfactory results of trials in the navies of the United States, England, and France in the early fifties. The lack of success in these as well as in subsequent trials was due not only to faulty constructions, but also to the inability of organic lubricants (the only ones at that time available) to stand a higher temperature than 250 deg. C. (482 deg. F.). It was the production of American mineral oil lubricants of high burning points that made it possible to use highly superheated steam in the engine. In its practical application Wilhelm Schmidt was the pioneer. He recognized and demonstrated the economies resulting from its use, designing and constructing a superheater which today, in its later development, is the one generally employed. Based on satisfactory results with stationary engines, the Prussian State Railways in 1898 built two express locomotives for superheated steam, the specifications being furnished by Garbe. These were put in service, and in spite of defects, since remedied, they showed a marked increase in efficiency and are still in use.

The scope of this part is best shown by the headings of its subdivisions:

1. The behavior of superheated steam as a source of energy.
2. The simple hot steam locomotive and the four-cylinder compound with moderate superheating.
3. Superheaters for locomotives.
4. The steam engine of the hot steam locomotive of the Prussian State Railways. (Details of construction.)
5. Tests and operating results of the hot steam locomotive.
6. The hot steam locomotive of the Prussian State Railways.

The presentation of the characteristics of saturated and of superheated steam, together with their behavior as vehicles of power, bringing out the importance of a high degree of superheat, is followed by a discussion of the principles that are to be observed in the construction of heaters to produce uniformly superheated steam, the influence of hot steam on the dimensions of the cylinders, together with various points of importance in connection with the saving of fuel and water, and the resulting increase in efficiency. The next chapter is devoted to the main contention of the author, that there is no advantage to be gained by compounding hot steam and that the engine of the future is the simple engine using hot steam.

The remainder of the book treats of the structural details of the constituent parts of the hot steam locomotive, tests and operating results. It contains a mass of information of great value not only to the builders of locomotives but also to the operating department of railways. Of particular interest to the latter will be that owing to the greater range of economic working the Prussian State Railways have, in the case of hot steam locomotives, been able to make a considerable reduction in the number of classes of locomotives needed to cover the requirements of their service. They have adopted for this purpose the following eight classes:

I.	4-4-0	Express	locomotive	78	in.	drivers
II.	4-4-0	Express	"	82½	"	"
III.	2-6-0	Passenger	"	63	"	"
IV.	4-6-0	Express	"	69	"	"
V.	0-8-0	Freight	"	53	"	"
VI.	0-6-0	Tender	"	53	"	"
VII.	2-6-0	"	"	49	"	"
VIII.	0-10-0	"	"	53	"	"

The entire work is one of the most valuable that has appeared in recent years on the subject of which it treats, and is the only one that thoroughly discusses the merits and construction of the most recent member of the locomotive family —the hot steam locomotive. E. F. E.

The Design of Highway Bridges. By Milo S. Ketchum. New York: *The Engineering News* Publishing Co. 144 pages; 6 in by 9 in.; 308 illustrations. Cloth. Price, $4.00.

This book is intended to be supplementary to the Design of Steel Mill Buildings by the same author. It will be an ac-

ceptable addition to the library of the designing engineer, especially in view of the paucity of works on the subject of highway bridges, despite the fact that railway bridges have been so extensively discussed and written about. The book before us is essentially a book for the student, not necessarily a student in a technical college, but a student in the sense of one who studies. It offers a brief course in the calculation of bridge trusses which is followed by a systematic discussion of the problems involved in the design. In a way it is elementary, in that it attacks and explains the first principles of calculating such stresses and yet in order that it may be followed intelligently it pre-supposes some previous knowledge of the theory of stresses but as to just how much it is difficult to say.

The opening chapter presents a series of descriptions of the several types of bridges that are in use and this is followed by one on loads and weights. This chapter contains some very interesting and valuable diagrams to be used in the preliminary estimates of the weights of bridges in order that the first estimate of stresses can be made before the details are worked out. In the third to eighth chapters there is given a short but exceedingly clear demonstration of the resolution of forces in the determination of stresses in the various types of structures that are under consideration. In this some preliminary training will be required for a complete understanding of the work, but to any one who has had this training the problems and their solution will be a simple matter to follow. Then comes a series of practical problems in the form of exercises that are to be worked out under the guidance of the text. The method pursued is to state a problem, giving the length of span, the type of truss, its depth, and dead and live loads per lineal foot. This is accompanied by an outline of the method to be pursued in the solution of the several stresses such as those that occur in the chords, webs, floors, etc. These problems cover work on the Warren, Howe, Pratt, Baltimore, Whipple and camel back trusses, several examples being given for each and all accompanied by diagrams of a typical case. The details of construction receive a large share of attention and this discussion of the details includes the piers and abutments with a chapter on the erection and estimates of weight and cost. The book is profusely illustrated, not only with diagrams of the structures under immediate consideration, but with reproductions of photographs and drawings of bridges that are in use.

While the book is intended chiefly for the use of the designer and student of steel bridges it also deals with stone, concrete and reinforced concrete bridges as fully as the limited space of a single volume will permit.

Letters to the Editor.

RAILROAD EMPLOYEES' AND INVESTORS' ASSOCIATION.

South Chicago, Ill., Jan. 5, 1909.

To the Editor of the Railroad Age Gazette:

Of the many agencies at work in the interest of industrial peace and prosperity none has chosen a more advanced and consistent basis of action than the Railroad Employees' and Investors' Association. In this movement is reflected the progressive spirit of the age and the need of the hour. Its formation adds a chapter to the railway history of America of greater interest and more importance to railway labor than is contained in the long record of needless and destructive warfare between employer and employee.

Ten years ago the writer, in an article published in this paper, expressed the opinion that "so long as the owners and operators of railways remained in hostile camps the interest of both must continue to suffer and be sacrificed as a penalty for outraging the laws of common sense and sound business methods." In this same article it was shown that as the scope of antagonism broadened between employer and employee the hardship and suffering of both increased.

While this new movement is misunderstood by many, and misrepresented by some, it is a cheering sign of the times that these two closely associated interests have at last concluded to heed the imperative duty of correcting at least some of the long continued abuses that disturb the railway household and weaken the entire structure.

As producers of transportation railway employees are interested in the market value of their product. The present great public clamor against the railways has for its basis the desire of the consumers of transportation to buy the product as cheaply as possible, and in many cases for less than the cost of production and without regard to how it would affect the more than a million and a half of men and women engaged as producers. For this, if no other reason, railway employees can with profit turn their attention toward this new association and give it hearty support, as in this way they can strengthen their positions as wage earners and bread providers.

F. J. O'Rourke,
Switchman, C., L. S. & E. Ry.

FOR INCREASED MISSOURI RIVER TERMINALS.

St. Joseph, Mo., January 26, 1909.

To the Editor of the Railroad Age Gazette:

With the restoration of normal industrial conditions and the general revival of business in the West, the volume of trans-Missouri traffic promises soon to reach the high level of the period immeditely preceding the "slump" in the latter part of 1907, but with this difference, that in 1907 was reached the crest of a series of record-breaking years in the movement of freight traffic, while the coming revival will, it is predicted, mark the beginning of a gradual increase to greater proportions than ever before.

These predictions coming true, the railways and the shippers of the Central West will face a problem of vast consequence to them—the problem of expeditious and economical handling of freight.

In this article especial reference is had to traffic crossing the Missouri river, in either direction, in the lower district, and to the concentration which of necessity ensues from interchange between roads at the principal gateways—in other words, to the important matter of terminal facilities at these centers.

The freight producers of the West are keenly interested in the question of how the railways are to meet the shipping demands of the future. Looking backward not more than ten years, and comparing the volume of trans-Missouri traffic of the present with that time, and noting the remarkable increase, then looking ten years ahead to the probable growth, no stretch of imagination is required to foresee this business doubled in volume. Recalling also to mind the congestion, delays and losses suffered for months prior to the slump referred to, it seems none too early to consider how the carriers are to provide for the calls of the future upon their facilities.

St. Joseph, the central gateway in the lower group of Missouri river cities, is well situated, geographically and physically, for terminal and interchange development. Six of the western trunk lines now enter this city, and six more are within 30 to 60 miles, and could conveniently gain access. The banks on each side of the river are high, and above danger from overflow. A large acreage of terminal property is available that could be secured and improved at comparatively low cost, and terminals so located as to be operated at minimum expense.

The correlation between all shipping interests is such that whatever would help or hinder one point would correspondingly affect other points. Therefore, this suggestion is not made in the interest of a single community, but for the relief of all the gateways—which are also important commercial centers—of all communities served by them, and of the car-

riers and the districts beyond which freight shipments must cross the river.

No more favorable time than the present will be afforded the railways to acquire new terminals or increase old ones at this point. St. Joseph is a city of well over 100,000 population and possessing extensive commercial and industrial interests, with every indication pointing to a rapid growth in these respects. In the course of events, property available for terminals and which might be secured now on low valuation, if not taken over for that purpose, will be devoted to other uses. Thus, the available terminal property will become limited in area and higher in price.

The shippers of this city and the entire West are greatly concerned in the matter of the prompt transportation of their goods. Good service is of such vital importance to them that the main question with them is how to co-operate with the carriers for better facilities. Congested terminals, interruptions in the movement of traffic and uncertain deliveries throw out of gear the machinery of industry, commerce and finance, and the losses entailed are incalculable. Closely following the losses to the shipping interests are those directly and indirectly sustained by the carriers from the same cause.

The time has come when shippers and the carriers should take counsel of each other for the well-being of all. The entire problem of rail transportation is a gigantic one, of which the matter of terminals in the principal and strategic centers is the most formidable. It is not sufficient that shippers merely call the attention of the carriers to their requirements and then, without offering a helping hand, sit by and ask that every provision be made to meet them. This is a joint, and should, in so far as the circumstances admit, be made a common cause between the patrons and the roads.

The business interests of St. Joseph, feeling, as they do, that advance preparedness is the surest safeguard against business losses through congestion and delay, and foreseeing the needs of the future, stand ready to render all possible aid to the railways in the development of terminal facilities at this gateway.

H. G. KRAKE.

Commissioner, St. Joseph Business Men's League.

WANTED; A DIPLOMATIC CORPS.

New York, January 27, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to the editorial in this week's issue, proof of which you have sent me, I believe that the principle enunciated is a correct one, and that the suggestion is most timely, as I believe that there is a better chance for the railways to get into more effective communication with the public now than has ever existed previously. I think that your simile in which will liken a railway to a country with its various departments of government is a most happy one and illustrates most clearly your point. I am disposed, however, to feel that diplomacy, such as you mention, would perform many of the functions of defense which the army performs in an ordinary state. In other words, I think that diplomacy in your figurative railway country is a more important factor than it is in an ordinary government. There is a question, however, of method, that is to say, whether or not the working organization should not be so constituted, and so trained, that it would perform the diplomatic functions rather than someone not connected with the working organization, as you suggest. The working organization, either in traffic or operation, or any other of the various departments, is in position to immediately accomplish those things that should be done to remedy improper conditions. It is true that each of these departments have charge of only a branch of the service, yet I believe with a proper general organization that each department will feel that it is its bounden duty to at once communicate to the others those things that they hear with reference to the other departments which might give rise to criticism. It is, however, true that there are certain local territories requiring particular attention in a diplomatic way, and these situations would have to be handled of themselves by men especially adapted to fulfill the requirements of such a position. This latter, in fact, may be true of an entire system of a railway, in which event I think that the suggestion made to appoint some one high in authority whose duty it will be to give particular attention to this character of work is the one which would be best to adopt. Considering the situation as a whole, therefore, it seems to resolve itself into what is the best method to adopt for each individual case. The principle, however, that there should be intimate attention paid to the relations between the railway company and its patrons, and intimate intercourse sought, should be carried out in a definite manner, and those arrangements made that are necessary to fully meet the requirements.

Even when a special man, such as is suggested, is necessary, I believe that the whole organization should be schooled to feel that their business conduct should be along the lines discussed. The best way to insure this is to direct the training of the men, particularly those men who are likely to be made officers, along these lines from their earliest start in railway business so that this will become a prominent feature in their mind.

Generally, it is only essential that the people should know the truth of railway affairs, and if we insure that they will know the truth in some manner, I feel that a good deal of antagonism will be avoided. We all know of instances in our recollection where simple statements in their transmission between many people become distorted until the original could not be recognized. I am sure that much of the bad impression that the people have received of the railways comes from the fact that many such distortions are always taking place. The best way to prevent such distortion is by such an arrangement that the people will receive as nearly as possible their information at first hand, so that imagination and deductions, which are also largely imagination, do not have to be the only means by which the public have to obtain such information.

My definition of the word diplomat, as herein used, would be one who has the ability to present convincingly the side of the railway on any mooted question, and in such a manner as will result in its obtaining its due, measured by the standard of ordinary business rules.

W. J. HARAHAN.

FLAGGING ZEAL.

New York, January 25, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The Pennsylvania Railroad, in advertising its passenger trains, says to the public:

> The traveler, in the selection of his route, looks for the most securely protected line. The through trains of the Pennsylvania Railroad are drawn over a roadbed of recognized superiority by the strongest and fleetest of modern locomotives, protected by a signal system of proved fidelity, and their reliability is as nearly normal as unflagging vigilance can make it.

It seems to me that a statement of this kind calls for a protest. As a passenger on the night trains of the Pennsylvania, I should be only too glad if the vigilance of the trainmen had a little less flagging about it. This statement—that they are unflagging—is grossly deceptive. It is true that on most roads most of the time, and perhaps all roads some of the time, and on some roads all of the time, the flagmen do not flag. They are universally unflagging, so far as can be observed from the rear end of the train. But as regards the Pennsylvania, the Union Pacific and a few other well-managed roads, the statement is untrue. The flagmen flag hundreds of times daily (and nightly) when there is no need of it. A dozen times on a trip you will see them go back. Usually they go but a short distance it is true; but they go far enough to show that the company does not feel a sufficient sense of security in its block signals, for they do this when a semaphore signal as large as life *stands in plain sight* a short distance back. Usually the stop lasts only

two or three minutes, and the flagman comes back without putting down a torpedo.

Assuming that flagging is necessary or desirable, the most that can be said for this process, as usually carried out, is that the flagman *prepares* to carry out the rule. If there really is a necessity for protection, this necessity grows greater with each succeeding minute, yet the final minute, during which the flagman is returning to his train, and which is the most dangerous minute, is left without protection. To really protect, he would have to go back 100 rods and put down a torpedo, so that there would be some protection while he was coming in.

Constantly making this exhibit before passengers is looked upon by some superintendents as a good advertisement for a railway. It shows them what careful habits are inculcated by the superintendent. Another view, however, is that passengers will be made timid, instead of being reassured, when they see how little dependence the railway places on its block signals.

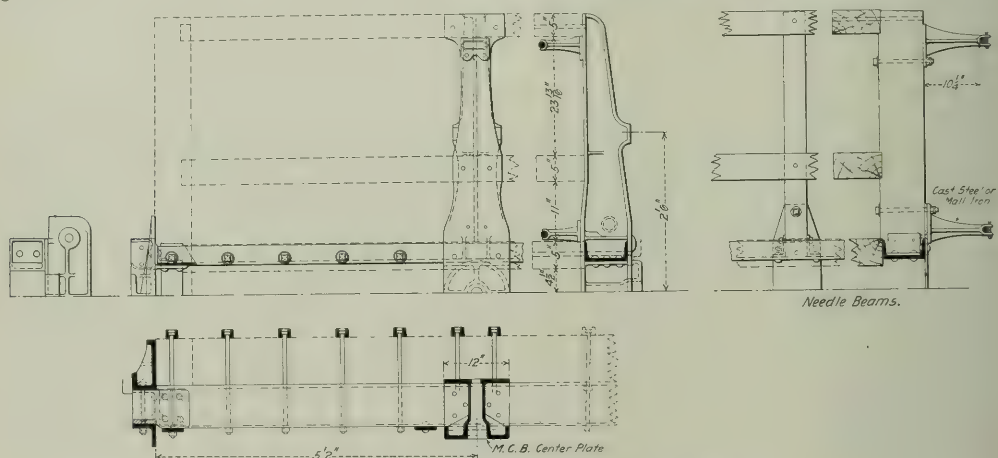
This question of the influence of flagging on passengers may perhaps be looked upon by you as academic; but there is another question that has a real bearing on human happiness if this hasn't; the question of the influence on passengers' peace of mind of the whistle-noise, which is used to call in the flagman. This is severely practical, especially at night. A passenger who depends, as many passengers do, on the noise and motion of the train to lull him to sleep in his berth, is quite likely to be awakened whenever the train has to make an unusual stop; and on the Pennsylvania the greeting that such a passenger usually receives after he has been awake a few seconds is the whistle-signal from the engine—four blasts—loud and not very short—calling in the flagman. Quite possibly the stop has been so short that the flagman has not gone back at all, but the whistle-signal is given invariably.

Let us hear from the literary artists of the Pennsylvania's press bureau on this phase of life on their superlatively excellent railway. This is not a mere growl from a grouchy country editor who has lost his Pennsylvania advertising; the disturbance to passengers which I have cited is a real defect that ought to be corrected. When the conductor goes through a parlor car on the Pennsylvania, punching the tickets, he scatters some of the punchings on the velvet carpet. Very soon the porter comes through with a dustpan and sweeps these up, thus removing what might offend the passengers' eyes. Why should not the company be equally solicitous to abolish all offense to the passengers' ears? S. G.

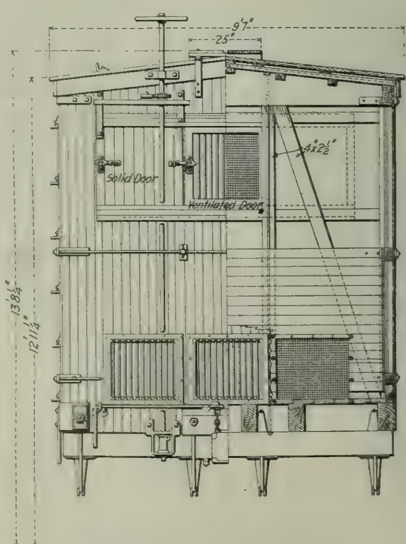
Contributed Papers.

FRUIT AND VEGETABLE CARS FOR THE SAN ANTONIO & ARANSAS PASS.

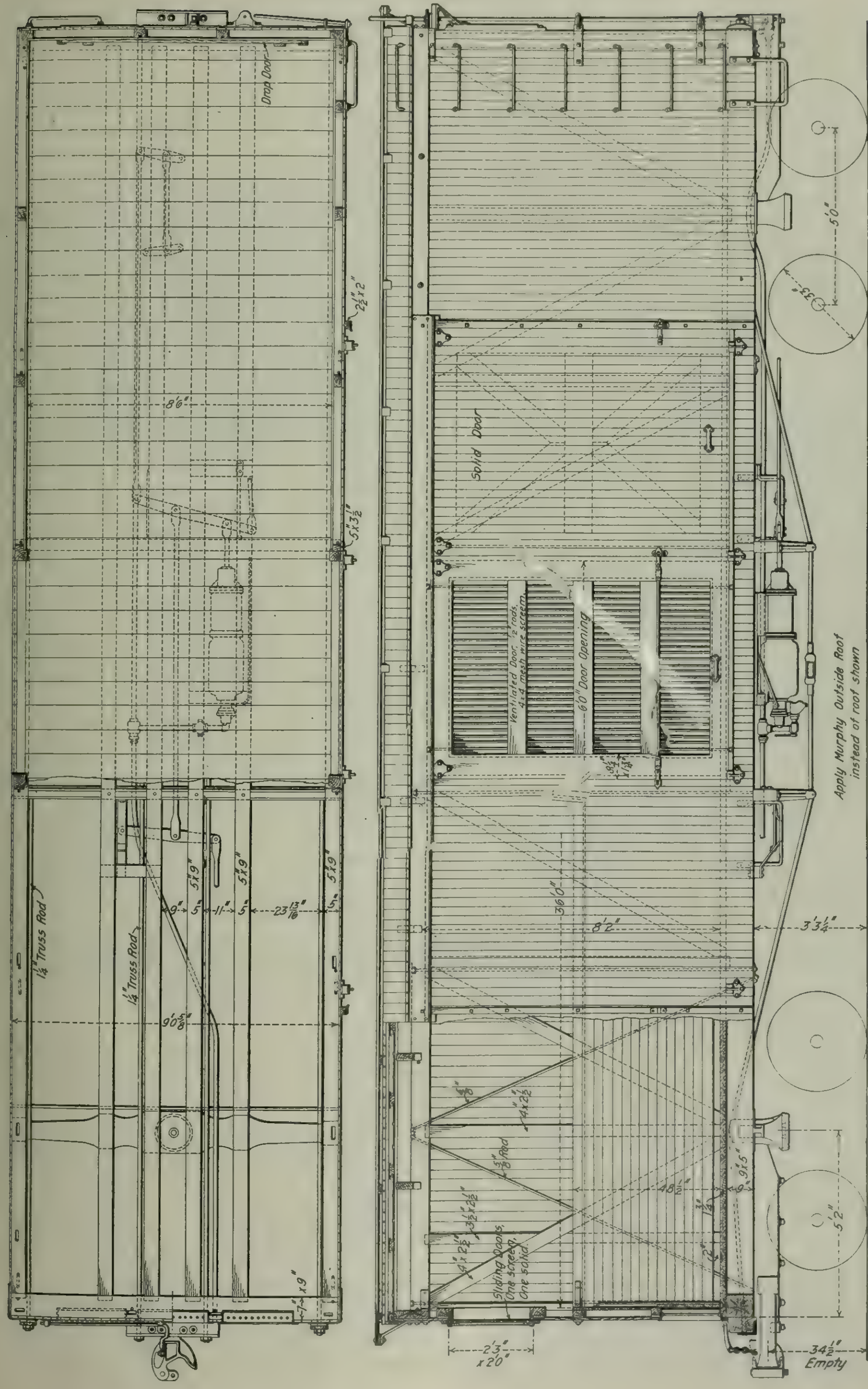
The San Antonio & Aransas Pass is having built by the American Car & Foundry Co. 500, 36-ft. thirty-ton wooden ventilated cars for fruit and vegetable shipments which contain some new features in the ventilating arrangement. This road has a considerable traffic from the truck-growing regions of Texas which it reaches. Truck growers complained that their shipments of fruit and vegetables were damaged from inadequate ventilation, no available design of ventilated car giving satisfaction in this respect. The San Antonio & Aransas Pass began a detailed investigation of the subject, experimenting with different ventilating arrangements and observing the effect on fruit and vegetable shipments as denoted by their



Details of Underframing; S. A. & A. P. Fruit and Vegetable Cars.



Half Sectional End Elevation.



Plan and Elevation of S. A. & A. P. Fruit and Vegetable Cars.

condition on arrival at destination. The arrangement here shown was finally adopted as one meeting the requirements of both the railway and shipper.

It will be observed that the lower end ventilators extends almost the full width of the car; also that the usual small side ventilators are omitted. It was found that these side vents caused the air currents from the end of the car to be deflected in such a way as to leave a part of the lading without air, hence their omission. It is said that air reaches every crate in the car in this arrangement, and that it is the best practicable plan for a car that is also to be used in general freight service. The frames of the lower end ventilators are made of solid malleable iron, which add strength to compensate for the cutting away of the siding for these openings. The end of the car is also stiffened by two horizontal truss rods, one about half way up, and the other near the bottom; the latter also serves as a handhold. Drop doors are provided for closing up and protecting the lower ventilator openings for shipments of lumber and other such materials, and to make them tight for grain shipments.

After the general drawings, reproduced herewith, were made, it was decided to apply steel draft beams, metal buffers, etc., to the cars. A supplementary drawing showing the details of these features was made, and it also is reproduced. The metal draft beams are 8-in. channels bolted to the under side of the wooden center sills to give continuous metal draft members, and also increase the efficiency of the car to load, a plan that is being used on other roads for light capacity wooden cars.

We are indebted to R. F. Peters, Mechanical Engineer of the San Antonio & Aransas Pass, for data for the foregoing.

REGULAR BILLING ACCOMPANYING OR IN ADVANCE OF TRAFFIC.*

BY W. H. NEWMAN.

The practice of receiving and forwarding cars on card bills, which is now being followed by some roads, is one productive of mny evils and should, I think, be promptly corrected. The necessity for such rules now is far greater than during the time prior to "Per Diem" being established.

Now that "Per Diem" rules are in effect and some lines have questioned the rule giving the right to make reclaim for "Per Diem" on cars that have been delayed awaiting regular billing, holding that inasmuch as it is the custom to interchange cars on card bills, no reclaim should be made, it makes it doubly hard on the innocent holding road.

Some roads decline to receive cars until furnished with revenue billing, which causes the intermediate road, who is in no way responsible for the delayed billing, to be the sufferer, not only on account of delay to the traffic, but in many cases perishable freight either has suffered a total or partial loss and had to be disposed of at a great sacrifice on account of inability of the intermediate line to make delivery to its connections, which would carry the traffic to its final destination, for want of revenue billing.

It is well known that the roads with scarcely an exception in what is known as C. F. A. territory have uniformly established rules, which are rigidly enforced, declining to receive a loaded car from any connection unless accompanied or they have been furnished in advance with revenue billing for such traffic, whilst in other territory their connections and lines with which they were daily interchanging business were receiving and forwarding traffic on card bills. Particularly in the South did these conditions prevail to a great extent some time back, but it is pleasing to note within the last twelve months a great number of the leading southern lines have established rules similar to those in effect in territory north of the river.

I think it will be conceded by all that when for some reason the line originating the business sees proper to let the car move on a card bill destined to territory to which the delivering and possibly intermediate lines refuse to accept unless furnished with regular billing and such traffic is delayed (in some cases suffering a total loss) at the junction point or yard, which not only adds to congestion, but requires considerable use of already over-burdened wires, it is manifestly unjust that they should bear this burden in addition to sometimes expense by loss and in all cases responsibility on account of delay to traffic, which has been held waiting for billing from original point of shipment.

Some roads claim that on account of large cargoes of fruit and other highly perishable freight being quickly unloaded at Coast points, and the yards not being of sufficient size to furnish storage for the entire cargo until such time as shippers could furnish billing instructions, they have to allow cars to go forward on card bills to be held at junction point or yard until such time as shippers could find markets for same.

Some officers have also expressed fear that in enforcing such a rule the traffic would seek other gateways. No well-founded objection has yet been advanced that could not be easily overcome if the rules were universally adopted. I hold the above objections only prove the great necessity of the rule being established, for as a matter of fact it would have the effect of preventing just what is claimed is feared, for the reason that no car would be moved from point of loading until revenue billing had been made, and the car being once started on its journey, its clear movement would be assured, which is not the case at present.

The failure to get uniform action of all lines on this subject is no doubt to a great extent due to the fact that it is a subject which affects both the transportation and traffic departments.

It is true that many times it occurs that the loading agent is not prepared to make revenue billing for the traffic at the time loaded, and sometimes it is days after the traffic has gone forward until billing is made due to the fact that he is waiting for instructions from the traffic department as to rate, divisions, route, or some other information that may be desired to be given by the traffic department. If for any reason traffic should be loaded at a point for shipment and the agent is not furnished with rates, divisions, routing or any other instructions, it is eminently proper that the traffic should be delayed with the originating line, which is wholly responsible, and it is a great injustice to intermediate and delivering lines for any initial line to load and forward traffic on a card bill, when it is a known fact before the traffic moves that it can not reach its ultimate destination until revenue billing is furnished. Unfortunately many agents do not realize the necessity of revenue billing being furnished and frequently are not energetic in getting proper information to make up billing after relieving their station of the traffic.

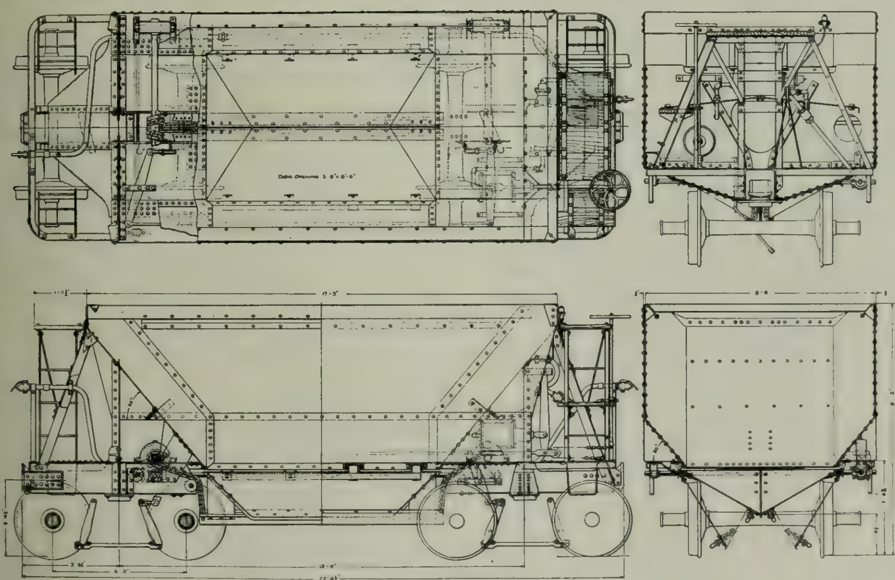
*A paper read at the annual meeting of the Central Association of Railroad Officers, Peoria, Ill., October 14-16, 1908.

The British Uganda Railway, from the Indian ocean at Mombasa west by north 584 miles to Lake Victoria Nyanza, during the year ending with March, 1907, carried 295,491 passengers and 59,118 tons of freight, which was an increase of 67 per cent. in passengers and 33 per cent. in freight over the previous year, and of 309 per cent. in passengers and 125 per cent. in freight over 1904-5. The progress is rapid, but the total traffic is still very light for a railway which has cost about $27,000,000. The gross earnings in the last year reported were $2,095 per mile, and the working expenses 68 per cent., leaving net $647 per mile. The passenger fare for natives was reduced from 1 cent to ½ cent per mile, which has greatly increased the travel from the sea for 300 miles inland, across the unhealthy plain; but there are still many natives who prefer to walk 300 miles to paying a farthing a mile; probably because they have no farthings, and no pockets to put them in if they had.

SUMMERS ORE CAR FOR THE DULUTH & IRON RANGE.

The Summers ore car is a self-clearing car that actually dumps all of the load. In the spring of 1908 a sample car, photograph of which is here shown, was sent to the Duluth & Iron Range Railroad for trial, which resulted in the placing of an order with the Summers Steel Car Company of Pittsburgh

General View; Summers Ore Car.



Plan and Elevations; Summers Ore Car.

for 800 cars for delivery early this coming spring. The cars as ordered have some slight changes from the sample car, but the general arrangement and operating mechanism remain practically the same.

The following are the principal dimensions of the cars ordered:

Capacity, 50 tons	820 cu. ft.
Length over dead woods	22 ft. $4\frac{1}{2}$ in.
" face to face of coupler knuckles	24 ft.
" center to center of trucks	15 "
" inside of car body	17 ft. 5 in.
Truck wheel base	5 ft.
Height top of rail to top of car	9 ft. 5 in.
Width out to out of car body	8 " 7 "
Width inside of car body	8 " 6 "
Discharge door opening	5 ft. 6 in. x 8 ft. 6 in.

Two doors made of heavy pressed steel shapes close to opening, which extends over a portion of the inner truck wheels, the ends of the doors being flanged upward, which permits them to open downward without obstruction by the wheels.

The side and end sloping floor plates have an inclination of 50 deg. with the horizontal. The end floor also has its side portions turned up at an angle conforming with the side floor slope, with the result that the ore over the end floor plate is not changed in cross section, as it slides out until it reaches the door opening. The doors open downward to such a degree that the resultant angle between the side and end sloping portion of the door is 50 deg. with the horizontal. The top flanges of the side and end sheets also slope inward and downward at an angle of 50 deg. with the horizontal.

With the door opening so wide, both transversely and longitudinally of the car, as to break the bridging effect of the ore, the portion of the load over the doors immediately falls out when the doors are lowered, and this is followed with that over the side and end floors which are of such an angle that the load slides off.

Each door is supported at its outer edge by four heavy hinges, and at both ends by ¾-in. chains. These chains are attached to and wind around a steel drum on 2½-in. steel shafts which are held from rotation and are actuated by means of worm gears. These are at the side of the car, having a common shaft actuating both worms in unison. A cross shaft just back of the body bolster extends from side to side of the car and is geared with miter gears to the worm shaft; this cross shaft provides a means of operating the doors from either side of the car by the use of a crank on the end of the shaft.

The worm gears hold the doors in any position from closed to full open, requiring no other latch mechanism; this enables the operator to open the doors slowly and prevent the whole load from dropping out at once, which might, by its impact, damage the dock.

The present equipment of the ore-carrying roads in the Northwest requires the united effort of from six to ten men to unload a car, which is accomplished by a number of the men getting on top of the load and poking the ore out with iron bars, while others pound the car sides to jar the ore down. With the new car one man can discharge the load and close the doors inside of two minutes, and is not required to get on

the load at all. This will mean the difference between carrying on full operations during the rainy weather with the new cars, and only partial operation with the old ones, as men will not get up in the ore while it rains.

A peculiarity of the new car is the lack of center sills; the draft sills terminating at the door opening. The buffing and pulling shocks from the engine are transmitted to the sides of the car through horizontal side girders which are attached to the tops of the draft sills, and to the car sides, which sides have their lower portions formed into triangular shaped columns and take the place of center sills.

The steel corporation has for several years been using cars of similar construction about its mills for handling refuse materials. The excellent service and low maintenance cost of these cars cause confidence in the durability of the new ore car. E. W. Summers, president of the Summers Steel Car Company, is the designer and patentee of both the cars used about the mills and those ordered for the Duluth & Iron Range.

RESULTS OF THE MODERN APPRENTICESHIP SYSTEM.

The railway world is, or should be, fairly familiar with the apprenticeship system that has been in use on the New York Central Lines for the past three years or more. When the subject was presented to the Master Mechanics' convention in 1907 it attracted more attention and elicited a more animated discussion than any other subject on the program. At that time, however, it was more or less tentative, and its supporters were enthusiastic rather for what was expected of it than for what it had accomplished. The officers of the roads could only refer to the indications of a probable success, and there were but a few, a very few, who doubted that their expectations would be fulfilled.

While it is still too soon to look for a complete fulfilment of the early anticipations, enough time has elapsed to make it possible to obtain some results as an inclination of what is to come.

In a recent address before the Pittsburgh Railway Club, C. W. Cross, the superintendent of the apprentice schools of the New York Central Lines, gave a brief outline of the practical results obtained, and these are more than encouraging. After stating the general purpose of the schools he said that the practical results which have already become apparent, in spite of the comparatively short time in which the system has been in operation, are remarkable:

"The one most noticeable from the installation of the new apprentice system has been the increased efficiency of the apprentices. This is largely due to the addition of the shop instructor, although the benefit of the class-room work is also apparent. Under the old system the foreman was expected to see that the boys received proper instructions concerning their work, and that they performed it properly. Ordinarily the foreman is too busy to give the boy anything like the proper amount of attention. With the addition of the shop instructor, who has the duty of looking after the boys, the efficiency of the apprentice has very greatly increased, with a resulting improvement both in the amount of output and the quality of the work done. There is no question but that the work accomplished by the shop instructors has more than paid for their salaries. The shop foremen, relieved of the care of the boys, can give their time to the more important details of the work.

"Reports from the ten shops where apprentice schools have been established on the New York Central Lines show that in every case the boys are not only turning out a better grade of work than ever before, but that they are working on machines, or doing bench work, that formerly it was not thought possible to entrust to apprentice boys.

"Another important advantage is that the apprentice, after he has had a few months of class-room instruction, can read simple working drawings, and the third and fourth year apprentices become adept in reading the most difficult drawings. When one stops to consider the comparatively small number of so-called mechanics in the average railway shop who can read working drawings readily, and the necessity of being able to do this, its importance can be realized. Not only this, but the boys are able to make sketches, or drawings, of shop devices or of broken parts, which it is oftentimes advisable to have for record at the local shop or for transmission to the mechanical engineer's office. During the past year the apprentices of the New York Central Lines made 1,344 drawings, which have been placed in the files of the New York Central Lines drawing rooms for use and record.

"The criticism may be made that this work will unfit the boys for remaining in the shop. A certain percentage of the boys will, of course, wish to be transferred to the drawing room, but anyone who is familiar with the difficulty of securing satisfactory draftsmen for a railroad drafting room, who have had the necessary shop experience to handle the work required of them to advantage, will realize that it is very desirable to have a few of the boys graduate from the shop to the drawing room.

"It is often desirable to conduct tests of tools or devices, or to determine the efficiency of various kinds of machines or other apparatus. The training which the boys have received in the class room has enabled a number of them to be used to great advantage during the past year in assisting on or conducting such tests. The benefit to the apprentice and the company is mutual.

"Another effect of the new system is the better discipline over the boys and the effect which this has had on the shop as a whole.

"At several of the shops the boys have organized apprentice or debating clubs. It is the practice to prepare papers on different topics and to discuss them. The class-room training helps the boys to take part in these meetings and has been the means of developing them to a considerable extent. This, in connection with the local baseball teams, which have been formed at three or four of the shops, has done much to establish a co-operative spirit among the apprentices and also to get them more interested in their work and in closer touch with the men.

"At several shops where it was formerly hard to obtain enough apprentices or to get a good grade of boys, little difficulty is now experienced, as the boys are assured of being given a thorough training in the trade and of having greater opportunities of advancement than formerly.

"It has been the practice for apprentices to occasionally make visits to neighboring shops of other roads or to some of the other shops on the system. This has had practical results, as indicated by the following extract taken from a report made at one of the apprentice instructors' conferences:

" 'Several of the boys obtained ideas which they put into use at once. One boy who was working on a boring mill changed the method of fastening the tires on the table to correspond to the methods he had seen at Schenectady. He did this without waiting for definite directions from the instructor, and soon found that he was able to gain one tire in his day's work. The impression made on the minds of the boys by observing the methods of experienced workmen prove much more lasting than when these same methods are explained ever so clearly by their instructors. It is a paying proposition to the company to allow either boys or men to visit other shops where work of a similar kind is being carried on.

" 'The boys, after the above-mentioned trips, were asked to write letters to the shop foreman as to their observations and what they had learned. These demonstrated the benefits which were gained.'

"The workmen are in thorough sympathy with the new movement. They realize that their sons are to have a better opportunity than they have had. The labor unions have given the movement their endorsement."

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

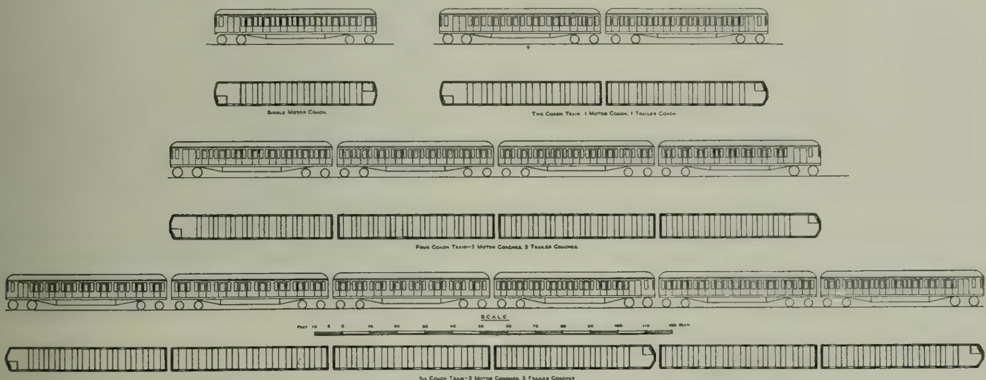
XI.

It has already been recommended that if electric traction be adopted, the suburban trains should be operated on the multiple-unit system.

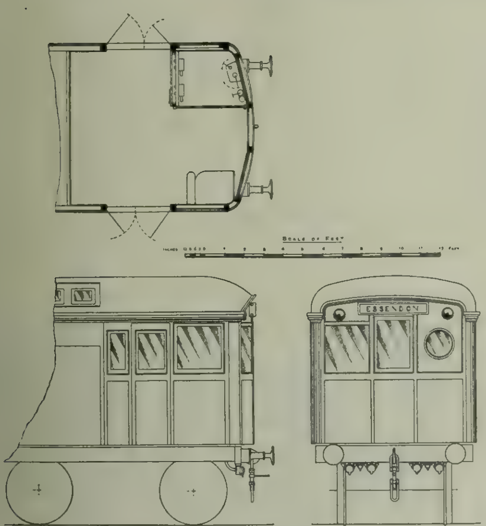
For your service, I recommend a standard train unit consisting of one motor coach and one trailer coach, with a seating unit trains for the different services is shown herewith.

Set workings for the proposed time table have been drawn up from which the number and type of coaches required can be definitely ascertained and also the number of coaches which it will be necessary to fit with one and with two driving equipments, respectively. The number and make-up of the trains required for each stage is given in the first of the accompanying tables.

For these trains, including an allowance of spare stock, the coaches in the second table would be required.



General Arrangement of Rolling Stock for Electric Operation.



Arrangement of Driving Cab.

capacity of 160 and equipped with two motors on one bogie of the motor coach. As there are many trains required for the service outlined which will never consist of less than two units (4 coaches) and in some cases three units (6 coaches) it is unnecessary to provide for driving cabs at both ends of all units, whilst a proportion of the motor coaches must be equipped with two driving cabs so that single motor coach trains may be used on the outlying lines to provide a frequent yet economical service. The general arrangement of multiple-

Briefly, the equipment of each motor coach will consist of two motors mounted on one bogie, contact shoes or collectors on each side, a set of contactors or switches, a master controller, a motor-driven air-compressor for the brakes, and the necessary cables and connections for this apparatus and for lighting and heating. The drawing shows a typical arrangement of motorman's cab.

To connect up the electrical equipment the following circuits are required:

The control circuit, consisting of a number of small cables

Make-Up of Trains for Proposed Electric Service.

Make up of trains.		Pt. Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
6-coach train (3 units)	Number of trains	2	12	21	24
	" " motor coaches	6	36	63	72
	" " trailer coaches	6	36	63	72
4-coach train (2 units)	" " trains	3	12	23	47
	" " motor coaches	6	24	46	94
	" " trailer coaches	6	24	46	94
2-coach train (1 unit)	" " trains	6	15	33	59
	" " motor coaches	6	15	33	59
	" " trailer coaches	6	15	33	59
Single motor-coach train.	Number of trains	..	1	3	3

connecting the master controllers with the contactors and enabling the former to operate the latter.

The motor circuit, which carries the main current from the contact shoes through the contactors to the motors and thence back to the rails.

The train line, a continuous conductor connected to all the contact shoes, which is carried throughout the length of the train and enables a train to bridge the gaps in the conductor rail at special track work.

The auxiliary circuits for the air pump motor and for the lighting and heating circuits, controlled from a separate switchboard preferably erected in the driving cab.

The arrangement of the cables and wiring on electrically equipped trains is a matter requiring more attention than is sometimes given to it. On it depends very largely not only the

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

freedom from accidents, but also the cost of maintenance and the life of the apparatus.

There are two systems of wiring, each of which has advantages. In one of these the insulation of the cables is supplemented by running them in insulated troughing made fireproof by lining the interior surface with uralite or asbestos; this system is particularly adopted to a type of construction where wood-work forms part of the coach sub-structure. The other method is to depend entirely on the insulation of the cables and to run them in weldless steel conduit, preferably carrying the conduit right up to the apparatus. In your case I recommend that the latter method should be adopted as far as possible.

Number and Type of Stock Required at Each Stage of Conversion (Including Spares).

Type of stock.	Port Melbourne and St. Kilda Branches.	Stage I.	Stage II.	Stage III.
Motor coaches (2 driving cabs)....	2	4	6	9
Motor coaches (1 driving cab).....	20	85	160	241
Trailer coaches (1 driving cab).....	8	20	40	78
Trailer coaches (no driving cab)...	12	60	109	168
Total	42	169	315	496

The handle of the master controller will be so arranged that if the motorman's hand is removed while the power is on, the current is automatically cut off and the brakes applied.

(*To be continued.*)

SALOONS VERSUS RAILWAY CLUBS ON THE HARRIMAN LINES.

BY F. G. ATHEARN.

Superintendent of Railway Clubs of the Southern Pacific Company.

The saloon-keeper, much as we may condemn his purpose and regret his influence, has been a close student of social tendencies and needs. He has made a special effort to incorporate into his business the things that make a man feel, even if only momentarily, that he has put the hardships of life behind and reached the goal of surcease from strife. He tries to make his customer care-free, at rest and welcome. When polish and glitter, easy chairs and inviting games, warm fires and hospitality fail, he has whisky to drug the senses and aid the unfortunate victim in making himself believe that he is what he is not.

The Roseville Club House.

Aside from his baneful influences, the saloon is, and has been, almost an ideal workingman's club. It has satisfied, to a certain degree, a primal, social craving. It is a place where a man may go whenever he is so inclined; where he can meet those with whom he has a common interest; where he is certain he will be welcome, and where he will find rest and recreation. Things are arranged and especially adapted to his needs. The pleasures offered are within his means. There are no extremes of social grades to make him uncomfortable. It makes not the slightest difference what his relations with a given person may be outside of the saloon; here all social and official inequalities are obliterated. The workingman, in these surroundings, feels himself a man and on an even footing with every other man. Here, too, his physical well-being is provided for. There are clean toilets, armchairs, cheerful fires and warm, well-cooked lunches. There is no direct demand for payment for these privileges; there is no membership fee. These things are paid for indirectly through the stuff he buys. All are desirable and conducive to happiness.

Card Room and Office at Roseville.

It should be further noted that the saloon is nearly always most conspicuously and conveniently located. Whenever possible, it will be found with a brilliant and attractive entrance, astride the cross-roads. How different is this from the usual method of the reformer, who hires a chilly, lonesome room on the second or third floor of a side street building and puts out a little sign, "Free Reading Room Upstairs. Everybody Welcome," and there sits with chattering teeth and wonders why the place is not crowded. Men want to be where things are "doing." The saloon has a tang of reality about it that no other institution has.

For a tired man's nervous system to respond and his body to be recreated he must have pleasures that are clear-cut and in contrast to the daily routine of his life. What nature demands we crave. The saloon has been developed to meet this demand. It is true that the saloon-keeper has aborted this to

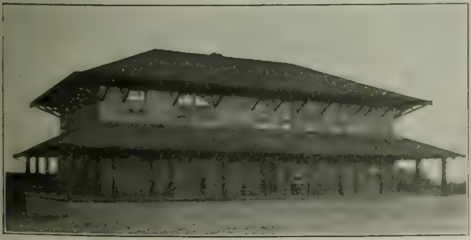
Library and Writing Room; Southern Pacific Club House at Roseville, Cal.

his own selfish and unlawful ends. It does not follow, however, that because the devil has taken possession of an institution that came into being as the result of perfectly natural, human desires, we should totally disregard the facts and tendencies made evident by it.

Silhouetted against the screen of the past may be clearly seen the tendencies that have fostered the saloon. Since the earliest days, when with crudely fashioned, flint-tipped reed, our ancestors slew their food and "cheek by jowl, with many a growl talked the marvel o'er," men have been gregarious. They have needed and demanded company. They have nourished the desire to attain a position where the never-ending struggle for existence might be lessened. Josiah Flynt gives it as his conclusion that by far the majority of the men who fail and become social degenerates are lured astray by the hope of quickly acquiring ease and comfort. Man longs for the better and brighter side of life, and, like the moth drawn to the flame, he finds, only too late, that the short cut has been a delusion, and that the net results are a pair of singed wings, impaired health and effectiveness.

Interior of Club at Dunsmuir, Cal.

To raise the standard of employees mentally, physically and morally, and thereby obtain a higher degree of efficiency and at the same time give opportunity for the exercise of those normal and natural tendencies which heretofore have attracted men to the saloon, is the vital problem which the management of the properties usually known as the Harriman Lines has attacked by methods which are at once stripped of all maudlin sentimentality and subterfuge, and brought down to scientific business principles. There is nothing asked for which is not paid for; there is nothing given for which return is not expected in some form. It is simply a question of whether the money expended is productive of higher efficiency; for all problems, whether social or economic, finally resolve themselves into problems of efficiency. This is particularly true with a railway, whether it be a matter of determining the most advantageous method of train operation, or the more important question of whether or not the maximum of efficiency is being obtained from the individuals who handle the trains. It has always been considered poor economy to do anything that would lessen, or to neglect to do anything which would increase, efficiency. But it has been in comparatively recent years that this same consideration has been made to apply to the men who do the bulk of the physical labor in running our railways.



Southern Pacific Club House at Yuma, Ariz.

The problem, which in this case is a social one, has not been given the close and intelligent study that has been accorded to the purely physical problems involved in railroading. Yet 42 per cent. of the gross receipts of a railway goes to pay salaries. And while we have gone to great pains to ascertain and obtain the most favorable conditions for a locomotive to work under, we have allowed the human engine to run without attention, or have left its care to spasmodic bursts of misdirected philanthropy, or have been content to believe that human efficiency depends primarily on morality, and hence have concluded that the burden of its care may be intrusted to institutions or individuals whose concern is for the soul rather than for the body. The question of a man's willingness to work may be an ethical one, but certain it is that his ability to work is a physical one. Without, however, discussing at this time the validity of the reasoning involved in this latter proposition (for I am aware that there are those who would honestly take issue with me as to the best agency to accomplish the ends desired), it must be borne in mind that, regardless of the methods employed, physical fitness, and ability to do, and ultimately morality, too, always will depend upon physiology. High ideals and empty stomachs do not make strong backs and sinewy arms. It takes good food, well cooked and plenty of it, sufficient rest in clean and comfortable beds, refreshing and cleansing baths, recreation for both mind and body, and an opportunity for social intercourse to give rest to it all.

Club House at Tucson, Ariz.

Since so great a proposition of the expenditures of a railway goes to the employee, and inasmuch as the measure in which the employee returns "value received" depends upon physiology, it follows that the socio-physiological problems—viewed from the standpoint of relative financial importance—should be more carefully studied than any of the many physical questions in connection with railroading. Their solution should not be left to chance philanthropy or single-eyed zeal. They should be investigated with the purpose of discovering all the factors involved, and to the end that the solution shall become an integral and continuous part in the economic scheme which forms the basis and gives right of place to the business of railroading.

The weak link in the chain is the one which joins the employer to the employee. There has been a lack of sympathy. Often when the employer has asked the employee to improve his habits and exercise more care and accuracy in the discharge of his duties, the request has been resented as unreasonable and unfair. The employer made the request because he believed that compliance therewith was his just due, because

he believed it to be for the best interest of the employee himself, and because the safety of the traveling public demanded it. The request was interpreted as greed; the resentment as moral turpitude. In most cases of this kind the physical and social environments were such that compliance with the demand was practically impossible. Both parties failed to recognize this—the education of both was defective.

The position is taken that the company having once paid an employee a fair day's wage for a fair day's work, performed under conditions cognizant to both parties at the time the work was undertaken, its economic obligation to that employee is fully and completely discharged. Now, if conditions are brought about voluntarily by the company, at its own expense, which make it possible for the employee to render services of more value, and which at the same time make the lot of the employee easier, the company should support the institution through which this increase is made possible, in so far as the services, under these circumstances, are of greater value than they would have been normally, and in so far as this same institution renders a contribution to the employee individually which is over and above his stipulated compensation, by adding to his material welfare, conducing to his peace of mind, and making him happier on the whole, he should aid in its maintenance.

It is along these lines that the railway clubs for employees have been built up. And the writer is free to confess that in doing this a study of the saloon and its methods has been, in large measure, a most valuable aid. Eliminate gambling and drinking, and there is none of the features of a saloon but should be sought for a railway employee's club—in fact, for any club. The men are accepted as they are, and provision is made for their physical comfort and enjoyment, which makes for greater efficiency and longer duration of service.

The club buildings are first of all attractive and constructed especially for the purpose. They depart from the severe railway type and are made club-like. They are furnished with the best and made pleasing both inside and out. The cost ranges from $10,000 to $35,000. Each club has hot and cold baths, a library of fiction and reference books, correspondence tables on which may be found neat club stationery, a billiard and pool hall, a gaming and recreation room, barber shop, cigar counter, a restaurant, which is open twenty-four hours a day, and a large number of bedrooms.

The restaurant and beds are deserving of special mention. In the restaurant, particular emphasis is placed on the proper cooking of food and on making it appetizing. The service is very simple, but neat. What is saved in service is put into food. There are four complete meal combinations, known as club meals, prepared each day. There is also quite a list of short orders. The charges are moderate; a good substantial meal may be obtained for from 15 to 25 cents. The cooking is done in plain view and everything is kept scrupulously clean. The bedrooms are small sleeping stalls, entirely open overhead in order to provide abundant ventilation. There are single iron beds with wire springs, each equipped with a 20-lb. silver-gray hair mattress, a feather pillow and woolen blankets. The linen is changed throughout for every man, and a charge of 15 cents is made for a night's rest. Preference is always given to train crews not at their home terminal.

The cost for a shave in the barber shop is slightly less than the usual charges for such service. The difference is chiefly due to the elimination of charges for extras.

A charge of 10 cents is made for a bath, two towels and soap being furnished.

The billiards and pool are paid for at the rate of 5 cents an hour a cue. The tables and cues are of the best, and much superior to any found in the average railway town, and hence are a great attraction.

Card tables and cards are provided. Gambling, of course, is strictly prohibited.

Cigars, tobacco and soft drinks are sold at standard prices.

In order to help men who are out of money, a system which practically amounts to advancing on salaries is in effect. An employee is allowed to sign an order against his wages for either $1.50 or $5. The amount is given to him in the form of coupons that are exchangeable for commodities and accommodations offered by the club the same as money.

The club rooms are so arranged that they may be used for entertainments, dances, lectures, etc., and they are put to such use frequently.

Each club is in charge of a secretary, with a sufficient corps of assistants to keep things clean, for *cleanliness* is the watchword. The secretary is chosen for his interest in welfare work and his ability to get on with men. He represents the lubricant that keeps the machinery of a concern of this sort running smoothly, and too much care cannot be exercised in his selection.

For all these privileges there are no other charges than those stated. There is no membership fee, no monthly deduction from pay check. There are no rules posted to govern conduct. There is not a notice to be found telling the men what they may or may not do. Espionage is not permitted. The men may discuss whatever they please without fear of its being reported to their superiors. There is no free list; superintendent and section hand enter the club on exactly the same footing. Any railway man who wishes to participate in the benefits of the club must subscribe to the following:

"I hereby certify that I am a bona fide employee of the ——— Railroad Company and I agree to conduct myself as a gentleman while enjoying any of the privileges of the club."

The whole aim of the clubs is to take care of the employee, whether he be in search of food, of rest, of play, or of study. And the best testimonal of the appreciation of these institutions is the fact that the clubhouses are crowded night and day, and that there has yet to be committed the first act of vandalism.

The Southern Pacific Company already has four of these clubs in full operation and is now preparing to construct seven more. The Oregon Short Line also is building three, and it is expected to extend them on to other lines as rapidly as time will permit.

THE NEW CAR SHOPS OF THE UNION PACIFIC AT OMAHA.

The Union Pacific Railroad has recently completed and is now operating its new car department plant at Omaha, comprising coach, cabinet, freight car, truck, wheel and axle and paint shops and a freight car repair yard. This plant, when finally completed, will also include a planing mill, dry kiln and lumber sheds. and will be one of the most modern car plants in the West.

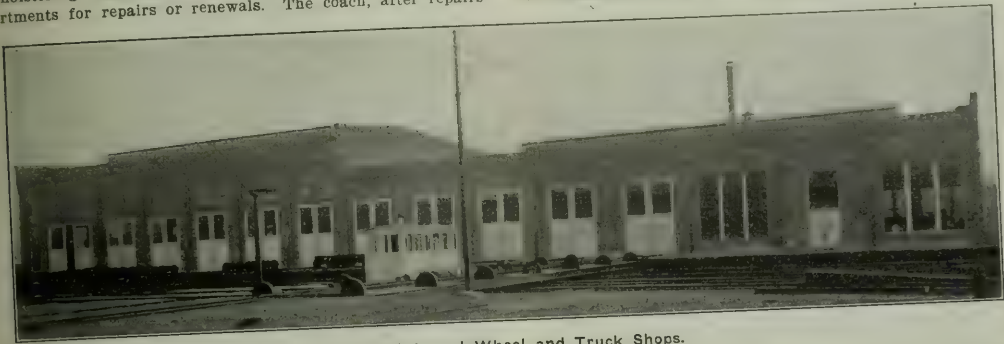
The buildings are of brick and steel construction. They are amply lighted and well ventilated and heated by means of a Sturdevant blower system. The shops are supplied with large lavatories and equipped with modern individual wash basins and lockers. The comfort of employees was given careful thought.

The car department is provided with a sub-store department, to facilitate the delivery of material, and the different shops, yards and material platforms have been so located that the cost of handling material has been reduced to a minimum. Conveniently located near the paint shop is an independent fire-proof building for the storage of paints and oils. The coach shop is connected with the paint shop by a 90-ft. electric transfer table. This transfer table, which is one of the largest in this country, was supplied by Geo. P. Nichols & Bro., Chicago.

For the removal of trucks from coaches, or for re-trucking, the car department has been provided with a 60-ton Whiting gantry crane, located outside the shop building over a track

leading to the transfer table. After removing the trucks, which are sent to the wheel and truck shop, the car is mounted on temporary trucks and passes through for repairs. Coaches coming in for repairs are stripped and the various parts and furnishings are distributed to the cabinet shop, plating room, upholstering room, varnish room, or to any of the other departments for repairs or renewals. The coach, after repairs are completed, is delivered to the paint shop and passes from here ready for service.

The freight car shop is equipped with overhead traveling cranes for handling cars and heavy material, and will also be equipped with modern machinery for repairing and building steel cars. The tracks, both in the repair and yard shop, are connected at each end with ladders, thus facilitating the movement of cars. Repair tracks are 22 ft. centers, and the yard has been well supplied with a system of narrow gage material tracks, so arranged and connected that material can be delivered to any point with the least expenditure of time and labor. A ten-ton electric crane spanning three tracks is used for unloading wreckage and handling heavy material.



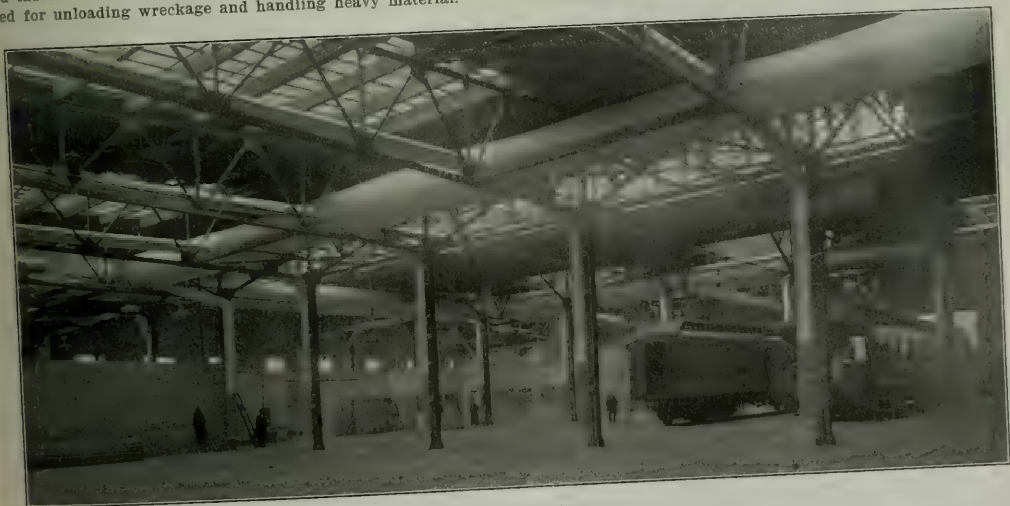
Coachpaint, and Wheel and Truck Shops.

The company list gives in detail the machinery intended for the planing mill, that already installed at the various shops, and the method of driving. In most cases the machines are individual motor driven, a few of the smaller machines being grouped. The electric motors are Westinghouse, using alternating current.

Taking up the different departments more in detail, it will be seen that there are only two main buildings, one on each side of the large transfer table. The main car shop contains a cabinet shop with its accessories, the coach repair shop with a large storeroom, and the freight repair shop, forming a long ell on this large building. The other building contains the coach paint shop and the truck and wheel shop.

Commencing at the extreme west end of the main car shop, the first section is occupied by the cabinet shop, which is 178 ft. long and 80 ft. wide, arranged with work benches along the west wall, and 33 ft. from the wall is a 2-ft. gage material track extending through the shop. Between this track and the inner wall the woodworking tools are arranged and the majority of them are motor driven. The names of the tools are marked on the plan, and the names of the makers and the size of the motors required for them are given in the tool list. At the northeast corner of the cabinet shop there is a scrubbing room with cement floor, 24 ft. square, and along the inner wall at the south end is a large glue press and heater box.

A low partition separates the cabinet shop from the upholstering shop and plating room. The upholstering shop is 56 ft. x 80 ft., and next to it is a tin shop 19 ft. x 37 ft., and a pipe shop, 19 ft. x 40 ft., equipped with all necessary tools. On the opposite side of the passageway is the plating room, 39 ft. x 82 ft., and separated by a brick partition is a large lavatory containing 78 double spigot basins and 130 metal lockers. The coach repair shop, 178 ft. x 40 ft., contains



Coach Paint Shop.

seven through tracks, each long enough for two large cars. Two of the tracks have pits 18 in. deep with cement floors. These are for convenience in working on the under side of the car and in repairing pipes and air brake fixtures. Next to the coach shop is a large storeroom, 38 ft. x 178 ft., and in it is located the office of the general foreman and a room for blueprint drawings. A 2-ft. supply track extends through the length of this storeroom.

The freight car shop is 150 ft. wide and 340 ft. long, with a lean-to 30 ft. deep for the hot blast heating fans. One bay of the freight shop is fitted with a 20-ton Whiting electric traveling crane, 50-ft. span, and the middle bay, 40 ft. wide, is constructed with longitudinal girders for a future overhead crane. The floor of this shop is made of gravel from Sherman Hill.

On the opposite side of the transfer table is located the coach paint shop and the wheel and truck shop in one building. The cross section of the portions of the building for these two departments is different, as is shown in the cross sections here illustrated, that of the paint shop, being symmetrical with the Louvre ventilator at the center and with side walls 27 ft. 2 in. high, while the truck shop has at one side a high bay 60 ft. 2 in. wide, with outer wall 37 ft. 5½ in. wide. This bay is constructed with longitudinal girders for a 10-ton electric traveling crane for lifting trucks, wheels, axles and other heavy material.

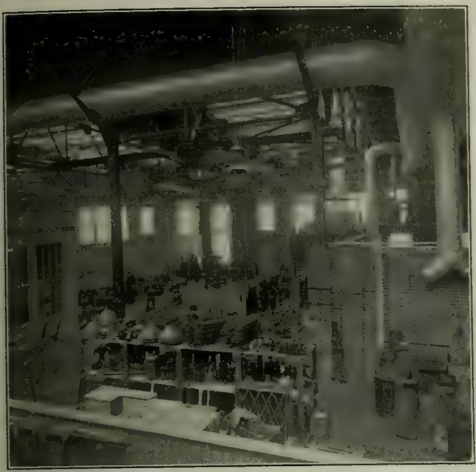
The interior arrangement of the paint shop is shown on the floor plan with varnish room 175 ft. 2 in. x 39 ft. 6 in. at one end, and next to it the lavatories, glass cutting room and acid room. The paint shop proper has five through tracks long enough for two cars on each track. The floor is made of brick between tracks and along a small border outside of the rails, while the remainder is made of concrete with cement top finish, the latter being used for floors throughout the remainder of the building. The paint store is in a small separate building, 62 ft. x 32 ft. outside brick walls, 18 ft. high from floor to lower side of roof truss. It has a small circular counter at the entrance and the arrangement of tables, shelves and racks is shown plainly in the floor plan. The barrels of liquid materials are hoisted by an air cylinder on the outside to a platform and then rolled on an inside platform over the large tanks and are emptied into them by gravity.

The planing mill, 90 ft. x 260 ft., is shown in dotted lines on the general plan, as it has not yet been erected. The pro-

Cabinet Shop.

Car Shops, Showing 60-Ton Gantry Crane and Transfer Table.

Freight Car Repair Shop.



Plating Room.

Lavatory; Coach Shop.

90-Ft. Transfer Table Connecting Car Shops With Paint and Wheel Shops.

Coach Shop.

posed arrangement of the woodworking machines for this shop is shown in detail floor plan, and the names of the tools and the size of the motors required for them are given in the tool list.

The general arrangement of the new car shops with respect to the older locomotive shops is shown on the general plan. The steam for heating the former and the electric current for lighting and power are obtained from the power house at the locomotive shops.

The plans for the shop buildings were prepared under the direction of the chief engineer, R. L. Huntley; and those for the location of machinery and other mechanic details, by A. H. Fetters, mechanical engineer, under the direction of W. R. McKeen, Jr., then superintendent of motive power.

Cabinet Shop Machinery.

Automatic cut-off saw	Fay & Egan	7½ h.p. motor
Rip saw	Fay & Co.	7½ " "
Jointer	S. A. Woods	5 " "
26-in. single surfacer	Fay & Co.	10 " "
36-in. band saw	Fay & Co	5 " "
Double cabinet maker's saw	Greenlee	7½ " "
7-in. moulder	Rowley & Hermann	10 " "
Universal wood-worker	Bentle & Margedant	5 " "
No. 2 scroll saw	Fay & Egan	2 " "
48-in. sander	Berlin Mach. Wks.	30 " "
Carver and dove-tailer	Boults	Group 20 h.p. motor
No. 3½ vertical mortiser	Fay & Egan	
Tenoning machine	Fay & Co.	
Grindstone		
Double emery wheel	Norton	

Plating Room

21 in. upright drill	Cincinnati	Group 10 h.p. motor
Sensitive drill	Barnes	
3 buffing lathes	Builders	
14-in. x 5-ft. lathe	Champlin & Spenser	
16-in. x 8-ft. lathe	Lodge & Shipley	
Double emery grinder	Norton	

Grindstone, motor and generator set 150 amperes.

Upholstering Shop.

1 hair picker	Champion	Air motor
2 sewing machines	Singer	1/10-h. p. motor on each.

Pipe Shop.

3-in. pipe machine	Sanders	5 h.p. motor

Mill Machinery.

36-in. heavy autom. cut-off saw	Proposed	15 " "
40-in. heavy autom. cut-off saw	"	15 " "
5-spindle car boring machine	"	20 " "
32-in. self-feed rip saw	"	20 " "
24-in. self-feed rip saw	"	15 " "
16-in. heavy autom. car gainer	"	15 " "
13-in. automatic end tenoner	"	15 " "
2½-in. heavy hor. auto. hollow chisel mortiser	"	15 " "
18 in. double cabinet maker's saw bench	"	7½ " "
30-in. single surface planer	"	7½ " "
2 spindle moulder and shaper	"	5 " "
4-in. band resaw	"	15 " "
14-in. variety saw	"	7½ " "
15-in. x 6-in. 4-head planer and matcher	"	40 " "
24-in. dimension planer	"	30 " "
20-in. hand jointer	"	5 " "
10-in. 4-sided moulder	"	10 " "
28-in. swing cut-off saw	"	7½ " "
66-in. triple drum sander	"	30 " "
2½-in. heavy vertical hollow chisel mortiser	"	15 & 5 " "
44-in. band saw	Atlantic	7½ " "
Horizontal tenoner	Greenlee	15 " "
No. 55 surfacer	S. A. Woods	20 " "
Swing cut-off saw	S. A. Woods	7½ " "
13-in. moulder	S. A. Woods	25 " "
4 spindle horizontal borer	Greenlee	15 " "
7-in. moulder	Fay & Egan	15 " "
42-in. band saw	Atlantic	5 " "
No. 4 car sill planer	Berlin	60 " "
Universal wood-worker	Bentel & Margedant	7½ " "
Automatic dove tailer	Fay & Co.	Group 10 h.p. motor
No. 70 tenoning machine	Fay & Co.	
No. 3½ vertical mortiser	Proposed	
No. 2 2 spindle radial borer	Greenlee	
Carver and moulder	Proposed	Group 7½ h.p. motor
Scroll saw	"	
24-in. x 16-ft. patternmkr's lathe	"	Group 7½ h.p. motor
26-in. x 5-ft. lathe	Fay & Co.	
Hollow chisel grinder	Atlantic	Group 10 h.p. motor
Band saw setting machine	Proposed	
Band saw filer		
Band and circle and rip saw sharpener	"	
Plane knife grinder	"	
Auto. circle and rip saw grinder	"	
2 double emery grinders	Norton	

The German Usambara Railway, which extends from the Indian Ocean westward, just a little south of British East Africa, and has for four years been in operation for 80 miles inland, is not a very productive enterprise yet. For the three years from 1905 to 1907, inclusive, its earnings per mile were, gross, \$557, \$738 and \$1,212; and net, \$160, \$333, and \$633, respectively. But there is encouragement in the way it grows. The road has cost \$2,150,000.

TWO-CENT FARE LEGISLATION.

Slason Thompson furnishes the following statistics relative to the 2-cent fare legislation of the last few years:

States Placing a Limit on Passenger Fares.

	Passenger fare limited to		Miles of line per hundred square miles of territory.	Population per mile of railway in 1906.
Alabama	2½	cents	9.64	416
Arkansas	2	"	8.54	314
Illinois	2	"	21.64	448
Indiana	2	"	20.05	377
Iowa	2 to 3	"	17.88	222
Kansas	3	"	10.88	181
Michigan	2 to 3	"	15.50	290
Minnesota	2	"	10.38	248
Missouri	2	"	11.74	417
Montana	3	"	2.26	92
Nebraska	2	"	7.59	183
North Carolina	2¼	"	9.08	476
North Dakota	2½	"	5.36	123
Ohio	2	"	22.79	486
Oklahoma	2	"	7.18	212
Pennsylvania	2	"	25.04	621
South Carolina	3	"	10.78	453
South Dakota	2½	"	4.19	145
Virginia	2 to 3½	"	10.19	473
Washington	3	"	5.38	174
West Virginia	2	"	13.08	340
Wisconsin	*2	"	13.61	312

* All but small roads.

In contrast with the conditions under which railways operate in these states may be cited those in the following states and countries where density of population warrants low passenger fares:

	Miles of line per 100 square miles of territory.	Population per mile of railway.
Massachusetts	26.36	1,439
Connecticut	21.01	989
England and Wales	27.20	2,050
German Empire	16.56	1,754
France	13.95	1,359
Belgium	25.17	2,353

A second statement gives the passenger earnings of 27 railways, each of which does business in one or more of the states named above, together with the average receipts per passenger-mile for each road, in 1906-07 and 1907-08, and the passenger revenues for each road in the latter year, if the average rate of the preceding year had prevailed:

Summary of Passenger Earnings of 27 Railways for Year Ending June 30, 1908; Average Receipts per Passenger Mile in 1908 and 1907 and Loss Caused by Legislation.

Name of road.	Avg. receipts per passenger mile. 1908, cts.	1907, cts.	Actual passenger revenue 1908. (000 omitted.)	Passenger revenue calculated on average receipts of 1907. (000 omitted.)	Loss produced by two cent legislation.
Atchison, Topeka & S. F.	2.10	2.18	\$21.643	\$22.458	\$814.818
Baltimore & Ohio	1.87	1.95	13.736	14.213	476.951
Central of Georgia	2.30	2.41	2,953	3,096	143.398
Chesapeake & Ohio	1.78	2.15	5.120	6.184	1,064.215
Chicago & Alton	1.85	2.05	3.511	3.890	379.482
Chicago & East. Illinois	1.76	2.04	1.680	1.960	280.365
Chicago & North-W'n.	1.81	1.99	15,734	17,302	1,567,547
Chicago, Bur. & Quincy	1.85	2.07	18.819	21.040	2,221.359
Chicago, Mil. & St. P.	1.91	2.20	11,883	13,630	1,747,290
Chicago, R. I. & P.	1.89	2.23	16,693	19,668	2,975,289
Chicago, St. P., M. & O.	1.97	2.26	3.600	4.215	524.723
Evansv'le & Terre Haute	1.93	2.29	570	677	107.276
Great Northern	2.27	2.39	11.189	11.797	608.152
Hocking Valley	1.63	1.78	837	914	77.131
Illinois Central	1.85	1.96	10,991	11,618	626.413
Iowa Central	1.88	2.24	479	569	89,891
Kansas City Southern.	2.31	2.37	1,302	1,351	48,611
Minneapolis & St. Louis.	1.82	1.92	1,003	1,060	57,224
Minn., St. P. & S. S. M.	2.09	2.28	2.681	2,925	243,858
Missouri Pacific	1.95	2.24	8.814	10,142	1,328,061
Norfolk & Western	1.90	2.36	3,977	4,941	963.595
St. Louis & San Fran.	2.15	2.56	8,927	10,602	1,675,919
St. Louis Southw'n.	2.19	2.42	1.924	2,094	169.753
Southern Railway	2.30	2.45	14.315	15.252	936.636
Toledo, St. L. & West.	1.59	1.79	519	583	63,437
Wabash Railroad	1.77	1.86	6.470	6.800	329.448
Wisconsin Central	1.80	2.00	1.608	1,706	98,655
Total			\$191.079	\$210.699	\$19,619,345

Same roads in 1907	\$193,026,000	
Decrease	1,947,000	
Average rate per passenger mile	1.964	cents in 1908
Average rate per passenger mile	2.166	cents in 1907
Decrease	0.202	

WORK OF THE AMERICAN RAILWAY ASSOCIATION.*

BY W. F. ALLEN,
Secretary of the Association.

II.

I have mentioned the fact that there are over 2,200,000 freight cars in use upon our American railways and that the interchange service of this equipment is very great. Many questions concerning this service outside of those connected with the maintenance and the cost of repairs of the cars are constantly arising.

So in 1889 a "Committee on Car Service" was appointed to suggest rules to govern this interchange use and to prevent the undue detention of the cars of one company upon the lines of another. When a car is loaded by one road and sent over the lines of another, it is intended that it should be returned, either loaded or empty, by the same route that it took on the outward journey. But, if at any station this car is found empty, and there is a load waiting to be shipped, the persuasions of the shipper and the inclinations of the agent are likely to result in the car being sent under load in whatever direction the freight may be going. In the meantime the road that owns the car is deprived of its use and from that cause may be unable to supply the demands of shippers on its own line. This condition of affairs has been the subject of long and heated controversies. It is claimed that the only permanent solution is the pooling of the cars, so that all cars can be used in common as vehicles of transportation without regard to whom they belong. This has been strongly advocated by those who have closely studied the subject, although undoubtedly great difficulties would be encountered in its practical operation. Those opposed to this plan object to the control of the cars being taken away from their owners, and viewing the matter in that light consider the proposed remedy worse than the disease. To this the advocates of pooling reply that the owners of cars have practically no control over them to-day.

For many years when one company used the cars of another company, it paid for their use at so much per mile run, latterly six-tenths of a cent, and kept the account itself. On July 1, 1902, this arrangement was changed after a long contest and an agreement entered into under which so much per day is paid. This method called the "Per Diem" system is now employed, but the rates have varied at times from 20 cents per day to 50 cents per day. During the very active business season of 1907 when cars were in demand, greatly in excess of the supply, the rate was 50 cents; and 75 cents or even $1.00 per day would in many cases have been gladly paid by the companies which were short of them, if the cars could have been obtained. When the dull business season of 1908 set in, the rate was reduced to 25 cents per day at which it still remains. The law of supply and demand governed these rates, rather roughly, it is true. They were adopted after having been approved by the companies which own more than two-thirds of the total number of cars.

The change in the method of payment for cars made it necessary to provide a code of rules to govern the service and these rules called the "Code of Per Diem Rules" were adopted in 1902. They provide among other things for an arbitration committee to settle all disputes that may arise between the owners and users of freight cars under the per diem rules and for the interpretation of the rules.

Co-operating with the Committee on Car Service and under the same Chairman is a Committee on Car Efficiency, organized in 1906.

The average movement of a freight car is less than 25 miles a day of which from 30 to 40 per cent. is without load, even in busy times. It is not the actual slow movement of the car which causes this low average, but its detention at terminals. This is largely caused by abuses which have grown up under severe competition, such as permitting consignees to use the cars as storehouses for their goods and undue delay in loading aand unloading. In no other country in the world are shippers and consignees given anything like such privileges in the use of cars as in this country. I can state this with confidence as I now have in my possession official information on the subject sent me in connection with a report to be made to the next International Railway Congress.

A permanent bureau of statistics has been established by the Committee on Car Efficiency, having offices in Chicago and New York, and very interesting and valuable reports are published from time to time showing the condition of the car supply, the general performance of the freight equipment and other important items. These reports showed that while in February, 1907, there was a demand for 150,000 more cars than could be supplied and in October, 1907, for 90,000 more cars, yet on December 24, 1907, there was a surplus of 209,000, which surplus reached 413,000 in April, 1908. These cars were lying idle upon the side tracks and with the accompanying idle engines would have completely filled a single track line from New York to San Francisco.

It will be realized that regulations to govern and hasten the movement of cars when there was a shortage of 150,000 would not be advantageous when over 400,000 were idle. Practices entirely equitable under the one condition worked unnecessary hardships under the other condition and resulted in no small economical loss.

A very important Commission has been appointed by the American Railway Association to determine what the user of a car should pay to the owner for its use and to decide upon a method by which the owner may be able to obtain control of his own cars when he has need of them. Skillful experts have been engaged at work for several months in the preparation of data to enable the Commission to settle these questions upon some mathematically correct and equitable basis. When it arrives at its conclusions, they will be submitted to a letter ballot. Its report has not yet been issued.

A Committee on Safety Appliances was organized in October, 1889. One of the most important functions of the operating department is the promotion of safety. The public as a rule only hears of those accidents where injury to persons or loss of life occurs. In addition to these, there are a great number of minor accidents which result from all sorts of causes, most of them out of control, unless perfect materials and infallible employees can be secured. A so-called safety device intended to remedy one of these causes may aggravate others, and do more harm than good. Thousands of devices offered to operating railway officials are of this character.

The Committee on Safety Appliances, however, does not examine special devices. It does consider and decide upon what are the essential requisites of any installations intended to promote safety. If a device in its operation violates any of these essential requisites, or fails to fulfill them, it ought not to be used, but inventive genius may be freely employed within the prescribed lines. The essential requisites for train heating, train lighting, automatic couplers and power brakes have been formulated by this committee. It has also formulated a Code of Air Brake and Train Air Signal Rules.

Another subject that it has acted upon is that of uniform rules for the examination of applicants for employment or for promotion. An applicant must submit to a physical and mental examination for the purpose of ascertaining whether he is capable of fulfilling the duties of the position he seeks. Among other requisites that of good eyesight, free from color blindness, is essential. Certain simple but effective tests are prescribed. The more eminent among the chief railway surgeons were consulted in the formulation of these rules. Provision is made for expert examination of the test-sets supplied for the examinations as to color blindness.

It must not be understood that it is possible always to submit

*From an address on "Railway Operating Associations," delivered before the Harvard School of Business Administration, January 11, 1909.

applicants for employment in the operating department to the rigid examination which these rules prescribe. In times of such stress as occurred in the early part of 1907, when the transportation facilities of the country were taxed beyond their limit, by shippers seeking an early market for their goods, great pressure was put upon the railway companies to increase their service and it was not possible to undertake more than the most essential of these examinations. Many men were necessarily admitted to the service who might have been rejected in normal times. In the quieter times that have since intervened, a weeding out process has been possible and a higher standard of service in consequence undoubtedly exists to-day.

Probably the examinations in busy times were similar to the one that the Hon. Theo. B. Reed is said to have undergone when he applied for admission to the bar of California. He and another young man came before the examiner who happened to be in a considerable hurry. He asked them both a single question on a then much mooted subject, "Is the Legal Tender Act constitutional?" Reed answered promptly "yes," and the other man, with equal promptness, said "no." Gentlemen," said the examiner, "any man who can answer that question off hand ought to be a member of the bar. I admit you both."

In the installation and operation of block systems and interlocking plants there are involved questions which relate to subjects within the province of this Committee on Safety Appliances, and others which affect the rules for the operation of trains, which latter subject belongs to the Committee on Train Rules. These two committees therefore act together on these subjects under the title of "The Joint Committee on Interlocking and Block Signals." It has formulated a code of rules for the installation and operation of interlocking plants and block signal systems.

A Committee on Statistics and Accounts was established in 1899. Railway operating statistics are extremely troublesome to formulate because of the difficulty of arriving at a satisfactory or stable unit, or a formula which does not omit some important factor. Some formulas have been advocated which appeared to be mathematically correct, but which, when carried out, demonstrated that it was cheaper to operate a road with heavy grades than with light ones, which, of course, is a practical absurdity.

There are very many factors to be considered in the statistics of railway operations and the relative value of these factors is constantly changing. A formula which was at least approximately accurate a few years ago may be found radically defective to-day. It may be said of railway statistics as of railway accounts that no matter how accurately they may be compiled they can never be entirely independent of the physical facts that are behind them.

Accounts and statistics show things in black and white. So do photographs. You may photograph fine scenery, a bouquet, or a beautiful woman with the utmost skill of the art; but the colors of the landscape, the perfume of the flowers and the grace and charm of beauty cannot be thus completely depicted. A prudent man would hardly decide to purchase a house, or marry a woman when their photographs only had been presented to him. So also with a railway. After statistics and accounts of its operation, stated with the utmost accuracy, have been fully examined there yet remain physical facts which must be taken into consideration if you are to arrive at correct conclusions. And these differ greatly at different times on different roads, or even on different divisions of the same road.

This committee has therefore acted with great caution, preferring to recommend, from time to time, units and formulae for trial and report, rather than to run the risk of having expensive and unnecessary compilations of operating statistics forced upon roads, especially the smaller ones, where they might not serve any useful purpose in testing efficiency. The fundamental duty of the operating department is to move the great traffic of the country safely and expeditiously without unnecessary waste of energy.

Energy may be expended with exactly equal skill in two separate roads, and yet, because of unavoidable diversities in the prices of labor and material, or in the nature of the traffic, or of the road itself, the results may appear widely different when reported in a financial statement. It is also quite certain that when railway financial statements show favorable results that have been obtained by any other means than efficiency of operation, no matter how accurately the figures may have been compiled, they are quite sure to be more or less misleading.

The gages of railway track, that is the distances from rail to rail, have varied from three feet, to six feet in this country, and to seven feet in England. In 1897 the American Railway Association established a standard gage of 4 ft. 8½ in. The Master Car Builders' Association had established a wheel gage and a wheel section in 1894, and the American Society of Civil Engineers had adopted a certain section for rails in 1893. In 1905, the Master Car Builders' Association desired to strengthen the flange of the wheels on account of the greater weight they must carry by reason of the larger cars in use. The gage and the section of the wheels bear an intimate relation to the gage and section of the rail, but there was no association which was authorized to deal with both. So in October, 1905, a Committee on Standard Rail and Wheel Sections was appointed by the American Railway Association. One fact developed by this committee, previously unknown to many, was that the planes upon which the wheel and track gages were measured did not coincide, one being considerably above the other. The alteration proposed in the wheel section which on the face of it appeared to require a corresponding alteration in certain distances related to the track gage, really did not affect them to any appreciable extent, when the different planes of measurement were considered.

This committee found that in formulating rail sections it must also consider the specifications for the manufacture of rails, and their chemical composition. The relative dimensions of the head, the stem and the base of the rails and the quantity of steel in them, affected the process of their manufacture to a considerable degree. New sections of rails weighing from 60 to 120 lbs. were therefore recommended for trial, as well as certain changes in chemical composition. All of these were decided upon after full consultation with the leading makers of rails and with those considered the best experts on the manufacture of steel.

It would be easy to reason out that the proposed forms of rails were better and safer than any others, and it might be plausibly urged that their use should prescribed by law. But every experienced railway officer knows how many times the desirability of such action in other cases, might have been theoretically demonstrated with equal force, and yet under actual trial, conditions have arisen, impossible to foresee, which have more than offset the advantages otherwise realized. The new sections will therefore be experimented with and their performance watched with the greatest care before any attempt is made to establish them as standard. In this work, the Railway Engineering and Maintenance of Way Association is co-operating.

At various times disastrous explosions have occurred on trains in transit, in cars on sidings and in freight houses, sometimes from known and sometimes from unknown causes. The great engineering and building operations of the country require the use of vast quantities of dynamite and other explosives, and these, to an amount estimated at not less than 500 million pounds per annum, have to be transported by rail. Upon some important lines quite strict rules were provided in order to minimize the danger of transporting such articles. The necessity, however, of providing uniform rules on this subject was evident, since with the great interchange of business

a laxity in the rules of one road might result in an explosion on a far distant line over which the article shipped from the first road was being transported.

So in 1905, a "Committee on the Safe Transportation of Explosives and Other Dangerous Articles" was formed. It called to its aid the best known experts on the subject of explosives on this continent including distinguished representatives of the ordnance departments of the army and of the navy. After very careful investigation a Code of Rules for the Transportation of Explosives was formulated by the committee and approved by the association. After these rules had been tested and modified as the result of experience, another step was taken. The then existing United States Statutes on the subject of the transportation of explosives in interstate commerce, were passed in 1866, before dynamite had been invented, and the regulations as to explosives, under the statute, actually increased rather than diminished the danger in carrying them. So Congress was appealed to and on May 30, 1908, a new and rational law was passed repealing the former statutes. The new law is upon sufficiently elastic lines to provide for future developments and it placed upon the Interstate Commerce Commission the duty of promulgating regulations for the transportation of explosives which would be as enforceable against the shipper as against the carrier. After a full hearing in which all parties interested were represented and careful examination and consideration on the part of the commission, it promulgatetd with but slight verbal modifications the regulations previously compiled and recommended by the Committee of the American Railway Association, and they took effect October 15, 1908. These have been supplemented by the association with such special rules as were necessary to put the regulations into effect in railway service.

It had previously become evident that the danger involved in the handling of explosives, and the care that had to be taken to avoid this danger, was one but little understood by the average railway employee, or official, even on the best organized lines. So a bureau for the Safe Transportation of Explosives was established in November, 1906. It has at its head a chief inspector who, as an army officer, is widely known as an expert on explosives, and two special agents. The whole railway system of the country is divided into sections, each in charge of a local inspector, of whom there are now 20 in service. They have been most carefully selected and drilled in their duties before appointment and their reports to the Chief Inspector are most interesting. They also inspect powder factories and magazines. They have no power whatever to enforce discipline, which must be exercised in all cases by the proper operating officials of the respective roads to whom they also report; but they can stop the movement of a car, or a shipment of explosives, found in a dangerous condition and provide for its safety and they instruct the railway employees in their duties in this particular. The work of the bureau has been most salutary and cannot be too highly commended. About $80,000 a year are expended for its maintenance. It has established a special laboratory for testing articles offered for transportation thought to be dangerous.

Recently this committee, in connection with the same bureau, has formulated regulations for the safe transportation of inflammables and acids, which also took effect October 15, 1908. As it is evident that explosives cannot be safely carried unless care is taken to prevent adjacent inflammable articles from igniting, the necessity of providing rules for handling the latter is evident. By the terms, "Inflammables," articles that will merely burn, like hay for instance, are not included, but those articles not so well known from which vapors arise that will explode when brought in contact with the flame of a lantern. Hay and articles of that nature are so evidently inflammable that a few simple precautions only are necessary to protect them. One of the features in the operation of the bureau is the giving of illustrated lectures for the purpose of instructing both railway employees and shippers as to the necessity of closely adhering to the regulations in order to secure safety in transportation. Great interest has been taken in these lectures and a voluntary attendance of an audience of a thousand persons is not unprecedented.

I have spoken of a freight car as if it were a unit of definite dimensions. Unfortunately for statistical and accounting purposes this is not so. The sizes and carrying capacities of cars have varied greatly in past years and they still vary so that the words freight cars may refer to a vehicle with a carrying capacity of 40,000 lbs. or to one of 100,000 lbs. There are a few special cars of still greater capacity and some old cars, now fast disappearing, of 30,000 lbs. capacity; but these bear but a small portion to the total equipment. The additional carrying capacity is sometimes provided for by increased length and sometimes in the case of box cars by increased size of the cross section. There are a number of reasons why there should be a standard box car, and, in April, 1889, a committee was appointed to consider that question. A careful and exhaustive inquiry was made for the purpose of ascertaining what size of cross section and what length of car would be best adapted to the requirements of the goods to be transported, such as the ordinary sizes of packing boxes for various articles. In October, 1901, this committee reported in favor of a box car with a width of 8 ft. 6 in., height of 8 ft., and length of 36 ft., all inside dimensions and this is now recognized as the standard box car. It should not be understood that all box cars are now built of these dimensions, as that is not the case, although many have been. Some managers consider that larger cars are better adapted to the needs of their special traffic, and a few of these have been built, but, when a standard box car is mentioned, all now know exactly what is referred to.

When an act of Congress was passed in 1893, requiring all freight cars to be equipped with automatic couplers, it became necessary to decide upon a standard height of draw bars, as even if the same kind of coupler were upon two cars of uneven height, they could not be safely coupled. This duty was placed upon the American Railway Association by the terms of the law and the height as required was duly certified to the Interstate Commerce Commission.

The American Railway Association has a standard cipher code for use in sending telegraphic messages. It is not a secret code, but is designed to promote brevity in the wording of telegrams. This was compiled under the supervision of a committee which was appointed in 1902. Its work was completed in 1906, and the code is now extensively used.

The tendency of modern times is very strongly towards the substitution of the power of electricity for that of steam wherever conditions are favorable for its employment. Roads that must continue to use steam, probably for many years to come, have installed electric service on parts of their lines, and in some instances both steam and electric trains run upon the same tracks.

The medium by which the current of electricity is carried along the line is sometimes a third rail, and sometimes an overhead conductor. The exigencies of the service therefore require that certain distances alongside the tracks, and a certain space overhead shall be kept clear for these appliances and for the attachments to the cars by which the current is transmitted to the latter.

Looking to the future when the electric service shall be widely extended, it is very desirable to anticipate difficulties that might arise from insufficient space having been left free for these appliances, which if not provided might interfere with the interchange use of cars and engines. So in 1906, a "Committee on Standard Location for Third Rail Working Conductors" was appointed to examine into this question. The construction of the track, bridges and other parts of the permanent way had to be taken into consideration as well as that of the engines and cars. In April, 1908, this committee pre-

sented its report, illustrated by a diagram, recommending certain lines of side clearances for both rolling stock and maintenance of way structures. It was unanimously approved and made the standard of the association. The requirements of clearances for overhead conductors have not yet been finally formulated but are under consideration.

I have not as yet mentioned the most important committee of the American Railway Association, which is, of course, the executive committee with the president of the association at its head. This committee has general charge of the affairs of the association. It decides whether any new subject suggested is a proper one for discussion, to what committee it should be referred, or what other course should be taken with regard to it. Its influence is, therefore, reflected in the work of all the other committees, and by supplementing that work often makes it more effective.

It has recently had under consideration a reorganization of the committees of the association with the view of providing an arrangement of their work on still broader lines, so as to increase their usefulness; and also, so that propositions of merit originating with and approved by other railway associations, the members of which have not the power to put them in effect, may be referred to one of the standing committees of the American Railway Association for consideration and report. It is intended that certain of the committees shall have chairmen who shall devote their entire time to the work of the association. It also contemplates the establishment of a reference library of railway information. Other important plans have not yet been sufficiently developed to be now commented upon.

One marked feature distinguishes all of these associations—they are absolutely without coercive power to enforce their decisions. In one form or another the same principle is enunciated in their constitutions that is embodied in the rules of order of the American Railway Association, which reads, "Its action shall be recommendatory and not be binding upon any member." The adoption in practice of anything recommended therefore depends entirely upon its intrinsic merit.

It will be noticed in the statements made of the work of the several committees that their actions have all been deliberate. Their general plan of working has been to first secure information as to the methods actually employed on the various roads in the matter under consideration, and to ask for suggestions as to their improvement. Then, after carefully considering these practices and suggestions, to formulate tentative recommendations. These are submitted to the general operating officers of each road and by them to their subordinates whose practice would be affected by the proposed changes, and all criticisms are returned to the committee. When the report takes its final shape it is again submitted to criticism on the floor of the convention. If great differences of opinion are developed the report will be referred back to the committee, generally at its own request, for further consideration.

When, therefore, a committee makes a final report the subject has been so thoroughly digested that it is, as a rule, approved by the association without much further opposition. If, however, it is a subject of great importance, a letter ballot will be ordered even when those present are ready to act favorably, and such ballots generally require a two-thirds majority for the adoption of the proposed measure. Under this plan of working it will be seen that any recommendatory action of the association has great moral force. Few managing officials will fail to put its recommendations into effect, and one who disregards them in any essential particular is likely to find himself sooner or later in a hazardous and unenviable position.

A BIT OF WISCONSIN SCENERY.

The serpentine freight train shown in the accompanying engraving, reproduced from a photograph, is one of the Chicago & North Western's. It consists of an engine, 55 cars and a caboose. Forty of the cars were loaded, and the estimated weight of the whole—loaded and empty—was 1,629 tons. The scene is near Ableman's, Wis., between Baraboo and Elroy, and the train is moving northward.

Rounding the Curve at Ableman's, Wisconsin; Chicago & North Western.

THE VALUATION OF RAILWAYS.

II.

The foundation for rate-making afforded by a valuation is believed to meet successfully all the foregoing requirements: to mark the line of separation between the obligations and the rights of carrying corporations in this particular, and to fix a definite basis for revenues. Not improbably it is the only one that does; certainly no method inconsistent with it will stand the test of reason and of law. It is not too much to say that these rights and obligations have never been adjusted to a basis of absolute equity, and it would be visionary to predict that they ever will be or ever can be so adjusted; but it is not the part of wisdom or of expediency to regard with contempt a measure affording practical relief because it is not ideally perfect. "What the traffic will bear" may be economically sound. Although the meaning of the clause has been so wilfully misrepresented that perhaps to the majority of intelligent and well-meaning persons it is synonymous with extortion, the principle is approved by leading authorities on the subject. (Reference: See e. g., Hadley: Railroad Transportation, pp. 17, 76, 123 and 124.) But its province appears to consist more in the adjustment of individual rates to a system than in determining the level of the system itself.

However firm one's reliance upon the essential integrity of the American people and the sense of justice inherent in them—a reliance that is fully warranted by a long and honorable record—there is no valid reason to expect that the popular demand for reduced rates and fares will undergo any permanent abatement until arbitrary judgment, caprice or prejudice, as a basis for governmental rate-making and rate regulation, gives place to a method at once practicable, rational, scientific and mutually just. Unrest, agitation and change are the conditions of progress; and to acquire as cheaply as may be is a necessary law of trade. Men are subject to leadership and to the influence of their leaders, which, if it were always scrupulous and honorable, is not at all times wholesome and wise. The field for the mere politician, the demagogue and the agitator is too fruitful to be abandoned lightly. All too frequently the hands of those exhibiting conspicuous evidence of essential statesmanship are to be found joined with those of the agitator for gain. Provoked or unprovoked, these influences asserted themselves and gained ascendency over the sober judgment of the people in the days of the Granger laws (Reference: Hadley: Railroad Transportation, pp. 134 and 135.); it has been so since that time; and there is no guaranty or assurance that it will not be so again at any time hereafter.

It is the special character of a Republican form of government that under it an evil must be brought forcibly home to its citizens and that injury must be sustained before an effective remedy can be applied. Approaching evils are not always clearly discerned; when they are they can seldom be forestalled. This is the course over which the problem of rates seems destined to travel; but the prediction is made with confidence that within a comparatively few years the railroads will be arrayed almost as a unit in advocacy of the valuation of their properties.

Briefly, therefore, the great immediate advantage which may rightfully be expected to accrue to a carrier from an official valuation of its property is that thereby it will be enabled to meet the proposition to impose any unequal or excessive burdens upon it, especially such as affect its gross or net revenues, by claiming the benefit of its rights and immunities under the Constitution and laws. The immediate practical benefit to the state and to the public lies in the fact that, the rights of the carriers being defined, they will be deprived of the pretext or the means of exacting more than their rightful due through the imposition of excessive rates and fares, and of evading their public obligations as regards the sufficiency of service or otherwise. To this principle—a principle which it seems otherwise impossible to enforce—there can be no valid objection.

But beyond such immediate advantages, there is involved a question of expediency of no less practical importance. The table which follows is as impressive as any comment upon it.

Statistics of Railroads Reporting to the Interstate Commerce Commission.

	1906.	1896.	Increase Amount.	Increase Per ct.
First track	222,340.30	181,982.64	40,357.66	22.18
2d, 3d & 4th track	20,981.98	12,439.76	8,542.22	68.67
Yard trk & sidings	73,760.91	44,717.73	29,043.18	64.95
Total miles	317,083.19	239,140.13	77,943.06	32.59
Locomotives	51,672	35,950	15,722	43.73
Passenger cars ...	42,262	33,003	9,259	28.06
Freight cars	1,837,914	1,221,887	616,027	50.42
Passenger miles...	25,167,240,831	13,049,007,233	12,118,233,598	92.87
Ton miles	215,877,551,241	95,328,360,278	120,549,190,963	126.46

Passenger traffic has almost doubled within a decade, freight traffic has considerably more than doubled. As previously observed, the limit of capacity in the transportation system has already been reached. We are not permitted to doubt that the country is just now pausing and acquiring force for another and still more notable stride in advance. At the rate of increase already established it is estimated that, in order to keep pace with the demands of commerce upon them, the railroads of the country will require upwards of half a billion dollars of additional capital annually for years to come; to be employed in the construction of new lines, the extension of existing ones, the establishment of more commodious terminals, double-tracking, the correction of curves, the revision of grades, the acquisition of equipment, and in a hundred other ways.

A large number of railway companies have found it necessary to curtail dividends; others still have been compelled to pass them altogether. Surplus revenues, where there are any, are wholly inadequate to the need. The experiences of the past few years, industrial, economic and otherwise, afford little incentive to extension were the means available. New construction or improvement, on any considerable scale, is paralyzed pending a change of condition. With a plentiful supply of loanable capital at low rates of interest, and with the enlarged needs of to-morrow for transportation staring them in the face, only those roads enjoying the highest credit have been bold enough to attempt new financing.

Whether the necessary funds can be attracted will depend wholly upon the fairness, to make no mention of liberality, accorded to capital invested in transportation undertakings. Failing to enlist fresh capital, there can be nothing more than sporadic and insufficient provision against the traffic of only a few years hence. Thus would an effectual check be placed upon the further development of the material resources of the nation, to the serious injury of every form of industry and trade dependent directly or indirectly upon transportation.

When any far-reaching measure is proposed, for which there is not ample successful precedent, there is never wanting a small army of good, substantial, but ultra-conservative and timorous people, to cry aloud in concert, "the thing can't be done." It is nevertheless true that if a railroad corporation really wishes to sell its property and plant, and another wants to buy, a valuation can be placed upon it which, if not mutually satisfactory, is mutually acceptable. A corps of experienced engineers, working under proper instructions or untrammeled by instructions, can approximate with remarkable accuracy the cost of a projected line. Assisted by the records of facts already accomplished and of expenditures already made, the approximation of legitimate cost or value will be closer yet.

In those cases where there has been impairment of original investment, or where original investment was deficient as compared with capitalization and the deficiency has not been made good from revenues, determined opposition may be expected. But in the minority of instances where this condition probably

prevails, the public interest will be served by a valuation as effectively, at least, as where a contrary condition obtains.

The most valid and steadfast objection is founded upon the apprehension lest a just valuation shall not be reached, by reason either of incapacity, intellectual bias, or a deliberate intent to wrong. The problem must be solved, not upon political considerations, but upon sound economic principles. There is not a dearth of capacity nor of intregity in this country, and when the time is ripe it can be drafted in the interest of a solution to this intricate and perplexing problem. The duty can only be entrusted, and will only be entrusted, to experienced technical and practical men without preconceptions or prejudices to vindicate, without selfish personal or political ends to attain, and who are beyond the allurements of dishonest gain. In such hands the state, the railroads and the investing community may look with equanimity to the outcome.

The most familiar form of appraisal, or valuation, made for purposes of investment but strongly advocated as the basis for capitalization, is in its essence if not in form a funding of net earning capacity or of gross corporate income. The questions which concern the bondholder or shareholder are, whether a company is able to meet its contractual obligations and leave a satisfactory margin of profit; whether earnings are stable, and the tendency is toward improvement or the reverse. In the subject of cost, original or subsequent, or of appraised valuation, he is little interested except in so far as it bears upon the probability that interest and dividend requirements will be met. Frequently, indeed the physical aspects of a property are subjected to severe scrutiny; but always with the object of ascertaining whether it is maintained in a condition to enable continued efficient service and to meet competition—that is, with a view to forming an intelligent opinion as to the continuity and stability of revenues.

Too often the creditor or the stockholder is indifferent to impairment of capital investment unless his immediate interests in the respects indicated are thereby visibly and palpably affected. Nor is such an attitude, not involving neglect of duty or the evasion of responsibility, as untenable as it appears upon first view. The security of the holder of a first mortgage railroad bond, for example, consists in the claim which he has upon net revenues. To be sure, he has a prior lien upon real property, and probably upon personal estate as well; but for uses other than transportation its value is nominal in comparison with the debt placed upon it, and for transportation uses net earnings are the measure of its value.

If there were assurance that revenues could be maintained, this basis would answer the requirements of the investor. As to those upon whom charges for transportation rest and as a guide to determination of the level of a schedule of rates, it is unsatisfactory, not to say wholly lacking. To conclude that, because a carrier is earning a certain sum, it is entitled to be capitalized for a given amount, and because of the capitalization thus reached its rates and fares should be such as to yield the sum first stated, is nothing less than absurd.

A further method proposed, which concurrently with other methods of valuation may be very enlightening and helpful, is that of comparison with another transportation plant similarly situated, as an assumed standard. This proposal is open to the objection that similarity of condition is so vague and uncertain as to warrant only the most general deductions, and that exact likeness of condition wth respect to transportation lines is so rare as to be practically nonexistent. The comparison of one uncertainty with another, or the comparison of an uncertainty with an established certainty under a mere assumption that the conditions affecting them are similar, is altogether too inexact and unreliable to be made a criterion in the defining of property rights and in their safeguarding.

In any systematic effort at valuation, cost is a matter for early consideration. If legitimate cost can be determined with accuracy, it can usually be relied upon as establishing a fair presumption of value. But here an intricate situation presents itself, and in the ascertainment of railroad cost many serious difficulties will be encountered. Some managers and accounting officers profess, with a convincing show of reason, inability to determine with any considerable degree of precision what their properties have cost. A few of the roads have been in existence for three-quarters of a century. In the earlier days there was no accounting organization worthy of the name. The science of accounts was undeveloped, the art was practiced with a laxity that is now difficult to comprehend, and there was little more than accidental uniformity of method. Such records as were made have, in many instances, been lost or destroyed. Consolidations have taken place, reorganizations have been passed through, and purchases have been made, under foreclosure or otherwise, at a valuation either greater or less than original cost. Capital assets acquired at one price have been replaced at another and different one. Operating cost and capital expenditure have been hopelessly confused. Finally, funds available for distribution have been withheld from shareholders and devoted to increase of capital investment and the improvement of facilities for transportation. To what extent these and other similar things have occurred, and to what extent actual investment has been increased therby, are questions it would not always have been easy to answer at the time; now it is all but impossible.

All tangible property essential to provision for the service which it is the duty of a carrier to provide and render, at its reasonable and necessary cost, is properly subject to capitalization, enters into and forms a part of the legitimate value of a company's plant and equipment; and what is true of tangible property is likewise true of intangible property to the same extent and with the same limitations. A franchise that costs nothing is the proper subject of capitalization only at a nominal value. If, in order to comply with the condition of obtaining a franchise, expense is necessarily incurred, such expense is an element of cost. The municipality, therefore, that sells a public service franchise is borrowing at an expensive rate of interest.

There is considerable diversity of opinion as regards the proper treatment of discount on securities sold. There is a distinction between bonds, representing corporate indebtedness and having a definite limitation as to the time of their redemption, and share capital, representing ownership and which as a rule is irredeemable. In relation to the former, there can be but one tenable view. If a company can market its 50-year 4-per cent. bonds at 90 per cent. of par, it means that the company's credit is on a 4½ per cent. basis; that it could market a like security paying 4½ per cent. at par. If it elects to issue at the lower rate it is merely sacrificing principal for the sake of a reduction in the annual interest charge; in other words, it is prepaying interest which would accrue during the life of the issue. If $10,000,000 par value were issued at 90 per cent., the discount would amount to $1,000,000, and the saving in interest to $50,000 per year, or $2,500,000 in 50 years. Obviously the company cannot claim the privilege of capitalizing the discount, while thereby availing itself of the reduction in interest. If such a course were legitimate in the case of a 5 or 10 per cent. discount, it would be equally so if the discount were 50 or 75 per cent., when the absurdity of the proposition would be perfectly apparent. The somewhat general practice of prorating the discount, as a charge against revenues, over the term of the obligation's existence is sound; but this should be done, not in equal installments, but on the basis of the appreciated value of the bond as it approaches par at maturity. There is no apparent objection to charging discount of this nature in a ump sum against an accumulated surplus. The capitalization of discount on stocks, involving as it does the introduction of fictitious values in capital assets, is wholly indefensible.

The official classification of accounts authorizes the capi-

talization of bankers' commissions for the sale or underwriting of capital issues. This is liberal to the carriers, but it is not subject to serious criticism. It is doubtful, however, whether the courts would allow such commissions as capital actually invested and employed for the public convenience. The better practice, it is believed, would be to refrain from capitalizing such items, restricting capital charges to cash actually invested and to property acquired at a cash valuation. The shareholders, on the contrary, are not called upon ultimately to bear this expense. It ought to be reimbursed to them in the annual rate which they are allowed to earn upon their investment.

There can be no doubt that interest accruing during construction is a legitimate capital charge; further, there is good reason to conclude that a company might rightfully assess such interest at a rate corresponding to the reasonable return which a carrier is entitled in law to realize from its service to the public; a rate, say, approximating 10 per cent.

The inclusion in cost of the expense of transportation, foreign and domestic, of persons and material during the period of construction is officially authorized. It is not universally conceded that the cost of domestic transportation incurred after a road is turned over to the operating staff complete or in condition for the performance of service, constitutes cost, though it is not plain wherein a different principle is involved. This qualification, however, should be noted: that a carrier, already earning the return upon its investment to which it is rightfully entitled, would, by thus augmenting its investment, be imposing an additional tax upon its patrons, the equivalent of a higher rate of return. But in this respect and with the qualification stated, subsequent construction, additions to and betterments of roadway, structures, equipment, etc., appear to rest upon the same foundation as original construction, for the reason that they are subject to capitalization. Perhaps it is superfluous to remark that the expense of transportation does not include any element of profit to the carrier immediately concerned.

A conclusion contrary to that stated above would result in disparities in the weight of capitalization within sharply-defined territorial limits, and, on the theory of a fair return, in the level of charges imposed upon the shipping and traveling community; which might tend to accentuate the advantage of consolidation to sections remote from distributing centres for railroad material, and thus to stimulate further centralization or in extreme cases to discourage extension of the railroad system.

Instances are not lacking wherein a road has paid regular rates of transportation on construction material to a neighboring line, and then been absorbed by that neighbor, thus by possibility incorporating revenues accruing to itself in the construction accounts of the purchaser. Meanwhile, these revenues presumably included a margin of profit, which in turn may have been expended wholly or in part in improvements, added to the cost of property, and capitalized.

On the contrary, if the test of the right to capitalize expenses of this nature be that a carrier is not otherwise realizing an equitable return, the result might be to enlarge the capitalization of these roads which, by reason of competition, sparse traffic, or other impediments, are least able to bear it. This topic will be referred to further in another connection.

It is apparent that the transportation of materials entering into maintenance and operation is a charge against current revenues; the assessment of revenues upon them by the home road would conduce to no useful end, and is not justified.

A line of road is constructed at a given actual outlay. Its projectors failed to foresee the developments that make for heavy traffic, or if they foresaw them conditions changed, much as the completion as the Panama canal promises to modify currents of traffic in this country, not in the first place well defined, and in some cases created; in consequence the road is inadequately maintained, becomes insolvent, and is acquired by another carrier at a fraction of the original cost. The question arises whether the new proprietor is entitled to earn a lawful rate of return upon first cost, or whether it must restrict itself to such rate upon the purchase price. Then modify the hypothesis and assume that the location of the line constructed was wise and fortunate; that its traffic was heavy, its revenues ample, and its maintenance on a liberal scale; and that then it was incorporated into another system at an appreciated valuation. Shall purchase price or original cost determine the rate of return? It would appear that, whichever consideration is adopted as governing in the one case, it ought in equity and by a parity of reasoning be controlling in the other. The value which may attach to a transportation property as part of an organized system, over and above its value as an independent enterprise, sometimes called franchise value, may warrant the expense of bringing together the component lines under a common control and management. Consolidation tends to efficiency of service and economy of operation. But if this principle be adopted, what should be the limits of its application? Certainly such expense should be admitted to capital accounts with caution.

The foregoing suggests the wisdom and the propriety of effective exercise by the governmnt of supervision and control over the incorporation of lines of transportation, with a view to prevention of economic waste through the construction of lines not demanded by traffic actually offering or in reasonable prospect, whether in competition with existing routes or not. The soundness of this proposition in its application to new lines, as a theory, will stand every test; but in practice there is grave doubt whether any body of men could be designated that would be more capable of interpreting tendencies and of foreseeing future developments and needs in this respect than the trained practical transportation men upon whom the responsibility has heretofore devolved. It is not improbable that any committee of ordinarily conservative persons would have refused on these grounds to authorize the location of some of the great railroads which have proved to be conspicuously useful.

What shall be said of locomotives costing $25,000 each that have served their purpose and been replaced by other and more efficient ones at $15,000; of the supplanting of rails costing $50 per ton by others at $25 a ton; of the substitution of freight cars costing $750 each for those which cost $250.; etc., etc.?

The substitution of a thing of lesser value for a corresponding thing of greater value, has the effect merely of changing the form of assets. If due provision for maintenance has been made, the difference is converted into cash, credit, or other thing of value, subject to employment for transportation purposes. But it is important in all such transformations that the bookkeeping method should reflect the fact. In the renewal of locomotives instanced above, the equipment account should be relieved of the difference in cost and value.

The substitution of a thing of greater, for a corresponding one of lesser value, represents improvement and constitutes additional investment; and, whether capitalized or not, it is on a parity with original investment. This principle, however, should not be accepted without qualification. When sucn an article of current supply as a crosstie at a cost of 30 cents is renewed at 60 cents, few people would undertake to justify capitalization of the difference in cost—unless the new tie had been treated with a preservative, were wrought of metal, r for other possible reason possessed greater utility than its predecessor. The better practice is to treat such differences as a charge against revenues.

The maintenance of a railroad or of any other property, rightly understood and strictly defined, implies the full compensation from current revenues for waste in capital investment, whether from use, decay, obsolescence or other cause,

either through actual expenditure or through the creation of reserves; anything beyond this is betterment. The classification of operating expenses promulgated by the Interstate Commerce Commission aims at this result, and so far as concerns equipment is well adapted to its attainment. But the issue of that classification thus defining maintenance became effective as late as July 1, 1907. Prior to that time its adequacy or inadequacy was made to depend in a large measure upon such considerations as the judgment of the board of directors, the company's supply of cash or other liquid assets, the continuance of dividends at an established rate, and the like. While, under this régime, some carriers no doubt failed in the full and complete maintenance of their plants, it is certain that a large number of others maintained theirs at an extensive rate. The conservative view taken of maintenance by the officers of roads whose revenues justified, has been not only that their physical plants should be kept at their original value or standard of efficiency, but further than this and in a spirit of wholesome rivalry, that a carrier should be kept in condition to transport traffic as expeditiously and inexpensively as its competitors; charging to the cost of operation many items of addition or betterment, new construction or road acquired. This theory of maintenance has been held in such high esteem as to be regarded as the mark of conservatism and merit in administration. It is not to be implied that there is objection to the upbuilding of the railroads from revenues. Within reasonable limitations it is in the interest alike of the carrier and of the public which it serves, and is highly commendable; but it is important that the distinction between expense and investment should be clearly drawn. This course is enjoined not merely as a matter of adherence to correct principle; it is dictated by the most superficial considerations of expediency and self-interest—a fact that the carriers have failed to their own serious detriment to perceive, or perceiving they have failed to appreciate.

It has long been the systematic practice of many of the railroad companies to appropriate to the same ends such large sums from income as their profits warrant—tantamount to the payment of dividends and the subsequent assessment of capital stock to the same amount. Some profess inability to understand how a stock whose value is fictitious, wholly or in part, may rightfully earn a profit on the excess above actual investment. But if the capitalization of a carrier is made up of bonds and stocks in equal amounts, the former only representing bona fide cost; if it has the right to a yield of, say 10 per cent. upon its investment; and if its borrowed capital costs only 4½ per cent., there will remain a profit to such carrier of 5½ per cent., subject to distribution among its shareholders. If there were original or subsequent investment in addition to the par value of bonds, if bond interest were at a rate less than 4½ per cent., if earnings were in excess of 10 per cent., or if the proportion of stock to total nominal capitalization were less than one-half, the effect would be more pronounced than here illustrated. Such increment to first cost is in its turn entitled to reward. The effect is cumulative, and if the practice is long continued it may result in the complete elimination of fictitious value. There is good reason to believe that in particular cases even more has been accomplished.

Conflicting opinions are entertained with respect to the status which should be assigned, in connection with a valuation, to donated property—right of way, station and terminal grounds, government land grants, and the like, to which no considerable cost attaches. Is it proper that it should be made a constituent of that value for the use of which the public may be taxed in the interest of the donee? If so, should it be appraised at its full worth in the market, or only at the cost to appropriate it? Is a grant of land, which must be converted into cash and re-converted into transportation property, different in any important particular from a gift of right of way, which enters directly into the transportation plant? Is the case affected by the origin of the gift, whether public or private, or by the consideration that it is devoted to a public use? It may not seem consonant with the principle that cost only should be capitalized, and sentimentally it may not seem fitting that the public should be assessed for the use of that which it has donated to a private corporation to be employed in the public service; but, much as one might incline to the opposite view, it is difficult to escape the conclusion that donated property ranks at its cash equivalent with that purchased or condemned. Upon conveyance of the gift estate title vests in the donee; if there are no qualifications, such title is absolute; and the use of the property, and the right of enjoyment of the profits arising from it, are necessary incidents of ownership.

It would be futile to deny, and in fact there is no serious effort to deny, that the property accounts of railroads have been unduly enlarged by charging to them fictitious items or items at a fictitious valuation; at their inception, at the time of making capital issues, and in connection with acquisitions and consolidations. To admit that "watered" railroad stock or bonds ever existed to any considerable extent, is to affirm this. Attempt is made to justify the custom on the ground that it was necessary in order to preserve the credit of the companies. This, if admitted, leads to the startling conclusion that misrepresentation is a proper basis for credit. Moreover, it was a deceptive device that deceived nobody in a quarter from which benefit might be expected. On the contrary, it served effectually to place railroad securities under a suspicion from which they have never fully recovered. This error was followed up by the practice, equally unwise and short-sighted, of adding to capital investment and building up property values without reflecting the fact in the accounts; at the very time that their public arraignment on the charge of overcapitalization was responsible for most of the woes that they lamented. But over against the fact of excessive capitalization there can be set a multiplicity of offsetting conditions heretofore sufficiently illustrated.

Prescience has never been a distinguishing characteristic of humanity, and it is too much to expect that it ever will be; but with the enlightenment of experience to serve as a guide, it is not too much to expect that the many errors which have gone before will in due course be righted.

While ascertained legitimate cost operates to raise a presumption of value, it is not thereby fully and finally established. On the one hand, investment may have become impaired; on the other hand, there may exist values in excess of cost, due to appreciation, or values acquired by indirect outlay, such as good will, an established capable organization or efficient operating body.

A farmer, we shall say, acquires a tract of land for $10 per acre. He may cultivate it, realizing such profit each year as is possible, or it may remain unimproved and virtually untouched. A few years later he finds that it has a value of $25 an acre. The country has gone forward in commercial and industrial development, the population has grown, and property values generally have increased. Not improbably, as has frequently been the case, the enhancement resulted largely from the facilities provided and the service rendered by the carrier. Estimates emanating from sources which command respect are that the farm values of the country have increased 50 per cent. within a decade. Is the railroad entitled to participate in the enhanced valuation? If not, does the act of withholding the privilege constitute a discrimination against railroad investment? Is the carrier sufficiently compensated by the enlarged movement of traffic? Certainly not if, by legislative act or the orders of regulating bodies, rates are so reduced as to disturb a proper relation between revenues and the expense of operation. Are its cross-country lines, having relatively small dismantled value, and its terminals and other property in cities and environs, having a large and increasing commercial value, on a parity in this respect?

(*To be continued.*)

General News Section.

The block system has been re-established on the Atchison, Topeka & Santa Fe between Pueblo, Colo., and Dodge City, Kan., 266 miles.

The Chicago, Milwaukee & St. Paul has bought a tract of coal lands in the Bull mountain field in Yellowstone county, Montana, near the Pacific coast extension, and has opened two mines.

An officer of the Great Northern writes that the management of this road has been investigating the A B C train despatching system, but, contrary to newspaper reports, has not decided to adopt it.

In the federal court at Galveston, January 20, the Missouri, Kansas & Texas was found guilty of violating the safety appliance law, in using a car on which there was a defective coupling, and was fined $100.

An officer of the San Antonio & Aransas Pass writes that this road is securing about 25,000 catalpa speciosa trees from Carney, Ala., and will plant them on a tract of land near Skidmore, Bee county, Texas, about 45 miles from the Gulf.

The Michigan Board of Assessors has completed its tentative assessment for 1908 of the properties of railway, express and car companies in Michigan. The total valuation of these properties is fixed at $211,368,250, as compared with $209,404,300 in 1907. The valuation of railway properties is increased from $207,130,000 to $208,967,000.

According to a press despatch from Mexico City, the Mexican government will spend a large sum of money on a monument to Jesus Garcia, a locomotive engineman at Macozari, Sonora, who, on November 7, 1907, coupled to a car of burning dynamite and hauled it out of town, thus saving many lives. The car exploded and Garcia was killed.

The Railroad Commission of Washington states that of the valuation placed by it on the Great Northern in Washington 55 per cent., or $32,767,466, should be allocated to interstate business, and 45 per cent., or $26,809,745, to intrastate business. The division of values is based by the Commission on what it estimates to be the relative costs of handling intrastate and interstate traffic.

F. W. Whitridge, receiver of the Third avenue (surface) street railway, New York City, has asked the state legislature to pass a law to kill off "ambulance chasers." Ambulance chasers are lawyers who try to make a living by taking up the cases of persons injured in the streets. They are constantly prosecuting suits against street railways. Mr. Whitridge proposes that when an attorney takes a case expecting to get his pay out of the damages recovered, the attorney himself shall be held liable for the costs.

Press despatches from St. Lake City, January 16, reported that the Southern Pacific line from Ogden westward, for the first time in its history, had been closed to traffic on account of washouts. The washouts were west of Sparks, Nev. Through trains were sent from Ogden to the Pacific coast by way of the Salt Lake route to the south and by the Oregon Short Line to the north. Press despatches of January 22 reported Spokane, Wash., cut off from the cities both south and west by breaks in the railways, due to thaws and heavy rains.

Complaint has been made to the New York State Public Service Commission, Second District, by R. W. Lowe, a former telegrapher, against the Delaware, Lackawanna & Western, charging it with violating the law limiting the working hours of telegraphers. It is charged that at Norwich the station office is kept open from 5.45 in the morning until 1 o'clock the following morning, and that only two operators are employed. One of the operators works from 5.45 a.m. to 5.45 p.m., and the other from 1 p.m. to 1 a.m. It is also charged that the law is violated at other stations.

The town of Greensburg, Pa., has become so very short of water, because of the long-continued drought, that the Pennsylvania Railroad has made a connection between its own pipe line, laid some time ago to supply locomotives, and the pipe lines of the water companies which supply the town, and has notified the water companies that the road will give water to meet the necessities of the citizens free of charge, so long as this can be done without crippling the operation of the railway. Over 35,000 people were in danger of being without water for either domestic or fire purposes, and the railway company felt in duty bound to give what assistance it could; but in making the offer President McCrea stipulated that the water must be given free of charge to the consumers. The question might be raised whether the railway had the right or power to sell water.

President Shonts, of the Interborough Rapid Transit, has again written to the New York State Public Service Commission proposing to sell the Steinway tunnel to New York City. This tunnel, which extends across the East river from 42d street, Manhattan, to Steinway on Long Island, was completed several months ago, but remains unused because the owners are in doubt as to the validity of their franchise. Mr. Shonts now proposes that the city pay for the tunnel $7,239,000, which is the same price as that formerly asked, but he withdraws the proposal to operate the tunnel in connection with the street railways in Queens county. Or, if the city will not buy, the Interborough will ask for a franchise, with a view to operating the tunnel; but in that case will not agree to carry passengers for less than 5 cents for the tunnel proper. The original offer contemplated 5-cent fares through to points in Queens county beyond the eastern terminus of the tunnel.

Employees Got All the Net Earnings.

Certain grateful employees of the Georgia Northern have given out an unusual story. On New Year's day about 50 of them were guests of President and General Manager C. W. Pidcock at his home in Moultrie, the occasion being a "state dinner." They were the regular conductors, engineers, firemen and station agents with the exception of those whose duties made it impossible for them to be present. As the guests were leaving each was handed an envelope, and each envelope was found to contain a check. It appears that when the officers of the railway came to cast up accounts at the close of 1908 they found, as did the officials of most other roads in the South, that the year had not been a particularly successful one. The net earnings for the year amounted to about two or three thousand dollars. The officers then put their heads together and resolved somewhat to this effect:

The net earnings are not sufficiently large to do the company any good. Divided among the employees the amount will help many of them over some rough places. Therefore the employees shall have it. Thereupon the total amount was duly appropriated among the conductors, engineers, firemen, station agents and certain other employees, and a check for the proper amount was made payable to each.

The Georgia Northern, formerly the Boston & Albany Railroad of Georgia, has seven locomotives, nine passenger cars and 33 freight cars; gross receipts for the year ending June 30, 1907, $221,620; dividends that year $60,000.

Illuminated Landmarks and Slow Boards.

A noticeable feature on French railways is the use of translucent ground-glass signs, one being placed about 1,200 meters in the rear of the distant signal at every point where a route diverges, bearing the word "Bifur," an abbreviation of bifurcation. Signs of this type are also used to indicate the ends of all stub tracks, displaying in large characters the words "Voie d'impasse"; bumping posts also being indicated by the same type of sign with the words "Heurtoir d'impasse." These same ground-glass signs with black numerals are used to indicate the permissible speed, in kilometers per hour, wherever

slow signals are required, a plain white board with a white light being used to denote that full speed may be resumed. These translucent signs are illuminated at night.—*I. C. C. Report.*

The Prospects of the Atlanta, Birmingham & Atlantic.

In a pamphlet issued to stockholders, H. M. Atkinson, President, and who was recently appointed receiver, says in part:

October, 1908, was the first full month that the completed mileage of the A. B. & A. was operated. The panic conditions of the past year not only delayed the completion of the road, but seriously affected its earnings, making it impossible to meet all of its obligations. The directors of the company felt that by putting the road in the hands of receivers it could be operated to better advantage and held together, which would be best for all the stockholders and its creditors. The earnings of the road are now increasing rapidly, and it is believed that the receivers will be able to build up its earnings within a comparatively short period so that plans can be worked out providing for all its obligations and stockholders.

The company has issued $25,000,000 common stock; $10,000,000 preferred; $18,533,000 first mortgage 5 per cent. bonds, and has outstanding equipment obligations amounting to $2,789,169, and has guaranteed principal and interest $3,000,000 bonds of the Georgia Terminal Co., and $2,445,000 bonds of the Alabama Terminal Railroad Co.

Mileage of the main lines in operation on January 5, 1909, are as follows:

Brunswick to Pelham	429.4 miles
Pelham to Birmingham (under contract with L. & N. Railroad)	19.0 "
Manchester to Atlanta	78.0 "
Fitzgerald to Thomasville	80.5 "
Waycross to Sessoms	26.0 "
Pyriton to Ashland	7.1 "
Total operated main line	640.0 miles

Earnings for Year Ended June 30, 1908, Covering an Average Mileage Operated of 491.2 Miles.

Gross earnings from all sources	$1,720,494.34
Operating expenses	1,157,142.21
Total net income	563,352.13

Earnings for the Five Months Ending November 30, 1908, with Comparative Figures for Corresponding Period of 1907.

	5 months ending Nov. 30, 1907.	5 months ending Nov. 30, 1908.
Gross earnings from all sources	$844,194.29	$882,369.24
Operating expenses	604,048.88	586,410.76
Total net income	$240,145.41	$295,958.48

In accordance with contract dated November 1, 1907, between the Atlantic & Birmingham Construction Co. and the Atlanta, Birmingham & Atlantic Railroad, the construction company as part of the expenses chargeable to it, on account of the unfinished condition of the work and the interference by its work with the operation, paid each month from November 1, 1907, to November 1, 1908, to the railway company, the portion of the operating expenses that equaled the excess of the total operating expenses above 70 per cent. of the total operating revenues. This contract terminated on November 1, 1908, and not until then did the railway begin its regular independent operations. The steady increase in earnings is encouraging, and it is believed, permanent. The road is only just in position to take advantage of its opportunities. Under the protection of the court and the aid which the receivership will afford, it is confidently believed that the road will work out in satisfactory shape.

In a report by P. J. Flynn, Traffic Manager of the Delaware, Lackawanna & Western, on the condition and traffic possibilities of the Atlanta, Birmingham & Atlantic, to Percy R. Pyne, published in the same pamphlet, Mr. Flynn says in part:

The expense of conducting the entire traffic department is not at all excessive. The freight service is adjusted to the requirements of the traffic, thus enabling the A., B. & A. to compete freely with its neighbors.

Before going South I wondered what the roads reaching the lumber tracts would do for traffic after the lumber had disappeared. I found that other traffic, principally cotton, had succeeded the lumber. Aside from the traffic moving between points on the A., B. & A. proper, the road is in position to, and does, handle considerable business to and from other territory, having junction points and pro-rating arrangements with nearly all Southern roads.

An arrangement which will bring to the port of Brunswick grain and other traffic from Western territory for exportation is very necessary. I learned that the management had this in hand.

The foreign freight department recently organized, and inexpensive to the company, should prove a valuable adjunct to the traffic department.

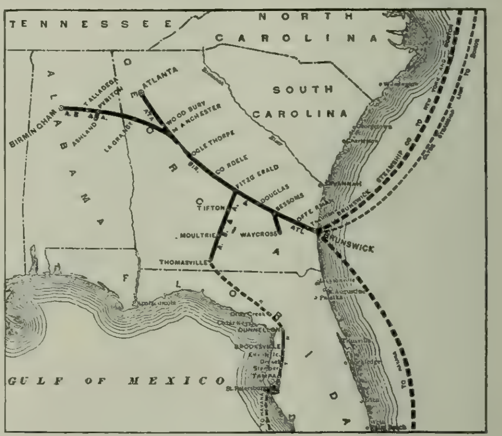
I suggested to Mr. Atkinson the importance of having an industrial agent to present to the manufacturer and the home-seeker the advantages offering along the line of the A., B. & A., and he made a note of it at the time.

I feel that great credit is due to the management for acquiring land for future development, such as for extension of facilities at stations and terminals, location of industries, etc., and at a time when it was available and comparatively inexpensive.

As the quantity of traffic to be obtained or the value of it to a carrier cannot be predicted, because of unforeseen conditions, an illustration of which we had a year ago, I felt, before reaching the road, that it would be very unwise to attempt any estimate. Now that I have been over the property and having carefully observed all conditions and possibilities, I can not refrain from saying to you that I firmly believe that the financial success of the enterprise is fully assured and that, with no great stagnation of industry, the revenue of the road ought to reach $6,000 per mile between now and January 1, 1910, and continue increasing perceptibly thereafter.

Sleeping car service of the Pullman Company is being operated on the night trains between Atlanta, Ga., and Thomasville, under the usual form of contract and is almost self-supporting. Service of this kind not yet warranted in other territory.

There is no through car passenger service in connection with other roads, but efforts are being made to establish same to a limited extent.



The Atlanta, Birmingham & Atlantic.

The present style of locomotives, road and switching, is well adapted to the requirements. The supply of road locomotives will have to be increased soon. The general shops built at Fitzgerald are wholly adequate for all general and heavy overhauling of the road. The passenger equipment is new and modern in every respect. The supply could be increased to advantage as it has been found necessary to hire coaches from other roads to care for special excursion traffic offering at intervals. The condition of equipment generally is very good, the percentage of it in shop from time to time being very low.

There is no large surplus of freight equipment and the present supply should care for $50,000 additional business.

The terminal property at Atlanta, comprising about two hundred acres, is well situated and ample to meet all future requirements of the company, such as yards, shops, stations, etc., with considerable land to spare for the location of industries producing freight traffic. Sufficient of this property has been improved to take care of a good volume of freight traffic to and from Atlanta as well as interchange with connecting roads. The company is now receiving about $30,000 per annum from tenants on the property who have not been disturbed to date. The acquirement of this property for terminal purposes gives the company marked advantages over the other roads reaching Atlanta.

The company uses for passenger traffic to and from Atlanta the Union Depot of the Western & Atlantic, Seaboard Air Line, Louisville & Nashville and Georgia railroads, under the usual form of contract. This depot is centrally located and the above named roads are natural connections of the A. B. & A.

The Brunswick terminals (land and water) cover a large area and additional land has been procured for future development.

The whole layout including the city freight and passenger stations is well located and a belt railroad, owned by the company, reaches the principal industries and wholesale houses, also a large acreage of unoccupied land suitable and available for industrial purposes.

The company is not yet operating to Birmingham over its own rails, using the tracks and terminals of the Louisville & Nashville, connecting at Pelham, Ala., a distance of 19 miles from Birmingham.

The company has terminal property in Birmingham conveniently located and ample for all future requirements.

The opening of the new line through a territory exceedingly rich in natural resources and now awaiting active development must of necessity call for additional outlay on the part of the company, such as tracks to industrial plants locating, switching service, station facilities, etc., and this before receiving any returns from the traffic to be moved.

To ascertain the exact total operating expense prior to November 1 last would be somewhat difficult because of some of the construction work, etc., going on at the same time having been interwoven with it. We learned, however, that the percentage of expense to gross revenue had reached as high as 78 per cent. It is our opinion, however, that ultimately the percentage of operating expense to gross revenue should reduce to 68 or 69 per cent.

The Atlanta, Birmingham & Atlantic runs in a northwesterly direction, across the states of Georgia and Alabama, and through parts of several counties that have heretofore been without railway facilities.

Fully 90 per cent. of the general traffic offering at present is directly or territorially competitive. Development of considerable traffic strictly local to the road has been retarded during the past by lack of transportation facilities. The principal commodities now being handled are cotton, lumber and naval stores (turpentine and resin).

Georgia ranks second as a cotton producing state, Texas first. Cotton offers for shipment in all territory reached by the road except in a stretch of mountainous country west of Talladega.

A matter for general congratulation is the fact that Manchester, Ga., a new place 78 miles out of Atlanta and the junction of the Atlanta division, now without any population to speak of, has been selected for the location of a large cotton mill to cost $500,000 and to be in operation for the cotton crop of 1909. This mill will employ at least 400 persons, for whom dwelling houses will be constructed at Manchester, and will immediately attract other lines of trade.

The Birmingham Coal & Iron Co., composed of interests friendly to the A. B. & A., owns over 40,000 acres of the best coal lands and over 3,000 acres of the best ore lands in the Birmingham district. It is estimated that the coal lands will yield 10,000 tons of coal per acre. This company also owns two blast furnaces near Birmingham capable of producing 10,000 tons of iron per month.

The coal mines, the iron mines and one of the furnaces are in operation, but not to the extent of their capacity. It is expected, however, that with the full resumption of commerce a very large tonnage will flow from these industries to the A. B. & A., to say nothing of the participation of the road in similar traffic from other like industries in the district.

The importance of Brunswick as a port and the necessity of maintaining the Brunswick Steamship Line as a connection of the A. B. & A. cannot be overestimated. The port of Brunswick is in competition with Charleston, Savannah and Jacksonville. This means that the Brunswick Steamship Line and the A. B. & A. are competing with the steamship lines to the ports just mentioned and their rail connections leading therefrom, and against long established and more frequent service, thus emphasizing the necessity of placing the Brunswick Steamship Line in position to freely compete with its neighbors, especially as upon efficiency of service depends the reputation and prosperity of any transportation company.

In a report addressed to the President of the Atlanta, Birmingham & Atlantic, H. A. Parker, formerly Vice-President and Chief Engineer of the Chicago, Rock Island & Pacific, in part says:

You have certainly built a good road and I believe strengthened your company by doing so. A finished road now certainly means less expense for maintenance in the future. Your company has also strengthened itself by securing large and convenient terminals at the three terminal points of Atlanta, Birmingham and Brunswick. It does not seem possible that your company will find it necessary, in this generation at least, to issue bonds as most old companies have done or are attempting to do, in order to secure funds for "betterments." These "betterments" generally consisting of the cutting down of grades; the elimination of curves; the replacing of temporary structures with permanent ones; sometimes double tracking, but more frequently the securing of additional terminals. Again it seems to me that your company is strong in the fact that it is in a position to control absolutely the movement of a large volume of traffic originating in the coal and iron fields of Birmingham; that it is so situated as to handle as cheaply and more expeditiously than your rivals, the cotton and other staples from probably the most fertile sections of Georgia and Alabama; and because with the completion of your line into Birmingham and its various connections at that place, there will be little temptation or occasion to build extensions and branches for self-protection.

While it seems probable that you will some day desire and in time will control a line to some port on the Gulf of Mexico, still, with its three terminals, Atlanta, Birmingham and Brunswick, and with steamship lines of adequate capacity from the latter place, the A. B. & A. will be in a position to sustain itself and rest from further construction if its owners so desire.

The completion of your road from Pelham to Mulga—about 29 miles—seems essential if the best results are to be secured. In other words, the reasons for undertaking the construction of the line in the first instance are still potent, and demand its completion at the earliest possible date, as by this line you secure entrance into your own coal fields. Next to the completion of your line to Mulga, the most important construction work in hand is the completion of the change of line of the old Eastern Alabama Railroad. This work is well advanced and the engineers in charge gave "early in January" as the probable time for completion, but considering the time of year and the nature of the work I would put this date near March 1, next.

It is my deliberate judgment that unless the present business depression has come to stay, which few expect, or the business of the country will dry up entirely, which no one believes, the A. B. & A. must soon come into its own, and furnish abundant reasons for its existence and justify the hopes of its builders.

Valuation of Railways in Minnesota.

The Railroad Commission of Minnesota has issued a pamphlet of 158 pages, giving the results of its appraisal of the railway properties in that state. The appraisal puts a considerably lower valuation upon the properties than that of the railway companies themselves. The railways claimed that the aggregate cost of reproduction of all the railways in the state on June 30, 1906, was $500,675,780; while the Commission's valuation, as of June 30, 1907, is much lower. The Commission practically made two valuations. In its estimate A, it made allowance for the claim of the railways that land used for right-of-way is more valuable than adjacent land used for other purposes, while in estimate B it inserted figures representing the values of the lands for other than railway purposes. In estimate A it fixed the cost of reproduction, new, of the physical properties at $411,735,195, and their present value at $360,480,160. In its estimate B it fixed the cost of reproduction, new, at $373,820,141, and the present value at $322,565,107. Omitting from estimate B allowance for adaptation and solidification of roadbed, amounting to $12,158,593, the Commission found the cost of reproduction, new, would be $360,961,548 and the present value $309,706,514.

The appraisements placed upon the different roads in estimate A are as follows:

Railway.	Miles of line in Minnesota.	Total cost reproduction.	Present value.
Chic., Burl. & Quincy	23.5	$2,726,670	$2,405,988
Chic. Great Western.....	117.6	7,769,914	6,714,147
Chic., Mil. & St. Paul....	1,202	54,591,393	47,459,752
Chic. & North Western..	651	21,214,978	17,463,934
Chic., Rock Island & Pac..	236	8,716,216	7,799,600
Chic., St. P., M. & O.....	431	26,778,560	22,838,120
D. & I. R.	241	20,564,552	17,771,796
D., M. & N..............	142	23,087,672	20,909,116
D. & N. E.	63.5	859,865	711,737
D. & M. N.	35	880,008	675,956
Great Northern	2,050	107,074,102	94,415,343
M., C. & F. D...........	27.3	772,072	622,941
M. & I.	174.5	3,966,309	3,409,461
M., St. P. & S. S. M.....	539.6	21,990,682	19,575,254
M. & St. Louis	378.5	16,622,245	14,276,189
Northern Pacific	967	69,397,955	61,099,563
Wisconsin Central	23.6	2,780,323	2,455,906
W., M. & P.	244	6,561,652	5,645,689
Illinois Central	30.2	944,302	800,845

Oklahoma Corporation Commission.

The state corporation commission of Oklahoma in its first annual report recommends that numerous sections of the law be made self-executing, giving the commission power for their enforcement. Among these provisions are those requiring public service corporations to maintain a public office in the state, where transfers of stock shall be made, etc., and shall not own or control the stock of any competitive corporation.

No vitality has been given, the report states, to the section making it mandatory, before license to do business in the state be granted to either foreign or domestic corporations, that lists of their stockholders, officers and directors must be filed with the commission. This information has proven of value to the state and the public, it shows, yet there is no means of enforcing the provision; also it suggests that, it be provided, that reports shall be made annually.

The commission wants authority to require a railway to pay for tracks extended to private industries, or such portion thereof as may be on the right-of-way of the railway company.

During the year ended Nov. 30 there were filed with the commission, 308 complaints, 52 of which are still pending. The

commission thinks that reductions in freight rates are saving the people between $1,000,000 and $2,000,000 annually.

The commission had intended to file suit before the Interstate Commerce Commission for reduction of interstate rates on hogs, grain, products and lumber, but a conference with the railway officials was held, and an agreement was reached for reductions which will amount to $500,000 annually as applied to Oklahoma. Henceforward the state corporation commission will require detailed reports by wire and mail from all railways and street railways relating to accidents.

Victorian Railways.

The following tables summarize the operating results of the Victorian Government Railways for the fiscal year ended June 30, 1908, and give comparisons of statistics for the last five years and the preceding five years. In 1908 the company operated 3,319 miles of line.

Financial Results, for Year Ended June 30th, 1908.

Gross revenue	$18,849,745
Operating expenses, including payment into railway accident and fire insurance fund	11,124,318
Net revenue	$7,725,427
Less deficit—St. Kilda and Brighton Electric St. Ry.	19,101
Total net revenue	$7,706,326
Special expenditures and charges completing liquidation of extraordinary liabilities taken over by the Commissioners on July 1, 1903.	229,008
Balance of total net revenue	$7,477,318
Interest charges and expenses.	7,220,946
Surplus credited to consolidated revenue	$256,372

	For five years		Change	
	Last.	Preceding.		
Gross revenue	$90,974,521	$76,167,484	Inc.,	$14,807,037
Operating expenses	48,835,532	45,544,907	"	3,290,625
Net revenue	$42,138,989	$30,622,577	Inc.,	$11,516,412
Special expenditures & chrgs*	3,398,715	781,706	"	2,617,010
Balance of net revenue	$38,740,274	$29,840,872	Inc.,	$8,899,402
Interest charges and expenses.	36,095,984	35,688,837	"	407,147
Surplus to consolidatd revenue	$2,644,290	....		....
Deficit paid out of consolidated revenue	....	5,847,965		....
Train mileage	48,007,400	52,459,079	Dec.,	4,451,679
No. passengers carried	324,149,961	262,105,154	Inc.,	62,044,807
Tons of goods carried	16,942,845	14,445,830	"	2,497,015
Tons of live stock carried	1,521,265	1,241,705	"	279,560
Operating ratio	53.68	59.80	Dec.,	6.12

*In liquidation of extraordinary liabilities.

Joint Inspection of Cars at Kansas City.

A committee of transportation and mechanical officers that was appointed to investigate the desirability of establishing a joint car interchange and inspection bureau at Kansas City made its report on January 11 to the Kansas City Division of the Central Association of Railroad Officers. The committee recommended the establishment of such a bureau.

In making its investigation the committee used the figures for the month of September, 1908, as a basis. During that month 100,528 cars were delivered and received at Kansas City. The total number of interchange clerks employed was 51 and the aggregate salaries paid them was $3,339. The total number of inspectors employed was 60 and the aggregate salaries paid was $5,155. The total cost of supervision of inspection, including the salaries of the chief joint inspectors, was $1,205, making the total cost of interchange and inspection $9,699, for the month, or an average of 9.65 cents for transferring. The committee estimated that if there had been a joint bureau to handle both interchange and inspection 51 clerks and inspectors could have done all the work, whose salaries would have aggregated $4,234, and that the cost of supervision of both services would have been $1,815, making an estimated total cost of interchange and inspection of $6,049, or 6.02 cents a car. The total estimated saving under the proposed bureau plan would therefore have been $3,650, or 3.63 cents a car. The committee presented elaborate tables giving the figures upon which it based its estimates. It favored the establishment of a joint interchange and inspection bureau in charge of a competent chief reporting to and working in connection with the Central Association of Railroad Officers.

It based its recommendation not only on the greater economy of operation, which it was thought would be nearly $44,000 per year, but upon the belief that joint transfers would promote a freer movement of cars between connections; the furnishing of more prompt and accurate interchange reports for general and local offices, as it would eliminate almost entirely the correspondence now necessary to verify car records; and would permit prompt settlement of per diem accounts and make seal records, which would be obtained and kept by disinterested employees, more accurate.

The committee called especial attention to the carding of cars. The expense of this work on interchange tracks, which is being done by yard clerks, is not included in the figures in the report, and neither is the work provided for in the proposed plan, it being the committee's belief that this work can be best arranged for primarily by the representatives of the individual lines. After it has been arranged for, joint clerks to do the work might be placed under the supervision of the bureau.

It was decided to appoint a committee of five to work out in detail the plan for a joint bureau, and to report at the next meeting of the association. This committee is composed of G. E. Smith (C. B. & Q.), Chairman; E. J. Lampert (M. K. & T.); J. A. Somerville (M. P.); John Forster (St. L. & S. F.); and R. L. Stewart (C. R. I. & P.).

For the Committee on Standard Code.

A railway official has waxed sarcastic as the result of the restrictions imposed by municipal ordinances upon railway traffic in Ohio towns and proposes the following rules:

"When a train is approaching a team the engineer must stop the train and cover the engine with a tarpaulin painted to correspond with the scenery.

"In case a horse gets scared at an engine, notwithstanding the scenic tarpaulin, the engineer will take the engine apart as rapidly as possible and conceal the parts on the river bank.

"On approaching a curve where he cannot command a view of the track ahead, the engineer must stop the train, blow the whistle, ring the bell, fire a revolver, and send up three bombs at intervals of five minutes. * * *

"In case a train comes up behind a pedestrian he shall affect deafness until the engineer calls him a hard name.

"All members of the police force shall give up Sunday to chasing trains. * * *

"When a train approaches a crossing where the tracks are dusty, the engineer must slow down to one mile an hour and lay the dust with a hand sprinkler."—*Exchange.*

Washington Letter.

WASHINGTON, Jan. 27.—A complaint unique in the annals of railway rate litigation has been filed with the Interstate Commerce Commission by James Manahan, of St. Paul, Minn., representing the Minneapolis Threshing Machine Co., a complaint which, if successful, opens a new field for these litigants throughout the country.

The complaint sets up as one of its allegations that the stockholders of the Chicago, Minneapolis & Omaha and the Chicago & North Western railways are injured because of the excessive freight rates of these companies on farm machinery from Minneapolis and St. Paul to points in Wisconsin, Iowa and Nebraska. The complaint says the efficiency of these railways as common carriers is, to a degree, destroyed by the folly of their traffic managers in making a rate so excessive as to bar the movement of freight, handicap the business of shippers and the prosperity of both consumer and producer, "as does the arbitrary, exorbitant and unlawful rate enforced for the transportation of agricultural implements by these defendants." The complaint states that "extortion" amounts to $100,000 annually, and leaves it to the imagination to estimate the amount the stockholders are injured.

This is the first time in the history of cases of this character that the interest of the stockholder of the railway has been set up by the complainant as a plea in favor of lowering a freight rate. But the threshing machine company claims it has to pay annually over $500,000 in freight rates that are so excessive as to materially interfere with the volume of business it would do

were the rates charged reasonable. This, it is alleged, must all come out of the farmer, and the natural result is that the latter individual often declines to buy machinery at all, and at all times exercises every possible makeshift to put off as long as possible the evil day when he will have to procure a new machine.

The complaint is specific in its allegations of over-charges as to the points in Wisconsin, Iowa and Nebraska. And it asserts that the North Western transports the same line of commodities like distances out of Chicago for a much lower rate. The charge is directly made that this commodity has to bear more than its share of the carrier charges and the reasonableness of the western classification is vigorously attacked.

Pursuing its assualt the complaint urges a special point against the Omaha road for increasing the rate from Hopkins, where the manufacturer's plant is located, $5 per car, the increase having been put into force January 10. In this connection the complaint alleges that the whole North Western system could be reproduced in its present condition for not more than $30,000 per mile, and yet that it earns net over legitimate operating expenses not less than $8,000 per mile annually, proving that it does not need this increase, which in many instances amounts to 30 per cent. G. G.

Railway Business Association.

On January 21, the Board of Directors of the Retail Merchants Association of Richmond, Va., adopted the following resolution:

"The railways and the industries directly and indirectly dependent upon them form a very large part of the commercial life of the city of Richmond, of the state, and of the entire country, the welfare of approximately thirteen million persons being greatly dependent upon the prosperity of these industries.

"We therefore favor and urge upon our legislators, state and national, the adoption of a policy which will tend to restore prosperity to these industries.

"The railway problem, overshadowing all others in Virginia and in the South, in our opinion, is how to furnish adequate service and conveniences and give additional transportation facilities. To this end revenues must be adequate and should not be diminished.

"We respectfully request the State Corporation Commission to withdraw the passenger rates recently promulgated.

"Resolved, That the foregoing be published, and a copy sent to the members of the State Corporation Commission, to all of our state officials and to each member of the Legislature of Virginia."

Resolutions bearing on this same subject were passed, up to January 25, by the following commercial bodies:

Illinois Manufacturers' Association.
Southern Commercial Congress.
Board of Trade and Transportation, City of New York.
Merchants' Association of New York.
Detroit, Mich., Board of Commerce.
Jacksonville, Fla., Board of Trade
Clarksburg, W. Va., Board of Trade.
Indianapolis, Ind., Board of Trade.
Dayton, Ohio, Chamber of Commerce.
New Orleans, La., Progressive Union.
National Boot and Shoe Manufacturers' Association.
Board of Trade, Chicago, Ill.
Merchants Association of York, Pa.
Bristol, Va.-Tenn., Board of Trade.
National Shoe Wholesalers Association of the United States.
American Hardware Manufacturers' Association.
Pittsburgh, Pa., Chamber of Commerce.
The Manufacturers' and Merchants' Association of Kansas City.
Philadelphia, Pa., Board of Trade.
San Antonio, Tex., Business Men's League.
Retail Merchants' Association, Richmond, Va.
Columbus, Ohio, Board of Trade.
Business Men's Association of Auburn, N. Y.
Battle Creek, Mich., Industrial Association.

Care of Gutters.

It is a very common thing to pass a railway building in otherwise good repair whose gutters leak. The cornice is bare and often rusty, and there is never a thought of the results or of a remedy. When a building is finished, when the cornice work is galvanized, no one thinks of rust. No one will ever see the inside of gutters and the money can be spent where it will make a better showing. In addition, they are never looked after or painted, even the cinders are not cleaned out of them until they are choked and run over, and when rust starts there is very little hope of saving them.

Railway buildings are not difficult to find that have been in use ten years, and those in charge cannot be induced to put a coat of paint on the metal work simply because the remainder of the building does not seem to need repairs. Very often double gutters of heavy material are allowed to rust through, and when this is done the only remedy is renewal, and with such gutters under a slate roof the expense is out of all proportion to the cost of cleaning out the cinders and putting on a coat of paint every year or two. No one seems to be willing to take the responsibility of keeping gutters from rusting out, but it would seem that if their care was turned over to the painter who would look after them, see that the cinders are kept out, and that they are properly painted during the dry weather, it would be the means of saving the cost of replacing two or three layers of slate and the expense of renewing, not to mention the inconvenience of leaking gutters and ventilators.—*From a paper by H. J. Barkley, Secretary, Maintenance-of-Way Master Painters' Association.*

A Suggestive Old Railway Contract.

The new and perpetual contract between the New York Central and the New York, New Haven & Hartford Railroad companies lately signed refers back in a number of places to the original contract of 1848, 60 years ago, of the New Haven and Harlem railroad companies. The original is in the archives of the contracting companies. It relates entirely to rates to be charged the New Haven by the Harlem for entry to New York over its tracks, and in its sixth paragraph indicates what a time of small things it was where there was to be in years after a great railway terminal. The paragraph reads as follows:

Sixth.—It is mutually understood and agreed that the New York & New Haven Railroad Company shall pay, in the manner hereinafter provided, and the New York & Harlem Railroad Company shall receive as full compensation, for the use and occupation of their track or tracks as aforesaid, a certain sum for each passenger transported by the said New York & New Haven Railroad Company in their several trains, to be dependent upon and adjusted by the total number so transported daily, according to the following scale: For any number not exceeding 1,000 per diem at the rate of 14 cents each; for any number not exceeding 1,250, but over 1,000, per diem, at the rate of 12 cents each; for any number not exceeding 1,500, but over 1,250, per diem, at the rate of 10 cents each; for any number not exceeding 1,750, but over 1,500, per diem, at the rate of 9 cents each; for any number not exceeding 2,000, but over 1,750, per diem, at the rate of 8½ cents each; for any number not exceeding 2,500, but over 2,000, per diem, at the rate of 8 cents each; for any number not exceeding 3,000, but over 2,500, per diem, at the rate of 7½ cents each; for any number not exceeding 3,500, but over 3,000, per diem, at the rate of 7 cents each; for any number not exceeding 4,000, but over 3,500, per diem, at the rate of 6½ cents each; for any number exceeding 4,000 per diem, without further limit, at the rate of 6 cents each.

At the present time, in contrast with those days, the New Haven Company carries in and out of New York City some 9,000,000 passengers a year, or nearly 25,000 a day entering or leaving the Grand Central station alone.

The old contract, bearing date of March 17, 1848, is signed by Charles Parshall, President of the New York & Harlem Railroad Co., and Robert Schuyler, President of the New York & New Haven Railroad Co., Schuyler being the man who, by a latter issue of spurious New Haven stock to the amount of $1,954,000—the genuine stock being $3,000,000—crippled his company for many years. The Harlem service supplied to the New Haven was between Williams Bridge and the old Canal street station of the Harlem Company, and the contract was, in a sense, forced from the New Haven corporation after its unsuccessful appeal to the New York legislature to secure charter rights to enter New York City. In resisting that attempt the Harlem Railroad Company was joined with the Westchester Turnpike Company. Had the New Haven succeeded it would probably to-day be owning the large terminal in the heart of New York City.

Panama Canal Cost.

The cost of the Panama Canal construction from May 4, 1904, to October 1, 1908, is as follows:

Department of Civil Administration	$2,381,000
Department of Sanitation	7,408,000
Department of Construction and Engineering	51,512,000
Bldgs. for Dep. of Const. & Eng., incl. quarters	8,550,000
Buildings for Department of Civil Administration	336,000
Buildings for Department of Sanitation	1,228,000
Buildings for military protection	64,000
Construction of electric light plants	206,000
Purchase of steamers Panama and Colon	1,300,000
Double-tracking Panama Railroad	1,056,000
Relocation of Panama Railroad	1,857,000
Docks and wharves leased to Panama R. R. Co.	514,000
Municipal improvements	2,281,000
Municipal impvmts. for benefit of Canal Zone settlemts.	3,701,000
Lands purchased and expropriated	97,000
Buildings, tools, Cristobal shops	174,000
Locomotives, cars, and equipment	610,000
Total	$83,275,000
French franchise	40,000,000
Paid Colombia	10,000,000
Grand total to October 1	$133,275,000

MEETINGS AND APPOINTMENTS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk, Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburg, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Association of American Industrial Commissioners.

A meeting of railway industrial agents was held at Birmingham, Ala., January 22, and about 50 of the leading railways of the United States were represented. Col. T. G. Bush, of Birmingham, was one of the chief speakers. Those in attendance included President J. C. Claire (Illinois Central), W. Gallagher (Western Maryland), Col. F. Y. Anderson (Alabama Great Southern), J. M. Mallory (Central of Georgia), Guy L. Stewart (Cotton Belt), C. J. Huff (Michigan Central), C. A. Park and S. B. Scott (Louisville & Nashville), E. V. Shoemaker (Delaware & Hudson), Luis Jackson (Erie), L. L. Lawrence (Mobile, Jackson & Kansas City).

Traffic News.

At Baton Rouge, on January 27, the Louisiana State Railroad Commission gave a hearing on a proposition to reduce rates on cotton seed for planting. As the cotton planting season is near at hand it is the purpose to make the proposed rates effective for February 1.

Important changes will be made soon in the passenger train service of the Burlington between Kansas City and Chicago and the Pacific coast. Solid through limited passenger trains will be put on from Chicago to Seattle, via St. Paul, and from Kansas City to Seattle, via Billings.

The Carolina, Clinchfield & Ohio has made its connection with the Seaboard Air Line at Bostic, N. C., and the first delivery of coal to the Seaboard has been made. The Carolina, Clinchfield & Ohio has agreed to deliver to the Seaboard Air Line Railway 1,000,000 tons of coal annually.

On the western lines of the Canadian Pacific there is now an Industrial Department. This department has been established for the purpose of providing a convenient means of intercourse between manufacturers and merchants who wish to embrace opportunities for business in western Canada and the boards of trade and property owners in that region who are interested in encouraging the establishment of new business enterprises.

The Union Pacific, to meet the complaint of the Nebraska State Railway Commission that local passengers are not given as good facilities as through, has put a buffet car on one of its local trains leaving Omaha in the morning so that passengers who desire meals can have them. Chair cars have been put on some of the fast through trains so that local passengers may have a suitable place to ride. The Overland Limited will not carry local passengers in Nebraska.

On account of the decision of the interstate commission on the two-cent refund allowed by New York lines to refineries on shipments of sugar, and because of the refusal of the commission to say whether or not the commission would prosecute if the practice were continued while the matter is being contested in the courts, the New Orleans tariff committee has decided to indefinitely postpone its proposed new sugar tariff. This action was taken after two days' discussion.

The Wisconsin Central began running trains over its new line into Superior, Wis., on January 4. The new line extends northward from Owen, Wis., and stations on it, with their mileage from Chicago, are as follows: Owen, Wis., 318 miles; Lublin, 330 miles; Gilman, 337 miles; Sheldon, 349 miles; Ladysmith, 362 miles; Murry, 373 miles; Weirgor, 380 miles; Stone Lake, 398 miles; Stanbery, 412 miles; Chittamo, 421 miles; Gordon, 430 miles; Solon Springs, 438 miles; Hillcrest, 450 miles; Way, 455 miles; Superior, 471 miles.

A short time ago the citizens of Lemont and Lockport, Ill., asked the Chicago & Alton for an additional train between these points and Chicago. There was a through train from Kansas City which came through these places at 7:30 a.m., but the people wanted a train that would leave at about 8:15, and always be on time. The officers of the road said that the train would not pay, but the citizens insisted that it would, and the Alton suggested that if they were sure they should guarantee its expenses. The city councils of Lemont and Lockport then met and voted to guarantee the expenses. The Alton finding them so confident announced that it would not insist upon the guarantee, but would put the train on for three months and would start it from Joliet so that it would get the benefit of the travel from that point. If at the end of three months it is found the train pays, it will be kept on.

If not, the citizens will be asked, in case they insist upon having it kept on, to pay any deficit that there may be in its earnings.

The competition of rival steamship companies for traffic between New York city and Gulf ports has become so sharp that railways to those points are becoming involved. The Texas City Steamship Company put vessels in service between New York and Galveston and Houston about five months ago, and made sweeping reductions in rates. The Morgan and Mallory lines responded by announcing still lower rates. The resulting situation amounts to a rate war for all traffic moving between New York and Gulf ports. Traffic to interior Texas points has become affected as these points can ship by boat to Galveston and thence by rail much cheaper than they can ship all-rail from New York. As no reductions have been made in rates from New York to New Orleans the jobbers in New Orleans are complaining of the rates to Galveston.

The lines in the Western Passenger Association have failed entirely to reach an understanding as to whether to maintain a flat 2-cent fare this year, and, if not, as to what special rates shall be made. The result is that some extremely low rates have been announced and it is an open secret that there are bitter feelings and harsh recriminations. One reduction announced is a rate of 1 cent a mile by the Union Pacific between Kansas City and Omaha. It has been decided, much against the wishes of some lines, to make a rate of one fare for the round trip between Chicago and Missouri river territory for the G. A. R. encampment at Seattle in August. The rate for the convention of the Young People's Society of Christian Endeavor at St. Paul will be a fare and a half, and for the convention of the National Educational Association at Denver the rate will be the regular summer tourist rate, $30 for the round trip from Chicago. These facts are sufficient to show that the entire plan for maintaining rates in W. P. A. territory on a 2-cent basis has gone by the board. The fundamental cause of the failure to reach any agreement was the desire of various roads to attract colonists to their respective territories by means of special rates. At the meeting of the W. P. A. in Chicago on January 22 the committee appointed to consider the entire question of reduced rates for gatherings made majority and minority reports. The majority opposed any further reductions. The minority favored one and one-half fare for gatherings of 1,000 persons or more. Neither report was adopted.

INTERSTATE COMMERCE COMMISSION.

Rates established by state authority are presumed to be reasonable, but the same presumption also attaches to rates voluntarily established by carriers, and in proceedings before this Commission no greater sanctity can be presumed in respect of rates established by a state railway commission than of those voluntarily established by carriers.

Prompt Delivery Not Enforceable by Commission.

J. C. Blume & Co. v. Wells Fargo & Co. Opinion by Commissioner Harlan.

Because of the failure of the defendant to make prompt delivery of a carload of fruit at the unloading station designated by the shippers, the latter were unable to take advantage of a high market and were compelled later to sell at lower prices. For the loss thus sustained they demand reparation. Complaints for damages of this character are not cognizable by the Commission. The prompt and safe carriage of goods is an obligation enforced on carriers by the common law and not by the act to regulate commerce. Damages may be awarded by the Commission only for a violation of some provision of the act.

Agreement in Making a Joint Rate..

Grand Rapids Plaster Co. v. Pere Marquette et al. Opinion by Commissioner Cockrell.

Complainant shipped two carloads of plaster from Grand Rapids, Mich., via Milwaukee, Wis., to Houghton, Mich., for which it was charged a rate of 20 cents per 100 lbs. When the shipments were made the initial carrier had a published rate on plaster between said points of 16½ cents per 100 lbs., but at the date of shipments the delivering carrier had not concurred in the 16½-cent rate. Subsequently the 16½-cent rate was made the legal rate over the route taken. The 20-cent rate was unjust and unreasonable, and the 16½-cent rate is a just and reasonable rate for the future. Reparation awarded.

Rates from the East to Green Bay.

Green Bay Business Men's Association v. Baltimore & Ohio et al. Opinion by Commissioner Prouty.

Rates from eastern territory to Green Bay, Wis., may properly be higher than the Chicago scale. The basis now in effect, which is about 107 per cent. of Chicago, is not found unlawful. The Commission has often held that the long maintenance of a given rate is an admission of the reasonableness of that rate. It has also held that where, on the strength of a given rate, capital has been invested and industrial conditions have become established, this rate cannot be discontinued without taking into account its effect on these commercial and industrial conditions. But it has never been said that there was any absolute rule requiring for any reason the indefinite continuance of such a rate. It is always a question of what, under all the circumstances, is just and reasonable.

No Authority Over Claims of Railway Against Shipper.

Laning-Harris Coal & Grain Co. v. St. Louis & San Francisco. Opinion by Chairman Knapp.

Between November 8, 1906, and April 20, 1907, defendant through error collected from complainant as switching charges on interstate carload shipments of hay to Kansas City, Mo., $42 in excess of the amount authorized by its tariff, and refused to refund the same because previously it had, through error, collected an amount less than that required by its tariffs, which it has since been unable to collect from complainant. It now pleads set-off of the amount alleged to be due it from complainant.

Inasmuch as the Commission is without authority to adjudicate the claim of a railway company against a shipper, it cannot consider the counter-claim of defendant, but it has authority to award damages in a case where a carrier collects a greater sum on an interstate shipment than is fixed by its published tariffs and therefore reparation of $42 is awarded.

Discrimination by the Use of Unfair Joint Rates.

Cedar Hill Coal & Coke Co. et al. v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Prouty.

A purchaser of coal from the Victor Fuel Co. at its mines on the Colorado & Southeastern for points of consumption on the Santa Fe has the benefit of the Trinidad rate, while coal from mines of complainants near Ludlow, in the same district, for the same destinations, must pay 40 cents above the Trinidad rate. The Colorado Fuel & Iron Co. ships coal from its mines on the Colorado & Wyoming to points on the Santa Fe at the Trinidad rate. The Victor Fuel Co. owns the Colorado & Southeastern, and the Colorado Fuel & Iron Co. owns the Colorado & Wyoming. Complainants, who are engaged in mining coal in the Trinidad district, in Colorado, near Ludlow, on the Colorado & Southern, claim that defendants unduly discriminate against them in favor of the other coal companies mentioned. The arrangements entered into between these railways work an undue prejudice against the mines of complainants and give unlawful preference to their competitors.

Railways should not be allowed to so divide and diversify themselves by contract and traffic agreements as to work a practical discrimination. So long as there is identity of ownership in the agency of transportation and the thing transported it is extremely difficult, if not impossible, to prevent discrimination between shippers.

The present rate of 40 cents per ton from the mines of complainants to Trinidad, when the coal is for points on the

Santa Fe, is excessive, and should not for the future exceed 25 cents. The Santa Fe should, by proper tariff provision, apply to this coal when received from the Colorado & Southern at Trinidad a rate of 10 cents per ton less than the local Trinidad rate.

Express Companies as Bankers and as Carriers.

American Bankers' Association v. American Express Co. Opinion by Commissioner Clark.

Complainants alleged that defendant express companies, by dealing in domestic and foreign exchange, money orders, letters of credit, travelers' checks and drafts, and foreign money, trespass upon the business of bankers, and by the unfair use of their business as common carriers violate the act to regulate commerce by unjust discrimination against complainants. Defendants claim that they are subject to the act to regulate commerce only as forwarders of goods by express and not in respect to any other kind of business, and that their financial business has no relation to their business as common carriers and does not constitute interstate or foreign commerce. On defendants' motion to dismiss complaint and complainants' request for subpoena. As there may be some question of unjust discrimination involved in the matter, the motion to dismiss the complaint is denied; but as the information sought by complainants through the issuance of subpoena does not seem to be necessary and the request is denied.

There can be no doubt as to the jurisdiction of the Commission of any question of discrimination connected with the service of the express companies as carriers; but even if unjust and undue discrimination, free from criminal act, were shown to exist in their practices, it is clearly the duty of this Commission to go no further in destruction or disturbance of the business of the carrier, or in depriving the public of conveniences and facilities of value to it, than is necessary in order to remove the discrimination to the extent that it is unjust or undue.

The extent, if any, to which defendants transport money for themselves for the purpose of settling balances in the carrying on of their financial operations has not been shown. The relationship of the cost of this service and of the charges made therefor has not been presented. There may or may not be some question of unjust discrimination involved therein, and complainants should be given an opportunity to present their proofs in support of this alleged discrimination and the defendants should have an opportunity to answer. The Commission shall therefore fix a time for hearing of further testimony along the lines herein indicated.

Coming into Court With Unclean Hands.

C. C. Folmer & Co. v. Great Northern et al. Opinion by Chairman Knapp.

Without tariff provision therefor, prior to August 28, 1906, the Wisconsin Central had an arrangement whereby it would hold at Menasha, Wis., shipments of shingles consigned to complainant and which originated on the Pacific coast, subject to rebilling and forwarding to points of destination beyond Chicago. Under this arrangement shipments would move to Chicago on the proportional rate applying between Minnesota Transfer and Chicago the same as if they had not been stopped at Menasha. In connection with a carload shipment delivered March 2, 1906, to the Great Northern at Bellingham, Wash., that company's agent failed to note on billing the bill of lading instructions for delivery to the Wisconsin Central at Minnesota Transfer, and shipment was at that point turned over to the Chicago, Milwaukee & St. Paul, whence it was rebilled to Detroit, Mich., resulting in the application of a 10-cent rate, Minnesota Transfer to Menasha, plus an 8½-cent rate, Menasha to Chicago, instead of the 10-cent proportional rate, Minnesota Transfer to Chicago, which would have been applied under complainant's arrangement with the Wisconsin Central had the car been delivered to that road at Minnesota Transfer. The negligence of the Great Northern caused complainant to pay $28.50 more than it preumably would have paid, but not more than it was lawfully bound to pay under the tariff then in force. The rate exacted was the only rate lawfully applicable, under the tariffs on file with the Commission, via either route.

The holding, storing, unloading and reloading of Pacific coast shipments of shingles at Menasha subject to rebilling and reconsignment under the proportional rate from Minnesota Transfer to Chicago was a privilege and service that required publication in a tariff in order to be lawful. An act of negligence which deprives the shipper of the enjoyment of an unlawful rate cannot be made the basis of a claim for reparation.

Meeting a Competitive Rate Not Compulsory.

L. B. Menefee Lumber Co. v. Texas & Pacific et al. Opinion by Commissioner Clark.

Defendants' rate of 32.5 cents per 100 lbs. for the transportation of yellow pine lumber from Lake Charles, La., to El Paso, Tex., 1,067 miles over two lines, cannot be found unreasonable because a single line has a published rate on such commodity between the same points of 25 cents per 100 lbs., carrying it 972 miles, even though defendants subsequently for competitive reasons reduced their rate to 25 cents per 100 lbs. Whatever may have been the practice in the past of "meeting the rate," the act to regulate commerce and the decisions of the Commission interpreting its provisions, unmistakably lay down the doctrine that tariffs must now be adhered to.

The Commission cannot sanction the idea that a lower rate in effect via one line than via another line is conclusive evidence of the unreasonableness of the higher rate. If reparation were granted in this case it would go far to support the theory that a carrier may not voluntarily reduce its rate without being liable for damages on all past shipments, a theory which cannot be accepted by the Commission.

STATE COMMISSIONS.

The Pennsylvania State Railroad Commission has recommended that the Pittsburgh, Westmoreland & Somerset, operating about 25 miles of line, reduce its passenger fares to 3 cents a mile for through passenger and 3½ cents a mile for local passengers. This is in accordance with the Pennsylvania Railroad law of 1849. The defendant claimed that its passenger business was not a source of profit, it being a lumber road.

The Railroad Commission of Wisconsin by denying the petition of Alderman C. F. Lang, of La Crosse, held that it cannot either authorize the construction or extension of any electric railway "within the city or prevent the abandonment or exchange of location of any such road constructed under a franchise granted by the common council if the council's consent thereto has been obtained." The commission decides it has no veto power over the act of a common council in consenting to the abandonment of a part of a street railway or its re-location within the corporate limits.

COURT NEWS.

The Supreme Court of the United States has denied the petition of the Chicago & Alton for a rehearing of the case in the conviction of the road and its Vice-President and General Freight Agent for refunding $1 a car on packing house shipments for use of the private tracks of the packer was affirmed.

The Railroad Commission of Texas has directed the Attorney-General to bring suit against the Missouri, Kansas & Texas for 24 alleged violations of the Commission's order that railways shall operate their trains in accordance with advertised schedules, no train's departure to be delayed more than 30 minutes past the schedule time.

The Federal government has filed at Portland, Oregon, 35 suits against the Oregon & California Railroad Company, the Southern Pacific Company, the present owners of the Oregon & California Railroad and more than 100 other individuals and private corporations, to recover from the railways and their grantees, who comprise the other defendants, an aggre-

gate of 353,288 acres of land, within the Oregon and California land grant in Oregon. The lands are valued at over $15,000,000. Among the defendants are Willis H. Gilbert, West Coast Timber Co. and Peninsular Lumber Co., Pillsbury Lumber Co., Central Trust Co., Chicago, and the Detroit Trust Co., Detroit, Mich.

Judge Hazen, Master in the suit by the Leavenworth & Topeka, to have freight rates fixed by the Kansas Railroad Commission annulled on the ground of unconstitutionality, has filed a report with the federal court at Topeka, Kan., holding that the road is entitled to a permanent injunction restraining the Commission from enforcing its order.

The Supreme Court of Virginia has denied the right of appeal to the state court in the two-cent rate case and the railways will either have to go into the United States Circuit Court of Appeals and have the case heard at length, or they can go to the corporation commission and make application for a revision of the rates on the ground that they are confiscatory.

The prosecuting attorney of Holmes county, Ohio, has begun a suit in the courts to dissolve, as unlawful, the agreement and regulations on which are based the relief associations of the Baltimore & Ohio Railroad and the Pennsylvania Lines. The petition asks that $4,000,000 held by the companies be paid back to the employees who have contributed it. This action is brought under a law passed in April, 1908, forbidding railways to enforce any arrangement or agreement which requires employees to waive rights to damages for personal injuries or death.

Railway Need Not Build Side Track to Factory.

The Supreme court of Oklahoma, reversing the action of the State Corporation Commission, decides, in the case of the Chicago, Rock Island & Pacific, that the road need not build a side track to the mills of certain grain companies. The court holds that a common carrier, though required to provide equal facilities, is not required to furnish facilities to overcome disadvantages caused by dissimilarity of location. The general public is not demanding this side track, nor is it clear that it would accommodate any considerable number of people except the complainants.

Argument in Missouri Rate Case.

Final arguments in the cases of the 18 railways that are contesting the constitutionality of the Missouri 2-cent fare and maximum freight rate acts, began before Judge Smith McPherson in federal court at Kansas City, Mo., on January 20. Frank Hagerman, who is counsel for all of the railways in these cases, said that under the 2-cent fare,—assuming that the cost of handling intrastate business was no larger than the cost of handling interstate business,—the Rock Island, the St. Louis & Hannibal, the Kansas City, Clinton & Springfield, and the Chicago Great Western showed an actual loss on intrastate business, and that the returns for other roads had been as follows: Frisco, 4 per cent.; Santa Fe, 5 per cent.; Kansas City Southern 2½ per cent.; Missouri, Kansas & Texas, 3 per cent.; Burlington, 4 per cent.

Sanford B. Ladd, in his argument for the state, contended that the Burlington, whose officers claimed it had lost $630,000 on intrastate freight business in 1904, actually made a profit on that business of $850,000. Herbert S. Hadley, Governor and Former Attorney-General of Missouri, who made the principal argument for the state, contended that if the railways would stop issuing free passes and otherwise discriminating between passengers, their passenger business could be made profitable on a 2-cent basis.

The argument for the railways was closed by Gardiner Lathrop (Atchison) who laid stress on the fact that recent reductions in rates by the states had compelled reductions in interstate rates, owing to competitive considerations, and said that if no restraint were placed upon the states they could practically work a repeal of the interstate commerce clause of the federal constitution. Mr. Lathrop also attacked the 2-cent fare law because it permits roads 45 miles long or less to charge higher rates than longer roads. This is class legislation.

State Control Over Interstate Traffic.

The Supreme Court of the United States on Monday last reversed the decision of the Kentucky Court of Appeals requiring the Louisville & Nashville to deliver to the Southern Railway live stock shipped over the L. & N. in its own cars and consigned to the Central Stockyards. These stockyards are on the Southern road, nine miles out of Louisville, and it was charged that in an effort to discriminate in favor of the Bourbon Stockyards the Louisville & Nashville had refused to make the transfer to the Southern notwithstanding the lines connect at more than one place in and around Louisville. The opinion was announced by Justice Holmes and was based on the ground that the transfer requirement was an interference with interstate commerce. The case affects the Constitution of Kentucky as it was under a provision in that instrument and not under a state law, that the attempt was made to compel transfer.

Justices Harlan, McKenna and Moody dissented, contending that the order of the state court should be upheld certainly as far as the intrastate traffic was concerned, and that the police power of the state was wide enough to cover all the traffic. Differing with the majority as to the failure to provide compensation and security for L. & N. cars delivered to the other road, Justice McKenna averred that the Kentucky provision certainly recognized that principle sufficiently, and he feared the departure from the previous decisions of the court in this regard would seriously affect important provisions of the interstate commerce act.

The majority decision, among other things, said:

"We are far from saying that a valid law could not be passed to prevent the cost and loss of time entailed by needless transshipment in case of an unreasonable refusal of a carrier to interchange cars with another . . . but such a law ought to be so limited as to respect the paramount needs of the carrier concerned and at least could not be sustained only with full and adequate regulations for his protection from the loss of undue detention of cars and for securing due compensation for their use. But the Constitution of Kentucky makes a universal undiscriminating requirement, with no adequate provision for these rights, and cannot be cured by inserting them in judgments under it. The law itself must save the parties' rights and not leave them to the discretion of courts as such. . . . The duties of the carrier to accept goods tendered at its station do not include the duty to accept cars offered it at any point near its terminal by a competing road for the purpose of reaching and using its terminal station."

Commissioner Colquitt on Rate Regulation.

Railroad Commissioner O. B. Colquitt, of Texas, in an address before the Retail Hardware and Implement Dealers' Association at Dallas on January 20, charged that to prevent reduction of rates the railways use shippers against each other. When the cotton shippers wanted a reduction in rates, railway officers got jobbers to ask the Commission to refuse to grant it for fear that the jobbers' interstate rates would be advanced. Then, he said, when the jobbers asked for a reduction in rates, the railways got the cotton shippers to oppose it upon the ground that an advance in rates on cotton would result.

Mr. Colquitt declared that the rate question had proved too big a problem for the Interstate Commerce Commission and asserted that rates in Texas are higher than anywhere west of the Mississippi or east of the Rocky mountains. If the State Commission reduced rates the railways raised the interstate rates. He said that he favored reducing rates in Texas in retaliation for the recent advances in interstate class rates, but that his colleagues voted him down. As a means of controlling rates Texas, he said, should control, if not own, a line of railway from the Red river to the Gulf. Texas ought, he said, to be a stockholder in every railway built in the state; that would let the state into the secrets of the railways. The railways have got control of the steamship lines. Texas should restore water competition by owning steamships. "The people will have to take hold of the interstate rate question themselves, for the Interstate Commerce Commission is going to fix as high a rate eventually as the Republican protective tariff; and on account of the different combinations of rates over the different lines, it is impossible for that Commission to afford the people relief."

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1908.
(See also issues of January 8, 15 and 22.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with 1907.
Charleston & Western Carolina	340	$88,732	$23,821	$119,422	$26,191	$14,019	$2,518	$50,698	$3,130	$96,556	$22,866	.....	$4,100	$18,766	‡$26,703
Chicago, Cincinnati & Louisville	285	86,097	20,283	112,426	29,797	25,778	8,347	51,983	5,440	121,345	8,919*	.....	3,250	12,169†	269
Chicago, Indiana & Southern	329	219,058	17,728	245,518	24,100	48,181	6,456	92,891	4,810	176,438	69,080	$3,500	15,000	57,580	42,460
Chicago, Peoria & St. Louis	255	99,843	24,333	130,963	19,579	27,935	6,334	58,080	5,685	117,613	13,350	.....	4,600	8,750	‡2,320
Chicago, Rock Island & Gulf	493	215,905	63,120	292,274	84,075	18,831	5,622	103,820	8,842	221,190	71,084	171*	682	70,231	‡9,803
Cleveland, Akron & Columbus	210	122,312	33,227	168,423	15,309	28,257	2,361	58,564	2,728	107,219	61,204	.....	7,077	54,127	5,075
Cleveland, Lorain & Wheeling	194	323,625	16,396	358,337	31,655	55,239	5,914	112,479	5,484	210,771	147,566	.....	9,406	138,160	‡30,777
Colorado Midland	338	166,194	27,685	225,752	20,555	28,719	9,773	87,189	5,916	152,152	73,600	376*	8,400	64,824	20,637
Cumberland Valley	162	155,145	44,974	210,987	16,481	17,110	3,387	61,738	4,336	103,052	107,935	482	3,713	104,704	10,011
Detroit & Mackinac	348	55,909	24,308	85,180	10,509	12,373	1,699	29,238	2,537	56,356	29,124	469*	6,932	21,723	‡7,517
Duluth & Iron Range	168	569,450	21,498	596,492	98,230	45,010	463	119,809	8,054	271,566	324,926	2,418	23,760	303,584	‡108,166
Elgin, Joliet & Eastern	239	198,815	79	205,086	24,269	33,218	2,500	66,015	6,627	132,629	72,457	.....	9,500	62,957	‡18,101
Evansville & Terre Haute	310	109,465	44,532	173,972	26,926	26,764	3,745	55,723	6,906	120,064	53,908	312*	9,035	44,561	‡18,925
Fort Worth & Denver City	454	319,148	136,248	473,490	66,460	75,294	6,669	132,138	14,551	295,112	178,378	387	8,800	169,965	26
Fort Worth & Rio Grande	196	109,673	34,060	149,388	11,744	12,536	3,242	37,852	6,135	71,509	77,879	.....	590	77,289	80,842
Georgia	307	170,635	59,361	245,060	47,437	27,924	9,056	104,485	6,686	195,588	49,472	.....	1,625	47,847	‡502
Gulf & Ship Island	307	124,454	31,930	168,013	33,443	25,450	1,395	52,251	7,416	119,955	48,058	.....	3,685	44,373	5,330
Houston, East & West Texas	191	78,474	25,782	110,532	18,669	9,184	807	32,412	3,031	64,103	46,430	.....	2,388	44,042	15,077
Kanawha & Michigan	177	166,950	25,609	197,172	39,238	48,088	2,815	62,138	2,988	155,267	41,905	34*	7,553	34,318	36,471
Louisiana Ry. & Nav. Co.	343	70,676	11,695	87,275	22,521	12,423	3,222	38,521	4,928	81,615	5,660	.....	3,750	1,910	20,407
Mason City & Fort Dodge	386	116,036	33,385	159,066	19,136	21,804	1,710	64,672	642	107,964	51,102	400	6,000	45,502	12,469
Morgans L. & Tex. R.R. & S.S. Co.	351	142,454	79,907	553,590	77,541	42,970	9,535	183,130	12,079	325,255	228,335	863	14,900	214,298	73,086
Nevada & California	379	61,400	25,802	91,404	14,715	15,403	920	33,249	1,798	66,085	25,319	209*	6,000	19,110	‡114,164
New Orleans & North Eastern	196	213,313	44,792	277,240	26,957	51,943	7,149	86,129	10,830	182,648	94,592	736*	8,500	85,356	‡3,102
New York, Philadelphia & Norfolk	112	183,132	27,137	224,842	15,187	41,351	2,715	85,485	10,234	154,972	69,870	.....	6,215	63,655	21,877
New York, Susquehanna & Western	151	130,600	46,709	203,975	20,711	23,167	1,508	72,050	3,794	121,230	82,745	3,225*	15,089	64,431	‡450
Peoria & Eastern	352	170,202	52,868	241,644	28,424	37,854	4,853	92,600	5,173	168,904	72,740	.....	9,505	63,235	26,775
Pittsburgh & Lake Erie	191	841,611	93,616	965,533	150,021	73,724	16,546	234,104	19,831	494,226	471,307	302*	17,500	453,505	‡217,170
St. Joseph & Grand Island	319	91,566	29,489	131,865	23,742	13,726	5,232	43,766	3,482	89,948	41,917	120*	25	41,772	5,104
San Antonio & Aransas Pass	727	280,648	62,915	361,394	52,634	38,073	4,582	130,024	9,131	234,444	126,950	.....	8,500	118,450	62,441
Santa Fe, Prescott & Phoenix	257	86,708	29,727	123,408	18,310	9,964	2,388	28,220	5,167	64,049	59,359	.....	.....	59,359	‡4,383
Texas Central	268	105,142	36,164	148,166	15,776	13,984	1,115	46,444	5,659	82,978	65,188	.....	1,969	63,219	18,884
Vicksburg, Shreveport & Pacific	171	73,014	42,893	125,148	17,561	28,794	3,914	36,266	4,162	90,697	34,451	1,800*	7,200	25,361	7,069
Virginia & South Western	183	92,877	11,919	105,741	13,721	18,729	873	32,923	3,392	69,638	36,103	.....	5,500	30,603	13,919
Western Maryland	543	424,767	52,748	498,715	59,299	80,085	6,695	165,080	11,575	322,734	175,981	.....	16,500	159,481	‡27,838
Wisconsin, Minnesota & Pacific	271	46,620	13,781	64,502	11,521	7,838	303	21,335	290	41,287	23,214	2	2,580	20,636	5,494
FIVE MONTHS OF FISCAL YEAR.															
Charleston & Western Carolina	340	$407,360	$115,604	561,585	$113,696	$75,001	$11,870	$212,129	$16,284	$428,980	$132,605	.....	$20,500	$112,105	$32,304
Chicago, Cincinnati & Louisville	285	406,380	133,366	567,496	159,095	126,378	38,142	236,468	29,416	589,499	22,003*	.....	16,250	38,253†	‡52,133
Chicago, Indiana & Southern	329	973,279	113,867	1,125,585	156,264	219,791	38,055	437,947	33,901	885,958	239,627	$9,550	75,000	174,177	‡1,397
Chicago, Peoria & St. Louis	255	497,190	157,160	687,374	99,637	155,054	30,347	266,692	23,672	575,402	111,972	.....	23,000	88,972	‡5,238
Chicago, Rock Island & Gulf	493	816,299	313,945	1,193,474	310,011	102,931	30,561	459,402	42,352	945,257	248,217	946*	16,891	230,380	‡34,295
Cleveland, Akron & Columbus	210	585,014	203,576	852,713	107,032	142,123	12,041	267,234	14,877	543,307	309,406	.....	33,077	276,329	‡5,092
Cleveland, Lorain & Wheeling	194	1,758,174	103,496	1,988,734	175,505	322,782	30,277	599,980	28,797	1,157,341	831,393	.....	47,032	784,361	‡176,416
Colorado Midland	338	723,931	190,588	1,034,464	137,272	129,741	48,637	406,281	29,521	751,452	283,012	527*	42,000	240,485	‡21,740
Cumberland Valley	162	764,337	264,209	1,079,152	111,015	95,093	18,833	319,925	25,452	570,318	508,834	3,221	18,565	493,490	‡59,247
Detroit & Mackinac	348	313,003	133,078	473,352	49,794	70,467	9,789	156,317	14,918	301,285	172,067	1,834*	33,282	136,951	1,383
Duluth & Iron Range	168	4,460,504	98,505	4,596,167	432,393	265,671	1,604	664,320	40,607	1,404,595	3,191,572	16,734	184,957	3,023,349	‡247,198
Elgin, Joliet & Eastern	239	997,017	254	1,035,326	114,168	169,403	12,154	315,949	31,756	643,430	391,896	.....	47,500	344,396	‡92,092
Evansville & Terre Haute	310	595,572	261,920	951,953	140,809	120,747	17,852	278,506	31,292	589,206	362,747	1,424*	45,175	316,148	‡2,691
Fort Worth & Denver City	454	1,333,306	778,771	2,209,539	339,531	291,312	38,789	644,207	68,354	1,382,193	827,346	3,209	43,533	787,022	39,322
Fort Worth & Rio Grande	196	304,031	145,699	476,748	67,568	49,302	12,994	163,260	24,459	317,583	159,165	.....	5,952	153,213	121,159
Georgia	307	836,769	323,251	1,232,760	262,133	173,565	41,210	501,252	33,906	1,012,066	220,694	.....	8,125	212,569	‡52,900
Gulf & Ship Island	307	558,827	154,143	758,690	164,093	125,657	7,214	258,817	35,700	591,481	167,209	.....	18,425	148,784	‡84,094
Houston, East & West Texas	191	357,506	117,069	502,659	86,801	39,232	6,574	150,592	15,551	298,750	203,909	.....	11,828	192,081	49,020
Kanawha & Michigan	177	875,182	146,902	1,044,017	179,193	243,990	11,801	302,643	13,597	751,224	292,793	93*	33,332	259,368	172,482
Louisiana Ry. & Nav. Co.	343	320,059	51,926	405,780	118,495	58,660	14,985	183,009	24,766	399,915	5,865	.....	15,750	9,884†	36,323
Mason City & Fort Dodge	386	584,290	206,201	841,896	106,639	108,794	8,576	317,702	3,173	544,884	297,013	2,533	30,000	269,546	12,511
Morgans L. & Tex. R.R. & S.S. Co.	351	1,402,336	409,747	1,928,043	340,962	215,390	42,296	727,629	60,066	1,386,343	541,700	1,482*	74,500	465,718	265,443
Nevada & California	379	262,255	115,914	415,298	72,713	59,003	3,947	154,087	9,714	299,464	115,834	158*	34,067	81,609	‡373,095
New Orleans & North Eastern	196	901,601	224,941	1,203,450	125,579	228,942	36,922	396,136	48,601	836,180	367,270	.....	35,500	331,770	‡27,910
New York, Philadelphia & Norfolk	112	936,906	171,046	1,187,893	91,950	203,185	15,582	422,356	57,027	790,100	397,793	.....	31,075	366,718	‡112,440
New York, Susquehanna & Western	151	650,190	266,208	1,032,644	130,888	108,722	7,234	362,761	19,504	629,109	403,535	12,126*	44,392	347,017	19,820
Peoria & Eastern	352	804,724	308,997	1,216,069	158,966	172,013	25,843	453,372	22,120	832,314	383,755	.....	41,924	341,831	‡30,694
Pittsburgh & Lake Erie	191	4,668,492	546,588	5,369,851	652,169	449,261	66,772	1,176,875	107,328	2,452,405	2,917,446	1,435*	87,500	2,828,511	‡1,136,562
St. Joseph & Grand Island	319	497,150	176,207	731,804	108,213	71,243	25,908	222,558	18,458	446,380	285,424	369	21,064	264,729	‡11,457
San Antonio & Aransas Pass	727	1,325,774	370,957	1,782,826.	233,643	180,228	20,516	611,765	43,425	1,089,577	693,249	.....	44,700	648,549	153,346
Santa Fe, Prescott & Phoenix	257	386,446	133,799	554,301	95,966	45,915	11,498	129,376	22,755	305,510	248,791	.....	.....	248,791	‡66,562
Texas Central	268	311,889	181,949	524,116	59,565	68,566	4,958	185,702	20,324	339,115	185,001	.....	9,985	175,016	3,831
Vicksburg, Shreveport & Pacific	171	323,350	202,347	568,036	82,497	124,482	16,841	173,547	20,506	417,873	150,163	.....	30,400	119,763	22,499
Virginia & South Western	183	445,661	76,343	529,948	58,669	83,441	4,501	146,955	18,274	311,840	218,108	.....	19,803	198,305	43,384
Western Maryland	543	2,056,468	407,082	2,584,950	299,430	369,845	36,904	787,823	57,692	1,551,694	1,033,256	.....	82,500	950,756	‡21,453
Wisconsin, Minnesota & Pacific	271	218,747	81,255	321,985	75,579	32,166	1,452	110,818	1,342	221,357	100,628	95	12,879	87,844	24,290

*Deficit. †Loss. ‡Decrease.

Capacity of New York Subway.

Bion J. Arnold, in his sixth report to the New York State Public Service Commission, First district, discusses the ultimate capacity of the subway lines. The subway was opened October 27, 1904. The ticket sales for 1905 were 116,209,313, for 1906 149,778,370, for 1907 182,559,990, and for 1908 220,991,-212. For the year ended June 30, 1908, different systems carried passengers as follows:

New York subway	200,415,050
Manhattan elevated lines	282,870,590
London underground tubes	160,000,998
Chicago elevated roads	147,267,113

The local trains earn more money per car-mile than the express trains. Mr. Arnold finds that a local train averages $46.30 for an average journey of nine miles in one direction, and as these trains are composed of five cars each the income per car-mile is $1.03 for rush hour service. The income from an average express train is $46.70, slightly more than that from the local train, but as the express train consists of eight cars and the length of haul averages 15.36 miles the income per car-mile is only 39 cents.

To be self-sustaining on the present 5 cent fare basis Mr. Arnold concludes that the road should have an average income of at least one cent per passenger-mile. In other words, with a uniform fare of 5 cents the average length of ride should not exceed five miles.

The average length of travel on express trains is now five and a half miles, or slightly above the critical average, whereas the average length of ride on the local trains is but two miles. The problem for the future, supposing the 5 cent fare to be retained, will be to find a way to handle short haul passengers in short haul cars and to make enough profit on the short haul business to be able to sustain the loss due to the long haul burden.

The local trains in the present subway are shown by experimental counts of passengers to have twice the earning power of the express trains, and the development of the short haul business must be encouraged by furnishing a convenient, rapid, safe and comfortable service of ample capacity.

Traffic Club of Chicago.

The annual dinner of the Traffic Club of Chicago took place at the Congress Hotel, Chicago, on the evening of January 27. The speakers and their subjects were as follows: Joseph E. Ransdell, Representative in Congress from Louisiana and President of the National Rivers and Harbors Congress, "Shall the Government Issue Bonds to Improve Its Waterways?" George F. Stone, Secretary Chicago Board of Trade, "The Progress of Opportunities;" Charles E. Kramer, "The Humor of It." The presidents and vice-presidents of the railways entering Chicago were guests of honor. The dinner was attended by about 300 persons.

Opposition to Rate Reduction in Texas.

J. W. Graves, President of the Texas Division of the Travelers' Protective Association, says that the traveling men of Texas are opposed to any reduction in passenger fares, but where good passenger service is not maintained, passengers ought to be permitted to ride on freight trains.

Twenty-one citizens of Dawson County, in West Texas, have sent to Governor Campbell a signed protest against the recommendation in his annual message for the passage of a 2-cent fare law. They say that there are thousands of bushels of corn in Dawson County lying out on the prairie in ricks and piles, worthless, because of the long distance to a railway, and that the development of West Texas will be indefinitely postponed unless the state adopts a less hostile attitude toward railways. The protestants say:

"While you no doubt seek to benefit all, you benefit only those who live in that part of the state where railways are abundant and transportation facilities ample.

"Those sturdy pioneers who have come here ahead of the road and of population are almost robbed of the fruits of their labors because of the lack of markets and the high price of imports. You will turn back the wheels of time for twenty years, so far as the development of this great section of the state is concerned. We have come here believing we should soon have railway facilities. But the prospect of a continued lack has fallen like a pall upon us. Hope has almost fled and many of us are heartsick."

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Newman Erb has been elected President of the Wisconsin Central, succeeding William A. Bradford.

Robert C. Wight, Secretary, and C. O. Kalman, General Auditor, of the Chicago Great Western, have resigned.

J. M. Baxter, Assistant Treasurer of the Lehigh Valley, has been elected Treasurer, succeeding W. C. Anderson, resigned. H. J. McQuade succeeds Mr. Baxter.

Judson Harmon, Receiver of the Cincinnati, Hamilton & Dayton, has withdrawn his resignation at the request of the court and will continue as Receiver.

Edison J. Chamberlin, formerly General Manager of the Canada Atlantic, has been appointed Vice-President and General Manager of the Grand Trunk Pacific, succeeding F. W. Morse, resigned.

A. E. Sweet, General Superintendent of the Southwestern district of the Chicago, Rock Island & Pacific, with office at Topeka, Kan., has been appointed Assistant to the Second Vice-President, with office at Chicago.

John Davis Caldwell has been elected Secretary of the Chicago & North Western, as previously stated in these columns. He was born July 4, 1863, at Lynn, Mass. After a school education he began railway work in 1880 as telegraph operator of the Delaware & Chesapeake, now a part of the Pennsylvania. From 1882 to 1884, he was telegraph operator and subsequently a clerk in the Motive Power Department of the Northern Central and Baltimore & Potomac, both of which roads are now parts of the Pennsylvania. From 1884 to 1885 he was a telegraph operator and later in the same year became Secretary to the Superintendent of Motive Power of the Denver & Rio Grande. He was appointed Secretary to the President of the Chicago & North Western on July 20, 1885, and remained in this position until elected Secretary, on January 12.


John D. Caldwell.

W. C. Brown, President of the New York Central & Hudson River and of other New York Central lines, has been elected President of the Cleveland, Cincinnati, Chicago & St. Louis and the Pittsburgh & Lake Erie, succeeding W. H. Newman, resigned, effective February 1.

A. B. Fall, General Counsel of the Sierra Madre & Pacific and of the Rio Grande, Sierra Madre & Pacific, has been elected also President of the Sierra Madre & Pacific, succeeding H. R. Nickerson, who remains President of the Rio Grande, Sierra Madre & Pacific.

James Grant has been elected President of the Kalamazoo, Lake Shore & Chicago, succeeding S. B. Monroe. George L.

Craig has been elected Vice-President and Traffic Manager, succeeding W. H. Cochrane. H. J. Schmeil, who has been appointed Assistant Traffic Manager, has been elected also Secretary and Auditor, succeeding James Grant. S. B. Monroe, heretofore President, has been elected Treasurer, succeeding F. G. Dewey.

Operating Officers.

H. M. Levinson, Superintendent of the Sierra Madre & Pacific, has been appointed General Manager.

James A. Donovan, formerly with the Nickel Plate Fast Freight Line, has been appointed Manager of the Lemac Carriers Co., with office in the Old Colony building, Chicago.

W. S. Martin, Assistant General Manager of the Denver & Rio Grande and the Rio Grande Western, has assumed the duties heretofore devolving upon the General Superintendent of the Denver & Rio Grande, and that position has been abolished.

P. B. Vermillion has been appointed Assistant Superintendent of the Chicago Great Western, at St. Joseph, Mo. W. G. Hunter is appointed Assistant Superintendent, at Des Moines, Iowa. The position of Trainmaster of the Southwest division has been abolished.

Charles B. Rodgers, whose appointment as General Manager of the St. Louis, Brownsville & Mexico has been noted in these columns, was born October 4, 1858, at West Point, Iowa. After a public school education he began railway work late in 1871, at Chariton, Iowa, as telegraph messenger on the Burlington & Missouri River, now part of the Chicago, Burlington & Quincy. In 1871 he was appointed an operator on the West Iowa division, and in 1874 he was made cashier and operator at the freight station in Omaha, Neb. In 1878 he was made chief clerk in the Superintendent's office, at Lincoln, Neb., and on March 1, 1881, was appointed Roadmaster of the Western division at Red Cloud, Neb. On June 1, 1882, he was made Trainmaster at Wymore, Neb., and three years later was appointed Assistant Superintendent of the Southern division, at Wymore, Neb. On March 1, 1889, he was appointed Superintendent of the Wymore division, at Wymore, where he remained until he resigned to take his new position on January 1.

Traffic Officers.

H. J. Schmeil has been appointed Assistant Traffic Manager of the Kalamazoo, Lake Shore & Chicago.

S. K. Martin has been appointed Commercial Agent of the Chicago, Rock Island & Pacific at Denver, Colo.

G. H. Robinson has been appointed Commercial Agent of the Georgia Southern & Florida, at Tampa, Fla., succeeding George Holden, resigned.

W. G. Yager has been appointed Traveling Freight Agent of the Nashville, Chattanooga & St. Louis, at Louisville, Ky., succeeding W. T. Vandenburgh, resigned.

Raymond Kelly, Commercial Agent of the Minneapolis & St. Louis, at St. Paul, Minn., has been appointed Commercial Agent of the Iowa Central and the Minneapolis & St. Louis, at St. Louis, Mo.

James R. Keith, Traveling Freight and Passenger Agent of the Illinois Central, at San Francisco, Cal., has resigned to become a member of the firm of Hoffman & Keith, 322 Montgomery street, San Francisco.

E. T. Munger, Superintendent of Motive Power and Equipment of the Metropolitan West Side Elevated of Chicago, has been appointed General Superintendent of the Hudson & Manhattan, with office at New York.

O. T. Fagg, Traveling Freight Agent of the Iowa Central, at Peoria, Ill., has been appointed Traveling Freight Agent of the Iowa Central and the Minneapolis & St. Louis, at Minneapolis, Minn., succeeding W. M. Hardin, promoted.

C. E. Crane, whose resignation as Division Freight Agent of the Lehigh Valley has been announced in these columns, has been appointed General Eastern Agent of the Kansas City Southern, in charge of seaboard territory, with office at New York.

W. L. Sargent has been appointed Traveling Immigration Agent of the St. Louis, Iron Mountain & Southern, the Texas & Pacific and the International & Great Northern, at Ft. Worth, Tex. A. H. Sevier has been appointed Traveling Immigration Agent, at St. Louis, Mo. R. R. Claridge has been appointed Traveling Immigration Agent, at Palestine, Tex.

G. B. Albright, Assistant General Freight Agent of the Chicago, Rock Island & Pacific, the Chicago, Rock Island & El Paso and the St. Louis, Kansas City & Colorado, at Kansas City, Mo., has been appointed General Freight Agent, with office at Kansas City, Mo. F. J. Shubert, Assistant General Freight Agent at Chicago, has been transferred as Assistant General Freight Agent to Kansas City. J. C. La Coste succeeds to the duties of Mr. Shubert, being given the title of Chief of Tariff Bureau at Chicago.

S. G. Lutz, whose appointment as Freight Traffic Manager of the Iowa Central and the Minneapolis & St. Louis has been announced in these columns, was born at Mt. Morris, Ill., December 8, 1868. He began railway work in October, 1890, as stenographer for the Traffic Manager of the Iowa Central. He filled various clerical positions in the Traffic Department until February 1, 1898, when he was appointed Assistant General Freight Agent, with office at Marshalltown, Iowa. On January 1, 1902, his headquarters were moved to Peoria, Ill., where he was given charge of through traffic. In February, 1905, he was made also Assistant General Freight Agent of the Minneapolis & St. Louis. His recent appointment as Freight Traffic Manager of both roads was made on December 16, 1908.

Engineering and Rolling Stock Officers.

P. A. McCarthy, Chief Engineer of the Groveton, Lufkin & Northern, has resigned to become Chief Engineer of the San Diego, El Paso & St. Louis.

W. R. Hastings has been appointed Superintendent of Construction of the Signal Department of the Chicago, Rock Island & Pacific, with office at Chicago.

A. L. Kendall, General Foreman of Car Shops of the New York Central & Hudson River at West Albany, has resigned to become General Salesman for the W. P. Taylor Company, Buffalo, N. Y.

T. L. Burton has been appointed General Inspector in charge of air brake, steam heat and car lighting equipment of the Philadelphia & Reading, and will also perform such other duties as may be assigned to him.

M. P. Paret, Chief Engineer of the Kansas City, Mexico & Orient, has resigned to engage in the practise of Consulting Engineer. Until Mr. Paret's successor has been appointed the Engineering Department of that road will be in charge of W. W. Colpitts, Assistant Chief Engineer.

C. M. Larson, who has been connected with the Tax Commission and the Railroad Commission of Wisconsin for several years in connection with railway inspection and appraisal work, has been appointed Real Estate Engineer of the Toledo, St. Louis & Western and the Chicago & Alton, with office at Chicago

J. M. Stark has been appointed Engineer in Charge of Construction of Extension of the Chicago, Rock Island & Gulf from Wildorado, Tex., to the Texas-New Mexico state line and Engineer in Charge of Construction of the Tucumcari & Memphis, from the Texas-New Mexico state line to Tucumcari, N. Mex., with office at Tucumcari.

E. J. Ayars has been appointed Supervisor of Division 28 of the Pennsylvania, having jurisdiction over the track between Bryn Mawr avenue, Philadelphia, and Mile Post 39, including the Pencoyd, Phoenixville and Royersford branches of the Schuylkill division, succeeding J. P. Carlton, promoted. H. S. Trimble has been appointed Supervisor of the Pennsylvania & Northwestern division and branches, succeeding W. S. Wilson, transferred.

William G. Atwood, whose appointment as Chief Engineer of the Lake Erie & Western has been announced in these columns, was born on August 4, 1872, at Fredonia, N. Y. He

received his education at Cornell University, graduating in the class of 1892. He began railway work on the Lake Street Elevated, Chicago, in 1893, and in 1895 he was appointed Assistant Engineer for the City of Chicago on the Southwest Land Tunnels. In 1897 he was appointed Mining Engineer and United States Deputy Surveyor for Alaska, and in 1901 he was made Superintendent of Construction of the Puget Sound Bridge & Dredging Co., Seattle, Wash. From 1902 to 1906 he was Division Engineer, Superintendent of Construction and Assistant Engineer of Construction of the Alaska Central. From 1906 until his recent appointment he was Locating Engineer of the Lake Shore & Michigan Southern and Division Engineer in charge of Construction of the Cleveland Short Line, a part of the Lake Shore & Michigan Southern.

Purchasing Officers.

Alfred Anderson has been appointed Purchasing Agent of the Metropolitan Street Railway, New York.

OBITUARY.

J. D. Tenbroeck, formerly Traveling Passenger Agent of the Union Pacific, died at Hillsdale, N. J., on January 19.

Edward Keller, formerly Traveling Engineer of the Atchison, Topeka & Santa Fe and later connected with the Colorado Fuel & Iron Co., died suddenly from heart disease on January 17, at Trinidad, Colo.

James A. Rumrill, a director of the Boston & Albany and President of the leased lines, died of pneumonia on January 20. He was born in New York; was a graduate of Harvard University and graduated in 1861 from the Harvard law school, and after practicing law for some years became Secretary of the Western Railroad, now part of the New York Central & Hudson River. He later became Vice-President of the Boston & Albany.

Railroad Construction.

New Incorporations, Surveys, Etc.

Abilene & Southern.—Press reports indicate that grading is about completed from Abilene, Tex., southwest to Winters, 38 miles, and that track laying is under way; also that it has not as yet been decided whether construction will be continued south of Ballinger. (Nov. 12, p. 1375.)

Alberta & Great Waterways.—Application has been made for a charter by Wallace McDonald, of Edmonton, Alb., for this company. The plans call for a line to be built from Edmonton, Alb., northeast to Fort McMurrary, with a number of branches, aggregating about 300 miles.

Altoona, Hollidaysburg & Bedford Springs (Electric).—This company, which was organized about two years ago to build a line from Altoona, Pa., east to various important cities, recently elected John G. Burns President. Work is to be started shortly on the line, which, it is understood, will be eventually extended west to Pittsburgh. F. W. Patterson, of Pittsburgh, is Chief Engineer.

Altus, Roswell & El Paso.—Press reports say that announcement is made that construction work on the line will be started at several places early in February. Funds are available to push the construction work. The projected route is from Altus, Okla., on the Kansas City, Mexico & Orient, west to Hollis and eventually to Roswell, N. Mex., a total of 286 miles. Grading has been finished in Oklahoma on 33 miles, and on 22 miles near Lubbock, Tex. About 20 teams are now at work and this number is to be increased to 120 shortly. Edward Kennedy, President, and H. Fielder, Chief Engineer, Altus. (August 28, p. 838.)

Atlantic Shore Line (Electric).—Press reports say that plans are being made to extend this railway from Sanford, Me., north through Alfred, Limerick, Kezar Falls and Fryeburg to Rumford Falls, about 120 miles.

Cabano Railway.—Incorporation has been asked for by this company from the Canadian Parliament to build a line from a point at Long Lake, Que., on the Grand Trunk Pacific (National Transcontinental) thence easterly following the valley of the Cabano river to Cabano on Lake Temiscouata. A. Fraser, Cabano, Que., is solicitor for the company.

Carolina, Clinchfield & Ohio.—A report from Atlanta, Ga., indicates that work is completed between St. Paul, Va., and Spartanburg, S. C., and that the line is practically ready for operation between Moccasin Gap, Va., through eastern Tennessee and western North Carolina to Marion, N. C. Extensive preparations were also reported being made for the development of the Clinchfield coal district of southwest Virginia. (December 25, p. 1664.)

Canadian Northern.—The Edmonton & Slave Lake, now in operation from Edmondton, Alb., north to Morinville, 23 miles, will apply at the next session of the Canadian Parliament for an extension of time to complete the line via Athabasca Landing and the Lesser Slave lake to Peace river, a total of about 400 miles. (R. R. G., May 15, p. 686.)

Chicago, Rock Island & Pacific.—President B. L. Winchell says that construction work on the cut-off from Amarillo, Tex., to Tucumcari, N. Mex., will be resumed in the spring and that if possible the entire line to Tucumcari will be finished during the coming season. The line is now built to Eldorado, 21 miles west of Amarillo. The distance from Eldorado to Tucumcari, which it is hoped to cover this year, is 90 miles. The completion of the Amarillo-Tucumcari line will give the Rock Island-Frisco system, via Oklahoma City, the shortest line from St. Louis to Tucumcari and also a direct and the shortest line from Memphis to Tucumcari.

Clarion & East Brady (Electric).—This company has been organized to build an electric line from Clarion, Pa., southwest via Sligo and Rimersburg to East Brady, 25 miles. G. E. Arnold, T. S. Arnold and F. M. Arnold, all of Clarion, are back of the project.

Cleveland, Cincinnati & Indianapolis (Electric).—According to press reports announcement has been made that a new line from Seville, Ohio, southwest to Mansfield, 42 miles, has been finished, and in a few days regular train service will be started between Cleveland and Mansfield. The company owns the old Ohio Central line between Mansfield and Bucyrus, and the Columbus, Delaware & Marion from Bucyrus to Columbus. Through these lines service to Cincinnati, Ohio, and Indianapolis, Ind., is to be established. At a recent meeting F. E. Myers, of Ashland, was elected President.

Colorado & Southern.—Press reports say that the Trinity & Brazos Valley will shortly begin work improving its line from Mexia, Tex., north to Cleburne. The bridges are now being rebuilt and ballasting will commence soon.

Cobalt Range.—Application will be made by this company to the Canadian Parliament for an extension of time to build lines already authorized and in addition to build an extension in a westerly direction from Haileybury, Ont., via Bucke, Firstbrook Barr, or Hudson, Lundy, Auld, Cane or Henwood, Barber, Tudhope or Bryce and James in the Nipissing district, to Elk lake, and thence by way of Smyth and unsurveyed portions of the Nipissing district to Gowganda lake; from its proposed line from Ville Marie to Opasitica lake, thence northerly to the Grand Trunk Pacific (National Transcontinental). MacCracken, Henderson, McDougal & Green, of Ottawa, are solicitors for the company.

Colorado & Mexico.—The incorporators of this company include Walter Douglas, E. E. Ellinwood, M. J. Cunningham, M. J. Brophy and John Boler, all of Bisbee, Ariz. E. E. Ellinwood is attorney for the company. (Jan. 8, p. 88.)

Edmondton & Slave Lake.—See Canadian Northern.

Gilmore & Pittsburgh.—An officer writes that this company, which will build a line from Armstead, Mont., west to Salmon, Idaho, will let contracts for grading, track laying and bridges about the first of February. The bids being asked cover 120 miles of line in Montana and Idaho, including a 750-ft. tunnel. Bidders must be prepared to begin work before March 1, 1909. W. A. McCutcheon, President, and T. H. Bacon, Chief Engineer, Machesney building, Pittsburgh, Pa.

GRAND TRUNK PACIFIC.—An officer writes that additional contracts will probably be let in the near future for building about 300 miles on the mountain section. (Jan. 1, p. 36.)

HUDSON & MANHATTAN.—President McAdoo has announced that the downtown tubes, from Jersey City, N. J., under the Hudson river to Cortlandt street, New York, will be opened by July 1, 1909. Trains will be run on a three-minute headway. The uptown tubes, from Hoboken to Christopher street and thence northerly, have been in operation for about a year.

JOLIETTE & LAKE MANUAN COLONIZATION.—Application is being made to the Canadian Parliament for an extension of time to build from Joliette, Que., northerly to Ste. Emilie de l'Energie, thence north and northwesterly to St. Michel des Saints and to Lake Manuan, about 150 miles. Desaulniers & Vallee, Montreal, Que., are solicitors for the company.

MEXICAN CENTRAL.—Reports from Mexico indicate that a cut-off line is being built to connect with the Mexican International in the vicinity of Monterey, Mex. The object of this new line is to shorten the distance between points on the Mexican International and Saltillo by about 75 miles.

MEXICAN INTERNATIONAL.—See Mexican Central.

MEXICAN ROADS.—Reports from the City of Mexico indicate that the aid of the state governments concerned is to be enlisted in the building of extensions of the federal system of railways. Public knowledge of the inauguration of this new policy has just been obtained through an agreement entered into by the Governor of Durango on behalf of that state and the National Lines of Mexico. It is said that under the terms of this contract the state of Durango guarantees an income of 6 per cent. on the amount of capital invested in building an extension of the Mexican International, one of the merger lines, from Durango to a tract of timber about 100 miles west. This extension is to be the first link in a much discussed connection between Durango and the port of Mazatlan on the Pacific coast in Sinaloa. Survey for this proposed extension is said to have been made several years ago after some difficulty in locating a route across the Sierra Madre range. It is further reported that the federal government will expect similar guarantees of interest charges from other states where extensions of the merger system are proposed.

MISSOURI, KANSAS & TEXAS.—An officer writes that there is no truth in the newspaper reports that this company has under consideration the question of double-tracking its line betweene Dallas, Tex., and Waxahachie, although double-track work is now in progress on other parts of the system. Between Dallas and Waxahachie sidings are being lengthened and other improvements for handling heavier traffic are being made, which it is thought will be sufficient to accommodate the traffic. (October 2, p. 1076.)

NEW YORK, PHILADELPHIA & NORFOLK.—See Pennsylvania.

NORTHEASTERN RAILWAY.—Application will be made by this company to the Quebec Legislature for an extension of time to build lines as follows: From near the Gatineau river, Quebec, east to Nominingue; from point near Ville Marie, Ont., on Lake Temiskaming, east, south of Lakes des Quinze, Victoria and Kakebonga, to Quebec; from Lake Temiskaming north to the Grand Trunk Pacific (National Transcontinental) near Lake Abitibi; from near Lake Kakebonga south to Maniwaki. Desaulniaers & Vallee, Montreal, Que., are solicitors for the company.

NUECES VALLEY, RIO GRANDE & MEXICO.—An officer writes that this company, organized to build a line from Eagle Pass, Tex., east to Aransas Pass, about 300 miles, has given a contract to the J. F. Burns Construction Co., of Devine, Tex., for building a section of 32 miles from a point on the International & Great Northern at Artesia, Tex., west to Asherton, which will be the western terminus for some time to come. Grading has been finished for 10 miles and track laying is to begin February 1. The line is to be laid with 65-lb. rails, and it is expected to begin work from Artesia east to Aransas Pass, and west from Asherton to Eagle Pass, in the near future. Asher Richardson, President, Carrizo Springs, and R. H. Gresham, Chief Engineer, San Antonio.

OKLAHOMA & GOLDEN CITY.—An officer writes that this company, which was incorporated in Oklahoma with a capital of $12,000,000 to build a line from Pawhuska, Okla., northeast through Bartlesville, Miami, Joplin, Mo., Carthage, Golden City, Stockton, Humansville, Climax Springs and Brazito to Jefferson City, and also a branch from Climax Springs, Mo., south to Springfield, will pursue the following order in the work of construction. First, from Golden City, Mo., northeast to Stockton, and from Golden City southeast to Carthage. When this is completed, work will begin from Pawhuska, Okla., to the northeast and from Jefferson City to the southwest, also continuing work on the lines in both directions from Golden City. Upon the completion of these lines, work will be begun on the branch from Climax Springs, Mo., south to Springfield. Contracts for grading, track laying, etc., will be let in April. Grades will be under 1 per cent. with no bad curves. There will be five large bridges and a number of smaller ones, also some trestle work. Officers of this company are: W. S. Pope, President, Jefferson City; J. A. Griesel, General Manager, Golden City; E. M. Dempsey, Vice-President, and W. S. Hawkins, Chief Engineer, Pawhuska, Okla.

OKLAHOMA ROADS (ELECTRIC).—C. T. Blake is Vice-President of a company which has been granted a franchise by the Hobart, Okla., City Council to operate a street railway. Final arrangements are under way and as soon as these are completed work is to be started on four electric interurban lines to be built from Hobart.

PENNSYLVANIA.—This company is arranging to double-track the line of the New York, Philadelphia & Norfolk, between Salisbury, Md., and Fruitland, a distance of about four miles.

PRINCE ALBERT & HUDSON BAY.—Application has been made to the Canadian Parliament for incorporation by this company to build a line from Prince Albert, Sask., crossing the Saskatchewan river and northeasterly to the mouth of Nelson river or York Factory on Hudson Bay; also for permission to operate vessels on all navigable waters touched by the railway. F. W. Halliday, Prince Albert, Sask., is solicitor for the company.

QUEBEC & ORIENTAL.—Application has been made by this company to the Canadian Parliament for an extension of time to build a line from Riviere du Loup, Que., southeasterly through Temiscouata county, to a connection with the Grand Trunk Pacific (National Transcontinental) in either Temiscouata or Kamouraska counties, and to buy railway lines from Metapedia east to Caplin, and from Caplin to Paspebiac, known as the Baie des Chaleurs section of the Atlantic & Lake Superior Railway; also for authority to increase its bonding powers to $45,000 a mile. D. R. Murphy, Montreal, Que., is solicitor for the company.

SOUTHERN PACIFIC (MEXICO).—Press reports from Guadalajara, Mex., say that the Southern Pacific of Mexico, previously referred to as the Mexican Pacific Coast, has finished the section on the southern end from Orendain, Mex., on the Mexican Central west to Tiquila, Jalisco, 22 miles. Work on the extension west of Tiquila is being pushed and it is expected to begin operating trains within a few months to Tesquesquite, which will afford transportation facilities to the Hostotpaquillo mining district.

STAMFORD & NORTHWESTERN.—An officer writes that a general contract has been given to P. M. Johnston, Son & Allhands for grading, buildings, bridges, etc., and sub-contract let to J. L. McSpadden for the first five miles out of Stamford. At present there are 250 teams at work and by the middle of February there will be 150 additional. The company was organized last fall to build a line westerly from Stamford in Jones county, Tex., to a point in Dickens county, about 65 miles. L. M. Buie, President, and P. G. Burns, Chief Engineer, Stamford. (January 15, p. 139.)

TEMISKAMING & NORTHERN ONTARIO.—Press reports say that this company has plans under consideration for building an extension from Charlton, Ont., to Elk Lake, 28 miles.

TEXAS STATE RAILROAD.—Reports from Palestine, Tex., say that this line, which is being built by convicts from Rusk, Tex., to Palestine, about 30 miles, is nearing completion and that the grading is finished to within three miles of Palestine

and track completed to within seven miles. It is reported that the line will be in operation within a few weeks. (See Texas Roads, November 13, p. 1375.)

Trinity & Brazos Valley.—See Colorado & Southern.

Vancouver, Fraser Valley & Southern.—Application is being made to Parliament for an act reviving the charter of this company granted in 1906. McPhillips, Tiffen & Laursen, Vancouver, B. C., are attorneys for the company.

Williamsville, Greenville & St. Louis.—This company, operating a line from Williamstown, Mo., to Hiram, contemplates, it is said, an extension from Cascade, Mo., to Fredericktown, for which survey has been made. No bids have yet been received for the construction work. G. A. Long, General Superintendent, Greenville, Mo.

Zinc Belt Railroad.—Incorporated in Arkansas, with a capital stock of $1,500,000, to build a line in the northern part of the state, and eventually from Little Rock, Ark., to St. Louis, Mo.

Railroad Financial News.

Central New England.—The stockholders of this company, which is controlled by the New York, New Haven & Hartford, are asked to exchange their certificates "of beneficial interest in the shares of stock deposited with the trustee" for stock, thus terminating the 10-year voting trust which began March 14, 1898. The present trustees are William Rockefeller, Charles F. Brooker, Charles Lanier, William Greenough and W. L. Barnett.

Chesapeake & Ohio.—Edwin Hawley and associates have bought the $15,630,000 stock of the C. & O. that was transferred by the Pennsylvania to Kuhn, Loeb & Co. in December, 1906. It would appear that the Hawley interests have acquired control of the Chesapeake & Ohio. Edwin Hawley and his associates now control the Toledo, St. Louis & Western, the Chicago & Alton, the Minneapolis & St. Louis, the Iowa Central and a one-sixth interest in the Hocking Valley. They very recently sold a controlling interest in the Colorado & Southern to the Chicago, Burlington & Quincy. Until the sale by the Pennsylvania of its holdings, the Chesapeake & Ohio has been controlled jointly by the Pennsylvania and the Vanderbilt interests. The capital stock outstanding amounts to $62,799,100.

Chicago City Railway.—The directors have declared an extra dividend of 3 per cent. on the $18,000,000 capital stock outstanding. During 1908 regular quarterly dividends of 1½ per cent. were paid the same as in 1907, and the present extra dividend of 3 per cent. corresponds with a like extra dividend paid at the end of 1907.

Chicago, Milwaukee & St. Paul.—The company has bought a tract of coal lands in the Bull mountain field near the Pacific coast extension in Yellowstone county, Montana, and has opened two mines.

Chicago Terminal Transfer.—The stockholders' protective committee, George I. Malcom, chairman, says that the holders of about 77,000 of the 81,481 shares of preferred stock have accepted the offer to sell their holdings for $20 a share to a purchaser understood to be the Baltimore & Ohio. The privilege of accepting the offer expires February 1.

Cincinnati, Hamilton & Dayton.—Judson Harmon, receiver, has withdrawn his resignation at the request of the court and will continue as receiver.

Cleveland, Cincinnati, Chicago & St. Louis.—See New York Central & Hudson River.

Denver & Rio Grande.—All of the $10,000,000 6 per cent. notes of 1908-1911-1913 have been exchanged for refunding bonds, of which there are now outstanding $17,500,000. The company is exchanging its stock for the stock of the old Denver & Rio Grande and the Rio Grande Western. The exchange is on the basis of one share of preferred new stock for one share of preferred stock of the old D. & R. G., and one share of new common stock for one share of common stock of the old D. & R. G. For one share of either preferred or common of the Rio Grande Western there is exchanged two shares of preferred stock of the new company.

Hidalgo & Northeastern.—See National Railways of Mexico.

Mexican Central.—See National Railways of Mexico.

Missouri, Kansas & Texas.—Speyer & Co., New York, have bought $3,310,000 first and refunding mortgage 4 per cent. bonds that have been held in the treasury of the M., K. & T.

National Lines of Mexico.—See Mexican Roads under Railroad Construction.

National Railroad of Mexico.—See National Railways of Mexico.

National Railways of Mexico.—The property of the Hidalgo & Northeastern has been transferred to the National Railways of Mexico, and its earnings, previously reported separately, have, since January 1, been included with those of the National Railroad of Mexico. The Hidalgo & Northeastern operates 152 miles of road and was previously controlled by the National Railroad of Mexico. Its road is now known as the National and Hidalgo divisions of the National Railroad of Mexico.

William Salomon & Co., New York, are offering at par a block of Mexican Central collateral trust 5 per cent. notes of 1906-1910. This is part of an authorized issue of $35,000,000, of which $15,740,000 are outstanding. The notes are a direct obligation of the National Railways of Mexico.

New York Central & Hudson River.—E. H. Harriman has been elected a Director of the New York Central & Hudson River, succeeding C. C. Clark. W. C. Brown has been elected a Director, succeeding Samuel F. Barger. Mr. Brown has also been elected a Director of the Cleveland, Cincinnati, Chicago & St. Louis, succeeding Alexander McDonald, resigned. He has also been elected President of the Big Four, succeeding W. H. Newman, who remains, however, a Director of the Big Four.

New York, New Haven & Hartford.—See Central New England.

New York State Railways.—The stockholders of the Rochester & Sodus Bay, the Rochester & Eastern and the Rochester Railway have ratified, it is said, the merger of these companies into the New York State Railways. (January 8, p. 90.)

Norfolk & Western.—Divisional first lien and general mortgage 4 per cent. bonds of 1904-1944 amounting to $10,000,000 have been sold to Kuhn, Loeb & Co. and the Guaranty Trust Co., both of New York. The bonds are part of a total authorized issue of $35,000,000, of which there are outstanding $23,000,000, including the $10,000,000 bonds now sold.

Western Maryland.—Blair & Co., New York, have bought $4,000,000 first mortgage 4 per cent. bonds held as collateral by the Deutsche Bank for a $3,000,000 loan to the railway company. When the railway company defaulted on the loan in March, 1908, the bonds were sold at auction and bid in by the bank at 53, leaving a deficiency against the loan of $800,000. The bonds are now worth more than the loan, but a suit has been pending to collect the deficiency.

Wisconsin Central.—W. A. Bradford, Jr., G. A. Fernald, T. L. Chadbourne and H. B. Starr have resigned as members of the executive committee and as directors. George J. Gould and T. F. Gates, directors, have resigned, and W. J. Wollman, C. G. Simpson and F. H. Prince have been elected members of the executive committee and directors, and E. N. Foss and Leroy Baldwin and F. H. Prince have been elected directors. Newman Erb, President, has been elected chairman of the executive committee, succeeding W. A. Bradford, Jr.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Coyaz Railway, Brazil, has ordered two locomotives from the Baldwin Locomotive Works.

The Manufacturers' Railway has ordered one locomotive from the Brooks works of the American Locomotive Co.

The Pennsylvania, reported in the *Railroad Age Gazette* of December 18 as having just begun the construction of 15 consolidation locomotives at its Juniata shops, has increased this number to 33 locomotives.

The Canadian Pacific, reported in the *Railroad Age Gazette* of January 22, has ordered 30 Pacific locomotives from the Locomotive & Machine Co., of Montreal.

General Dimensions.

Weight on drivers	135,000 lbs.
Weight, total	214,200 "
Cylinders	21 in. x 28 in.
Diameter of drivers	69 in.
Diameter of trailers	44 "
Boiler, type	Extended wagon top
Boiler, working steam pressure	200 lbs.
Firebox, length	94½ in.
Firebox, width	69⅞ "
Tubes, length	19 ft. 6 "
Tubes, outside diameter	(193) 2¼ in.; (22) 5 "

The Grand Trunk Pacific, reported in the *Railroad Age Gazette* of October 30, has ordered 25 American locomotives from the Locomotive & Machine Co., of Montreal.

General Dimensions.

Weight on drivers	74,700 lbs.
Weight, total	120,700 "
Cylinders	18 in. x 24 in.
Diameter of drivers	69 "
Boiler, type	Extended wagon top
Boiler, working steam pressure	200 lbs.
Firebox, length	95¾ in.
Firebox, width	41⅞ "
Tubes, number	210
" length	11 ft. 2¾ in.
" outside diameter	2 "

The Great Northern, as reported in the *Railroad Age Gazette* of January 22, has ordered 20 Pacific locomotives, equipped with superheaters, from the Baldwin Locomotive Works.

General Dimensions.

Weight, on drivers	151,000 lbs
Weight, total	375,200 "
Cylinders	26 in. x 30 in.
Diameter of drivers	73 in.
Boiler, type	Belpaire
" working steam pressure	150 lbs.
" diameter smallest ring	72 in.
Heating surface, tubes	2,847.39 sq. ft.
" " firebox	210.77 "
" " total	3,058.16 "
Tubes, total number	292
" number in superheater	32
" diameter	2¼ in.
" diameter in superheater	5 "
" length	21 ft.
Firebox, length	116¼ in.
" width	66¼ "
" depth, front	72 "
" depth, back	64⅜ "
Grate area	54.15 sq. ft
Water capacity	8,000 gals.
Coal capacity	13 tons

CAR BUILDING.

The Pere Marquette is asking prices on 50 forty-ton box cars.

The Chicago, Milwaukee & St. Paul is in the market for two buffet library cars.

The Harriman Lines are asking bids on 1,500 refrigerator cars, the contract for which will probably be let in a few days.

The Aurora & Dekalb has ordered one 58-ft. combination passenger and baggage car from Hotchkiss, Blue & Co., Railway Exchange building, Chicago.

Special Equipment.

Brakes	Westinghouse
Curtain material	Pantasote
Heating system	Two Spear stoves
Interior finish	Oak, natural wood
Lighting system	Four double-chandelier oil lamps
Parcel racks	A. & W. 4-ft. sections
Seats	New reversible
Seat covering	Pantasote
Trucks	4-wheel
Wheels	Steel tired

The Cleveland, Akron & Columbus is said to have ordered 100 freight cars from the Standard Steel Car Co. This item is not confirmed.

The Pennsylvania has asked bids on 2,100 new freight cars for the Lines West. These cars are for replacing their proportion of pool freight equipment.

The New York Central Lines are asking prices on from 50 to 80 passenger coaches, three combination smoking and baggage, two smoking cars and 200 thirty-ton stock cars.

The Nevada Northern has ordered two 60-ft. combination passenger, baggage and smoking cars from Hotchkiss, Blue & Co., Railway Exchange building, Chicago.

Special Equipment.

Brakes	Westinghouse
Curtain material	Pantasote
Heating system	Steam and two Spear stoves
Interior finish	Oak, natural wood
Lighting system	Four double-chandelier oil lamps
Parcel racks	A. & W. 4-ft. sections
Seats	Reversible
Seat covering	Pantasote
Trucks	6-wheel
Wheels	Steel tired

The Seaboard Air Line, as reported in the *Railroad Age Gazette* of January 22, has ordered 500 thirty-ton steel underframe ventilated box cars from the South Baltimore Car & Foundry Co.; 200 fifty-ton steel phosphate hopper cars from the Barney & Smith Car Co., and fifty 40 cu. yd. capacity ballast cars from the Rodger Ballast Car Co. All of this equipment is for early delivery.

BOX CARS.

These cars will be 36 ft. long, 8 ft. 2½ in. wide and 7 ft. 6 in. high, inside measurements, and 37 ft. 9¾ in. long, 9 ft. 1¼ in. wide and 12 ft. 8⅜ in. high, over all. The bodies will have steel frames with wood lining and siding. The underframes will be of steel. The special equipment includes:

Axles	Seaboard standard
Bolsters, body	Pressed steel
Bolsters, truck	Cast steel; American Steel Foundries
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Seaboard standard
Couplers	Simplex; American Steel Foundries
Doors	Seaboard standard
Door fastenings	Dayton, Jones fixture
Draft gear	Farlow
Dust guards	Bass wood
Journal boxes	Symington
Paint	Seaboard standard
Roofs	Murphy outside metal
Side bearings	Seaboard standard
Springs	" "
Trucks	" "

PHOSPHATE CARS.

These cars will be 34 ft. long at hopper top, 9 ft. 1⅝ in. wide and 7 ft. 5 in. high, inside measurements, and 37 ft. 2 in. long, 10 ft. 8 in. wide and 10 ft. 5¼ in. high, over all. The bodies and underframes will be of steel. The special equipment includes:

Axles	Seaboard standard
Cast steel	American Steel Foundries
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Seaboard standard
Brasses	M. C. B. standard
Couplers	Simplex; American Steel Foundries
Doors	Seaboard standard
Door fastenings	Seaboard standard
Draft gear	Farlow, twin spring
Journal boxes	Symington; malleable iron
Paint	Seaboard standard
Roofs	⅛-in. steel
Side bearings	Seaboard standard
Springs	" "
Trucks	Seaboard standard with Andrews side frames

BALLAST CARS.

These cars will be 40 ft. long, 8 ft. 8 in. wide and 3 ft. high, inside measurements, and 41 ft. 6 in. long, 10 ft. 2⅝ in. wide, inside measurements, and 7 ft. 5 in. high above rail. The bodies will have steel frames with wood siding and the underframes will be of steel. The special equipment includes:

Axles	Seaboard standard
Bolsters, body	Built up
Bolsters truck	Cast steel; American Steel Foundries
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Seaboard standard
Brasses	M. C. B. standard
Couplers	Simplex
Draft gear	Farlow
Dust guards	Bass wood
Journal boxes	McCord
Paint	Seaboard standard
Side bearings	" "
Springs	" "
Trucks	" "

The New York Central Lines, reported in the *Railroad Age Gazette* of December 4 as being in the market for five postal cars, have ordered 11 of these cars from the Pullman Co.

The Chesapeake & Ohio order of three dining cars from the Pullman Company, reported in the *Railroad Age Gazette* of January 22, is a restoration of an order which was canceled about two years ago. No contracts have as yet been made for freight equipment.

The Seaboard Air Line, reported in the *Railroad Age Gazette* of January 22, has ordered 5 passenger, 2 passenger-baggage, 3 mail-baggage and 5 express cars from the Barney & Smith Car Co. for early delivery. These cars will be 69 ft. 2¾ in. long, 8 ft. 10⅞ in. wide, 9 ft. 5¼ in. high, inside measurements, and 71 ft. 10 in. long over buffer sills, 10 ft. ⅝ in. wide at eaves and 10 ft. 5$\frac{5}{16}$ in. high. The bodies and underframes will be of wood. The special equipment includes:

Axles	M. C. B.
Bolsters, body and truck	Cast steel; Commonwealth Steel Co.
Brakes	Westinghouse
Brake-beams	Hercules; American Steel Foundries
Brake-shoes	Lappen
Couplers, vestibule cars	Janney, long stem
Couplers, stub-end cars	Janney Bohoup; short stem
Curtain fixtures	National
Curtain material	Pantasote
Draft gear	Seaboard standard
Dust guards	Symington
Heating system	Safety, direct
Journal boxes	Symington
Lighting system	Pintsch gas
Paint	Seaboard standard
Platforms	Standard Steel; Type A
Roofs	Seaboard standard
Side bearings	Woods
Springs	Seaboard standard
Trucks	Seaboard standard, 6-wheel
Ventilators	Seaboard standard
Vestibules	Pullman, wide Type C
Ventilator diaphragms	Carrest
Ventilator trap doors	King
Wheels	36-in. steel tired

IRON AND STEEL.

The Detroit & Mackinac has ordered 1,000 tons of rails from the Illinois Steel Co.

The Isthmian Canal Commission has ordered 7,000 tons of rails from the Pennsylvania Steel Co.

The Toledo, Peoria & Western is said to have ordered 1,000 tons of rails from the Illinois Steel Co.

The Cleveland, Akron & Columbus is said to have ordered 3,500 tons of rails from the Carnegie Steel Co.

The Cincinnati, Hamilton & Dayton is said to have ordered 1,000 tons of rails from the Carnegie Steel Co.

The St. Louis, Brownsville & Mexico has ordered 530 tons of structural steel from the Wisconsin Bridge Co., for use in bridge construction.

The Long Island has given a contract to the American Bridge Co. for about 600 tons of steel for use on the new shed of Old Pier 32, East river, New York City.

The Isthmian Canal Commission will receive bids until February 15 for steel rails, angle bars, tie plates, frogs, switch points, switch stands, rail braces, spikes, track bolts, etc. Circular No. 491.

The Colorado Springs & Cripple Creek District has ordered a tonnage of 75-lb. rails from the Colorado Fuel & Iron Co., sufficient to re-lay 22 miles of track between Colorado Springs, Colo., and Cripple Creek.

The New York, New Haven & Hartford is said to have given an order to the McKenna Process Co. for re-rolling 8,000 tons of 100-lb. rails. It is understood that these rails will be re-rolled into 90-lb. rails for use on sidings.

The Crane Co., Chicago, reported in the *Railroad Age Gazette* of January 22 as being in the market for 500 tons of structural steel for a warehouse at San Francisco, Cal., has placed this order with the Receivers of Milliken Bros.

The Great Northern, reported in the *Railroad Age Gazette* of January 22 as being in the market for 8,000 tons of rails, has placed an order with the Illinois Steel Co. for 6,500 tons. This order is for prompt delivery. In addition to this tonnage, the Great Northern is now getting prices on 18,000 tons of rails for later delivery and is also in the market for 150,000 special rail joints.

RAILROAD STRUCTURES.

Abilene, Tex.—Local press reports say that surveying for the site of a new roundhouse, between Eighth and Ninth streets, has been begun.

Comanche, Tex.—The Texas Railroad Commission has ordered the Ft. Worth & Rio Grande to build a new station at Comanche. Plans for this structure are now being prepared.

Denison, Tex.—It is reported that a contract has been given to Stewart & Stewart for the new Union station, which is to cost about $250,000, and that work is to be started at once; also that the building will be completed within about six months. (July 10, p. 500.)

Natchez, Miss.—Press reports indicate that G. B. Swift & Co., Chicago, have been given a contract for building the depot of the Mississippi Central. It is understood that the building will include the freight and passenger depot with office rooms and that the building is to be finished in about five months.

New York, N. Y.—The Long Island has given a contract to Edward B. Jenks, New York, for building the new shed on Old Pier 32, East river. About 600 tons of steel will be used. (See Long Island Railroad under Iron and Steel.)

Tacoma, Wash.—The Great Northern has given the contract to H. Chase & Co., Seattle, Wash., for building its freight terminal buildings. The freight shed will be two stories, of brick construction, 58 ft. x 500 ft., to cost about $30,000. (Jan. 22, p. 189.)

Williamson, W. Va.—The Norfolk & Western intends to enlarge the pumping station in order to secure a sufficient quantity of water of good quality for terminal facilities. A new pumping plant is now being built by company forces. This pumping plant will be operated by electric power, and a new power house, 50 ft. x 100 ft., sufficient for providing all the necessary electric power, is now being built. The concrete foundations of this building are being built by The E. G. Nave Bros. Co., of Portsmouth, Ohio, and the brick building proper by J. P. Pettyjohn & Co., of Lynchburg, Va. The power house and equipment will cost about $30,000.

Winnipeg, Man.—Work will be started soon, it is said, on new union stock yards at Winnipeg as soon as the St. Boniface Council carries out its agreement to open several streets and construct sewers. About $395,000 is to be spent in laying out the yards, exclusive of the buildings. (July 17, p. 549.)

SIGNALING.

The government of British Columbia is in the market for an electric interlocking plant for the Fraser river drawbridge at New Westminster, B. C.

The Kentucky & Indiana Bridge & Railroad Co. is in the market for block signals for its line between 30th street, Louisville, Ky., and Dewey street, New Albany, Ind. The type of signal to be used has not been decided.

The Chicago, Milwaukee & Puget Sound has ordered from the Union Switch & Signal Co. the material for a mechanical interlocking plant at the crossing of the North Pacific at Sinclair, Mont. The machine will be of the Saxby & Farmer type, 20-lever frame, 16 working levers. Distant signals will be power-operated, style B motors without track circuit. No electric locking will be provided. All signals will be two-position upper quadrant.

Iron and Steel Institute Scholarship.

Andrew Carnegie has given the Iron and Steel Institute (England) a fund of $89,000 to establish a research scholarship. The object is to enable college graduates or men trained in industrial work to conduct researches in iron and steel

metallurgy and allied subjects. There is no restriction as to the place of recearch as long as it is properly equipped. The scholarships shall be awarded for one year, but may be renewed instead of making a new selection. The results of the research are to be presented in the form of papers before the institute, and if of sufficient merit the Andrew Carnegie gold medal shall be awarded.

United States Steel Corporation.

The income account of the United States Steel Corporation for the quarter ended December 31, 1908, is as follows:

Net earnings			$26,225,485
Sinking funds on bonds of subsidiary companies		$248,272	
Depreciation and reserve funds		4,965,550	
			5,213,822
Balance			$21,011,663
Interest on U. S. Steel Corp. bonds outstanding		$5,942,354	
Sinking funds on U. S. Steel Corp. bonds, viz.:			
Instalments	$1,012,500		
Interest on bonds in sinking funds	357,109		
		1,369,609	
			7,311,963
Balance			$13,699,700
Net adjustments in sundry accounts			289,183
Total			$15,988,883
Preferred dividend, 1¾ per cent		$6,304,919	
Common dividend, ½ per cent		2,541,513	
			8,846,432
Surplus for the quarter			$5,142,451
Total surplus			$133,991,154

The above net earnings compare with previous quarters as follows:

Quarter ending.	Net earnings.	Quarter ending.	Net earnings.
Sept. 30, 1908	$27,106,274	Dec. 31, 1905	$35,216,062
June 30, 1908	20,265,756	" 31, 1904	21,466,631
Mar. 31, 1908	18,229,005	" 31, 1903	15,037,182
Dec. 31, 1907	32,534,191	" 31, 1902	31,985,759
" 31, 1906	41,750,125		

The fourth quarter's earnings, by months, for a series of years are as follows:

Year.	October.	November.	December.	Total.
1908	$9,415,668	$8,756,729	$8,053,088	$26,225,485
1907	17,052,210	10,467,252	5,014,728	32,534,192
1906	14,984,925	13,482,464	13,282,735	41,750,125
1905	12,400,306	11,827,215	10,988,542	35,216,063
1904	7,250,204	7,117,417	7,099,010	21,466,631
1903	7,675,141	4,069,901	3,292,139	15,037,181
1902	12,652,707	10,686,906	8,000,000	31,339,613

The unfilled orders on hand, December 31, 1908, were 3,603,527 tons.

This compares with previous quarters as follows:

Quarter ending.	Tons, unfilled orders.	Quarter ending.	Tons, unfilled orders.
Sept. 30, 1908	3,421,977	Dec. 31, 1905	7,605,086
June 30, 1908	3,313,876	" 31, 1904	4,696,203
Mar. 31, 1908	3,765,343	" 31, 1903	3,213,123
Dec. 31, 1907	4,624,553	" 31, 1902	5,347,252
" 31, 1906	8,489,718		

Mr. Faulkner's Observations on Sleepers.

While in Germany I looked into the steel tie question and was assured by the managers of the operating departments of the various roads that they found the life of a steel tie was no longer than that of a wood tie [meaning, presumably, creosoted wood]. Last year I was in Japan and learned that 300 years ago the government began to conserve its forests and replant them, and the result is that they are now selling railway ties to this country and also to Mexico. I purchased 5,000 ties from Japan for our road. A vessel is now unloading at San Francisco ties from the Hawaiian Islands, and next week another vessel is expected. And remember that we are paying a duty of 20 per cent. on each tie brought from a foreign country into the United States.—*E. O. Faulkner, Manager Tie and Timber Department, Atchison, Topeka & Santa Fe.*

Harbor Improvement in Brazil.

According to a consular report, work on harbor improvements at Pernambuco, Brazil, is about to start, and there may be a demand for American dredges and other material. M. Bartissol, 7 Rue Lafayette, Paris, France, has the concession for the work and will have charge of the improvements.

Supply Trade News.

J. M. Hopkins, General Manager of the Camel Co., Chicago, has been elected President of that company.

William H. Dyer has been appointed Master Mechanic of the Valdosta shop of the Southern Locomotive & Car Mfg. Co., Valdosta, Ga.

The Youngstown Car Manufacturing Co., Youngstown, Ohio, has opened a Chicago office at 1508 Fisher building, in charge of Charles B. Owens.

C. B. Goodspeed has been elected a Director of the Buckeye Steel Castings Co., Columbus, Ohio, succeeding R. M. Rowand, resigned. Other directors have been re-elected.

John P. Cosgrow has been appointed District Manager of the Allis-Chalmers Co., Milwaukee, Wis., with office in the El Paso & Southwestern building, El Paso, Tex.

The O. M. Edwards Co., Syracuse, N. Y., are to furnish window fixtures for the Carolina, Clinchfield & Ohio cars being built by Harlan & Hollingsworth. Automatic window design 1-Bl will be used.

E. A. Johnson, who for 12 years has been with the Watson-Stillman Co., New York, has been appointed General Eastern Sales Manager of the Duff Manufacturing Co., Pittsburgh, Pa., with offices at New York, effective February 1.

The Railway Telephone & Electric Co., Chicago, has been incorporated to do a general manufacturing and sales business of electrical appliances. Capital stock, $30,000. The incorporators are: Max W. Zabel, A. Miller Belfield and O. M. Wermich.

The Cold Blast Refrigerator Transit Co., Chicago, has been incorporated with $25,000 capital to manufacture and deal in refrigerator cars and refrigerating apparatus. The incorporators are: Delbert E. Johnson, Walter M. Anthony and William H. Skaggs.

The Carnegie Steel Co., Pittsburgh, Pa., has made a contract with the Chicago City Railway to furnish hereafter all the new car wheels for its rolling stock. The different kinds of wheels now in service will be replaced from time to time with Schoen steel wheels.

The Isthmian Canal Commission is asking bids up to February 8 on wire screens, condenser tubes, locomotive castings, manganese steel bars, chain, wire, valves, drills and other machine tools, pipe cutters, hammers, punchers, files, screws and other hardware.

F. G. Stevens, who has been connected with the advertising department of the *Railroad Age Gazette* in Chicago since the consolidation of the *Railroad Gazette* and *The Railway Age*, has resigned to enter the employ of the *Railway and Engineering Review*, with headquarters at Chicago.

Samuel B. Sheldon, General Superintendent of the Buffalo plant of the Lackawanna Steel Co., New York, has resigned to go to the Bethlehem Steel Co., South Bethlehem, Pa. George F. Downs, Assistant General Superintendent, succeeds Mr. Sheldon; T. H. Mathias succeeds Mr. Downs.

William C. Ennis, heretofore with the American Locomotive Co., New York, has been appointed Eastern Traveling Representative of the Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio. Mr. Ennis has served as Superintendent of Motive Power and Master Mechanic on various railways.

According to a consular report, the Secretary of the Birmingham Chamber of Commerce says that he can furnish the names and trades of British manufacturers who are prepared to negotiate for buying, or working on royalty or other agreed terms, British patents owned in the United States.

V. K. Spicer has been appointed Canadian Manager of the Union Switch & Signal Co., Swissvale, Pa., effective January 31, and will take charge of the Montreal office about March 1. W. E. Foster has been appointed Western Manager, in charge of the Chicago office and district, effective February 1.

M. P. Paret, Chief Engineer of the Kansas City, Mexico & Orient, has resigned that position to go into partnership with E. J. Beard, as Consulting Engineers, with main offices at Kansas City, Mo. Mr. Beard was formerly Principal Assistant Engineer of the Chicago, Rock Island & Pacific, and for the last two years has been Chief Engineer of J. G. White & Co., New York.

The W. K. Kenly Co., Chicago, which is the western representative of the Kalamazoo Railway Supply Co., Kalamazoo, Mich., has appointed the Hofius Steel & Equipment Co., Seattle, Wash., its Pacific coast representative. A complete stock of hand, push and velocipede cars will be carried in Seattle. The Hofius company will also carry a stock of Latimer switch point locks.

Herbert DuPuy, Second Vice-President, has been elected Chairman of the Executive Committee of the Crucible Steel Company of America, Pittsburgh, Pa., succeeding William G. Park, who died on January 19. George E. Shaw, of Pittsburgh, has been elected a Director. John A. Sutton, Third Vice-President, succeeds Mr. DuPuy. Fourth Vice-President C. C. Ramsey succeeds Mr. Sutton. O. H. Wharton succeeds Mr. Ramsey.

The Rockwell Furnace Co., New York, has been awarded the contract covering the complete furnace equipment for the new locomotive shops of the Delaware, Lackawanna & Western at Scranton, Pa. The furnace equipment consists of 35 furnaces operated with 300 B.t.u. water gas, which is made in Loomis Pettibone producers. These shops will be capable of turning out complete locomotives, and are to be in operation in three months.

The Darley Engineering Co., New York, has the following recent orders for 8-in. patented suction ashes conveyors: United States Navy, for Charleston, S. C. (fourth order from the Navy Department); Armour & Co., for South Omaha plant (fourth order from Armour & Co.); American Steel and Wire Co., for Rankin plant (third order from United States Steel Corporation and second order from American Steel & Wire Co.); Quincy Market Cold Storage & Warehouse Co., Boston, Mass., for Richmond street plant.

F. R. Wadleigh, for 12 years Chief Inspector and Fuel Engineer for Castner, Curran & Bullitt, Philadelphia, Pa., sole agents C. C. B. Pocahontas coal, has been appointed Assistant General Manager of the Chesapeake & Ohio Coal & Coke Co., with headquarters in New York. Mr. Wadleigh will act as Chief Inspector and Fuel Engineer for this company, and will have charge of the inspection, preparation and use of its coal, as well as any matters in connection with the selling and placing of its coals that may be assigned to him by the President.

The Foundry & Manufacturers' Supply Association will hold its 1909 convention and exhibit during the week of May 17, in Cincinnati, Ohio. It will be, as usual, in conjunction with the meeting of the American Foundrymen's Association. There will be an executive meeting of the former association in Cincinnati on February 5, to complete arrangements for exhibition buildings and to prepare a plan for awarding space to exhibitors. Previous to that time no space will be assigned. It is probable that the exhibits will be in Horticulture Hall. C. E. Hoyt, Chicago, is Secretary.

The Grip Nut Co., Chicago, has recently received contracts whereby Grip nuts are to be used in the construction of the 500 ventilated fruit and vegetable cars and 200 stock cars, now being built by the American Car & Foundry Co., at Madison, Ill., for the San Antonio & Aransas Pass; also for the 800 steel hopper cars to be built by the Standard Steel Car Co. for the Duluth & Iron Range. The plant of the Grip Nut Co. at South Whitley, Ind., is being enlarged in order to meet the demands of its business. The sale of Grip nuts for last week exceeded 500,000, the orders having come from various parts of the country.

At a meeting of a number of railway supply men in New York city last week, it was decided to reorganize the old, but not forgotten, "Hod Carriers' Union." This company was notorious for its many mysterious dealings in connection with a number of the annual conventions of the Master Car Builders' and American Railway Master Mechanics' Associations. It is expected by those at present interested otherwise than financially in the reorganization, that active operations will begin at a new "plant" in Atlantic City about the time of this year's conventions. J. M. McCarthy is President and Frank A. Barbey is Vice-President and Treasurer. Those interested in investing or wanting further particulars should address Mr. Barbey at 230 South Terminal Station, Boston, Mass.

TRADE PUBLICATIONS.

Denver & Rio Grande.—"The Lands of Taos" is the title of an attractive catalogue, well illustrated with views of the country in and surrounding the Taos Valley, New Mexico. Additional information as to special rates to homeseekers, etc., may be obtained from the Denver & Rio Grande Railroad.

Car Interchange Manual.—The McConway & Torley Co., Pittsburgh, Pa., has issued a supplement to its handy little pocket manual which gives a complete epitome of the cases decided by the arbitration committee of the Master Car Builders' Association. Anybody interested can get a copy of the manual, with the supplement, by writing to the publishers.

Steel Tubes.—The National Tube Co., Pittsburgh, Pa., has just issued a very attractive and complete catalogue on the subject of Shelby steel tubes and their making. The catalogue is fully illustrated with half-tones showing the different processes of the manufacture of these tubes. This booklet is not for general distribution but will be sent to those who are particularly interested.

Steamer Commonwealth.—The passenger department of the Fall River Line of the New York, New Haven & Hartford has recently issued an artistic booklet which describes the new $2,000,000 steamer Commonwealth. A number of illustrations show various parts of the interior of the vessel. The steamer Commonwealth was described in the *Railroad Age Gazette* of July 3, 1908.

The Electrical Show at Chicago.

The fourth annual electrical show, under the management of the Electrical Trades Exposition Co., is now in its second and last week at the Coliseum, Chicago. This show has become one of the most popular large trade shows in the country, and this year's has eclipsed its predecessors

The exhibition booths have been arranged by the management in a uniform style and all available space is occupied. The decorative scheme has been well devised. Each booth is lighted by a number of tungsten, instead of the ordinary carbon-filament, lamps and on a dark background overhead have been arranged numerous small incandescent lamps in flashing sockets, the whole being a very good imitation of a starlit sky. The number of exhibitors this year is 105. A partial list of the exhibitors includes:

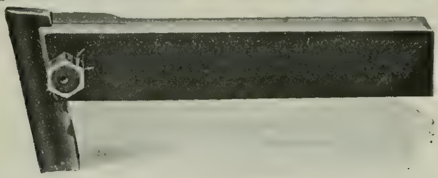
Allis Chalmers Co., Milwaukee, Wis.
Crane Company, Chicago.
Chicago Pneumatic Tool Co., Chicago.
General Electric Co., Schenectady, N. Y.
Kellogg Switchboard & Supply Co., Chicago.
International Correspondence Schools, Scranton, Pa.
H. W. Johns-Manville Co., New York.
Stromberg Carlson Telephone Manufacturing Co., Rochester, N. Y.
Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.
Western Electric Co., Chicago.

Lang Tool Holder.

The accompanying illustration shows a 2 in. x 3 in. x 16-in. inserted tool holder, designed especially for use in turning locomotive tires. The holder is said to have the rigidity, backing and radiating surface of a solid tool. While it is not intended for use on all classes of work, it is particularly useful on plain work in a lathe, vertical mill, planer or pony wheel lathe, in which cases special sized shanks can be furnished. It is claimed that a tool used with this holder will withstand a 5/8-in. cut with a 1/4 in. feed at a speed of from 10 to 15 ft. per min., working on a 72-in. worn locomotive driver tire.

The method of holding these cutters will be understood by reference to the accompanying cut, the lower part of the tool proper showing the notches for meshing with the bolt which clamps the two dove-tailed jaws of the holders upon the tool. The regular cut-

ters are of drop-forged high-speed steel, and the points are air hardened and ground. The cutters are 7 in. long and 2 in. across the flat, set in the holder at an angle to give 10 deg. front and side clearance. This permits grinding on the face as well as the top, and it is necessary to grind only a short distance down from the top to get the usual clearance of 7 deg. If the cutter be set at this



Lang Tool Holder.

latter angle, it would necessitate more grinding. Cutters may be used with this holder when even less than 3 in. long.

To remove the cutter for grinding or to adjust it to another notch it is not necessary to remove the bolt from the holder, merely to loosen the nut and turn the bolt one-quarter revolution, when the cutter can be slipped out. Shops using these holders can make their own cutters, which permits of their being able to use their standard grade of tool steel as well as use up all the short pieces to a good advantage. The correct shapes for inserting in these holders are easily forged by using a form.

The holder, made by the G. R. Lang Co., Meadville, Pa., is said to be of steel of over 100,000 lbs. tensile strength, oil hardened. The holders are made for right and left-hand feeds.

Charcoal Iron Boiler Tubes.

The statement is said to have been made that at the present time there is no charcoal iron being used in the manufacture of boiler tubes, but that the material used is a mixture of steel and iron scrap, such as would result from a busheling operation, where the heated and unmelted charge is simply welded together.

Of the tube mills possessing their own sources of supply in the shape of forge fires owned by themselves, are the Parkesburg Iron Co., Parkesburg, Pa.; Worth Bros. Co., Coatesville, Pa., and Tyler Tube and Pipe Co., Washington, Pa. Of the other mills producing charcoal iron tubes, Spang, Chalfant & Co., Pittsburgh, Pa.; Reading Iron Co., Reading, Pa., and Reliance Tube Co., Pittsburgh, Pa., are said to be able to secure, from trustworthy sources, either charcoal iron blooms or skelp for tubes rolled from these blooms. The modern charcoal iron forge is in principle a duplicate of the old, while in practice the only change is a more careful inspection of the finished product and a more careful selection of the change, due to the fact that any stock containing elements detrimental to the finished blooms can be eliminated by chemical analysis.

The charge consists, as in the past, of run out metal, which is pig from which the silicon has been oxidized, or of clean finely divided wrought and steel scrap. The present forge consists of flat cast plates arranged rectangularly, as was the case in old forges, having the same relative positions to one another, and even the same names. For example, the Merritt, which is said to be known to every forgeman, is placed over the tuyere, which latter must be adjusted to the correct angle to allow the blast to work most effectually. The forgemen themselves are said to have either been working along the same lines for 30 years or have followed the former methods and manners. The unit by which they are paid, the bloom ton of 2,464 lbs., is now as it was formerly.

As to the process of manufacture, the operation of sinking the charge into a bloom consists of feeding the stock, with the charcoal, into the fire, where through the action of the blast the metal is melted and sinks to the hearth. A basic slag is produced, the carbon, silicon and manganese are practically eliminated and the sulphur and phosphorus very largely reduced. The metal, in the form of drops, encased in cinder filaments, is "brought to nature" by the reducing flame, as in the puddling process, and collects into a ball of pure fibrous iron subdivided by a network of cinder. This is then shingled under the hammer into a bloom of pure charcoal iron.

The length of service of boiler tubes made from this material, due to their non-corrosive qualities, has, it is said, enabled them to meet the competition of cheaper steel and should make them particularly efficient where quality is considered.

Steel Underframe Box Cars for Argentina.

The Ferro Carril Central de Buenos Aires is one of the several properties centering in Buenos Aires which have been developed by Miguel Lacroze, a capitalist, now living in London. Most of the Lacroze lines are electric railways, but both steam and electric properties are of a character which compare favorably with roads of similar mileage in the United States. The rolling stock in particular is thoroughly modern, as is indicated by the thirty-ton, 30-ft. steel underframe box car illustrated and described herewith. 50 of which have just been completed and shipped by The J. G. Brill Co., Philadelphia, Pa., on an order placed through J. G. White & Co., New York.

The underframe used for the cars is of the structural type and well adapted for a country where the necessary standard shapes could be quickly obtained for repairs. The center sills are 15-in. channels, spaced 14 in. apart. The side-sills are 10-in. channels, the end sills 12-in. channels and the intermediate crossings 8-in. channels. The bolsters and needle beam are built up of plates and angles. Two ¼-in. plates, 14 in. deep at the center and 10 in. deep at the side sills, are used for the bolsters. These are reinforced with 3-in. x 3-in. x ¼-in. angles at the edges. Six-in. angles are used to tie the bolsters to the side sills. The needle beam is of similar construction, though a single plate and lighter angles are used.

The body framing of the cars is almost entirely of oak. The corner posts are 2½ in. x 5 in.; side posts, 2½ in. x 5 in.; inside top plate, 3⅜ in. x 7½ in.; outside top plate, 1¾ in. x 6½ in.; rafters, 1¾ in. thick, and diagonal body braces, 2½ in. x 5 in. The roof purlins are of yellow pine 1½ in. x 3 in., and ⅞ in. x 5 in. yellow pine side sheathing, as well as 1¾-in. yellow pine flooring, is used. The lining, running to the waist rail, is of ⅞-in. tongue-and-grooved yellow sheathing.

The trucks are the Brill company's standard for freight car use.

Brill Steel Underframe Box Cars for Argentina.

of the diamond arch bar type with a steel bolster built of channels and plates. The truck wheel base is 5 ft. 6 in. and the truck centers, 19 ft. 1 in. The principal dimensions of these cars are:

Length, over body	29 ft.	7 in.
Length, inside	28 "	$10\frac{1}{2}$ in.
Width, inside	7 "	$7\frac{1}{2}$ "
Width, over body	8 "	4 "
Height from track to top of floor	3 "	$11\frac{1}{4}$ "
" from top of floor to top of roof	7 "	$4^{7}/_{16}$ "
" from track to top of roof	11 "	$3^{11}/_{16}$ "
Center to center of trucks	19 "	1 "

Pond Sash Operating Device.

The illustrations herewith show the Pond sash operating device, designed for opening and closing adjoining window sashes, and which may be used over distances up to 2,000 lin. ft.

Fig. 1 shows this device controlling the sash of a clearstory, all the sashes of which are in one line and operated by one gear. The

Fig. 1—Pond Operating Device in Clearstory.

exclusive feature of this device is that the power is transmitted by tension to two flexible rods or cables to a double series of arms hinged at the sides of the windows, these arms being connected by rods to each side of the sash. The transmission rods are operated by a phosphor bronze gear of the worm and segment, and the gears are immersed in oil. At the opposite end of the line of sash a loose pulley or trans-

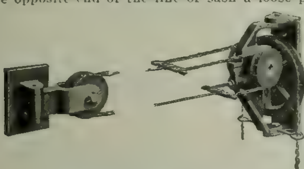


Fig. 2—Loose Pulley or Transmission Bracket.

mission bracket is located as shown in Fig. 2. The tension transmission makes it possible to operate a line of considerable length, and where there are more than one line of sash, the additional lines may be connected together and all of the sash on one side of the building operated as shown in Fig. 3, which shows the conditions existing

Fig. 3—Pond Operating Device In Dynamo Room of Power House.

in the dynamo room of the power house of the Union Terminal, Washington, D. C., D. H. Burnham & Co., Architects. This installation has ninety-nine sash in three different lines, each 200 ft. long, making a total of 1,100 sq. ft. of area operated from one station with a 15-lbs. load on the operating chain.

There is said to be no torsion in the Pond operating device and that the leverage is favorable at the peak load, as when the sash are perpendicular and in contact with the frame. The working conditions are made permanent by the use of phosphor bronze bearings and immersed gears. Ventilation is secured without draught by opening all of the windows the distance required to properly ventilate the building.

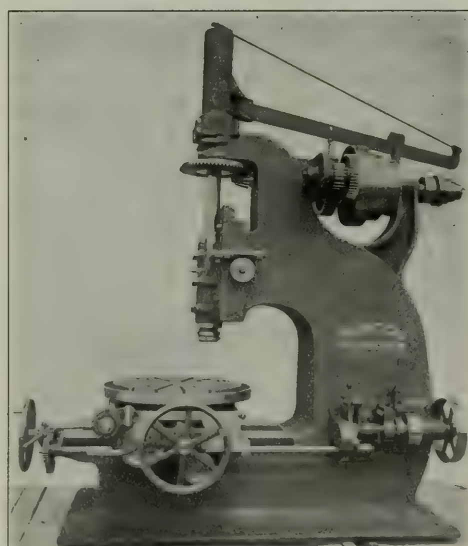
The Pond operating device is patented by Clarke P. Pond and manufactured exclusively by David Lupton's Sons Co., Philadelphia, Pa.

H-O Pipe Joint Cement.

The H. W. Johns-Manville Co., New York, has recently placed on the market its H-O pipe joint cement. As this cement is put up in powder form it can be kept in stock without drying out or deteriorating. For use, the cement is mixed with either water or linseed oil. The chemical properties of H-O cement are said to be such that it expands after the joint is made, thereby insuring a tight joint. It is claimed that the joint can be easily broken without danger of injuring the fittings. It is claimed that one pound of this cement when mixed with water is equivalent to four pounds of the ordinary ready mixed cements.

Newton No. 3 Vertical Milling Machine.

The vertical milling machine of the type here illustrated is specially adapted to finishing locomotive side and main rods, eccentric rods and various parts of the link motion and Walschaerts valve gear. The circular table and deep gap admit a wide swing in finishing long rods. With a horizontal cutter head it is also useful in



Newton Vertical Milling Machine.

finishing the flat surface of castings, and it is claimed, will complete steam chest joints more rapidly than the planer.

The cut illustrates a new design of the No. 3 vertical milling machine made by the Newton Machine Tool Works, Philadelphia, Pa. It has reversing power feeds and fast traverse for the in and out, cross and circular motions. The table is 36 in. in diameter, entirely surrounded by an oil pan. It has in and out feeds of 26 in. and cross feeds of 30 in. The drive to the spindle is through a 3-step cone, giving a ratio when geared direct of 4.28 to 1, and when driving through the back gears of 11 to 1. The spindle is $4\frac{1}{2}$ in. in diameter and has a hand vertical adjustment by gear and rack from a minimum distance of 3 in. from bottom of spindle to top of work table to a maximum distance of 18 in. The feed motion is carried to the rear side of the machine and transmitted to the worm and worm wheel, to which are connected tumbler gears by which

the reversing feed motion is controlled. The spline shaft for the circular movement and the screws for the cross and in and out adjustment have clutches to the feed which can be engaged or disengaged by the levers shown without removing any gears. A swinging crane, as illustrated, is furnished to support the outer end of rods or similar work.

Drilling Square Holes.

The accompanying illustrations show a chuck for drilling square and angular holes in steel, iron, copper, brass or other materials. This device can be applied to any ordinary milling machine, lathe or drill press without requiring any change in the machines. The principle on which the tool operates is the combination of a specially shaped drill turning in an adjustable guide formed in accordance with the shape of the drill. The drill continually changes its position with respect to the center axis of the spindle to which the chuck is attached and the cutting edges of the drill follow a course coinciding with the form of the hole presented by the guide. The apparatus consists of the two parts, B and D, fitted together by nutring C and the plate A, which is screwed on the spindle of the machine and fastened to the turning part D by countersunk head bolts. In the end of the part B is a small eccentric plate G, into which the drill is screwed and which gives the drill its motion. As D revolves, this plate G has a cam action. The small circular plate H serves as a filler piece between the end of the drill and the bearing edges of B. D is the part which is held stationary and in which the adjustable guide is fitted. C is a nut screw which holds B and D tightly together.

The method of working is largely a milling process, owing to the shape of the drill, the undersides of which are sharpened similar to a cutter, while the lateral cutting surfaces are hollowed out. This has the advantage that grinding can be easily and rapidly performed on any grinding mill. Fig. 1 shows the chuck in position attached to a milling machine. The method of holding the rigid part D of Fig. 3 is clearly illustrated. Fig. 2 is a near view of the chuck, showing in place the drill for sharp-cornered holes. It appears from this photograph that the jaws of the chuck clamp the drill shank rigidly, but this is not the case, as the jaws merely present the square guide which gives the cutting edges of the drill their proper motion. The outline drawings, Fig. 4, are given to show the method of obtaining a hole with sharp or rounded corners. The drill shown in section in both cases is of the same size. The left-hand drawing shows the drill as used in making the sharp-cornered hole. The outline e is the guide presented by the chuck jaws. The sleeve is shown as d. It will be noticed that the one rounded corner of this sleeve is opposite the point a of the drill. It is this curved surface which is always opposite the finishing edge of the drill, the other two edges making the roughing cuts. The hole being drilled is shown in outline as b, and c is the drill itself. In the right-hand drawing the hole has rounded corners and the guiding faces of the chuck e and those of the drilled hole b coincide, shown as e *and* b. Similarly, the faces of the sleeve d and those of the drill c coincide, or, as will be noted by reference to the drill shown in place in Fig. 2, the surfaces of the drill shank for round-cornered holes act as the guiding surfaces. Fig. 5 shows the drill for sharp-cornered holes with a sleeve which provides the guiding surfaces.

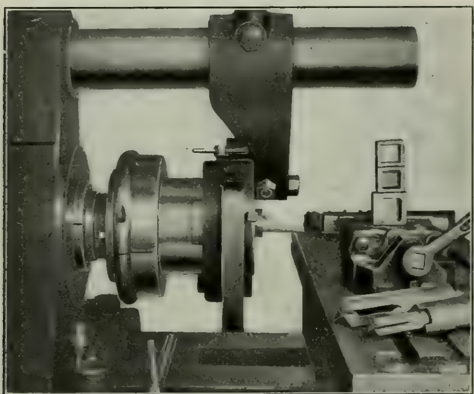


Fig. 1—Chuck as Attached to Milling Machine.

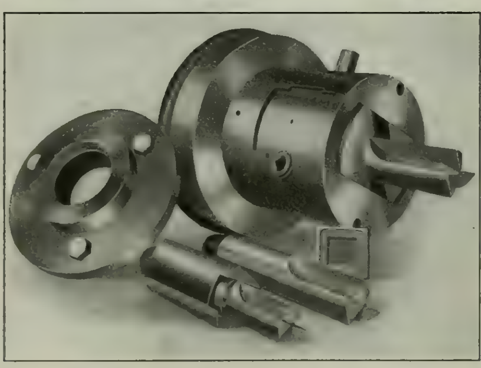


Fig. 2—Near View of Chuck, Showing Drill in Position.

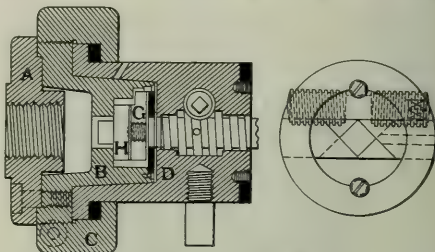


Fig. 3—Details of Chuck.

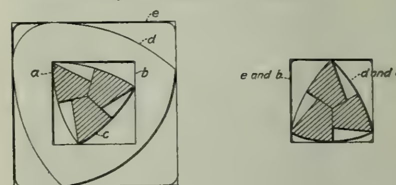


Fig. 4—Diagrams Illustrating Action of Drill.

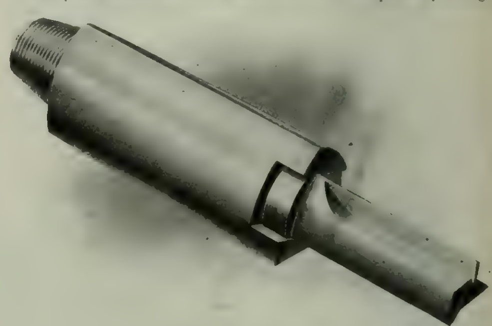


Fig. 5—Drill, with Sleeve, for Sharp Cornered Holes.

The square hole drilled with this device will have perfectly straight, perpendicular sides only when the drill is properly ground, and a special attachment, which holds the drill shank in a V-block and at the proper angle, has been provided to meet this requirement. It is not necessary to use the heavy clamping arrangement shown in Fig. 1, but a stop bar may be screwed into the chuck as shown in Fig. 3.

The Radical Angular Drill Co., 114 Liberty street, New York, control the patents on this device in the United States. It is claimed that the device has been in use in Europe for several years.

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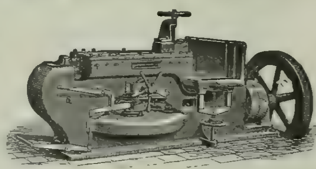

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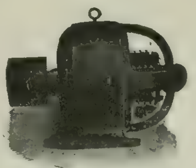

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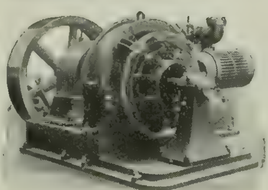

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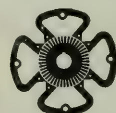

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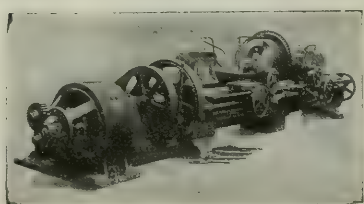

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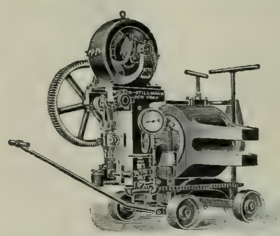

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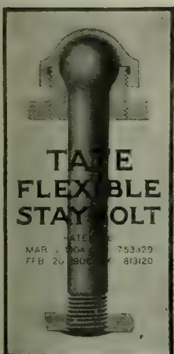

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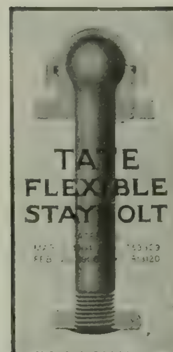

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CONTENTS

The Hedschas Railway, built for pilgrims to Medina and Mecca, for several hundred miles north of Medina, was built chiefly by Turkish engineer troops, who had been instructed in the several necessary trades, especially stone-cutting and masonry, for the purpose. The thermometer on the sandstone and lava desert goes up to 130 deg.; there is one stretch of 120 miles without water, which is scarce almost everywhere; and under these circumstances, cost of transportation being great, contractors refused to bid. The work has been rushed for the last two years, and perhaps half of the road is barely in condition for trains running 10 miles an hour; but considerable advantages are obtained by having such a route for materials, etc. There is some population about Medina, but further north there are only a few oases, and elsewhere no permanent population. When the rare rains have produced some vegetation, nomads drive their herds there while it lasts. There is one short tunnel through sandstone, and in several places the road has been laid around sand dunes, which are for the most part stable if the surface is not broken. For several hundred miles the stations are loop-holed for musketry and barracks provided for a guard as a defence against Bedouins, who, however, have not resisted the construction of the railway, as was feared; probably because it was too well guarded. Medina is 225 miles due north of Mecca, and there is a direct pilgrims' road between the two holy places. It has been determined, however, not to build the railway over this route, but to turn southwest from Medina to the Red sea at Rabigh, follow the coast for some distance and then turn southeast to Mecca. In this way pilgrims traveling by sea from Egypt and the Soudan can reach the railway; and the latter can obtain coal and heavy supplies for the southern half of the road much more cheaply. By this route the distance from Medina to Mecca is 280 miles. This will make a line nearly 1,100 miles long, built exclusively for religious purposes, as much so as a church or a monastery. The money to build it has been obtained from Mohammedan contributions, and doubtless no such amount could have been raised in Turkey for any money-making enterprise whatever. The building of it also has drawn out qualities of persistence, endurance and self-sacrifice, which have won the admiration and respect of the few Europeans familiar with the work. The chief engineer, Meissner Pasha, is a German, but many of his staff are Turks, or at least subjects of the Turkish empire.

In the current issue there will be found the third instalment of an extraordinary paper on railway valuation; extraordinary because the author has very unusual equipment and speaks with unusual knowledge of facts and conditions. Probably most of our readers will not agree entirely with his conclusions. We ourselves, at all events, do not, but we admire the skill and fairness with which the case has been presented. By a coincidence, the report of the valuation undertaken by the Railroad Commission of Minnesota appears at the same time that this other serial is running, so that we are giving more than our accustomed proportion of space to this topic in the current issue. But we feel justified in doing so, in view of the fact that physical valuation for the purpose of limiting railway rates, either directly or by implication, is surely going to be one of the landmarks in American railway history during the next few years. We rejoice frankly that the Minnesota commission has proved beyond doubt, though quite unintentionally, that rates cannot fairly be made on the basis of a physical valuation. The writer of our serial paper sees things pretty clearly, but we do not believe that he yet sees this proposition as clearly as the Minnesota commission has demonstrated it.

MINNESOTA VALUATION OF RAILWAYS.

The Railroad Commission of Minnesota has just finished what is probably the most exhaustive physical valuation of railways ever made. The results, which are given elsewhere in this issue, are of special interest just now because of the widespread discussion of the subject of valuation. The figures are a good answer, as far as they go, to the charge that American railways, as a whole, are over-capitalized. The Minnesota Commission has meant to be fair, but it has borne the reputation—justly, we think—of being rather hostile to the railways. It certainly is not unduly friendly to them. It is, therefore, of unusual significance that its investigation shows that it would cost $397,299,471 to reproduce, new, the nineteen carrying railways in Minnesota, or $52,430 per mile; and, allowing for depreciation, due to wear and tear on roadway and rolling stock, that the "present value" of the properties is $347,051,336, or $45,799 per mile, while the Minnesota proportion of the capitalization of these 19 roads is but $334,979,691, or $44,206 per mile. The commission found that both the cost of reproduction and present value of 12 out of 19 carrying roads exceed their capitalization. This is the situation the *Railroad Age Gazette* repeatedly has said that any fair valuation either of the railways of a single state or of the nation would disclose.

But the commission repudiates the valuation it made based

on the actual cost of reproducing the properties. Its investigation showed that it costs an average of from 25 to 350 per cent. more to get land for railway right-of-way, yards and terminals than to get the same land for other purposes, and in its Estimate "A" it made allowance for this greater cost. It contends, however, that what the railways would have to pay to get for railway purposes the land they now own is not a fair basis for estimating its value. The fair basis, the commission says, is the "true or market value" of the land for other than railway purposes—in other words, assuming it unoccupied, what a farmer or real estate dealer would have to pay for it for farm, residence, or business purposes. The commission, therefore, makes an Estimate "B," in which it allows nothing for the extra cost of acquiring the land for railway purposes, and which, in consequence, is, for all the 25 carrying and switching roads in the state, $37,515,054 less than its Estimate "A." Estimate "B," it contends, is the correct valuation.

The commission's position is untenable. The question is not how much it would cost to reproduce farms, or city residences or business lots, but what it would cost to reproduce land for railway purposes. The taking of land for railway use involves damage to adjacent property. A farm or a city house and lot are bought in one deal; while the purchase of land for a railway involves many deals, and land which it is known the road wants consequently goes up in price. The railway has got to pay for such incidental damages, it has got to pay the inflated price caused by its own purchases, or go without the land.

The mileage of railways in Minnesota is small compared with that in the eastern states; many more miles will have to be built to develop the state's resources. Let us see how the commission's theory would work in practice. Suppose a new company wishes to build a line, or that an existing road wishes to build a new branch. It will have to pay, say, from two to four times as much for the necessary land as the same land would cost for other purposes. If the so-called "true or market value" of the land is $100 an acre, the railway will have to pay from $200 to $400 an acre. We will assume that the commission thinks 6 per cent. is a fair return on the physical valuation of a railway. On its theory, the correct valuation of the land, after it was acquired by the railways, would be $100 per acre. But if the railway were allowed to earn only 6 per cent. on a $100 valuation, its return on its cash investment of $200 to $400 would be only 1½ to 3 per cent. Does the commission think such a return would encourage further railway building in Minnesota?

The commission perhaps would answer that it would be only fair to let a new road earn a return on its actual investment of $200 to $400 an acre, but that it is not fair to let an old road, which paid much less for its land, earn a return on $200 to $400 an acre merely because it would cost that much to get the land now. But is not the equivalent of this done in other businesses? There are "early settlers" in Minnesota who bought their land for $1.25 an acre. There are other farmers—just across the road, perhaps—who came to the state later and paid $25, $50 or $100 per acre. Is it unfair, because the former bought their land earlier and cheaper, that they should get as much per bushel or per acre for their crops as the later arrivals and that their land should be held to be equally valuable? The commission may reply that a public service corporation has not the same right as a farmer to enjoy the benefit of the increment in value of land. But if it has not, how does the commission propose to adjust rates on old and new competing roads so as to withhold from the old roads the benefit of the increment in value of their land, and at the same time secure to the new roads a fair return upon the higher price that they pay for land? No human ingenuity can do that as long as competitive rates on old and new roads must be the same; and they must be the same as long as shippers selfishly prefer to ship by the road that makes the lowest rates.

Mr. Morgan, the engineer who had direct charge of the valuation, says in his report to the commission:

> "Cost of reproduction and value as a utility have no necessary or logical relation and the fact that the terminal lands or the properties in part or in whole are not actually to be reproduced, or the fact that it might not be possible at all to reproduce them or their equivalent, probably renders their present possession invaluable, not only to the owners, but to the communities dependent upon the facilities afforded for industrial activity and commercial supremacy. It is not clear, however, that these elements, which can conveniently be made the basis for extremely high figures of value, should either merit support or find justification in an estimate purporting to represent reproduction cost."

This statement knocks the props from under the entire theory of physical valuation. The theory is that a railway should be allowed to earn only "a fair return on a fair (physical) valuation," this to be based on its cost of construction and reproduction. Mr. Morgan found it impossible to ascertain the cost of construction of the older lines in Minnesota. This condition exists everywhere. So cost of reproduction is usually the sole available basis of physical valuation. But, Mr. Morgan says, "cost of reproduction and value as a utility have no necessary relation." But if there is no necessary relation between cost of reproduction of property for *railway purposes* and its value as a transportation utility, what possible relation can there be between its cost of reproduction for *non-railway purposes* and its value as a transportation utility? And if there is no relation in either case, why waste money on "physical" valuations? For everyone, except the advocates of physical valuation of railways, recognizes that utility is the true economic basis of the value of everything that can be considered capital, and utility also has been declared by the Supreme Court of the United States to be the legal basis of the value of a railway. In the case of C. C. C. and St. L. Railway *v.* Backus, 154 U. S., p. 445, the court used this unequivocal language:

> "But the value of property results from the use to which it is put and varies with the profitableness of that use, present and prospective, actual and anticipated. There is no pecuniary value outside of that which results from such use. . . . Will it be said that the taxation must be based simply on cost, when never was it held that the cost of a thing is the test of its value? Suppose there be two bridges over the Ohio, the cost of the construction of each being the same, one between Cincinnati and Newport, and another 20 miles below, and where there is nothing but a small village on either shore. The value of the one will, manifestly, be greater than that of the other, and that excess of value will spring solely from the larger use of the one than of the other."

If that is good law as defining the basis on which a railway should be valued for taxation, why is it not good law as defining the basis on which a railway should be valued for purposes of rate regulation? We wish particularly to call attention to the decision in the Backus case, because in discussing the legal phases of valuation most people go back no farther than the Nebraska rate case. The Backus case was decided only four years before the Nebraska rate case, and the decision in the latter should be read in the light of the decision in the former. Together they show as clearly as language can that the Federal Supreme Court would give exceedingly little weight to a valuation based solely on cost. It believes the basis of value is utility; and, like Mr. Morgan, it said that there is no necessary relation between utility and cost.

The theory of physical valuation of railways, in the modified form it has taken in the hands of the Minnesota commission, as well as in its usual form, is based upon economic fallacies. The first fallacy is that the value of a railway is the sum of the values of its parts; as the Supreme Court says, "there is no pecuniary value outside of that which results from use." The second fallacy is that rates should be based on cost of service, or the value of the instrumentality that does the work done; whereas, the main proper basis is the value of the work done—the basis on which are fixed the charges for the services of lawyer, surgeon, maidservant and cook. The time will come when every intelligent economist, statesman and jurist will see that physical valuation of railways for purposes of rate regu-

lation is as arrant economic moonshine as greenbackism or free silverism.

PROPOSED WORKMEN'S COMPENSATION LAW IN NEW YORK.

Elsewhere in this issue is given the substance of a bill which has been introduced in the legislature of the state of New York relating to compensation to workmen for accidental injuries suffered in the course of their employment. Its provisions are of interest for several reasons. The bill may be taken as representative of the views of organized labor; it is founded upon and follows closely the provisions of the English law which went into effect on July 1, 1907, and which has made it necessary for every English employer of labor of whatever description to take out as many policies of insurance as he has employees and one over for emergency, such as a temporary service; and it provides two chances of recovery of damages, one for a smaller amount based upon the amount of the workman's wages and available in case his original action for a larger amount—a lump sum—fails.

Attention may be called briefly to the latter feature, which is covered by section 3 of article II. In case of death resulting from injury, a workman's dependents, according to the provisions of the proposed law, are entitled to recover an amount equal to his earnings in the same employment during the three years preceding the injury, but not to exceed $1,500. If totally or partially incapacitated for work as a result of the injury, he is entitled to recover an amount represented by 50 per cent. of his average weekly earnings during the previous twelve months, payable in weekly instalments during incapacity, but such weekly payments are not to exceed $10 nor aggregate a greater amount than $1,500.

But if, instead of availing himself of the provisions of this act, the workman or his representative shall choose to bring an action independently thereof, as under the common law, for instance, and fails to recover in such action, the action may be dismissed and a second suit brought under the terms of this act. In other words, if a suit is brought originally for, say, $5,000 or more for the death of a workman, and it is determined that the injury is one for which the employer is not liable in such action, then a second action may be brought for an amount calculated as above stated, and not in excess of $1,500. Under this act the only exception to the liability of the employer is "the serious and wilful misconduct or serious neglect" of the workman.

In view of the fact that the bill in question is based upon the English law, and of the further fact that, if passed, there is a reasonable expectancy that its terms will be interpreted somewhat in accordance with the interpretation of the English courts upon similar points, it is perhaps worth while to consider a few of the views that have already been expressed in England in relation thereto. The definition of "workman" in the bill as presented is not so minute as in the English act, but seems to be sufficiently comprehensive, as it is taken to include "every person who is engaged in an employment, whether by way of manual labor or otherwise, and whether his agreement is one of service, apprenticeship or otherwise, and is expressed, or implied, is oral or in writing." In England the same term is taken to mean—in addition to those ordinarily understood to be included in the term—all classes of domestic servants, barkeepers, clerks, commercial travelers, companions, governesses, nurses, farm employees, porters, school teachers, typewriters, etc. The term also includes occasional workmen if employed at fairly regular intervals, either privately or for the purposes of trade or business—as window cleaners, scrubwomen, etc. In fact, the term seems to include everyone who performs any kind of service for another at a yearly rate of wages not in excess of £250 ($1,250) per year. There appears to be no limitation in the present bill which would exclude any of the classes of labor mentioned.

As to what constitutes an accident, and the determination of whether an injury was received in the course of the workman's employment, there are several interesting decisions. The contraction of the disease anthrax, from sorting and handling hides, wool, etc., was, in the case of Brintons v. Turvey, decided to be an accident within the meaning of the act of 1897, which is far less favorable to labor than the present. The county court judge found that the disease was caused "by the accidental lighting of a bacillus on a part of the deceased's person, which afforded it a harbor in which it would grow and multiply, and so cause a malignant disease and consequent death." The principal English commentator upon this act infers that the contraction of any infectious or contagious disease, in connection with most of which bacilli or germs have been identified, if it arose out of and in the course of employment, would be an "accident." In fact, the law specifies six classes of disease and the kinds of employment in which they seem likely to arise, and it appears to be inferred that their existence is *prima facie* evidence that they arose from such employment.

An engineman was injured by the glass from the broken window of his engine, which had been struck by a stone thrown by a boy. It was held that this was an accident that arose out of his employment, and his employer was therefore liable (Smith v. Lancashire & Yorkshire Railway Company). A similar view was taken in the case of a bricklayer who was struck by lightning and fell while working on a scaffold 23 ft. from the ground (Andrew v. Failsworth Industrial Society). In the case of a carpenter working for one day, and who ate his lunch at noon in the barn where he was working and was bitten by a pet cat belonging to his employer, with the result that blood-poisoning set in, his employer was saved from the payment of damages only by the showing that the carpenter had teased the cat to the detriment of its dignity and the loss of its temper. A man standing by a hatchway, and being taken with a fit, fell into the hatchway. It was decided that the injury was caused by the hatchway and not by the fit, and therefore arose out of his employment. A man employed in a shop, and who injured his hand in trying to replace a belt upon a machine, though it was no part of his business to do so, was decided to be entitled to recover damages from the owner of the shop, on the ground that he was endeavoring to do the latter a service. In Holmes v. Great Northern Railway a workman had been directed to go to work at a place four miles down the line from King's Cross station, and traveled from that station in one of the company's trains. In an action for damages for an injury received it was decided that his employment began at King's Cross. A man who quit work at 6 o'clock in the morning, but was killed at noon in crossing the tracks to get his pay, was decided to have been injured in the course of his employment, although the train was not owned or operated by his employer. (Lowey v. Sheffield Coal Co.)

These various cases are cited briefly, not for the purpose of calling attention to any vagaries of the interpretation of English law, but for the purpose of directing attention to the law itself, inasmuch as it is the prototype of one which may be in force in the state of New York after January 1, 1910. Under the English law as it stands it is difficult in most cases to see how any other kind of decisions could have been rendered. There is no reason to suppose that any more substantial justice would be rendered in this country under a similar law.

Favorable as the bill in question appears to be to the workman, however, its enactment would work less of benefit to the honest claimant or his representative than certain plans that have been adopted by some industrial concerns of their own volition. A notable instance in this category is the New York Edison Company, whose plan has been described in a paper prepared by one of its officers. The plan need not be described here, but it is sufficient to say that the company does not limit its benefits to $1,500, that it takes ample care

of its injured employees and their dependents, and that the results, so far as the employees themselves are concerned, have been so satisfactory as to result in the practical elimination of damage suits. Out of over 3,000 cases, the company has had only seven suits, and six of these were determined in the company's favor. It seems to require only a certain degree of confidence to be established between employer and employed to afford more satisfactory results than can be secured by the most stringent legal enactment. Whether railways can be brought to the point of seeing that it is better that a liberal treatment of injured employees and of the dependents of those who may have lost their lives in the course of their employment shall originate voluntarily with themselves than under the compulsion of drastic laws, is a question we hesitate to try to answer.

THE CHESAPEAKE & OHIO PLACE IN THE HAWLEY SYSTEM.

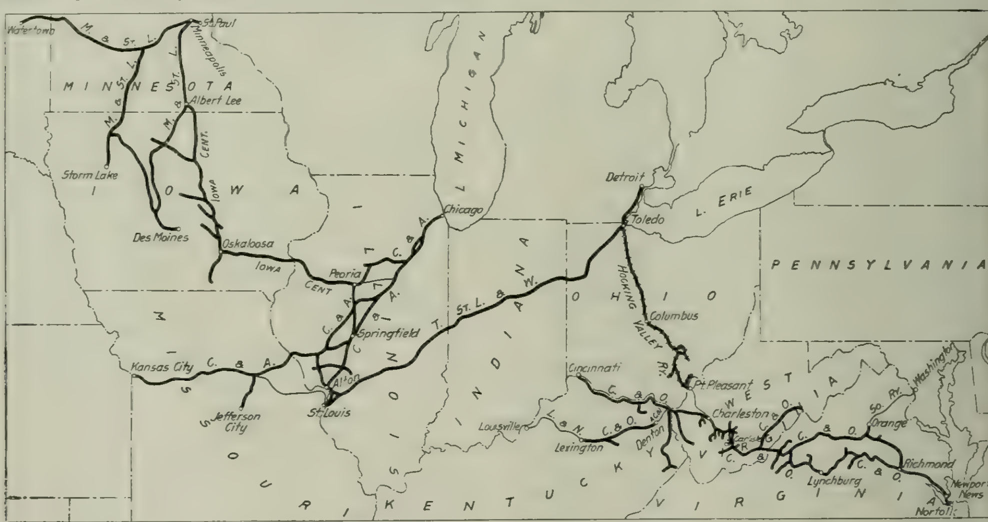
The sale of the Colorado & Southern and the purchase of the Chesapeake & Ohio within a couple of months has not apparently been a step in the direction of making the roads controlled by the Hawley interests a more homogeneous system. Previous to the sale of the Colorado & Southern the Hawley roads were the Toledo, St. Louis & Western; the Chicago & Alton; the Minneapolis & St. Louis; the Iowa Central, and, away off in Colorado and Texas, the Colorado & Southern and its controlled and leased lines. The two recent deals have resulted in the loss of the Colorado & Southern and the gain of the Chesapeake & Ohio, but there is no physical connection between this road and the others in the system, and a glance at the map shows that there is a strip of territory, about as wide as the distance between Toledo and Cincinnati, slanting southwesterly to the Gulf, that is nowhere spanned by a Hawley road.

The Clover Leaf-Alton, Iowa Central, and Minneapolis & St. Louis group of roads do form a system over which it is possible to route freight so as to get a haul all the way from points in northern South Dakota east as far as Lake Erie; but the route is not a direct one and the territory traversed is highly competitive.

The Chesapeake & Ohio owns a sixth interest in the Hocking Valley, shown cross-hatched on the map with the Hawley roads. The Hocking Valley runs from Toledo south as far as Point Pleasant on the Ohio river, and freight could be routed over the Kanawha & Michigan, from there to Charleston, W. Va., on the C. & O., 56 miles south of Point Pleasant. To route freight over the Hawley lines to Toledo, then south over the H. V. to the C. & O. would be rather fanciful.

The Clover Leaf-Alton system hauls large quantities of coal from fields in southern Indiana to Chicago, or turns this traffic over to the Iowa Central for final destinations in Iowa, Wisconsin or South Dakota, but the Alton is not a soft coal road, of course, in the sense that the Chesapeake & Ohio is. There would be no object in shipping coal from West Virginia fields westward.

The recent financial management of the Chicago & Alton has left it with heavy interest obligations, but the road physically is in first-class shape. It conducts an admirable passenger service from Chicago to St. Louis and Kansas City, and its earning power is shown by slightly over 2½ per cent. earned on its common stock in the exceptionally bad year ended June 30, 1908. The Toledo, St. Louis & Western, which owns a majority of the stock of the Chicago & Alton, having bought this stock from the Rock Island in 1907, paid 4 per cent. dividends on its $19,544,000 preferred stock in 1908 and had a small surplus available for the common.



The Hawley Roads and the Hocking Valley.

The Hocking Valley, in which the Chesapeake & Ohio has an interest, shown cross hatched.

The Colorado & Southern was acquired by the Hawley interests when it was in a bad way. The business of the road was developed, the lines extended and large sums spent for betterment, and the affairs of the company steadily bettered from a state of receivership, until last year the Colorado & Southern paid 4 per cent. dividends on both first and second preferred stock; it was then sold.

The Chesapeake & Ohio has been a conservatively managed, first-class soft coaler, paying 1 per cent. dividends on its $62,799,100 stock, the rate being the same since 1899. Large sums have been put back into the property for improvements that might well have been charged to capital account, and this policy has so enhanced the value of the property itself that, taking into account its geographical position, it appears likely that the acquisition of the C. & O. was rather an investment of funds received from the sale of the Colorado & Southern than an extension and enlargement of the Hawley system.

There may be a hint of the future policy of the company in a circular announcing the meeting of stockholders for February 9 to act on the proposed issue of $30,000,000 bonds, in which G. W. Stevens, President, says that the result of the success of the plan to issue bonds will mean that "the company will be able to distribute to stockholders a more satisfactory share of its future surplus earnings."

Letters to the Editor.

RAILWAYS AND POLITICS.

104 Girard street, Winnipeg, Man., January 20, 1909.

To the Editor of the Railroad Age Gazette:

An editorial in to-day's *Saturday Evening Post* says: "In New England and the West, especially, the roads still meddle with politics. Wherever they touch politics the touch leaves a rotten spot."

And when politics touches the railways? Again—"On the whole, the experiment of socializing the railways by Government regulation (or civilizing them, if the other word shocks any overtender sensibilities) is working encouragingly." In Texas, for example.

A. C. L.

THE STATE COMMISSIONS.

Denver, Colo., January 21, 1909.

To the Editor of the Railroad Age Gazette:

Referring to your issue of January 15th, in an article entitled, "The State Railway Commissioners," you failed to do justice to the retiring board of commissioners of the state of Colorado, composed of F. J. Chamberlin, H. L. Ritter and Bulkeley Wells, in that you failed to state that they employed as clerk a man of fifteen years' experience in all branches of the traffic department. Politics played no part in the selection of the man for this position, except that the commission took the position that they desired to select a man of railway experience and not a politician and their wishes prevailed over the solicitations of numerous politicians and I was made clerk. My experience was gained with the Southern Railway. My connection with the commission terminated when the new commission came into office on the 12th inst.

E. O. ALSTON.

OCEAN STEAMSHIPS VS. TRAINS DE LUXE.

To the Editor of the Railroad Age Gazette:

The progress in methods of transportation in the last quarter century is most unequal. New York's efficient underground trolley service, subway and river tunnels have not obliterated the belated horse car, long since eliminated from the streets of minor cities. The Harlem river is still encumbered with swinging bridges and their obstructive center piers, a type rapidly being supplanted by lift bridges in the Chicago river. The magnificent new railway stations of Washington and New York find no counterpart in Pittsburgh or Chicago; American steamship piers do not yet approach those of Europe; but the general progress in transatlantic service has rapidly outstripped the improvements in transcontinental service. One may take a luxuriously furnished boat in New York for almost any port in Europe, but one cannot secure anything better than a second-class tourist car to cross that continent. No first-class ticket from New York to San Francisco can obviate the necessity of changing cars in a congested station, although the traveler may otherwise fare sumptuously from London to Yokohama.

The accidental character of some improvements is unfortunate but comprehensible. Yet how shall we explain the vast superiority of the best ocean service to the best railway service of to-day? The eighteen-hour trains de luxe of the New York Central or Pennsylvania lines, the pride of American railway engineers, will not stand comparison with the best transatlantic steamships, measured by the progress of twenty years. There is not in use any improvement in the railway terminals in New York or Chicago comparable to the transformation of the docks in New York, Southampton, Liverpool, Plymouth, Antwerp, Bremen or Hamburg. The New York stations will shortly rival the docks, but the Chicago terminal of the Pennsylvania system is worse than it was twenty years ago.

Railway roadbed, signals and rolling stock have improved enormously in twenty years, but not at the pace set by the steamship companies. Grade crossings still abound; the air brakes, now in use even on freight trains, are so inadequate that a heavy freight car may double up on a light one in the path of the eighteen-hour train at any time; block signals are by no means perfected; oil, substituted for coal on the Pacific coast, is still unappreciated in the eastern states; electricity is used only in the New York terminal. On the other hand, the steamships have promptly employed turbine engines and wireless telegraphy, with an acceleration of speed and an added safety which make the railway improvements look primitive. In appointments for the convenience of passengers the railways may boast of vestibules, electric lights and fans, steam heat, stenographer, barber and manicurist, all of which find their counterpart on the ocean liners. Wireless telegraphy, however, has not been employed, and should that be excused on the ground of imperfection, the railways cannot claim to have experimented as the steamship companies have. Meanwhile the telephone, which would seem to be more available on land, is more used at sea.

The great deficiencies in the railway service, however, are in those fundamental conveniences which represent superior intelligence and no unreasonable expenditure. The compartment cars offer comforts beyond the old sleeping cars, but they still include that abomination of the old sleeping car: upper berths; and the size of the berths is still unpardonable small. The railways cannot excuse themselves on the ground that there is no room for such suites, with beds and bathroom, as one finds on the best ocean steamships, for at least one American railway company justifies its advertisement of berths longer, wider and higher than others. No gain in speed can compensate for the retention of the upper berth, the small lower berth, or the insufficient toilet accommodations for women. A sleeping car on either eighteen-hour train, which has all the berths occupied—a not unusual occurrence—has no hygienic advantage over the steerage of the best Atlantic vessels. It is unhealthful and indecent to crowd people into the space provided in the "best train in the world." While the success of one railway in enlarging these facilities is ignored; while such an early advance as the Mann boudoir car has established no precedent, and the steamship staterooms remain unrivaled, the railways must speak more modestly of their accomplishments.

Other services on the trains are similarly deficient. The contemporary dining car is a marvelous multum in parvo, but often a train needs two diners, which are seldom supplied. Besides, even with the introduction of the a la carte service, the hours of the boarding house instead of the European hotel are retained. Baedeker refuses to "star" any American hotel which does not serve meals at all hours. Similar discrimination should be made against the eighteen-hour train. The great ocean liners have grill rooms where meals can be served at any time. Even where this provision is not made, and always in addition to it, afternoon tea is served free, and a night luncheon is available. It would not overtax the limited space of these "limited" trains to have a small buffet from which tea balls, in addition to the highly remunerative high balls, might be provided. It could also be made easier to furnish service to the cars at all hours instead of regular meals in

the dining car, a standard approached even in the day coaches of the Empire State express and some western trains. If mechanical improvements are necessary for this, then some of the steamship engineers might be employed to furnish the initiative.

May it be that the eighteen-hour train is a business man's train where speed is more important than comfort, the typewriter paramount to the bed; where if stock quotations be furnished hourly, train despatchers' messages may be adequately transmitted by the primitive Morse telegraphy, which has witnessed no improvement in a generation? Is it possible that the subsidies given to the European steamship lines enable them to rise above commercial competition in their experiments? Do European standards of comfort dictate the transoceanic advances, or the needs of European stockholders limit the possible expenditure on American railways? Or is it simply because, as usual, we have not thought of employing the comparative, scientific method of securing the best attainable regardless of provincial prejudices or economic egotism?

CHARLES ZUEBLIN.

[Mr. Zueblin was until recently Professor of Sociology in the University of Chicago. He is now engaged in social settlement work in Boston. In a recent lecture in Chicago he said that the best modern railway equipment is far behind modern ocean steamships in the matter of improvements. We asked him to write out his views on the subject, which he has done in the accompanying article. Warren J. Lynch, Passenger Traffic Manager New York Central Lines, at our request, has written a reply. Mr. Zueblin's letter does not call for a very serious answer, however. The development of ocean line traffic has been furthered by the fact that the permanent way is broad, and that it does not cost anything to maintain it between terminals. It has been demonstrated that economy in working is more or less proportionate to the size of the ship, always providing that there is enough regular traffic so that the ship will not run empty; consequently, in the absence of special features to limit the size of the hull, it has been found profitable to make ships bigger and bigger, and they have grown in 65 years from the 230 ft. and 1,150 tons of the first Cunarders to the 850 ft. and 44,000 tons of the new White Star boats now building. The parts of a modern ship that pay the chief operating costs lie beneath the feet of the cabin passengers. Freight and steerage traffic do not need the top decks, and in a ship the size of the Baltic these decks offer some 50,000 sq. ft. of available space which can be dedicated to the comfort and luxury of the cabin passengers without appreciably detracting from the earning power of the rest of the ship at all. It is possible to arrange this enormous area in handsome, airy prospects, which would not be the case if it were extended to fill the approximately equal floor space of a train of 80 Pullman cars.

To sum up, the steamship has more space available for its first-cabin passengers than it can use, and yet can make a profitable voyage with this space empty, when freight and steerage traffic are on the basis they were in 1906 and 1907. The railway cars must needs deal in inches where the steamships deal in yards, and yet high-class long-distance rail traffic is a little cheaper than high-class long-distance steamer traffic—public impression to the contrary. An interesting table may be constructed as follows:

Table of Fares, Moderate Speed Services.

	Miles.	Fare.	Meals.	Half-stateroom.	Tips.
New York to Chicago	1,000	$20	$3	$7	$1
New York to Liverpool	3,000	—$125—			$8

Assume fare at 2c. a mile and meals at $1 each; then the following table can be constructed:

	Miles.	Fare.	Meals.	Half-stateroom.	Tips.
New York to Chicago	1,000	$20	$3	$7	$1
New York to Liverpool	3,000	60	24	33	8

That is to say: stateroom accommodation from New York to Chicago costs 7 mills per mile; from New York to Liverpool, 1.1 cents per mile. The total cost per trip works out at 3.1 cents per mile by rail and at 4.1 cents per mile by water. To compare with the rail stateroom, an outside stateroom on a high class steamer of moderate speed is assumed.—EDITOR.]

OCEAN STEAMSHIPS VS. TRAINS DE LUXE—A REPLY.

To the Editor of the Railroad Age Gazette:

Mr. Zueblin's article is unfair to the railways for the fundamental reason that it is a comparison of two things that are essentially unlike because they must be built and operated under essentially dissimilar conditions and limitations. He errs in assuming that the difference between the accommodations furnished a passenger by land and a passenger by sea is due to the difference in the abilities of the designers of the two methods of transportation, viz., the railway car and the steamship. One might as well contrast Wilbur Wright's aeroplane with Count Zeppelin's airship and claim superiority of inventive genius and constructive ability for Count Zeppelin, because his machine affords the passenger a greater degree of comfort and convenience than is afforded by the machine produced by the American inventor. Wilbur Wright's machine represents the highest development of the heavier-than-air flying machine; Count Zeppelin's airship represents the highest development of the lighter-than-air machine. In the same way the Mauretania represents the highest development of water transportation, just as the Twentieth Century Limited and the New York Central Railroad, in my judgment, represent the highest development of land transportation.

Mr. Zueblin alludes to the fact that the horse-car is still found on cross-town street railway lines in New York City. I hold no brief for the street railways of New York, just as I hold no brief against the ocean steamships; no one admires more the genius that has been shown in the development of the magnificent modern Atlantic liner. But since the presence of horse cars in New York has been mentioned as an instance of the backward development of land transportation, it seems only fair to say that one of the reasons why the cross-town lines on Manhattan have not been electrified is the great expense of installing an electric system which would haul passengers but a short distance, Manhattan island being but 2 miles wide, and which would of necessity cross so many other electric systems. There has been no satisfactory, self-sustained power developed as yet for lines where there would be interference with so many crossing lines. The line on the water front in New York has not been electrified because the city will not allow an overhead wire in that section and the transportation company fears that an underground electric current would be greatly interfered with by the water conditions.

Mr. Zueblin says the magnificent railway stations in New York and Washington have no counterpart in Pittsburgh or Chicago. As a matter of fact, Pittsburgh has as fine railway stations as any city of its size in the United States, or the world. The union station of the Pennsylvania system there is a splendid structure. The station of the Pittsburgh & Lake Erie is a model. The Wabash has a beautiful terminal there. Is it possible Prof. Zueblin made the statement referred to without ever having seen the stations at Pittsburgh? As for Chicago, the Rock Island and Lake Shore have in the La Salle street depot one of the finest and most modern stations ever constructed, and the Chicago & North Western is spending $20,000,000 in erecting a passenger depot that will be one of the finest used by a single railway in the world.

It is asserted that "American steamship piers do not yet approach those of Europe." As a matter of fact the new terminal piers of the North German Lloyd in Hoboken, N. J., are perhaps the finest in the world. It is hardly possible fairly to compare them with the steamship piers in Europe, because most of the harbors in Europe are closed tidal docks,

as, for instance, those of Liverpool, London, Southampton, Havre, Hamburg, Bremen, etc. Conditions in New York are very different from those in Northern Europe, as, owing to the configuration of the New York harbor and the slight difference between high and low water, it is possible and necessary at New York to dock steamers at piers built out into the stream. The North German Lloyd piers in Hoboken are as fireproof as such structures can be made. The substructure consists of piles driven 70 to 90 ft. in the mud, on which is laid a concrete deck pier, the superstructure which consists entirely of steel being rendered fireproof by jackets of concrete. It would be impossible to construct piers in the New York harbor on anything but pile substructures because the silt or mud in the harbor is too deep for stone construction. Aside from these technical details the docks at Hoboken are extremely beautiful from an artistic point of view.

It is complained that one cannot secure anything better than a second-class tourist car across the American continent. As a matter of fact, one cannot secure even a second-class tourist car across the continent because all cars stop at Chicago. (Except on the C. P. R.—Editor.) This is made necessary by considerations of cleanliness and sanitation. It would be impossible to run a car with passengers from New York to San Francisco without its getting into a more or less unclean and unsanitary condition. Cars are kept as clean as possible from New York to Chicago, and there the passenger takes another clean car to San Francisco.

What have Mr. Zueblin's references to roadbed and signals to do with ocean steamships? The railways of the United States have in use every improved signal device that has been proved practicable, and, as past experience shows, any inventor who will produce a better signal than those now in use can speedily get it adopted. Furthermore, the signaling devices of the railways are installed and maintained at their own expense, whereas the various governments of the world build and maintain lighthouses for the protection of steamships.

It is complained that sleeping cars still include upper berths. They only include upper berths when the passenger does not pay for an entire section. The passenger can only get a whole room on a ship when he pays for it, and he can get a whole room on a sleeper when he pays for it. If the railways should take out all upper berths and make each passenger pay for an entire section they would be apt to receive very severe criticism. The size of berths and rooms on trains is small, but this is necessarily true owing to the limitations imposed by the size of the car. The standard gage of a railway track is 4 ft. 8½ in. The gage once fixed, cuts once made, tunnels once built, limitations are imposed upon the car designer which he cannot escape. The problem then is simply to make what space there is in the car most comfortable for passengers. The marine designer on the other hand is governed by no limitations of length, breadth or depth, except the minimum depth of the harbors to which the ship is to go. As soon as steamship companies evinced a desire to build ships of greater draught than existing harbors would admit, all the wealth and power of all the governments of the world were set to work to deepen and widen harbors. No part of the expense of this work had to be met by the private capital operating the steamship companies. Suppose one of the great railway companies should desire to operate passenger cars of twice the size and convenience and having twice the air space of any existing cars. Would the government come forward and provide a roadway with the curvature, tunnels and terminals necessary to handle such cars?

It is complained that the dining service on "trains de luxe" is inferior in some ways to that on steamships. The statement is true only to a limited extent. But travelers on trains are not on them as long as travelers are on ocean steamships, and therefore their requirements in this respect are much less. As a matter of fact, however, there are many American trains making long runs on which meals can be got at all hours. There is hardly a railway handling through passenger business in this country which does not have on its principal trains buffet cars, in which a passenger can get food and drink any time he wishes it.

I would not be understood as implying that the railways furnish better passenger service in their field than the ocean steamships furnish in their field. The ocean passenger vessel is one of the greatest transportation developments of modern times and is entitled to all the praise that Prof. Zueblin or anyone else can give it. But I do not believe that anyone who is thoroughly familiar with the different conditions under which American passenger trains and ocean steamships have been developed and the different conditions under which they are operated, will assert that the development of railway passenger service in the past 20 years has been less remarkable than the development of ocean passenger service, or that the railways do not give to all classes of passengers as good service in proportion to the physical limitations under which they labor and to the charges for and the cost of rendering the service, as do the ocean steamship companies.

WARREN J. LYNCH.
Passenger Traffic Manager, New York Central Lines West of Buffalo.

Contributed Papers.

CENTRAL OF NEW JERSEY BRIDGE RENEWAL AT BETHLEHEM.

Near the point where two lines of the Central of New Jersey meet at Bethlehem Junction, Pa., the former bridge over the Lehigh river has been replaced recently with one designed to correspond more closely in capacity with the great increase in weight of motive power and rolling stock and the growing volume of traffic. There are three 146-ft. spans, resting on piers and abutments of stone masonry. The masonry was found to be in good condition, and has not been rebuilt, except for some slight changes required by the new superstructure, which formerly consisted of three single-track through pin spans and which have been replaced by the same number of single-track through riveted spans.

The general situation of the bridge is shown by the location plan and by the photographs of the old and new structures. At the point of crossing, the direction of the line is a little north of northwest. On each side of the crossing, it is nearly east and west, the bridge being interposed as a tangent between the two parts of a reverse curve. On the south side, directly on the bank of the river, there are buildings, and the Lehigh Valley Railroad is crossed; on the north side, between the river and the point of junction of the two lines, are a road and a canal with its towpath. The space for storage ground was thus extremely limited and not conveniently situated. Space was selected at the north end of the bridge and in the narrow space between the river and the canal. Notwithstanding the additional difficulty imposed by the nature of the location, there were no delays to traffic, except that one train during a period of a few days was sent around the site by another line. About four months were occupied in the work of removal of the old spans and the erection of the new.

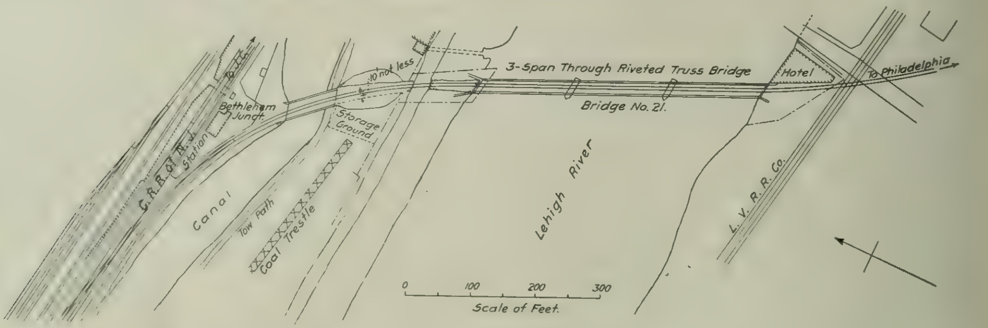
The tops of the stone masonry piers and abutments are capped with a grillage of 10-in. I-beams, filled in with concrete, on which rest the cast-steel shoes of the fixed, and the rollers of the movable, ends of the spans. The skew is 9 ft. The requirements for erection specified that two spans must be trestled up complete and the existing trusses removed so that the railway company could make the necessary alterations to the masonry.

The order of erection was as follows: (1) Erection of traveler and false work. (2) Removal of the old floor and placing

of the new stringers on the false work to carry traffic. (3) Blocking up and removing the old trusses. (4) Placing the floor beams and advancing the new stringers into their final position. (5) Erection of the new trusses.

The false work of each span consisted of a series of six bents spaced about 19 ft. 10 in. apart between centers of uprights, each of the three pairs being tied together by diagonals. There were also two bents placed in skew against the abutments. Each bent was made up of eight 10 x 12-in. uprights about 25 ft. long, supported on a 12 x 12-in. mudsill—the river bottom being hard sand—and joined at the top by a 12 x 14-in. cap supporting 10 x 12-in. stringers carrying 12 x 12-in. blocking under the stringers of the old span. On these bents the traveler was erected, the legs being spaced 21 ft. center to center. The height of the old trusses was 24 ft. center to center of chords, and that of the new, 30 ft. center to center of chords. The spacing of the old trusses from center line of truss to center line of track was 8 ft., and of the new, 8 ft. 2½ in.

After the removal of the old floor, the new stringers were laid on the false work to carry traffic, but, as required by the change of structure, a little distance, out of the final position to which they were afterwards advanced just before the erection of the new trusses. The old trusses were then blocked up and removed while the alterations to the masonry were being made and the floor beams put in position. The material required for the false work of one span was 36,610 ft., board measure.

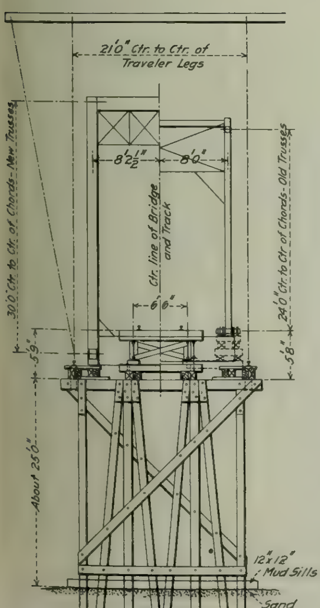


Location of Lehigh River Bridge; Central of New Jersey.

All three spans are alike in every essential respect. Dead load is assumed at 2,700 lbs. per lineal foot, and live load, 5,000 lbs. The end stringers are made up 30 in. x 9/16-in.

Old Lehigh River Bridge.

New Lehigh River Bridge; Central of New Jersey.

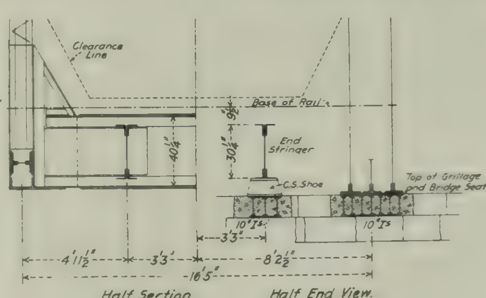


End Elevation of Falsework.

plates, with 6 x 6 x 1-in. angles; the other stringers are the same, except that the angles are only ¾-in. thick. The floor beams are made of 40 in. x 9/16-in. plates, 6 in. x 6 in. x 9/16-in. angles, and 13 in. x 9/16-in. cover plates. The bottom chord of the middle section is made continuous for a length of 72 ft. 9 in.; it is a built-up H-beam, and the angles and side plates are each in one piece of this length. The angles are 6 x 4 x ¾ in., weighing 25.4 lbs. per foot, and the side plates are 14 x 9/16 in. The thickness of the made-up chord section is 13¼ in. back to back of angles. Lacing bars are 3 x ⅜ in.

The vertical members of the truss are made up each of two 15 in. channels, 33 lbs. per foot, web 13/32-in. thick and with 3 13/32 flanges. The middle section of the top chord is composed of two web plates 20 x ½ in., cover plate 24 x ½ in., upper angles 3½ x 3½ in. and lower angles 5 x 3½ in. The side plates are spaced 15½ in. between webs. The length of plates and angles is 40 ft.

The diagonals are made up of angles and lacing, the angles



Detail of Bridge Seat.

being 6 x 3½ x 9/16, and weighing 17.3 lbs. per foot, or 6 x 3½ x ½, weighing 15.4 lbs. per foot, according to position in the truss.

In the end section of the trusses similar features of design are carried out, with the changes required by the difference in position. The end posts are made up of two 20 x ½-in. web plates, two 12½ x ¾-in. side plates, cover plate 24 x ½ in.,

and 3½ x 3½-in. and 5½ x 3½-in. angles, etc. The end pins are 6 11/16 in. in diameter.

Work was completed and the bridge put in service in August, 1908. The steel was fabricated and erected by the Phoenix Bridge Co., Phoenixville, Pa., under the direction of the engineering department of the Central of New Jersey, Joseph O. Osgood, Chief Engineer, and J. J. Yates, Bridge Engineer. A. B. Milliken, of the bridge company, was Superintendent of Erection.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XII.

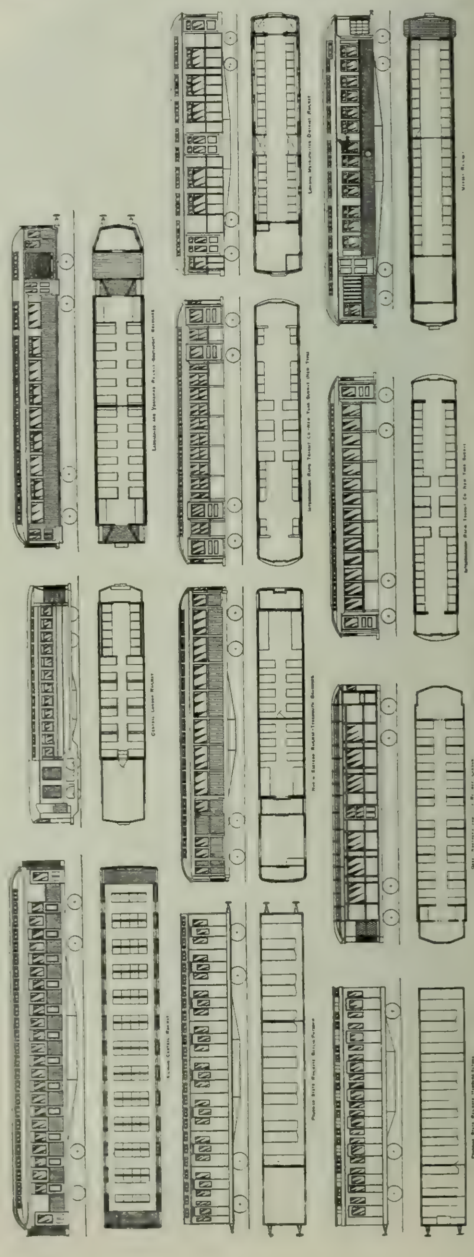
In considering the question of the most suitable type of rolling stock for a large, important and rapid suburban service, the two chief considerations are: Firstly, to secure the maximum passenger accommodation for a given weight of coach; this is particularly important with electrical operation because the amount of electrical energy used in driving the trains increases in almost direct proportion to the weight. Secondly, to adopt a design which will enable the passengers to enter and leave the trains at the different stations as rapidly as possible, thus reducing the time spent in stops to a minimum and thereby increasing the schedule speed. As would be expected, the first of these considerations is best met by making each coach as large as possible, that is, as long and as wide as possible. The length and width of coach are, in practice, limited, not by difficulties of construction, but by the fact that the dimensions have to be kept within such limits that the coaches do not foul platforms or other trains on adjacent tracks when rounding curves. The second consideration is almost entirely one of arrangement of seats and doors.

The types of stock generally in use may be classified under two general heads: Corridor stock with doors at each end, and cross-compartment stock with side doors. The general outline and seating capacity of different designs in use for suburban traffic are illustrated herewith. Whereas end-door stock is usual in America to the almost entire exclusion of side-door stock, the reverse holds good on the continent of Europe. For main-line and high-speed working, corridor stock has great advantages; the design may be made rigid and strong and the side framing, being without openings or breaks for doors, can be built in a form of a continuous girder. The corridor also admits of communication throughout the length of the train, a requirement of all modern main-line stock, and the doors at the ends being arranged to open inwards the coaches can be built of maximum width, *i.e.*, with minimum clearance between passing trains.

In America, and to a certain extent in England, the corridor type of coach has also been developed for suburban working. For tube, subway or underground railways dealing with very heavy traffic, it has undoubted advantages, if trainmen are stationed at each end of every coach to open and shut the doors and to hurry up passengers in entering and leaving cars at stations, and if it be a question rather of coping with the traffic than of operating at minimum cost. It is not necessary to delay the starting of the trains to shut the doors, an important matter with high acceleration, and passengers do not waste time walking up and down the platforms looking for seats as they do where there are separate compartments and, further, this design provides for a maximum of standing room, which for short journey traffic is a valuable feature.

On the other hand, for ordinary suburban working the expense of so many train attendants is prohibitive and without them there is delay in discharging and loading trains where all passengers have to leave by comparatively small end doors. The importance of providing ample door area may be judged from the fact that on some lines where corridor stock is in use, additional doors in the ends and also in the centre of the coaches have been proposed and in some cases adopted.

While such a coach may be best suited to the special conditions of tube and subway working where there are very frequent stations and where, in consequence, very high accelerations and short time stops have to be adopted to maintain a



Types of Rolling Stock Used on Electrically Operated Railways.

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

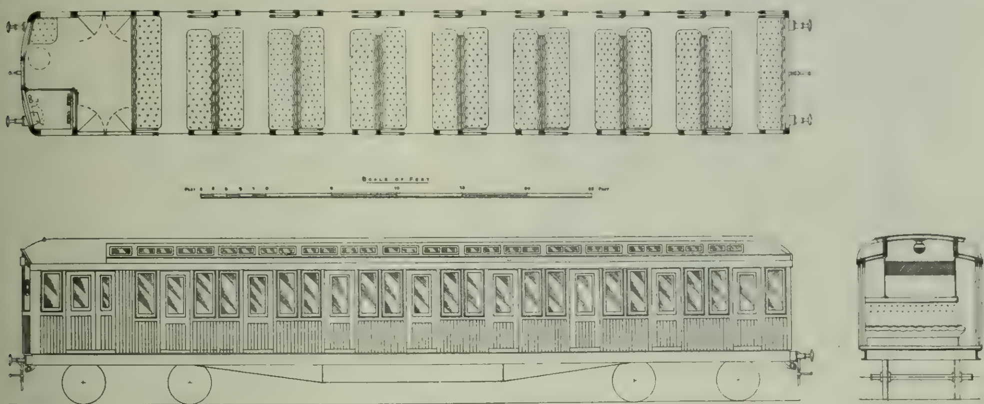
good schedule speed, I do not think that the extra expense of the train crews involved would be justified, or that a type of coach, the chief merit of which is large standing space, is the best suited to the conditions on the Melbourne Suburban system on which many people have daily to travel considerable distances.

The illustration shows that, although with the corridor type of coach there is a large amount of standing room, the seats provided for the same length of coach are considerably less than in the case of the compartment coaches; corridor stock, on the other hand, provides facilities for changing from one compartment to another in a crowded coach even after the train has started, and this is an advantage not lightly to be sacrificed. If, therefore, it were a question of building new stock, I consider the proposed type shown herewith, originally suggested by your chairman and designed by the chief mechanical engineer while I was in Melbourne, would be the most advantageous. This design is really a combination of the two types, being a cross-compartment coach with a communication-way between compartments. Such a coach has been used on certain of the American and German lines and has been proposed for some of the English systems. The use of sliding doors that can be easily closed by the passengers without danger even after the train starts, avoids delay at station compared with the ordinary outward swinging doors, the absence of which also enables the coaches to be built of the maximum width, since even if the sliding doors were inadvertently left open there would be no danger of fouling passing trains as would be the case with swinging doors. Thus, in the case of Melbourne you would, while retaining the large seating capacity of the cross-compartment coaches, also obtain the advantages of the communication passage between compartments; such a design of coach is a combination of the best points of the latest types of suburban stock of Europe and America.

The estimated cost of a coach body of this type complete with trucks, but without electrical equipment, varies from £1,650 to £1,790 according to the class of compartment and the provision made for motormen's and guards' compartments.

While any new stock should, I think, be built generally in accordance with this design, it does not follow that you would be justified in scrapping all the existing stock and, if it be not scrapped and new stock built, the question arises as to what the existing stock should be used for. The importance of this question is obviously in inverse proportion to the magnitude of the electrification scheme. If the contemplated conversion affects only a small fraction of the stock, the provision of new electric stock could be easily justified, since the necessity for continually adding to the steam stock to provide for the increasing traffic would, in a very short space of time, absorb the steam stock thus displaced. As, however, I do not recommend proceeding with a small portion of the scheme only, I do not consider that you would be justified in providing new rolling stock throughout, more especially as the existing stock is of the cross-compartment type which, in that it provides large seating capacity and avoids the necessity for a large number of attendants on the trains, is in every way suited to the Melbourne suburban service.

(To be continued.)



Proposed New Rolling Stock.

EMPLOYEES IN ITALY.

The Italian State Railways in 1907 employed on their 8,293 miles of road 142,353 men, or 17 per mile of road—nearly 2½ times as many per mile as in this country, where the average passenger traffic is lighter, but the freight traffic very much greater. Their pay was at the average rate of $267 per year, against $641 in this country. Employees pay absorbed 44 per cent. of the gross earnings in Italy and 41 per cent. here.

STROUSE PATENT LOCOMOTIVE STOKER.

This stoker was invented by an Iowa Central locomotive engineer, and has been developed on that road, the first tests being made in September, 1907. The stokers show a saving in fuel of 15 to 20 per cent. compared with hand firing. The fires do not require cleaning on the line on a division 182 miles long; the boilers maintain uniform steam pressure and the tubes give no trouble from leaking. Two locomotives equipped with the stoker have been in service on the Iowa Central for more than a year, and it has recently been ordered for 20 new locomotives for the Chicago and Alton.

The stoker consists, briefly, of a horizontal plunger mounted in guides and operated by a steam cylinder. This plunger carries at its forward end a special shaped distributor, which is arranged to discharge the coal on different parts of the grate, depending upon the speed and length of stroke of the plunger. The forward stroke of the plunger throws the coal forward and to the sides of the grate, and the backward stroke, by means of pockets in the distributor, places the coal on the back corners and rear of the grates. The coal is fed into a large hopper from which it falls upon the distributor. The fire door opening is provided with a specially designed door, hinged at the top, and is opened and closed automatically by the movement of the throttle lever. The whole apparatus, except the special fire door, is mounted on a framework sup-

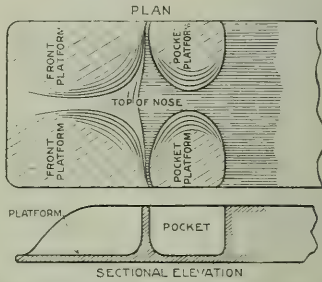
ported by small wheels, and is secured to the fire door ring by two slotted lugs with keys, and also by two suspension turnbuckle rods which hook into eyes on the boiler head. The length and intensity of the stroke of the plunger are governed by levers, shown at the left side, which are operated by the fireman.

Strouse Locomotive Stoker.

The stoker is constructed almost entirely of cast and wrought steel and is consequently strong and durable. The wearing parts are made extra large, thus reducing the maintenance to a minimum and increasing the reliability to a maximum. The workmanship is of the best quality throughout and all the stokers are thoroughly tested under pressure at the works before shipment. All parts are made interchangeable so that any part can be cheaply and quickly replaced.

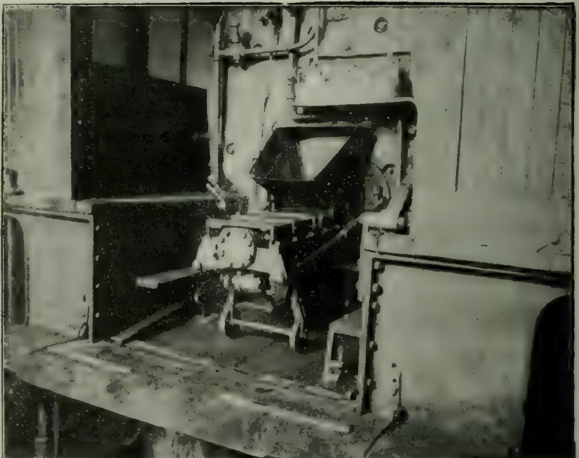
The operation of the Strouse stoker is very easy, as the fireman simply fills the hopper, and then by moving the stoker throttle lever operates the stoker according to demand. Usually no regulation is required, as the distributor is designed to fire the engine perfectly without any adjustment, but the length and strength of the stroke is easily governed at any time required by simply moving the stroke lever.

The Strouse stokers are designed to be absolutely reliable, durable, simple, compact and easily operated; to fire successfully all sizes and kinds of coal, including inferior grades of coal; to produce a very substantial saving in coal under ordinary operating conditions; to control admission of air into the firebox; to fire in small quantities at frequent intervals, according to demand; to maintain a light, bright, clean and uniform fire which will require less draft; to permit the use of larger nozzles, reduce the back pressure, prevent clinkers, reduce the smoke, etc.; to enable the average fireman to produce results continuously better than expert hand firing; to reduce the labor of the fireman, giving him more time and endurance to properly perform all of his duties, and also preserve the firemen's eyes and health; to require only simple, brief, plain instructions to be efficiently operated; to fire practically perfect throughout the longest and heaviest runs; to reduce cleaning of fire to minimum; to maintain full uniform steam pressure all of the time, permitting engine to be worked to its fullest capacity. They are meant to be suitable for all types and sizes of locomotive fireboxes, and to be easily and quickly attached or detached; and to allow easy inspection of the fire at any time. They require little or no adjustment for changes in coal or in other conditions; reduce the flue and firebox leaks and repairs, and make no objectionable noise. There are no parts fixed inside the firebox to warp or burn out, and there is automatic draft relief when the engine slips.



Plan and Sectional Elevation of Plunger.

These stokers now fire heavy consolidation engines on the longest and heaviest runs, with full tonnage, with practically no variation in the steam pressure and without any other attention to the fire except the shaking of the grate occasionally, and, moreover, the fire is usually in perfect condition at the end of each run, even when burning inferior grades of coal. These stokers are manufactured by the American Automatic Stoker Company, 213 Railway Exchange, Chicago.



Strouse Stoker in Position.

The Swiss authorities will provide for a session of the International Railway Congress in Berne, July 3 to 16, 1910.

MR. ARNOLD'S REPORT ON NEW YORK SUBWAY TRAFFIC.

Bion J. Arnold, Consulting Engineer, has made his sixth report on the subways operated by the Interborough Rapid Transit Co. in New York, and a brief report of his conclusions was given in the *Railroad Age Gazette* of January 29, page 233. Previous reports were noticed in these pages last year.

The present report is based on studies of train movements and passenger movements. The number of passengers carried in the subway for the first four years of its operation was as follows, in *millions*:

1905	116.2	1907	182.6
1906	149.8	1908	221.0

The principal recommendation made is that the local traffic, that done by the trains which stop at all stations, be cultivated and improved to the utmost, because it is more profitable than that carried by the express trains. On the express trains many passengers are carried 15 miles for five cents, which is far below cost. The opening of the Brooklyn extension early in 1908 decreased the sales of tickets at the Brooklyn Bridge station in Manhattan by over 20 per cent., but the sales at the stations south of there increased. It appears that passengers who formerly came over the bridge from Brooklyn and went thence north by the subway, now come through from Brooklyn by the subway; and many of the Bowling Green, Fulton street and Wall street passengers travel to and from Brooklyn by the subway. It is estimated that the ticket sales in Brooklyn will be at about the following rates per year, in *millions*:

Borough Hall	7.5	Nevins street	2.5
Atlantic avenue	9.5	Hoyt street	2.5

or a total of 22 millions a year. Mr. Arnold calls this a fortunate addition to the subway business, as most of the Brooklyn passengers ride comparatively short distances, and the current of traffic is opposite to the heaviest currents of the Manhattan traffic. No precise estimate is made of the heavy fixed charges due to the cost of the Brooklyn extension.

The decrease in the traffic of the subway during the summer months is much more marked than the decrease on the elevated roads at the same time. The lightest traffic of the week on the subway is on Sunday and the heaviest is on Monday, when shoppers are out for the bargains which have been advertised in the Sunday papers. The subway is now carrying from 650,000 to 750,000 passengers a day, and the heaviest day on record is December 21, 1908, when 886,000 were carried. On Sundays, except in bad weather, the traffic is from 350,000 to 450,000.

All of the trains are uniformly late during the rush hours. This is due to the longer stops at the stations and not to any inability of the motors to haul the heavier loads. From the Brooklyn bridge to Ninety-sixth street, 6.43 miles, the schedule time of express trains is 16 minutes. In the rush hours the time taken is about 21 minutes. These are the records taken about a year ago. By shortening the track circuits at the stations, and by introducing the speed control signals at Ninety-sixth street (recently noticed in the *Railroad Age Gazette*), the service has now been improved so that often trains reach their destination only two and a half minutes behind time, instead of five minutes behind. The local trains are also delayed by the rush of passengers, their schedule time of 26 minutes being lengthened to 28 or 30 minutes. These delays are due mainly to the longer stops at those stations where pasengers transfer from the locals to the expresses and from the expresses to the locals.

Observers were employed to count the passengers on a number of individual trains in January, February and March, 1908. On eight local trains the average total number of passengers carried on each trip was 2.58 times the maximum number on the train at any one time; on 10 express trains this ratio was 1.62. In other words, the local trains are partially emptied and partially refilled, while on the expresses the larger share of the passengers take long rides. The local trains carried 4.36 passengers per seat, while the express trains carried from 3.24 to 3.62 passengers per seat. The average distance traveled by passengers on local trains was about two miles, and on the expresses about 5.5 miles.

Careful counts were made to see what proportions of the passengers secured seats. There is a much more even distribution of passengers through the cars of an express train than through the local trains, due apparently to the fact that passengers will take more trouble to avoid a crowded car on an express than they will when making a short trip on a local train; but considerable improvement could be made, says the report, in more evenly distributing the passengers throughout the length of all trains. On the heaviest trains, for a good part of the trip, there were about as many passengers standing as sitting, and in some cases more; that is to say, trains with 416 seats frequently contained over 900 passengers. In one case the total number was 1,050.

Studies were also made of the hourly variation in traffic. Of the passengers traveling in one direction during the day, fully one-third travel during the two hours of the rush period.

Mr. Arnold estimates that with side doors in the cars and a ninth car added to the express trains in the rush hours (without lengthening the platforms), the capacity of the subway in seats per hour may be increased from 22,000 passengers an hour to 36,000 passengers an hour. In this connection he makes the following estimate:

Capacity of Express Trains in Seats per Hour.

	Increase.	Total.
Capacity during fall of 1907	.....	12,000
Improvement during year 1907	1,250	13,250
Improvement anticipated due to additional doors in sides of cars near ends	1,250	14,500
Improvements anticipated by use of a speed control signal system	650	15,150
Improvements anticipated due to changes at Ninety-sixth street	850	16,000
Additional capacity to be secured by running 9 cars in each express train, instead of 8 cars	2,000	18,000

But at best the subway will be crowded during the rush hour period, and the only remedy is to build new subways. In future construction each express track should be doubled at the stations so as to permit two trains to be unloaded at the same time.

Another recommendation made by Mr. Arnold is to provide storage for empty cars at terminals, so that cars going south in the morning loaded will not have to run back northward empty because of lack of room. This same wasteful running of empty cars occurs in the opposite direction in the afternoon, so that there should be storage room at the north end also. He also says that considerable economy should be secured by adopting an automatic coupler, so that cars could be taken on or left off at intermediate points. This point will be of interest to long-distance railway managers who haul heavy cars many miles at high speed to avoid the delay necessary to attach or detach a car and test the brakes. This practice is common on some roads where seemingly two minutes would be less valuable than on the subway lines.

The figures on which Mr. Arnold estimates the average earning capacity of the trains are in substance as follows:

Of 1,400 passengers using a local train, 326 have come from express trains and 474 are on their way to express trains leaving 600 passengers, or 43 per cent. of the total number, using the local trains who are strictly local passengers riding from one local station to another.

The express stations contribute an average of 114 new passengers and the express trains transfer an average of 326 passengers, making a total of 440 passengers to each local train to offset the 474 passengers which the locals furnish to the express service.

Of the 1,400 passengers who patronize a local train there are 474 who transfer to the express trains. The income from this local trip may therefore be taken (1,400 — 474) x 5c., or $46.30, and as this train is composed of 5 cars and has traveled an average of 9 miles in one direction the income per car mile for this part of the trip is equal to $\frac{\$46.30}{5 \times 9}$, or $1.03 per car mile for rush hour service.

In a similar way the income from an express train carrying 1,300 passengers may be found by deducting the 326 passengers who transfer to the local trains, making the income for one express train northbound trip (1,300 — 326) x 5c., or $48.70. This express train, how-

ever, consists of 8 cars and travels an average of 15.38 miles in one direction, thus reducing the income per car-mile to $\frac{48.70}{8 \times 15.38}$, or 39 cents.

This result confirms the conclusions that the earning efficiency of the local service is more than twice that of the express service.

The local service is capable of not only maintaining itself, but it can also earn enough more to maintain the burden of the entire collecting and distributing system of which it is a part and assist in compensating for the loss due to long haul business carried by the express trains.

In conclusion, Mr. Arnold recommends that if the uniform five-cent fare is to be retained, the short haul business must be developed to make a profit sufficient to support the unprofitable long haul traffic by express trains. Possibly, he says, the moving platform may prove to be the most economical way of moving passengers short distances.

NEW AUTOMATIC SIGNALS ON THE BOSTON & ALBANY.

In the recent installation of automatic block signals made by The Hall Signal Company on the Boston & Albany, the signals are of the upper quadrant, three position type, and a number of special features and new types of instruments have been used on the work. The signals are situated between Westfield, Mass., and Rensselaer, N. Y., on different tracks and sections, as follows (parts of the line being already signaled): West bound track between Westfield and Washington, 29 miles; east bound track between Chester and Washington, 14 miles; west bound between Pittsfield and Richmond, 9 miles; and east bound between Niverville and Rensselaer, 16 miles; in all 95 automatic signals and 8 slots applied to mechanical signals. The contract was signed September 3, 1908, with a stipulation that the work be completed, and signals reported ready for service, January 1, 1909. The signals were reported ready for service December 30, the entire work thus requiring less than four months to complete. Taking into consideration the amount of special apparatus designed for the work and the territory covered, a new record has probably been established.

The circuit for the control of the signals is arranged "normal danger." The signals are made to assume the forty-five degree position (one block clear) by the presence of a train two blocks in the rear, and the ninety degree, or all clear position, by the presence of a train in the block approaching the signal. Clearing relays, such as have generally been used in normal danger circuits, are not used on this installation; the line wire for the home control is carried through a back contact on the track relay in the rear, which provides a positive clearing action. A section of the wiring diagram is shown.

No. 10 B. & S. gage, hard drawn copper wire with double braid weatherproof insulation is used for the line. The connections from the line to signals on the line side are carried overhead and into the signal cases through a hooded pipe connection on top of the cases. The wires carrying current are marlined together, but not taped nor braided, and are tied at intervals to a steel messenger wire which is fastened to the pole, just above the case. At locations where the signals are on the side of the tracks opposite the pole line, the wires are carried from the line into a junction box, clamped to an iron post, in the same general manner. The junction posts are provided with a hook under the pinnacle, for fastening the messenger wire, and a hooded pinnacle through which an entrance is effected for the wires inside the post and to the junction box. These posts are also arranged with two hooded openings at the ground line, at right angles to each other, for the trunking leads. One of these leads runs to the track and the other to the battery well. All the trunking is placed so that the top of the capping is flush with the top of the ballast. Thus all the wires are readily accessible, a feature which will be of interest to signal engineers who cover their wire leads with trunking and ballast. The objection to this construction that has frequently been raised in the past,

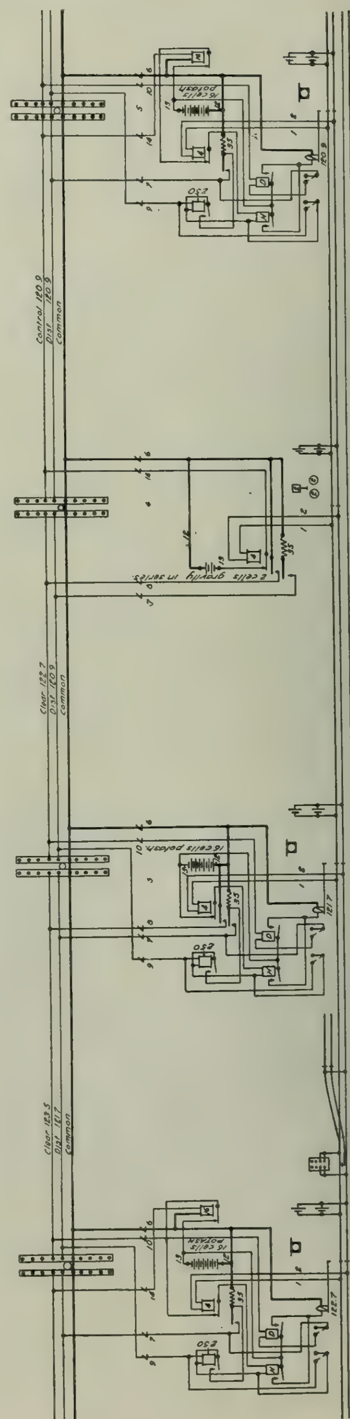


Fig. 1—Wiring Diagram for Normal Danger Hall Automatic Block Signals on Boston & Albany.

namely, that the right of way is obstructed by unsightly poles and wires, may readily be refuted by a trip over this section of the Boston & Albany.

The wires from the line to the signal and junction posts are No. 14 B. & S. soft drawn rubber-covered copper wire, and No. 10 B. & S. soft drawn copper wire is used for the connections from junction boxes to track and for all wires in trunking. All rubber covered wire used was made in accordance with the specifications of the Railway Signal Association. In the track connections the soldered connection of the copper and iron wires is made outside the trunking, where inspection may readily be made.

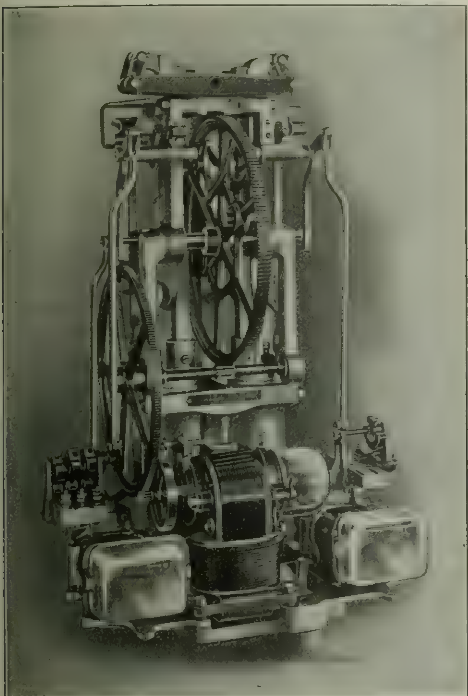


Fig. 2—Hall Electric Motor for Semaphore.

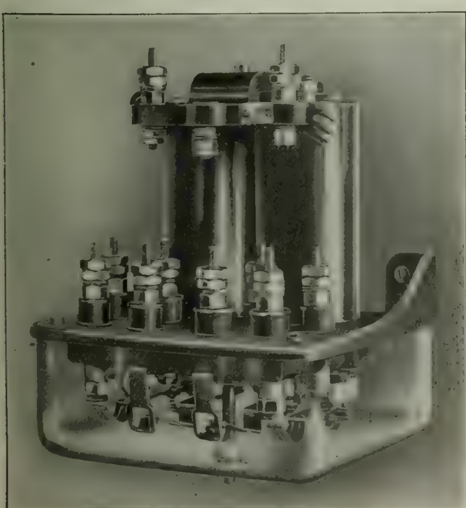


Fig. 4—Track Relay.

The signal mechanism used is The Hall Signal Company's improved Style F, three position thrust mechanism. The shaft for the blade grip is mounted on the right hand side of the post as in the standard designs of lower quadrant signals, but the motion is reversed by a link arrangement of cranks in the shaft bearing. A view of the mechanism is shown in Fig. 2, and of the up and down rod connections in Fig. 3. No rack or gear movement is used for the change of motion, this being accomplished by a novel arrangement of links and cranks.

The signal posts are mounted on a single mechanism case with doors on both front and rear. The cases are set on a concrete foundation, the top of which is one foot above the top of the rails. The center of the blade is 21 feet above the top of the foundation, or 22 feet above the top of rail in ground post signals. On bracket signals, the top of the bracket is 22 feet above the top of rail, and the center of blade 8 feet above the top of bracket, making the center of blade 30 feet above the top of rails. Bracket posts are made of steel pipe, 8 inch and 9 inch sections swedged, sulphured in a heavy cast iron base and with channel and angle cross-trees and braces. In all of the automatic signals an extra lamp, with red lens in front, is placed three feet below the signal lamp and on the opposite side of the post. This is the marker arrangement proposed by the committee of the Railway Signal Association.

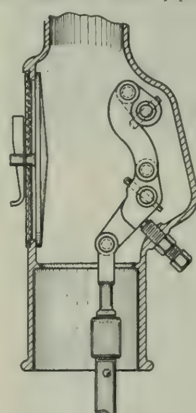


Fig. 3—Semaphore Connection.

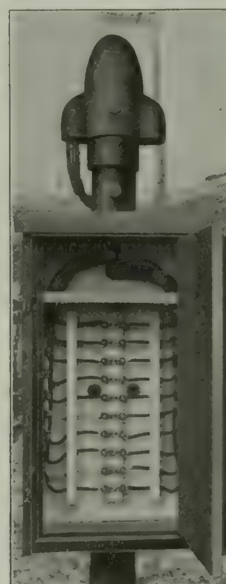


Fig. 6—Junction Box.

The relays used in this installation are illustrated in Fig. 4. They are of the wall type and were designed from specifications submitted by the Signal Engineer of the Boston & Albany. This is a very compact instrument and has a number of novel features. The binding posts are so arranged that a very neat arrangement of wiring in signal cases and relay boxes is possible. The wires, coming from the top of the signal case or box are passed through distributing strips to the lightning arresters or brass terminals, and thence to the instruments. Fig. 5 shows a view of the inside of a relay box and Fig. 6 a view of the inside of a junction box. At all straight post signals the relays are placed in the signal cases.

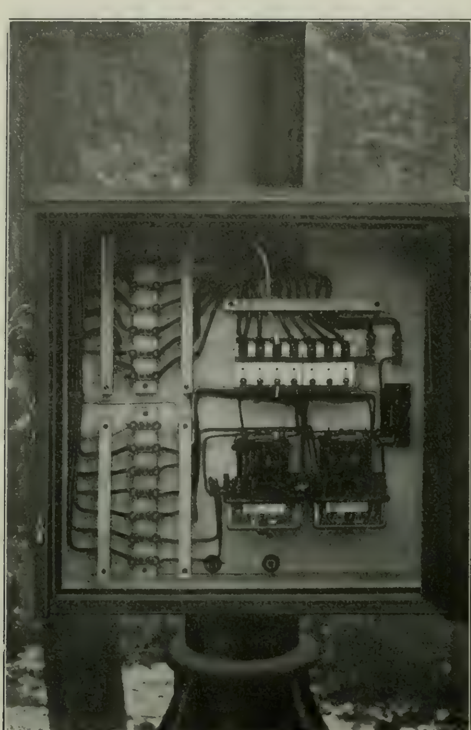


Fig. 5—Relay Box.

Fig. 8—Automatic Three-Position Block Signal—One Block Clear.

Fig. 7—Automatic Three-Position Block Signal—Two Blocks Clear.

Fig. 9—Bracket Signal.

but at bracket posts they are placed in relay boxes clamped to the bracket posts.

The blade grips used on this installation are the Hall Company's standard upper quadrant spectacle, made of sheet steel riveted on a cast iron hub at the shaft support. The posts are of such a height as to make the top of the pinnacle reach to the center of the blade when the signal is clear. Views of ground post and bracket signals are shown in Figs. 7, 8 and 9.

Gravity battery is used for the operation of the track circuits, and Waterbury and Gordon potash batteries for the motor and slot circuits. The potash battery is placed in Massey concrete wells. At signal locations the gravity battery is put in the same wells but at cut sections and points where wells are not required it is put in chutes.

The signals were installed by the Hall Signal Company, from specifications made by J. M. Fitzgerald, Signal Engineer of the road, and the work was done under the supervision of F. A. Whitcomb, Supervisor of Signals.

THE VALUATION OF RAILWAYS.

III.

Good will, an established organization, and a loyal esprit de corps are expensive to acquire, in money equivalent, skill, patience and talent; and while they do not appear on the balance sheet of any railway, are nevertheless things of real value. A manufacturing plant with an experienced administrative organization, trained and disciplined operating staff and an established trade, has a commercial and an economic value in excess of a new and similar concern of corresponding cost and in corresponding physical condition. Is the case affected by the public nature of the service provided by carriers, and by the degree of monopoly they enjoy and exercise? In respect of a railway, good will and organization, as an inducement to patronage, inure to its material advantage; but as enabling efficient service, economical operation and the maintenance of revenues notwithstanding low rates and fares, they are no less an asset in the hands of the public.

The exact weight, therefore, that should attach to these intangible values in the appraisal of railway property is a question not easy of determination. It is not improbable that most of the railways would willingly waive their rights with respect to these values, and possibly other similar ones, if secured in the enjoyment of a legitimate rate upon the direct cost, original and subsequent, of their properties; but whether it would be in the public interest thus to remove the stimulus to excellence and place a premium upon inefficiency, is questionable.

The table submitted below shows the amount of money in circulation in the United States per capita (Reference: Statistical Abstract of the U. S., 1907, p. 17), and the average price of a number of selected commodities, each proportioned to consumption (Dun's Index Number), at the times stated:

	Circulation per capita.	Average price of commodities.
July 1, 1866	.....	$207.978
" 1, 1876	$16.12	116.479
" 1, 1886	21.82	89.226
" 1, 1896	21.41	74.317
" 1, 1906	32.32	105.216

In appraising the value of the road, equipment and other property of a carrying company as of the last date stated, when the per capita circulation was $32.32 and the average commodity price was $105.216, should the carrier receive special consideration by reason of expenditure made in 1896, when the per capita circulation was only $21.41 and when the utility of a unit of currency was greater by 40 per cent.? Or, is it sufficiently compensated for its outlay by the same rate of income, on the cost of property, that would have been reasonable and just at that time? The owners of commercial property are benefited in price by increased circulation (unless offset by other circumstances) and other conditions which operate to elevate the level of commodity prices. It is held that a security yielding a fixed rate of income does not so benefit; but the correctness of this theory has not been fully demonstrated. Moreover, the creditor can protect himself against such changes, in part at least, by altering his position with respect to a particular class of investment—a course not open to the carrier as such.

These and other similar considerations may tend to determine the superiority of an appraisal over other methods of valuation.

The point, no doubt, around which thought should revolve for the present is a valuation by appraisal—ascertainment of reconstruction cost—modified by larger bona fide outlay where it can be shown.

Once an official valuation is made, an excess in capital assets as compared with nominal capitalization could be provided for by writing up such assets, crediting surplus, which excess would be subject to future capital issue. A corollary of this, in the case of a possible deficiency in assets, would be to write the amount of the deficiency off the assets and capital stock. Par value need not be interfered with; the nominal amount could, if desired, be shown in the nature of a memorandum, and the amount paid up be extended as a liability. As to the distribution of profits, the status of a shareholder would be unaltered, his holdings representing the same proportion of the total as before.

It had been far better for the railways themselves if their property and stock accounts had been treated from the beginning in the manner above indicated. By this means capital assets would have been carried at their proper cost, additions thereto from revenues would have been shown in the same manner as if provided for by assessments on capital stock, and the accounts would have reflected facts rather than fictions.

We should divest ourselves of the impression, if not the belief, that the proposal to subject railway property to a valuation is in effect an attempt to assail values, or that it would necessarily or probably result in the impairment of values to any appreciable extent. The protection of the rights and the enforcement of the obligations involved, must be the motive, as it is the vindication, for a valuation. Not improbably, it would reveal isolated instances of deficient value in comparison with nominal capitalization; but it does not necessarily follow that the carrier, its owners or creditors, would sustain injury from the mere ascertainment of the fact. It is not inconceivable that, even in such extremes, substantial benefit might accrue to each of these interests through the drawing of a line beyond which restrictive regulation might not pass, and the establishment of a definite basis for revenues.

But admitting for the moment the force of the objection made, no violence is done to the principles or the accepted notion of practical justice; it is applicable in the same sense and in a like degree to the majority of the laws on the statute books, and equity jurisprudence had its origin in the recognition of this truth.

But the task set before us is not completed by the mere ascertainment of railway values. There remains the separation of the portion of value devoted to interstate, from that appropriated to intrastate use. The succeeding extract is to the point:

"In our judgment, it must be held that the reasonableness or unreasonableness of rates prescribed by a state for the transportation of persons and property wholly within its limits must be determined without reference to the interstate business done by the carrier, or to the profits derived from it. The state cannot justify unreasonably low rates for domestic transportation, considered alone, upon the ground that the carrier is earning large profits on its interstate business, over which, so far as rates are concerned, the state has no control, . . . It is only rates for the transportation of persons and property between points within the state that the state can prescribe; and when it undertakes to prescribe rates not to

be exceeded by the carrier, it must do so with reference exclusively to what is just and reasonable, as between the carrier and the public, in respect to domestic business. The argument that a railway line is an entirety, that its income goes into, and its expenses are provided for, out of a common fund; and that its capitalization is on its entire line, within and without the state, can have no application where the state is without authority over rates on the entire line, and can only deal with local rates and make such regulations as are necessary to give just compensation on local business." (Reference: Smyth v. Ames, 169 U. S., 466.)

It is believed that such apportionment of value to the respective uses is possible, with a minimum of arbitrary choice, on the basis of the units of product—that is, the passenger mile and the ton mile—having due regard for the proportion of passenger to freight traffic and for the classification of both.

Moreover, the legal right to realize a stated yield upon a determined value is in itself of little importance if natural condition or economic law interposes to prevent its enjoyment. It is not only possible but highly probable that, to restrict those railway companies whose traffic is most dense, whose roadway and equipment are best, and whose operating efficiency is greatest, to a rate of income which would be just and reasonable in the average, would be to disturb the entire rate situation. Inequalities must arise from such conditions as the competition of water routes; the competition of rail lines upon unequal terms; sparse traffic; expense of construction or operation disproportionate to traffic, etc.; but such inequalities are susceptible to correction by the application of the pooling principle. This is the principle that would apply if all the railways were combined into a single system, and it is the principle that now applies to every large railway. Not every part of a line is equally productive in proportion to investment outlay. But the relatively unproductive portion is scarcely less necessary than the more productive. and it seems eminently proper that the stronger should be made to contribute to the support of the weaker.

So far as concerns the carrier, taxation would not be highly important if taxes are considered as part of the expense of operation and if net revenues sustained an equitable relation to investment. A possible excess in taxation would be relevied through its rates and fares, in part at least, upon the patrons of the carrying company. But the burden might readily fail to devolve upon those who ought to bear it within the state, and might further be levied thus indirectly upon interstate shippers and travelers, in contravention of the accepted principles of taxation. It may appear that, strictly defined, the rightful limit of state taxation is the intrastate use of transportation property, valued in accordance with the assessment of other like property, and at a like rate. Whether this view is tenable or not, it is certain that in equity and good conscience the tangible property of railways should not be assessed for taxation at a higher valuation or rate than other real and personal estate, and that their intangible property should not be made the pretext for imposing an unequal share of taxation upon them. Especially is this true when, as at present, the mere law of expediency is the dominant factor in rate making and the paramount consideration in rate regulation. Neither should they be taxed upon a valuation greater than that reached by the funding of net revenues or gross corporate income at a suitable annual rate, reduced by the prevailing margin between assessed and actual values. When the taxes of railways show increases of 15 per cent., 25 per cent., and 35 per cent. from one year to the next, at a time when traffic and revenues are almost correspondingly diminished, there is grave question whether these limitations are being exceeded. Here, again, the advantages of a valuation become apparent.

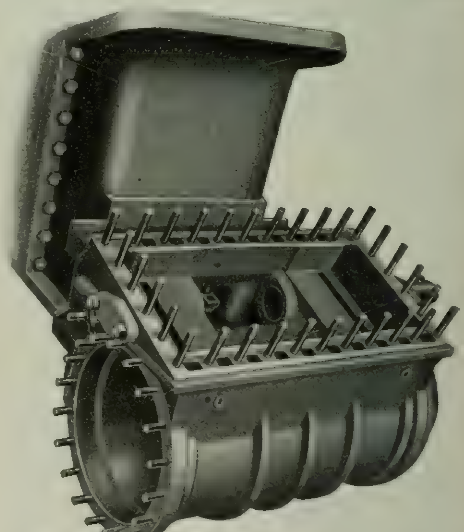
There may properly be question as to what constitutes a just and reasonable rate of income. Obviously, it will depend upon whether the investment is secured, upon the degree of security, and whether it is unassisted or requires the aid of industry, skill, intelligence and talent. It is probably true that Government bonds, irrespective of the demand for them to serve as the basis for circulation under the national banking laws, could be sold at a price yielding 2 per cent. per annum, or less. The best corporate securities yield a return of from 3 to 4 per cent. But no one would think of entering upon a business enterprise which held the prospect of no greater profit upon his capital. The succeeding extract is taken from a recent article by Elijah W. Sells, C. P. A.: (Reference: The Government Accountant, June, 1908.)

"It is interesting also to note that the revenue to the investor from the interests in railways is far less than his revenue from an interest in manufactures. The average rate of net income on railway investments in only about 4 per cent., while the average net income from investments in manufactures is about 15 per cent."

(To be continued.)

THE ALLFREE LOCOMOTIVE VALVE.

Among the numerous designs of valves and valve gears for locomotive engines, that known as the Allfree-Hubbell has probably been brought to the attention of railway officers as extensively as any others. It originally consisted of a gear as well as a valve, the fundamental idea of the combination



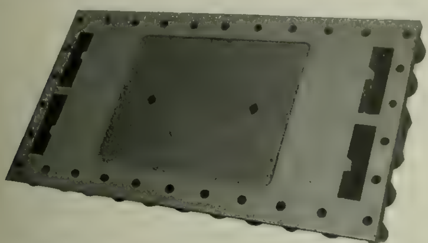
Cylinder Casting for Allfree Locomotive Valve.

being to reduce the clearance space to a minimum by the use of very short and straight ports and also to reduce compression and provide only for bringing the reciprocating parts to rest. In other words, to delay the exhaust closure in the return stroke as late as possible.

While retaining the fundamental idea, as mentioned, the present device is a modification of the earlier designs, in discarding all of the special arrangements and parts outside the cylinder and steam chest, and now consists of a special design of cylinders and valves which may be applied to any locomotive and be operated by any form of valve gear. The object of this design is to produce a locomotive cylinder in which, for a given cut-off, the steam will be held as long as possible, then exhausted rapidly, and during the return stroke of the piston, closing of the exhaust passages will be avoided until very nearly the end of the strike.

While the device is very simple in principle, construction

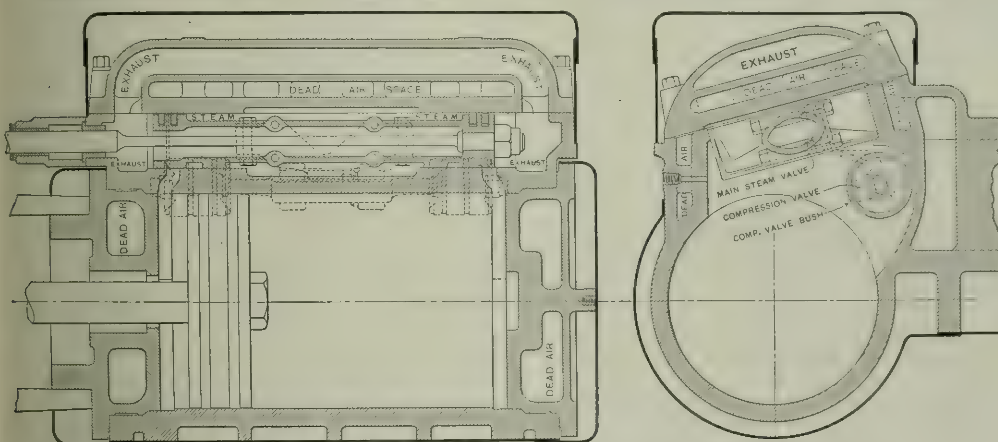
and operation, it will require some attention in order to properly understand it from the drawings, but such attention is well worth while. Two illustrations of sections of the cylinder and steam chest with the main valve are shown herewith. From the cross section it will be seen that the main steam chest is set at an angle of about 15 deg. with a horizontal and that on one side the valve face is close to the curve of the inside of the cylinder, while on the other side it is raised somewhat



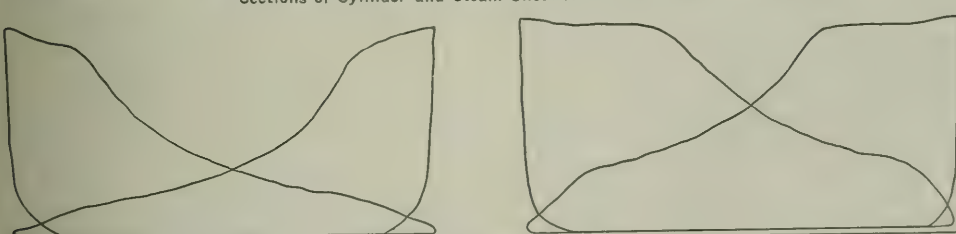
Combined Steam Chest Cover and Pressure Plate.

Admission and cut-off are controlled entirely by the main valve and inside admission is used. The half-tone engraving of the cylinder, with the steam chest cover and valve removed, shows the location of the circular compression valve chamber and to the left of it the entrance passageway for the live steam. The steam thus comes up against the under side of the valve and is admitted to the steam chest along the entire lower edge and up one side of the valve. It enters the cylinder through the long straight port in the usual manner, so that a large port opening is provided for admission. In passing from the steam chest to the cylinder the steam thus passes on both sides and around the compression valve chamber which cuts through the main port at each end but does not interfere with its area because of the increased depth of port, as shown on the cross section.

The exhaust is also controlled by the main valve, but to this is added the exhaust of the compression valve, thus increasing the exhaust area. It is in this compression valve that the whole gist of the delayed exhaust closure lies. The valve is driven by an arm projecting down to it from the main valve. This arm has, however, some lost motion between the points of bearing on the compression valve. Suppose for ex-



Sections of Cylinder and Steam Chest for Allfree Valve.



Sample Indicator Cards from Locomotive Equipped With Allfree Valve.

above it. In the space thus left below the valve there is a chamber, circular in section, that is occupied by the compression valve having broad rings. This valve delays the closing of the exhaust and thus reduces the compression line to a minimum.

The steam chest cover, which is reproduced by a half-tone engraving, forms the top side of the steam chest and provides through a cored passageway above, a by-pass equalizing passage between the exhaust chambers at each end of the cylinder. The main valve is rectilinear in form to fit the steam chest. It is balanced for all pressures and speeds and is provided with special riding or wearing shoes, so that the wear is uniform regardless of the travel.

ample, that the piston has reached the end of its stroke to the left, as shown in the longitudinal section of the cylinder. The main valve has moved far enough to the left to have opened the lead for the admission of steam and the arm has struck the compression valve and carried it far enough to the left to have closed the exhaust and both valves are still moving to the left and will continue to do so until the end of the valve stroke is reached. The main valve then starts to return, and due to the lost motion between the arm and the bearing points of the compression valve, the latter remains stationary until this lost motion has been taken up. This delays the action and motion of the compression valve by that amount. When this lost motion has been taken up the two

valves continue to the right, following the piston. The sequence of events is, first the main valve closes the steam admission port if the cut-off is early and in due course, closes the main exhaust opening on the right hand end. Under ordinary conditions the compression on the right would then begin, but owing to the delay in the movement of the compression valve the exhaust through it on the right remains open until it can be pushed across the opening left in the chamber which it occupies and which leads to the exhaust chamber at the end of the cylinder. It does not close this until the piston has nearly reached the end of the stroke when the main valve opens the exhaust at the left end. On the return stroke the cycle is repeated.

In examining the drawings it is simply necessary to remember that the main valve acts similar to any other inside admission valve and that attached to this is another valve that drags behind it, delaying the closing of the exhaust.

It is evident that the decreasing of clearance is of prime importance in locomotive economics, and if this can be reduced from the usual 10 per cent. to 2.5 per cent., there is a great gain in steam consumption for each filling of the cylinder.

By an increase of the exhaust lap, the opening of the exhaust can be delayed and thus the steam used through a higher degree of expansion for the same point of cut-off while the double opening afforded by the compression valve makes it possible to attain a rapid and effective exhaust which with the reduced compression at the other end of the stroke increases the effective area of the indicator card as shown in the sample cars reproduced. It is claimed that a saving in coal of about 10 per cent. or more can be obtained by the use of this device. The idea and its application are reasonable in that they involve but little more than that which belongs to the ordinary valve and its motion. The device uses nothing which has not been well tried out and the actual saving accruing from its use can be readily determined. The arrangement here described has been developed by E. H. Allfree and is controlled by the Locomotive Appliance Company, Old Colony Building, Chicago.

TEST OF LLOYDELL COAL AND BRIQUETS ON THE LOCOMOTIVE TESTING PLANT AT ALTOONA.

Bulletin 363 of the United States Geological Survey relates to comparative tests of run-of-mine and briquetted coal on locomotives, and was edited by W. F. M. Goss. It includes also torpedo boat tests of briquettes, foreign specifications for briquetted fuel, especially for railway use and road tests of briquettes on the Atlantic Coast Line and the Chesapeake & Ohio. An elaborate and carefully executed series of tests involving the use of natural coals and of briquets made from the same coal previously crushed, which tests have been carried out on a locomotive at the testing plant of the Pennsylvania Railroad at Altoona, is also described. The last named tests were made under the direction of A. W. Gibbs, general superintendent of motive power, by E. D. Nelson, engineer of tests, and the following report is abridged from the more elaborate report of results which was prepared by Mr. Nelson.

PURPOSE OF THE TESTS.

Many low-volatile coals, such as those mined in the vicinity of Johnstown, Cambria County, Pa., are semi-smokeless and therefore very desirable for use in locomotives at or near terminals; nevertheless, on account of their low evaporative efficiency, they have not been found altogether satisfactory when used as a locomotive fuel. Their tendency to disintegrate rapidly on the grate during combustion causes large quantities of cinders and sparks of high calorific value to be discharged. These cinders accumulate in the smoke box of the locomotive, obstruct the draft and reduce the capacity of the boiler. The investigation here reported, therefore, was undertaken to determine in what measure, if any, the process of briquetting will serve as a remedy for these defects and to discover the effect of the process on efficiency and capacity.

The coal selected for the tests was taken from a mine working the Lower Kittanning coal bed near Lloydell, Cambria County, Pa., on the South Fork branch of the Pennsylvania Railroad. This coal was practically the same as that mined in the Scalp Level district of Pennsylvania, which was used in all the locomotive tests made by the Pennsylvania Railroad at the Louisiana Purchase Exposition in 1904. Its characteristics as a locomotive fuel were therefore well known. The Lloydell coal is a very friable, low-volatile bituminous coal, and the carloads selected for the tests consisted of run-of-mine. The coal was exposed to the weather for 30 days on the way to the St. Louis testing plant, before being briquetted. It showed but little change due to this exposure except a decided increase in moisture, which, however, was eliminated in the briquetting process.

The briquets tested were of two sizes, and the amount of binding material in them ranged from 5 to 8 per cent. The larger size, called in the tests "square," was rectangular in form, about 3 in. x 4¼ in. x 6¾ in., with slightly rounded corners, and weighed about 3½ lbs. The smaller size of briquet, called "round," was cylindrical with convex ends, had a diameter of about 3 in. and a length over the convex ends of 2 in. and weighed about ½ lb.

The binding material in all the briquets was water-gas pitch. This material was furnished at the briquetting plant of the United States Geological Survey, in St. Louis, at $9 per ton, or 0.45 cent per pound. The least amount of binding material that would make perfect briquets was found to be 5 per cent of the weight of the coal. The cost of the binder in one ton of the 5 per cent. briquets was therefore 45 cents.

The cost of briquetting, including all charges, is estimated to be about $1 per ton of briquets; that is, the briquetting added approximately $1 per ton to the cost of the coal. The briquets were made, however, in an experimental plant, and the price is for this reason probably not so low as if they had been made on a much larger scale.

The briquets were made by the fuel-testing plant of the United States Geological Survey at St. Louis. The method of making the briquets is described in detail in previous reports of the Geological Survey. In this process the binding material is mixed with the crushed coal, the mass is softened by contact with steam as it passes to the briquetting press, and the briquet is finally formed in a compressing machine.

The locomotive used for all tests was a simple Atlantic (4-4-2) type passenger locomotive of the Pennsylvania Railroad, class E2a. This engine had cylinders 20.5 in. diameter, with a piston stroke of 26 in. Its firebox heating surface was 156.86 sq. ft. and the tubes 2,162.4 sq. ft.; totaling 3,319.26 sq. ft. The steam pressure was 205 lbs. per sq. in. In order to obtain results covering all practical rates of evaporation up to the limit of the boiler capacity, tests were made with each style of briquets and with the natural coal under the following conditions of running: First, a low evaporation test at 80 r.p.m. and 15 per cent. cut-off; then a higher evaporation test at 120 r.p.m. and 20 per cent. cut-off; next a still higher evaporation test at 160 r.p.m. and 25 per cent. cut-off; and finally a test made at the maximum possible evaporation. With the briquetted coal this maximum-capacity test was at 200 r.p.m. and 32 per cent. cut-off. Four, or at most five, tests were thus sufficient to cover the range of boiler capacity.

RESULTS OF TESTS.

A summary of the observed and calculated results is presented in the subjoined tables. The data tabulated represent the performance of the boiler and furnace more or less completely; as tests of coal concern primarily the boiler, the record of the engine performance is much abridged, only a few of the more important results being included.

Graphic logs for the tests are also shown. These are presented to explain some apparent irregularities in the plotted results. For example, in Test 1, the constant slope of the

water and coal lines and the absence of abrupt fluctuations in the steam-pressure line show at once the accuracy of the results. In Test 4 the change of slope in the coal line at the beginning and the end of the test make the reliability of observations during these periods seem more or less doubtful.

ANALYSES OF COAL AND BRIQUETS.

The proximate analyses and the calorific values of the fuel are given as columns 31 to 36 in the table of fuel analyses.

Test No.	Laboratory symbol	Date of test	Duration of test (hours).	Position of reverse lever (notches from center forward).	Barometer pressure (pounds per square inch).	Boiler pressure (pounds per square inch). Average.	Maximum.	Minimum.	Temperature of laboratory (°F.).
1	2	3	4	5	6	7	8	9	10
1	80-15-F	May 2	3.0	15.5	14.20	201.4	205	196	63
2	120-20-F	March 17	3.0	15	14.02	203.5	206	198	60
3	160-25-F	March 24	2.0	14	14.06	200.2	204	192	65
	160-25-F	May 1	2.0	14	14.17	201.1	205	192	64
5	160-30-F	May 3	2.0	13	14.16	193.9	205	179	61
6	80-15-F	May 6	3.0	15.5	14.11	204.2	206	202	65
7	120-20-F	May 8	3.0	15	14.12	204.8	206	200	65
8	160-25-F	March 23	2.0	14	13.96	202.5	205	196	60
9	120-20-F	May 9	3.0	15	14.05	205.0	206	203	70
10	160-25-F	March 26	3.0	14	14.07	202.8	205	199	65
11	160-25-F	March 18	2.5	14	14.09	203.8	205	199	58
12	160-30-F	March 19	.5	13	14.01	205.3	206	205	61
13	160-32-F	March 20	2.5	12.5	14.13	202.3	205	190	61
14	200-32-F	March 22	1.0	12.5	14.16	189.1	197	182	52
15	80-15-F	May 7	3.0	15.5	14.03	201.9	204	199	70
16	120-20-F	May 4	3.0	15	14.07	203.9	206	198	64
17	160-25-F	March 25	2.5	14	14.04	201.6	205	196	71
18	160-30-F	March 26	1.83	13	14.08	203.3	206	201	65
19	200-32-F	March 29	1.0	12.5	14.13	187.6	201	166	67
20	200-32-F	March 30	1.0	12.5	14.03	173.6	192	160	72

NOTE.—Throttle opening full in all tests.

General Conditions.

Test No.	Laboratory symbol.	Speed. Revolutions per minute.	Miles per hour.	Feet per minute (piston).	Water. Temperature of feed water (°F.).	Water delivered to injectors (pounds).	Water lost from injectors (pounds).	Water delivered to boiler and presumably evaporated (pounds).	Steam. Steam delivered by the boiler per hour (pounds).	Quality of steam (per cent).	Dry steam delivered by boiler per hour (pounds).
1	2	11	12	13	14	15	16	17	18	19	20
1	80-15-F	80	18.89	173.1	54.8	43,940	670	43,270	14,423	98.47	14,206
2	120-20-F	120	28.34	259.6	46.7	58,736	399	58,337	19,446	98.60	19,253
3	160-25-F	160	37.78	346.2	47.9	51,510	0	51,510	25,755	98.28	25,441
4	160-25-F	160	37.78	346.2	50.4	51,920	0	51,920	25,960	98.45	25,674
5	160-30-F	160	37.78	346.2	49.9	61,316	0	61,316	30,658	98.40	[illegible]
6	80-15-F	80	18.89	173.1	53.8	45,201	30	45,171	15,057	98.46	14,861
7	120-20-F	120	28.34	259.6	51.7	60,852	78	60,774	20,258	98.42	20,061
8	160-25-F	160	37.78	346.2	45.9	52,323	0	52,323	26,162	98.42	25,809
9	120-20-F	120	38.34	259.6	53.0	61,098	150	60,948	20,316	98.47	20,005
10	160-25-F	160	37.78	346.2	47.4	78,000	0	78,000	26,000	98.45	25,714
11	160-25-F	160	37.78	346.2	49.9	66,039	42	65,997	26,399	98.48	26,117
12	160-30-F	160	37.78	346.2	46.0	16,173	0	16,173	32,346	98.52	32,006
13	160-32-F	160	37.78	346.2	43.8	87,261	0	87,261	34,904	98.46	34,524
14	200-32-F	200	47.23	432.8	45.0	36,716	0	36,716	36,716	98.31	36,275
15	80-15-F	80	18.89	173.1	54.1	46,088	1,300	44,788	14,929	98.49	14,703
16	120-20-F	120	28.34	259.6	51.8	60,536	0	60,536	20,179	98.49	19,903
17	160-25-F	160	37.78	346.2	47.7	63,953	0	63,953	25,581	98.33	25,279
18	160-30-F	160	37.78	346.2	46.1	58,753	0	58,753	32,105	98.34	31,729
19	200-32-F	200	47.23	432.8	50.4	36,875	0	36,875	36,875	98.54	36,492
20	200-32-F	200	47.23	432.8	49.4	34,473	0	34,473	34,473	98.58	34,121

Speed, Water and Steam.

Test No.	Laboratory symbol.	Kind of fuel.	Binder in briquet (per cent).	Fuel as fired (pounds).	Dry fuel fired (pounds).	Dry ash by analysis (pounds).	Combustible by analysis (pounds).	Dry fuel fired per hour (pounds).	Dry fuel per square foot of grate surface per hour (pounds).	Cinders collected in smoke box per hour (pounds).	Sparks discharged from stack per hour (pounds).
1	2	21	22	23	24	25	26	27	28	29	30
1	80-15-F	Coal	......	5,370	5,303	395	4,908	1,768	31.86	28	39
2	120-20-F	do	......	8,430	8,325	620	7,705	2,775	50.00	112	37
3	160-25-F	do	......	8,201	8,099	604	7,496	4,050	72.97	205	140
4	160-25-F	do	......	8,354	8,250	615	7,636	4,125	74.32	214	347
5	160-30-F	do	......	11,334	11,193	834	10,359	5,597	100.85	373	385
6	80-15-F	Square briquets	[illegible]	5,291	5,258	437	4,821	1,753	31.59	28	13
7	120-20-F	do	5	7,198	7,153	595	6,558	2,384	42.95	70	29
8	160-25-F	do	[illegible]	6,766	6,723	559	6,165	3,362	60.58	[illegible]	25
9	120-20-F	do	6	7,016	6,970	591	6,380	2,323	41.86	52	25
10	160-25-F	do	6	10,559	10,490	889	9,610	3,497	63.01	212	26
11	160-25-F	do	7	8,570	8,520	708	7,812	3,408	61.41	126	26
12	160-30-F	do	7	2,345	2,331	194	2,138	4,662	84.00	246	56
13	160-32-F	do	7	13,388	13,310	1,106	12,205	5,324	95.93	419	60
14	200-32-F	do	7	6,257	6,221	517	5,704	6,221	112.09	1,021	118
15	80-15-F	Round briquets	8	5,290	5,256	473	4,782	1,752	31.57	23	22
16	120-20-F	do	8	7,396	7,348	662	6,686	2,449	44.13	58	95
17	160-25-F	do	8	7,955	7,903	712	7,191	3,161	56.95	61	18
18	160-30-F	do	[illegible]	7,653	7,603	685	6,918	4,155	74.86	132	49
19	200-32-F	do	8	7,030	6,984	629	6,355	6,982	125.84	292	149
20	200-32-F	do	8	6,673	6,630	597	6,032	6,630	119.46	776	126

Fuel.

Test No.	Laboratory symbol.	Proximate analysis (per cent). Fixed carbon.	Volatile matter.	Moisture.	Ash.	Sulphur (separately determined).	Calorific value (B. t. u. per pound). Dry coal.	Combustible.	Cinders.	Sparks.
1	2	31	32	33	34	35	36	37	38	39
1	80-15-F								12,216	8,453
2	120-20-F								11,167	11,167
3	160-25-F	72.03	19.37	1.24	7.36	1.20	14,918	16,119	10,385	12,097
4	160-25-F								12,685	[illegible]
5	160-30-F								11,019	11,737
6	80-15-F								10,593	9,912
7	120-20-F	69.95	21.16	63	8.26	1.35	14,745	16,082	10,080	8,524
8	160-25-F								11,618	9,462
9	120-20-F	69.43	21.50	65	8.42	1.58	14,612	15,965	10,023	9,741
10	160-25-F								11,713	8,091
11	160-25-F								9,157	9,781
12	160-30-F								7,370	9,899
13	160-32-F	69.88	21.28	[illegible]	8.26	1.28	14,777	16,116	11,523	11,048
14	200-32-F								8,434	8,838
15	80-15-F								11,003	9,178
16	120-20-F								10,208	8,574
17	160-25-F	68.19	22.21	65	8.95	1.81	14,708	16,164	10,022	9,782
18	160-30-F								11,761	8,816
19	200-32-F								11,378	9,941
20	200-32-T								11,378	10,022

Fuel Analyses.

Test No.	Laboratory symbol.	Water evaporated (pounds). Per square foot of heating surface per hour.	Per pound of dry fuel.	Equivalent evaporation (pounds). Per hour.	Per square foot of heating surface per hour.	Per pound of fuel as fired.	Per pound of dry fuel.	Per pound of combustible.	Boiler horsepower.	Efficiency of boiler based on dry fuel (per cent).	Heat lost due to cinders and sparks (per cent).
1	2	50	51	52	53	54	55	56	57	58	59
1	80-15-F	6.15	8.07	17,392	7.50	9.72	9.84	10.63	504.1	63.7	2.55
2	120-20-F	8.30	6.94	23,637	10.19	8.41	8.52	9.20	685.1	55.16	4.02
3	160-25-F	10.97	6.28	31,193	13.45	7.61	7.70	8.32	904.2	49.85	6.32
4	160-25-F	11.07	6.22	31,415	13.55	7.52	7.62	8.23	910.6	49.33	10.97
5	160-30-F	13.07	5.42	37,073	15.98	6.54	6.62	7.16	1,074.6	42.86	10.30
6	80-15-F	6.42	8.49	18,174	7.84	10.30	10.37	11.31	526.8	67.92	1.24
7	120-20-F	8.64	8.40	24,492	10.56	10.21	10.27	11.20	709.9	67.27	2.71
8	160-25-F	11.15	7.69	31,780	13.70	9.30	9.45	10.31	921.2	61.90	5.15
9	120-20-F	8.66	8.65	24,544	10.58	10.49	10.57	11.54	711.4	69.86	2.26
10	160-25-F	11.09	7.35	31,551	13.60	8.96	9.02	9.85	914.7	59.62	5.27
11	160-25-F	11.26	7.66	32,116	13.85	9.37	9.42	10.28	930.9	61.57	3.55
12	160-30-F	13.80	6.87	39,326	16.96	8.39	8.44	9.20	1,140.0	55.16	4.37
13	160-32-F	14.89	6.48	42,485	18.32	7.93	7.98	8.70	1,231.5	52.11	6.97
14	200-32-F	15.64	5.83	44,535	19.20	7.12	7.16	7.76	1,290.9	46.80	10.50
15	80-15-F	6.37	8.43	18,015	7.77	10.22	10.28	11.30	522.2	67.50	1.76
16	120-20-F	8.61	8.15	24,405	10.52	9.90	9.97	10.95	707.4	65.47	3.90
17	160-25-F	10.90	8.00	31,006	13.37	9.74	9.81	10.78	898.7	64.42	2.70
18	160-30-F	13.68	7.64	38,976	16.81	9.32	9.38	10.31	1,129.8	61.59	3.25
19	200-32-F	15.73	5.23	44,590	19.23	6.34	6.34	7.02	1,292.5	41.91	4.67
20	200-32-F	14.71	5.15	41,662	17.96	6.24	6.28	6.91	1,207.6	41.24	10.34

Boiler Performance.

Test No.	Laboratory symbol.	Drawbar pull (pounds).	Drawbar horse-power.	Steam lost from boiler per hour (pounds).	Fuel lost, due to steam loss, per hour (pounds).	Dry steam per drawbar horse-power per hour (pounds).	Dry coal per drawbar horse-power per hour (pounds).	Thermal efficiency of locomotive based on fuel (per cent).
1	2	60	61	62	63	64	65	66
1	80-15-F	7,464	376.0	290	35.9	37.18	4.70	3.63
2	120-20-F	7,607	574.8	93	13.4	33.34	4.83	3.53
3	160-25-F	8,975	904.2	330	52.6	27.78	4.48	3.81
4	160-25-F	8,854	892.0	212	34.1	28.55	4.62	3.69
5	160-30-F	10,459	1,053.7	193	35.6	28.58	5.31	3.21
6	80-15-F	7,310	398.3	736	99.1	38.40	4.76	3.63
7	120-20-F	8,066	609.5	243	28.9	32.47	3.91	4.41
8	160-25-F	8,935	902.2	200	26.0	28.45	3.73	4.63
9	120-20-F	7,931	600.8	215	24.9	33.09	3.87	4.50
10	160-25-F	8,961	902.8	298	40.6	28.16	3.87	4.50
11	160-25-F	9,012	908.0	319	41.6	28.42	3.75	4.59
12	160-30-F	10,842	1,092.3	273	39.7	29.06	4.27	[illegible]
13	160-32-F	12,068	1,215.9	226	34.9	28.21	4.38	3.93
14	200-32-F	10,101	1,272.1	188	32.3	28.37	[illegible]	3.52
15	80-15-F	7,217	363.6	329	[illegible]	39.72	4.82	3.59
16	120-20-F	7,792	588.8	330	40.5	33.33	4.16	4.16
17	160-25-F	8,540	865.4	199	24.9	29.08	3.65	4.74
18	160-30-F	11,095	1,117.8	254	33.3	28.16	3.72	4.65
19	200-32-F	9,986	1,257.6	188	35.6	28.67	5.55	3.12
20	200-32-F	9,248	1,164.7	173	33.6	29.15	5.69	3.04

Locomotive Performance.

These analyses were made on carefully selected samples from carload lots of the coal, and on briquets of several qualities. They show that the coal contains more fixed carbon and moisture and less volatile matter and ash than the briquets from the same coal. The calorfic value per pound of dry fuel seems to be greater for the natural coal than for the briquets, notwithstanding the fact that the binder used in making the briquets has a higher heating value than the coal itself.

Values representing the evaporative efficiency are presented as columns 50 to 59 in the boiler performance table. In Fig. 2 is shown the equivalent evaporation per pound of dry coal plotted against the rate of combustion. The figure presents a comparison under the same test conditions between the natural Lloydell coal and the same coal briquetted. It shows that a well-defined improvement in the evaporation per pound of fuel is obtained by briquetting. Fig. 3 shows the same relation as Fig. 2, expressed in per cent.

In Fig. 4, where the comparison is made on the basis of evaporation per square foot of heating surface, the better results for briquetting are further emphasized. It will be noted that the maximum evaporation possible with the natural Lloydell coal is 16 lbs. per sq. ft. of heating surface per hour,

but with the same coal briquetted the evaporation is more than 19 lbs.

The following table, derived from Fig. 4, gives a comparison of the different fuels at equal rates of evaporation:

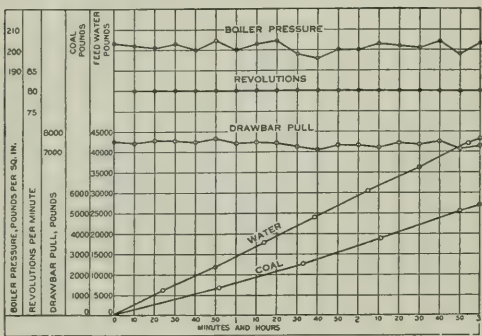
Comparison of Coal and Briquets at Equal Rates of Evaporation.

	Lbs.				
Evap. per sq. ft. heating surface per hr...	8	10	12	14	16
Equivalent evaporation per lb. of fuel:					
Natural Lloydell coal................	9.5	8.8	8.0	7.3	6.6
Briquetted Lloydell coal.	10.7	10.2	9.7	9.2	8.7

The ultimate measure of locomotive efficiency is expressed, of course, in terms of coal per dynamometer horsepower hour. This value plotted against dynamometer horsepower is given in Fig. 5, which shows that whatever may be the power developed the briquets give the greater efficiency, but that when the power is extremely low or extremely high the difference is small. At the point of maximum efficiency the difference amounts to nearly 35 per cent. It should be remembered, however, in dealing with dynamometer horsepower that several variable factors, such as machine friction and engine efficiency, are introduced into the equation; and that the only true comparison to disclose the relative values of different fuels is that which is based on boiler performance alone.

CINDERS.

In Fig. 6 the weight of cinders collected in the smoke box is shown for different rates of combustion. There appears to



Graphic Log., Test 1.

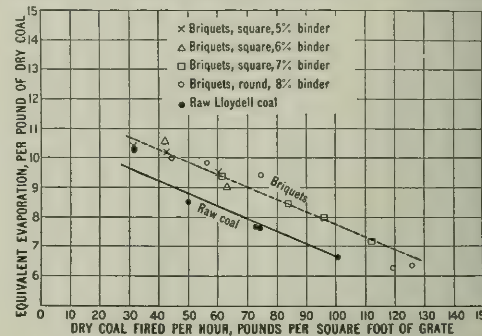
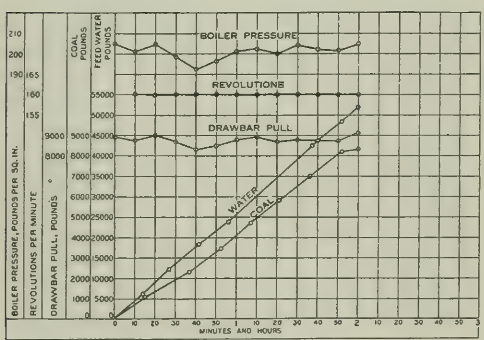


Fig. 2.



Graphic Log., Test 4.

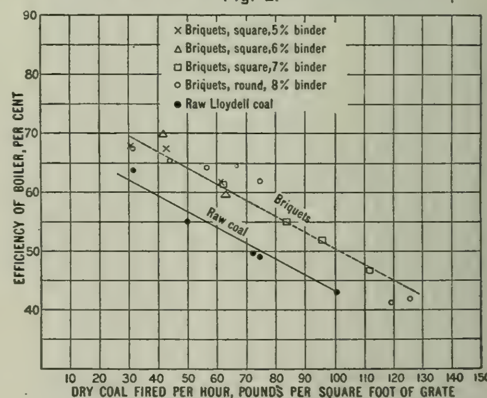


Fig. 3.

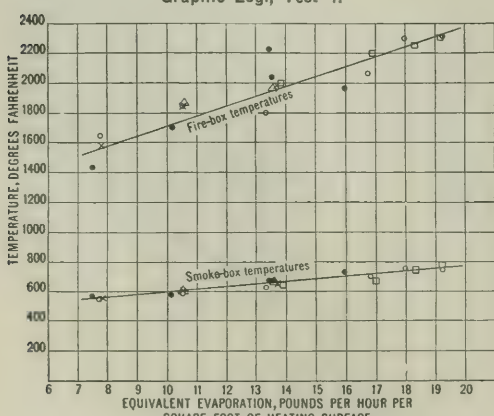


Fig. 1.

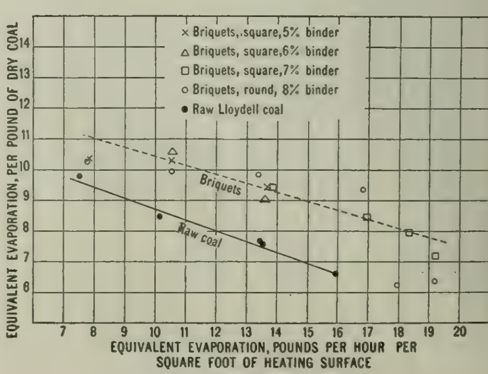


Fig. 4.

be little or no difference in the results obtained from the natural coal and the briquetted coal. The sparks from the stack, when the locomotive was fired with briquets, were in the form of flakes of a size considerably larger than those discharged when coal was fired.

The calorific value of the cinders collected in the smoke box and the sparks discharged from the stack is, in general, higher for the natural coal than for the briquetted coal. That is, the heat loss due to the sparks and cinders is greater for the natural coal, though the quantities in pounds of cinders may be the same.

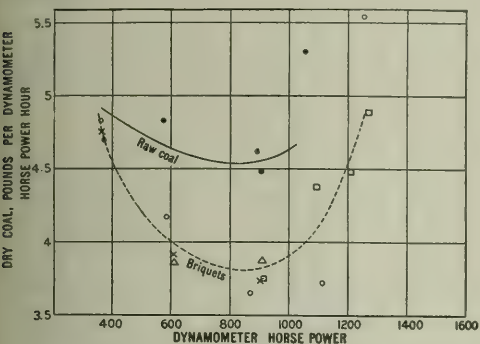


Fig. 5.

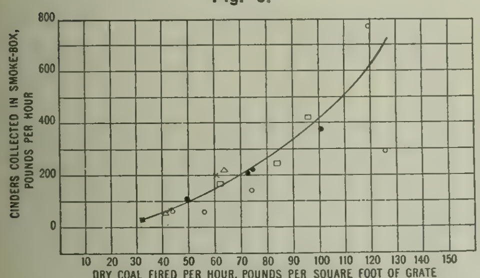


Fig. 6.

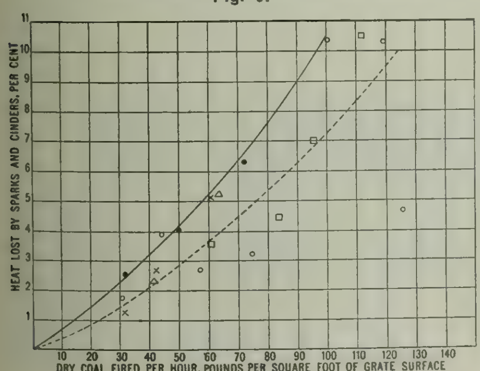


Fig. 7.

The amount of heat lost in the form of cinders and sparks, expressed as a percentage of the total heat supplied, is shown graphically by Fig. 7, in which the solid line represents the average cinder and spark loss for raw Lloydell coal at varying rates of combustion, and the broken line the same loss for the briquetted Lloydell coal. The points representing the former lie extremely close to the average line, but those representing the latter do not fall in such close alinement. It is a fact worthy of note, however, that those points which represent tests with briquets having the larger percentage of binder generally fall below the average line, whereas those for the smaller percentage of binder generally fall above the average line. The percentage of binder generally falls above the average line. The curve therefore shows that (*a*) the loss due to cinders and sparks is greater when raw coal is used than when briquets are used, and the difference increases as the rate of evaporation increases; (*b*) the loss due to cinders and sparks decreases slightly as the percentage of binder used in the briquets is increased.

SMOKE.

The density of the smoke from the locomotive was compared with the Ringelmann charts. These charts are usually designated as follows: No. 0, no smoke; No. 1, light gray; No. 2, darker gray; No. 3, very dark gray; No. 4, black; No. 5, very black. The gradations in shade corresponding to the above scale of densities are shown in the illustration herewith.

Smoke records were made at 10-min. intervals, 20 observations, approximately three seconds apart, being made the basis for each record. It was assumed that observations made for one minute at the beginning of each 10-min. interval would represent the average conditions for the whole interval. To reduce the number of observations to 10 for each 10 minutes every other reading was taken.

In order to present these smoke indications in better form for comparison, average values have been calculated, and the results are given in the subjoined table.

Test No.	Laboratory symbol.	Percentage of capacity of boiler.[a]	Density of smoke.[b]	Kind of fuel.
1	80-15-F	43.5	1.1	Coal.
6	80-15-F	45.4	.3	Square briquets, 5 per cent binder.
15	80-15-F	45.0	.5	Round briquets, 8 per cent binder.
2	120-20-F	59.1	1.2	Coal.
7	120-20-F	61.2	.4	Square briquets, 5 per cent binder.
[illegible]	120-20-F	61.4	.3	Square briquets, 6 per cent binder.
16	120-20-F	61.0	.8	Round briquets, 8 per cent binder.
3	160-25-F	78.0	1.8	Coal.
4	160-25-F	78.5	1.6	Do.
8	160-25-F	79.5	.4	Square briquets, 5 per cent binder.
10	160-25-F	78.9	1.0	Square briquets, 6 per cent binder.
11	160-25-F	80.3	.4	Square briquets, 7 per cent binder.
17	160-25-F	77.5	.7	Round briquets, 8 per cent binder.
5	160-36-F	92.7	2.1	Coal.
18	160-36-F	97.3	1.8	Round briquets, 8 per cent binder.
13	160-32-F	106.2	1.4	Square briquets, 7 per cent binder.
14	200-32-F	111.3	3.3	Do.
19	200-32-F	111.5	4.1	Round briquets, 8 per cent binder.
20	200-32-F	104.0	4.2	Do.

[a] Based on 40,000 pounds equivalent evaporation per hour.
[b] Average number Ringelmann scale.

Results of Smoke Observations.

A careful examination of this table shows that for a given boiler capacity more smoke is made when raw coal is fired than when briquets are fired. Thus, on comparing tests 3 and 4 with tests 8, 10, 11 and 17, we find the average density of smoke for raw coal to be 1.7, whereas for briquets it is but 0.62. Test 20 with briquets shows very black smoke, but in this test the boiler was forced to an evaporation far beyond that found possible with natural coal. The smoke-box gases show over 7 per cent. of carbon monoxide and less than 1 per cent. of oxygen, indicatiing very incomplete combustion. In Fig. 8 the smoke density is plotted against boiler capacity, and average lines are drawn through points representing tests with raw coal and briquets with 8, 7 and 5 per cent. of binder. As there are but two points representing tests with briquets having 7 per cent. binder, and as their position seems to be contradicted by the position of the other points, no line has been drawn through them. The curves show that the smoke density is nearly constant for all capacities under 90 per cent. of full load, but that for capacities beyond this point the density increases rapidly. It appears that for all tests with briquets the density of the smoke is less than for corresponding tests with raw coal; but more smoke is produced with briquets having 8 per cent. binder than with those having 5, 6 or 7 per cent. Whether this fact is to be explained by the varying amounts of binder used or by the difference in size and shape is a question. However, as the binding material employed consists largely of volatile matter, it is reasonable to suppose

that the varying amounts used in the several briquets cause the varying density of the smoke shown in Fig. 8.

SMOKE DENSITY IN INTERMITTENT RUNNING.

At the end of test 13, with the locomotive standing, the blower was put on, and after two minutes the smoke cleared. Immediately after the close of test 14, with a very heavy fire, the engine was again started at a slow speed and with partly open throttle. With these conditions of running, the smoke cleared entirely after 18 minutes. These conditions are not dissimilar to the intermittent operation to which a locomotive is subjected as it enters a terminal, and the results show the degree of smoke control which the use of briquets makes possible under such adverse conditions.

BEHAVIOR OF COAL AND BRIQUETS DURING COMBUSTION.

Briquets of both small and large size were fired with the ordinary shovel and were handled in much the same manner as coal. In all tests they were fired alone without mixing with coal. It was not necessary to break the briquets in order to handle them readily with the ordinary scoop shovel, and the unbroken briquets burned freely and completely. They disintegrated slowly from the heat of the flame and became more or less porous as they swelled and opened under the action of the heat.

In the process of starting a fire with briquets no difficulty was experienced, the ordinary blower arrangements at the engine house being sufficient. The natural coal was finely divided when fired and did not form so open a mass in the fire box as the briquets. Much of the finer portion was drawn, unburned, through the tubes by the force of the draft.

EFFECT OF HANDLING AND WEATHERING ON BRIQUETS.

To observe the effect on briquets of exposure to the weather, a number of the round and square briquets were placed on the roof of the testing plant. After four months of exposure for the round and three months for the square briquets, no change whatever from their original condition was noticed. They appeared to be entirely impervious to moisture and were still firm and hard.

The briquets were little affected by handling. They were loaded at St. Louis in open gondola cars and shipped to Altoona, where they were unloaded by hand and stacked. They were handled a third time in taking them to the firing platform of the test locomotive. After these three handlings they were still in good condition, very few were broken, and the amount of dust and small particles was practically negligible.

CONCLUSIONS.

The results of the tests justify the following conclusions:

(*a*) The evaporation per pound of fuel is greater for the briquetted Lloydell coal than for the same coal in its natural state. This advantage is maintained at all rates of evaporation.

(*b*) The capacity of the boiler is considerably increased by the use of briquetted coal.

(*c*) Briquetting appears to have little effect in reducing the quantity of cinders and sparks; the calorific value of these, however, is not so high in the briquetted as in the natural fuel.

(*d*) The density of the smoke with the briquetted coal is much less than with the natural coal.

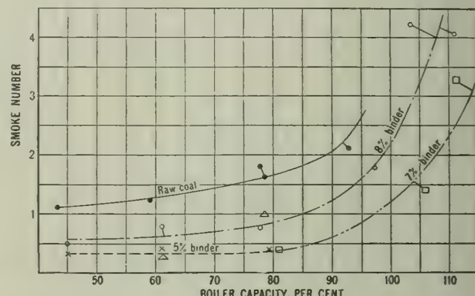
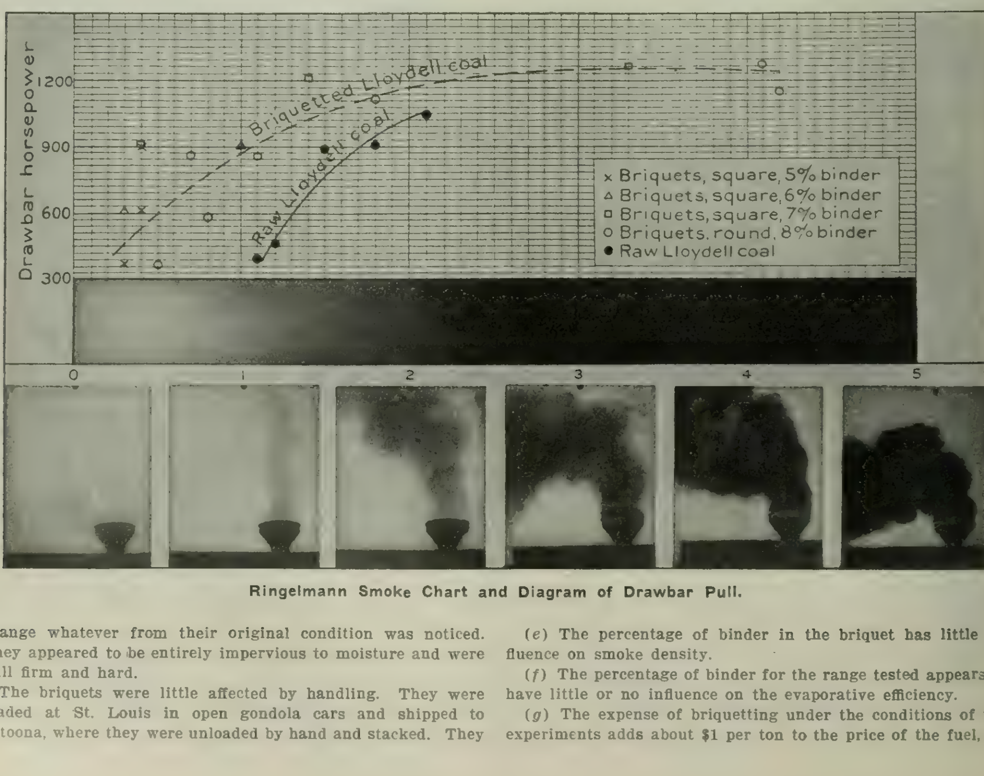


Fig. 8.



Ringelmann Smoke Chart and Diagram of Drawbar Pull.

(*e*) The percentage of binder in the briquet has little influence on smoke density.

(*f*) The percentage of binder for the range tested appears to have little or no influence on the evaporative efficiency.

(*g*) The expense of briquetting under the conditions of the experiments adds about $1 per ton to the price of the fuel, an

amount which does not seem to be warranted by the resulting increase in evaporative efficiency.

(*h*) With careful firing, briquets can be used at terminals with a considerable decrease in smoke.

(*i*) The briquets appear to withstand well exposure to the weather, and suffer little deterioration from handling.

VALUATION OF RAILWAYS IN MINNESOTA.

The Railroad Commission of Minnesota made public on January 25 the results of its valuation of the railways in that state. This is in many ways the most exhaustive physical valuation of railways ever made. It includes the properties of 19 carrying railways, having in Minnesota a line mileage of 7,578 miles, and a track mileage of 10,334 miles, and of 6 switching or terminal railways, having a line mileage of 19 miles and a track mileage of 104 miles. The total miles of line appraised was 7,597, and of all tracks, 10,438. The work was begun January 26, 1906, and took almost three years.

The carrying roads whose properties were appraised are the following: The Chicago, Burlington & Quincy, the Chicago, Great Western, the Chicago, Milwaukee & St. Paul, the Chicago & North Western, the Chicago, Rock Island & Pacific, the Chicago, St. Paul, Minneapolis & Omaha, the Duluth & Iron Range, the Duluth, Missabe & Northern, the Duluth & Northeastern, the Duluth & Northern Minnesota, the Great Northern, the Mason City & Fort Dodge, the Minnesota & International, the Minneapolis, St. Paul & Sault Ste. Marie, the Minneapolis & St. Louis, the Northern Pacific, the Wisconsin Central, the Minnesota & Pacific, and the Illinois Central.

The switching, or terminal, roads whose properties were appraised are the following: The Duluth Union Depot & Transfer, the Minnesota Transfer, the Minneapolis Eastern, the Minneapolis Union, the Minneapolis Western, and the St. Paul Union Depot.

The method used in making the valuation was fully described in *The Railway Age* of December 20, 1907, page 877. It was in brief as follows: At a meeting of the commission and its engineers with officers of the railways on January 26, 1906, it was agreed to take the prices prevailing in 1905 as unit prices of materials for the five-year period, ending June 30, 1907. Using these prices as a basis, the railways submitted estimates, on blanks furnished by the commission, of the cost of reproduction, new, of all the elements of their physical properties, as of June 30, 1906. The commission's engineers, headed by Dwight C. Morgan, Chief Engineer, then went over all the lines, through all the shops, etc., of the roads, and checked the figures of the railways, making the commission's valuation as of June 30, 1907.

The commission sought to find:

(1) "The cost of acquiring presently the lands and other real estate owned and occupied by railways for railway purposes, also the cost of reproducing new the physical elements entering into the construction of the lines, with all appurtenances: assuming that the location, environments and conditions affecting each railway and governing such costs of acquirement and reproduction are as they exist to-day."

(2) "To establish the depreciation in value of the physical properties due to the effect of the elements and to the wear and tear by use, to be determined from an actual examination of the railways, thus enabling a personal knowledge of the standards of construction and maintenance and of the conditions affecting each property."

The results obtained are referred to as (1) "Cost of reproduction" and (2) "Present value of the physical properties."

COST OF REPRODUCTION OF RAILWAY LAND.

The most difficult problem encountered was that of fixing a proper valuation upon land used for right-of-way, yards and terminals. Dwight C. Morgan, Chief Engineer, discusses this vitally important subject at length in his report to the commission, from which the following extracts are taken:

"In reaching a determination of the true value of lands adjacent to the railways from which to consider the cost of reproducing the right-of-way there has been taken into consideration more than 55,000 *bona fide* sales of property, representing more than 1,300,000 acres of land and involving considerations approximating $100,000,000 which, supplemented with the opinions of disinterested parties and with personal observations along each line of railway in the state, formed the basis for establishing the true value of lands abutting the right-of way of the railway companies. The purchase of lands for a right-of-way requires the consideration of two elements: first, the fair value of the land taken, and second, the damages to the residue in consequence of a part of the tract having been taken for railway purposes.

"The variety of conditions and circumstances which attach to each individual purchase of right-of-way, if considered separately, could but lead to a maze of uncertainty because the actual cost of the individual parcels acquired, ranges between a nominal amount and more than ten times the true value of adjacent lands.

"It is, therefore, proper to state that in all of the work relating to the value of lands and to the appraisal in its entirety, the application of rules for the determination of reproduction costs have not been adhered to so rigidly as to preclude the rejection of results which it could be seen were plainly and palpably inconsistent and at variance with either professional intelligence or common sense. Every means which seemed to furnish reliable information has been availed of, and bona fide sales of lands to railways covering the more recently constructed lines consisting of more than 7,000 acres located in different parts of the state for which more than $4,200,000 was expended in its acquirement, have been employed in determining the relation between the average normal value of lands and their average actual cost to the railways.

"Careful and full consideration of all information made available for establishing the value of the right-of-way owned and used by the railways for railway purposes, led to the conclusion that in the state at large, exclusive of the three terminals of St. Paul, Minneapolis and Duluth, a multiple of 3 applied to the true value or normal value of lands as obtained from the transfers, would in general satisfy the conditions. The details of the acquirement of the right-of-way of the Illinois Central between Lyle and Glenville, in the counties of Mower and Freeborn, show that, of 35 per cent. of the right-of-way acquired by condemnation proceedings, the company paid about 4½ times the average true value of the lands, and of the 65 per cent. purchased by agreement the price paid was but 1.7 times the average true value of the lands. From the facts gathered in this and other instances it may be accepted as a general rule that where right-of-way is obtained by condemnation, the price paid per acre is usually more than that of lands purchased by agreement.

"SALES METHOD" USED FOR TERMINALS.

"The basis for the determination of the value of lands in St. Paul, Minneapolis and Duluth was the 'sales method' familiar to all those who have investigated the subject of taxation and real estate values. Each sale is accompanied by two values—the selling price and the assessed value from which the ratio of true to assessed value is obtained. The problem of the value of real estate in these cities was worked out on the general formula: 'As the assessed value of lands sold is to the consideration paid, so is the assessed value of the real etate for the entire assessment district to the full value thereof.'

"During the past six years the general transactions in real estate in St. Paul, Minneapolis and Duluth have been extensive and during the same period the purchase of terminal property by railways in these cities aggregate more than 320 acres, costing the companies nearly $3,000,000. How much the railways paid for these properties in excess of their normal value, was determined from the relation their assessed value and sale price bore to the assessed value and sale price of all other

lands transferred in the respective cities, that were not acquired for railway purposes.

"The following example will illustrate the practical workings of the principle upon which terminal property values were established: An important line owning terminals in St. Paul recently purchased 44.67 acres of land within the city for $54,047.75; this same tract was at the time of purchase assessed at $18,135, which from the records of upwards of 10,000 sales is normally 60 per cent. of its true value; therefore, its probable sale price, under normal conditions, and for purposes other than railway use, would have been approximately $30,225.

"During the period referred to, the railways paid for the property acquired by them, over and above its normal value, an amount sufficient to justify the use of the following multiples: St. Paul, one and three-fourths; Minneapolis, one and three-fifths, and Duluth, one and one-fourth; which, when applied to the normal value of the lands as established from contiguous and surrounding property, formed the basis for measuring the cost of reproducing the existing terminals.

"In the development of these factors, it was fortunately true that the data available included the cost of the newly-acquired terminals of three railway companies; two entering St. Paul and one entering Duluth.

"It may be asserted that the 'sales method' does not represent real value. I cannot presume to try to settle a question so replete with human mystery; it is sufficient answer here that if it does not represent real value, then the multiples used for the determination of right-of-way values must be correspondingly modified so that in the end the same result for right-of-way values, as well as for terminal values, ought to obtain.

"The true value and the right-of-way value of lands returned in the reports of the railways for the present appraisal of their properties is based largely upon opinion. In the cities of St. Paul, Minneapolis and Duluth, commissioners were selected by the railways to return jointly for the several companies their estimates of the value of the terminal lands.

"If the problem in hand contemplated the actual taking over of these properties, there might possibly be no alternative but to adhere to the principle that value depends upon its power to satisfy human want, in which event no economic principle can prevail that is apart from man's estimate of the want satisfying power. We are not, however, confronted by the conditions which such a procedure would impose, but it is sought to determine what it would cost to reproduce these terminal properties in the possession of its present owners as measured by the value of contiguous and surrounding property, primarily without reference to present use, its indispensability for the purposes of transportation, or to strategy of location which, when pre-supposed, must tend to confuse the judgment as between reproduction cost as land and what its value may be regarded because it is utilized for a particular purpose. Cost of reproduction and value as a utility, have no necessary or logical relation, and the fact that the terminal lands or the properties in part or in whole are not actually to be reproduced, or the fact that it might not be possible at all to reproduce them or their equivalents, probably renders their present possession invaluable not only to the owners, but to the communities dependent upon the facilities afforded for industrial activity and commercial supremacy. It is not clear, however, that these elements, which can very conveniently be made the basis for extremely high figures of value, should either merit support or find justification in an estimate purporting to represent reproduction cost.

"As further evidence of the inequalities which spring from individual opinion of the value of lands for railway purposes, in the reports of the railways in this appraisal inconsistencies are not infrequent; sometimes the values are not high enough, more often they are too high. The station of Fridley, in Anoka county, situated on the Northern Pacific and the Great Northern, about 10 miles north of Minneapolis, is not incorporated, it has no business houses and is distinctly an agricultural district. The right-of-way of the Northern Pacific and the Great Northern adjoin and are parallel; the main tracks are about 16 feet apart and a small shed used jointly as a depot serves the patrons of the roads. In estimating the cost of reproducing its right-of-way within the station limits, the Northern Pacific made no distinction as between the value of its right-of-way in the immediate vicinity of Fridley and that situated within several miles north and south of the station, because no local conditions prevailed which justified a right-of-way value higher than that applicable to occupancy through the agricultural region adjoining. The Great Northern entertained a different opinion; and for a class of property which the Northern Pacific estimated the cost of reproduction at $600 per acre the Great Northern estimated at $3,000 per acre.

"In acquiring the property for its entrance into St. Paul in 1901-2, the Burlington, Cedar Rapids & Northern, now the

TABLE I.—MILEAGE, CAPITALIZATION AND VALUATION OF MINNESOTA RAILWAYS.

Railways.	Mileage in Minnesota.	Minnesota share capital.	Railways' estimate cost reproduction, 1906.	Commission's estimates "A" Cost reproduction, 1907.	Commission's estimates "A" Present value, '07.	Commission's estimates "B" Cost reproduction, 1907.	Commission's estimates "B" Present value, '07.	Capital per mile in Minn.	Est. cost reproduction per mile Railway's, 1906.	Est. cost reproduction per mile Com's. estimate "A," 1907.
Chicago, Burlington & Quincy..	23.5	$757,242	$2,957,221	$2,726,670	$2,405,988	$2,451,931	$2,131,250	$32,278	$126,054	$116,226
Chicago Great Western	118	16,743,875	17,639,880	7,769,914	6,714,147	6,595,116	5,539,349	142,392	150,012	66,076
Chic., Mil. & St. Paul	1,202	43,371,044	54,888,175	54,591,393	47,459,752	46,459,470	39,327,829	36,083	45,665	45,418
Chicago & North Western	651	25,068,954	20,914,139	21,214,978	17,463,934	18,541,144	14,790,100	38,492	32,113	32,574
Chic., Rock Island & Pacific....	236	12,095,605	11,280,105	8,716,215	7,779,600	7,493,711	6,577,096	51,207	47,755	36,900
Chic., St. Paul, Minn. & Omaha.	431	16,717,540	29,217,691	26,778,560	22,838,120	22,553,406	18,612,966	38,777	67,772	62,113
Duluth & Iron Range	241	14,232,000	27,267,140	20,564,552	17,771,796	19,226,745	16,433,990	59,095	113,221	85,390
Duluth, Missabe & Northern ...	142	13,155,500	24,031,984	23,087,672	20,909,116	22,328,569	20,150,013	92,565	169,096	162,452
Duluth & North Eastern.......	63	500,000	665,582	859,865	711,737	791,496	643,368	7,874	10,481	13,541
Duluth & Northern Minnesota..	35	200,000	968,039	880,008	675,956	836,477	632,425	5,714	27,658	25,143
Great Northern	2,050	78,268,492	134,823,938	107,074,102	94,415,343	95,406,976	82,748,216	38,181	65,770	52,233
Mason City & Fort Dodge......	27	3,237,425	1,625,205	772,072	622,941	690,926	541,795	118,587	59,531	28,281
Minnesota & International	174	2,645,000	4,944,057	3,966,309	3,409,461	3,709,605	3,152,757	15,160	28,338	22,733
Soo.	540	18,255,913	20,992,511	21,990,682	19,575,254	19,392,305	16,976,876	33,834	38,906	40,756
Minneapolis & St. Louis	378	20,884,937	21,845,196	16,622,245	14,276,189	14,185,150	11,839,093	55,184	57,721	43,921
Northern Pacific	967	55,898,480	86,817,468	69,397,955	61,099,563	60,679,409	52,381,018	57,801	89,772	71,760
Wisconsin Central	24	1,235,380	4,238,241	2,780,323	2,455,906	2,201,481	1,877,064	52,389	179,586	117,810
Western Minnesota & Pacific...	244	10,539,656	11,959,545	6,561,652	5,645,689	5,763,945	4,847,982	43,190	49,008	26,889
Illinois Central	30	1,172,648	819,544	944,302	800,845	798,458	655,001	38,868	27,164	31,300
Duluth, Union Depot & Terminal	0.4	....	1,018,170	910,698	817,541	821,545	728,388	......	2,558,217	2,288,185
Minneapolis Eastern	0.9	....	969,164	897,460	847,488	639,268	589,296	......	1,023,404	947,688
Minneapolis Union	3	....	7,773,750	4,321,250	4,021,728	3,364,425	3,064,904	......	2,955,798	1,643,061
Minneapolis Western	2	....	1,745,899	1,078,831	966,210	849,883	737,262	......	1,033,076	638,362
St. Paul Union Depot.........	0.6	....	5,495,150	4,354,202	4,184,311	2,847,343	2,677,453	......	9,812,767	7,775,360
Minnesota Transfer	12	....	5,777,987	2,873,283	2,591,546	2,332,762	2,051,025	......	462,239	229,863
Total	7,597	....	500,675,781	411,735,195	360,480,161	360,951,548	322,565,107	......	....	....

NOTE.—Average capitalization of railways in Minnesota (except the six switching roads, last-mentioned in table), $44,206 per mile; average cost of reproduction of 19 carrying roads, as estimated by themselves, 1906, $65,909 per mile; Commission's estimate "A" cost of reproduction of carrying roads, 1907, $52,430 per mile; Commission's estimate "A," present value, $45,799 per mile; Commission's estimate "B," cost of reproduction of carrying roads, 1907, $46,202 per mile; estimate "B," present value, $39,571 per mile; average valuation placed on six switching roads (last mentioned) by roads themselves, $1,216,152 per mile; Commission's estimate "A," cost of reproduction of switching roads, 1907, $770,933 per mile; estimate "A," present value, $717,160 per mile; Commission's estimate "B," cost of reproduction of switching roads, $579,718 per mile; estimate "B," present value, switching roads, $525,945 per mile.

Chicago, Rock Island & Pacific, purchased a total of 45.55 acres for $137,299. The estimated cost of reproducing this property to-day as determined from the sales method using the established multiple for St. Paul of one and three-fourths is $255,199. The commissioners appointed by the railways placed a value on this same property amounting to $978,263.

"The estimates prepared under my direction and the returns made by the railways, in some instances approximate very closely and in other instances disclose wide variations in the comparative estimates of cost, and by far the largest single factor responsible for this difference relates to the lands for right-of-way and terminals."

TWO ESTIMATES OF COST OF REPRODUCTION MADE.

The views expressed by Mr. Morgan are shared by the Commission. Owing to the differences of opinion that developed between the Commission and the railways as to the proper valuation to be placed on land, the Commission decided to prepare two sets of tables, Estimates "A" and "B." In Estimate "A" the valuation upon land used by railways is based upon what the Commission's investigations show it probably now would cost the roads to acquire the land for railway purposes; in Estimate "B" the valuation upon land is based upon what it probably would now cost—assuming it were not being used for railway purposes—to acquire it for other than railway purposes. Table I, presented herewith, entitled, "Mileage, Capitalization and Valuation of Minnesota Railways," contains, among other data, the railways' estimates of the cost of reproduction of their properties, and the Commission's estimates "A" and "B" of cost of reproduction.

The difference between the Commission's estimates are due entirely to its having made different allowances for the cost of reproduction of land used for right-of-way and terminals. Estimate "B" is the one that the Commission regards as correct. Table II, entitled "Commission's Estimates of Cost of Reproduction of Land for Railway Purposes," gives the two estimates of land values, and the ratios between them for the various roads.

TABLE II.—*Commisison's Estimates of Cost of Reproduction of Land Used for Railway Purposes.*

Railways.	Estimates "A."	Estimates "B."	Av. ratio of estimates "A" to "B"
Chic., Burl. & Quincy.....	$770,586.87	$567,165.17	1.359
Chicago Great Western....	1,841,975.58	1,006,676.50	1,829
Chic., Mil. & St. Paul.....	11,563,590.19	6,355,933.84	1.819
Chic. & North Western.....	2,470,078.37	1,053,811.51	2.343
Chic., Rock Isld. & Pacific..	1,466,031.22	658,962.88	2.224
Chic., St. P., Minn. & O...	7,275,263.37	4,245,392.75	1.713
Dul. & Iron Range	1,258,388.03	625,556.25	2.011
Dul., Missabe & Nor.......	842,419.93	547,653.34	1.538
Duluth & Northeastern ...	18,000.00	6,000.00	3.000
Duluth & Nor. Minn......	13,094.10	4,364.70	3.000
Duluth, Union Dep. & Tr.	379,422.21	303,537.74	1.250
Great Northern	13,918,819.32	7,479,957.80	1.861
Mason City & Fort Dodge..	73,888.26	25,707.42	2.874
Minnesota Transfer	919,791.06	494,315.20	1.860
Minnesota & International.	117,960.45	39,586.15	2.979
Minneapolis Eastern	593,834.89	371,146.82	1.599
M., St. Paul & S. Ste. M...	2,974,028.98	1,589,445.92	1.871
Minneapolis & St. Louis...	3,398,754.84	1,872,522.04	1.815
Minneapolis Union	2,216,103.02	1,385,064.43	1.599
Minneapolis Western	521,324.85	326,130.46	1.599
Northern Pacific	15,385,078.47	9,498,099.27	1.619
St. Paul Union Depot.....	3,069,563.95	1,754,036.57	1.749
Wisconsin Central	1,127,785.85	659,372.31	1.710
Western Minnesota & Pac..	836,537.23	342,191.50	2.444
Illinois Central	149,436.66	62,628.97	2.386
Total	$73,201,757.70	$41,275,259.54	1.7735

Mr. Morgan describes fully the examination of the physical properties by the Commission's engineers. (See *The Railway Age*, December 20, 1907, page 877.) The following extracts are taken from the parts of his report in which he discusses "units of cost," "adaptation and solidification or roadbed," "contingencies and interest during construction."

UNITS OF COST.

"The units of cost, which are vital to the work, are the result of much research. The units of cost used by the railways in their reports were compiled in detail and furnished not only very instructive data, but were very interesting in the range of prices put upon identical items upon which there should be no very material differences.

"For example: The price of steel rails varied from $20 to $31.50 per ton, f.o.b. St. Paul or Duluth.

"Bridge steel of the same class ranged from 2½c. to 4½c. per lb.

"Locomotives of the same type and weight varied from 6¼c. to 12¾c. per lb.

"Engineering, superintendence and legal expenses, between 1½ per cent. and 15 per cent.

"Contingencies, between 5 per cent. and 50 per cent.

"Interest during construction between 1 per cent. and 12 per cent.

"It became an impossible task to attempt to reconcile some of these differences, but from the extensive data made available it was possible to reach conclusions and establish units of cost that it is believed are fairly representative.

"Regarding other items entering into the estimates, it was wholly impracticable to use unit constants, and in respect to these each property was considered separately. Several important subjects in this class may be mentioned as, the cost of grading, which varies with the character of the work, ranging on different sections of the same line and for different lines, between 17 cents and 36 cents per cubic yard for earth work; solid rock, between $1 and $1.50 per cubic yard, according to its character which in some localities is ordinary lime rock, while in other localities a very hard basaltic rock is encountered; the cost of clearing and grubbing in heavily timbered regions cannot be made the basis for that class of work in the sparsely timbered sections of the state.

ADAPTATION AND SOLIDIFICATION OF ROADBED.

"Adaptation and solidification of roadbed was considered separately by but one railway. In most instances, however, the prices employed by the railways are regarded as sufficiently high in themselves to give recognition to this element of cost.

"It appears to be a well established fact that in constructing a railway the engineer is seldom, if ever, permitted to fully complete his work before the actual operation of the line is undertaken. The investment in the project is large and it is important to start an income account just as soon as the construction work has advanced sufficiently to permit it; therefore, upon the opening of a new line for the purposes of transportation it cannot be assumed that with the inauguration of service the property represents a finished product.

"Adaptation in its application to the problem of reproduction cost is the adjustment of the physical line to its environments and purposes. Solidification of roadbed is its settlement to a stable condition.

"Cost of reproduction, as given interpretation in this appraisal, has been taken to imply that the property to be reproduced must be considered in the light of its perfectness, of its stability and its fitness as a working tool.

"If, in preparing such an estimate, fair units of cost are applied to the elements entering into the construction of the line up to the time it becomes available for use, it is apparent that the already established line has, in addition thereto, the expenditures of seasoning, which it is impossible to incorporate in the accounts of any newly constructed railway. Bearing in mind that equivalent conditions are sought, possible only in the progress of time, it seemed desirable to consider this element of cost separately because it avoids disturbing normal construction costs and provides for the policing of the line until such time as, it may be reasonably regarded, the property is unaffected by the deficiencies attributable to newness.

CONTINGENCIES.

"In preparing estimates for the construction of a projected line of railway it is customary for engineers to add a percentage to the estimated cost to cover unforeseen conditions that develop in the execution of the work.

"Engineers differ as to the percentage to be added to estimates of cost. In many cases they are governed by their own experiences, but the usual amount added for projected lines is 10 per cent. of the estimated cost.

"The estimates I have prepared of the railways of Minnesota are not for projected lines of railway, but for the reproduction of existing railways, in which many of the contingencies met with in the original construction and in the development of the properties during the past thirty years, have been made

known to me by officers of the respective companies associated with the construction and development of the properties.

"From the careful examination made of the lines and from a study of the original construction profiles, I was enabled to observe the truthfulness of the representations made to me of difficulties encountered and expenditures made in constructing and perfecting the lines, and it was possible to include under their proper headings many things which otherwise would have been unknown and consequently disregarded in the estimate of reproduction cost.

"Considering the detail with which the estimates have been prepared and the inclusion in them of many items of a contingent nature, it does not appear justifiable to consider an estimate of the cost of reproducing a railway, as synonymous with an estimate for constructing a projected line. The essential difference rests in the fact that in reproduction cost the estimate is prepared in the light of known conditions, whereas for a projected line the contingencies are wholly unknown. These facts have been instrumental in reaching a determination that 5 per cent. for contingencies is fair under the circumstances attaching to the work of this appraisal.

"Such data as appeared to reflect the normal condition of the money market, aided by the consensus of opinion as expressed in the reports of the railways seemed to justify 4 per cent. per annum as a fair rate of interest to apply to the estimated cost of reproduction.

"The rate of interest as established is applied to the total estimated cost of reproduction assuming that the necessary funds would be fully employed one-half of the estimated time required to build the respective lines, which, according to their mileage, carried from one to eight years."

"PRESENT VALUE."

The plan of appraisal, as indicated above, contemplated the ascertainment of the "present value" of the properties, as well as their cost of reproduction. With few exceptions the railways did not supply data "involving such modification of the figures of reproduction costs new, as might reasonably be attributed to the action of elements and to wear and tear by time and use." Mr. Morgan attributes this to divergence of views between railway officers, some thinking there is no depreciation in the physical properties of a railway—that an old line, through thorough maintenance and for other numerous and good reasons, is more serviceable and valuable than a new one. The Commission's engineers, however, made estimates of "present value" of the properties to correspond to estimates "A" and "B" or cost of reproduction; and these for the various roads are given to the table entitled "Mileage, Capitalization and Valuation of Minnesota Railways." Table III, entitled "Cost of Reproduction and Present Value of Physical Properties," gives in detail the Commission's estimate "A" of the cost of reproduction new and the present value after depreciation of the various elements entering into the physical properties.

In the report appears a similar table giving the Commission's estimate "B" of the probable cost and present value of the various elements, but this differs from estimate "A" only because of the difference of $37,515,054 in the appraisal placed in the two estimates on the single item of land.

It will be noted that there are really four valuations: (1) Estimate "A," total cost of reproduction new, of all roads, $411,735,194, or $52,430 per mile for the carrying and $770,933 per mile for the switching roads. (2) Estimate "A," total present value (1907), $360,480,160, or $45,799 per mile for the carrying roads and $717,160 per mile for the switching roads. (3) Estimate "B," cost of reproduction, new, $373,820,141, or $46,203 per mile for the carrying roads and $579,718 per mile for the switching roads. (4) Estimate "B," present value, $322,565,106, or $39,571 per mile for the carrying roads and $525,945 for the switching roads. The average capitalization per mile of the carrying roads ($44,206) is less than either of the first three valuations for them. In a way the Commission really made six valuations. By omitting from estimates "B" $12,858,593 which it had allowed for adaptation and solidification of roadbed, it reduced those estimates to, cost of reproduction new, $360,961,548, and present value, $309,706,514. It is evident that all these estimates were made so that, whatever the courts might ultimately hold to be a fair basis of valuation, the Commission would have available a valuation that would meet the courts' views.

ORIGINAL COST OF CONSTRUCTION.

The Commission also desired to ascertain the original cost of construction of the various properties, but Mr. Morgan states investigation has shown that data on this point for most of the large roads is entirely unavailable.

TABLE III.—*Cost of Reproduction and Present Value of Physical Properties, All Lines.*

Subject.	Cost of reproduction new.	Present value.
Land for right of way, yards and terms	$73,201,757.70	$73,201,757.70
Grading, clearing and grubbing	56,006,782.11	56,006,782.11
Protection work, rip-rap, retaining walls	2,419,292.42	2,419,292.42
Tunnels	253,250.00	215,262.50
Cross ties and switch ties	17,491,500.06	9,627,539.85
Ballast	9,413,351.34	9,413,351.34
Rails	33,010,087.72	25,199,668.20
Track fastenings	5,936,740.60	4,543,054.70
Switches, frogs and railroad crossings..	1,389,363.52	962,741.45
Track laying and surfacing	5,340,689.05	5,340,689.05
Bridges, trestles and culverts	19,567,524.80	14,518,834.30
Track and bridge tools	201,918.21	151,438.71
Fences, cattle guards and signs	2,768,394.93	1,403,082.54
Stock yards and appurtenances	559,896.21	349,759.71
Water stations	1,606,164.62	1,144,535.43
Coal stations	717,519.88	507,703.49
Station buildings and fixtures	5,855,258.56	4,097,249.08
Miscellaneous buildings	4,344,684.37	3,403,171.52
Steam and electric plants, gas plants...	797,484.52	656,069.99
General repair shops	4,123,119.91	2,959,019.07
Shop machinery and tools	1,831,671.22	1,484,756.11
Engine houses, turntables & cinder pits	2,837,988.58	1,874,436.40
Track scales	184,130.00	129,474.45
Docks and wharves (inc. coal & ore)..	6,065,496.69	5,392,960.85
Interlocking plants	403,071.57	293,197.56
Signal apparatus	155,766.71	126,217.89
Telegraph lines and appurtenances....	1,316,048.16	994,227.19
Telephone lines and appurtenances	94,526.17	70,926.17
Adaptation and solidification of roadbed	11,743,007.15	11,743,007.15
Total	$269,636,486.78	$238,230,206.93
Engineering, superintendence, legal expenses, 4½ per cent............	12,133,641.89	12,133,641.89
Total	$281,770,128.67	$250,363,848.82
Locomotives	17,090,953.40	12,608,422.67
Passenger equipment	6,616,170.78	4,554,442.63
Freight car equipment	46,911,106.58	34,068,095.26
Miscellaneous equipment	1,326,666.16	876,057.17
Marine equipment	43,500.00	32,625.00
Total	$353,758,525.59	$302,503,491.55
*Freight on construction material.....	3,635,535.03	3,635,535.03
Total	$357,394,060.62	$306,139,026.58
Contingencies, 5 per cent., on above ..	17,869,703.02	17,869,703.02
Stores and supplies in Minnesota	5,210,010.98	5,210,010.98
Interest during construction	31,261,419.93	31,261,419.93
Grand totals	$411,735,194.55	$360,480,160.51

*For cross ties, rails, track fastenings, switches and frogs.

In the preface by the Commission to Mr. Morgan's report, the Commission says:

"Another important work in connection with valuing the properties, to be undertaken by the Commission, is to establish the original cost of the lands to the railways. It must be apparent to all that if the constantly increasing value of railway properties is to be taken as the basis for computing proper returns without regard to the original cost of the same, it is only a matter of time when transportation companies will, by absorption, own a disproportionate share of the wealth of the country."

The shipments of fresh flowers to Berlin during the winter from Italy and the French Riviera have become so important as call the attention of the railway authorities, who questioned whether space could be afforded for them on the express trains, and asked the Berlin Chamber of Commerce whether the local green-houses could supply the demand at reasonable prices, in case they should not be accepted on such trains. The answer was that it could not be, and that even the florists had nothing to gain by such exclusion.

General News Section.

The timber-treating plant of the Mexican Central at Aguascalientes is now treating with Ebano oil 3,500 ties a day. The amount of oil absorbed by each tie is about three gallons. The ties thus far received are mostly from the United States (yellow pine), but some have been received from Japan.

A. W. McLaren, of the New York Central Lines, Chicago, who has been promoted to the position of Chief Clerk to Vice-President Daly, with office at New York, was the recipient on January 30 of a handsome gold diamond studded watch fob, the gift of officers and employees of the New York Central Lines at Chicago.

J. Sullivan, Traveling Engineer of the Cincinnati, Hamilton & Dayton, has been nominated by Governor Judson Harmon, of Ohio, as a member of the State Railroad Commission, to succeed J. C. Morris. Mr. Morris was nominated for another term by Mr. Harmon's predecessor, Governor Harris, and was confirmed by the Senate, and it is said that he will resist the action of Gov. Harmon superseding him.

The government has brought suit in the United States District Court at Chicago against the Atchison, Topeka & Santa Fe for violation of the federal law regulating the time service of telegraphers. Seven violations are charged. It is charged that the road keeps operators on duty at Corwith, Ill., from 6.30 a.m. to 6.30 p.m., with three hours off at noon, and that this is an evasion of the law. This will be made a test case to determine the true meaning of the law.

The St. Louis & San Francisco now numbers its trains by divisions. Trains on the Eastern division will be numbered below 100, except branch trains, which will be numbered between 1,200 and 1,300. The Northern division trains will be numbered above 100 and below 200, the Ozark division trains above 200 and below 300, etc., the highest numbers to be on the Southeastern division, where trains will be numbered over 900 and under 1,000. Foreign line trains on any division will be numbered over 1,300 and under 1,400. Through trains out of St. Louis and Kansas City will carry their numbers through to ultimate destination regardless of the numbers of the divisions they run over. Through trains which do not run from St. Louis or Kansas City take the series of numbers which are assigned to the division over which they run.

Superintendent H. P. Lincoln, of the Eastern and Susquehanna divisions of the Pennsylvania Railroad, has written a letter of commendation to Brakeman George B. Donly, of Williamsport, for prompt and courageous action when an engine blew up near Pine Creek Junction January 7. The train, a freight, was moving at about 30 miles an hour. Suddenly the crown-sheet of the locomotive dropped, blowing open the firebox door and forcing out steam and burning coal. The engineman and fireman at once jumped off, but Donly, who had been shoveling down coal on the tender, jumped over to the side of the tender and, holding on with his hands, worked himself to the engine, jumped to the engineman's seat and applied the airbrakes. As the explosion had not interfered with the engine's running, and as the train was running down grade toward Newberry, there might have been a collision or other smashup if the train had not been promptly brought under control. Donly was commended for his physical courage as well as for his quick wit. The act was all done in a few seconds, while live steam was still escaping.

Private Car Owners' Wishes.

The changes which are desired in the Master Car Builders' rules for the interchange of cars, which have been drawn up by the Individual Car Owners' Association, have been considered and approved by a committee of private car owners and have been sent to the officers of the M. C. B. association. The committee transmitting the proposed rules consists of J. M. Belleville, J. B. Frost, F. H. Stark, V. B. Ward and Robert J. Bailey. Mr. Bailey, who is Secretary of the Individual Car Owners' Association, represents the Monongahela River Consolidated Coal & Coke Co. Among the changes proposed are a number of reductions in prices of couplers and coupler parts and journal bearings. The private owners desire to have representation on the Arbitration Committee of the Master Car Builders' Association; and they also desire that anyone owning 100 or more cars shall be made eligible to membership in the association.

Proposed Workmen's Compensation Act in New York.

On January 13 there was introduced in the assembly of the state of New York by Mr. McGregor a bill entitled "An Act respecting compensation to workmen for accidental injuries suffered in the course of their employment." While the text of the bill is considerably abbreviated from that of the law in force in England since July 1, 1907, it is based wholly upon the English law and is to all intents and purposes the same in scope and principle. As its provisions may be taken as representative of the views of organized labor the bill is of more than passing interest even at its present stage. The substance of the bill is as follows:

"Workman" is defined to mean every person who is engaged in an employment, whether by way of manual labor or otherwise, and whether his agreement is one of service, apprenticeship or otherwise, and is expressed or implied, is oral or in writing. The liability of an employer for personal injury to an employee by accident arising out of and in the course of his employment is set forth as follows:

The employer shall not be liable in respect of any injury which does not disable the workman for a period of at least two weeks from earning full wages at the work at which he was employed.

When the injury was caused by the personal negligence or wilful act of the employer, or of some person for whose act or default the employer is responsible, nothing in this act shall affect the civil liability of the employer, but in that case the workman may, at his option, either claim compensation under this act, or take the same proceedings as were open to him before the passage of this act.

If it is proved that the injury to a workman is attributable solely to the serious and wilful misconduct or serious neglect of that workman, any compensation claimed in respect of that injury shall be disallowed.

If any question arises in any proceedings under this act, or as to the amount or duration of compensation under this act, the question, if not settled by agreement, shall be settled by arbitration.

If, within six months from date of injury or death, an action is brought to recover independently of this act for injury caused by any accident, and it is determined in such action that the injury is one for which the employer is not liable in such action, but that he would have been liable to pay compensation under the provisions of this act, the action shall be dismissed, but the court in which the action is tried shall, if the plaintiff shall so choose, assess such compensation and shall be at liberty to deduct from such compensation all the costs which, in its judgment, have been caused by the plaintiff bringing this action instead of proceeding under this act.

When death results from injury it is provided that the workman's dependants shall be entitled to a sum equal to the amount of his earnings in the employment of the same employer during the three years next preceding the injury but not exceeding $1,500. Any weekly payments that may have been made are to be deducted from this sum. Where total or partial incapacity results from the injury the employee shall be entitled to a weekly payment during incapacity not exceeding 50 per cent. of his average weekly earnings during the previous 12 months, not exceeding $10 per week, and in the aggregate not exceeding $1,500. He shall at the request of the employer be required to submit himself to medical

examination or payment may be withheld, and this examination may be required from time to time. Any matter in dispute may be settled by submission to a committee representing employer and workman or an arbitrator appointed by a judge of the Supreme Court. Attorney's fees shall be determined by the arbitrator and he may submit any question of law to the decision of a judge of the Supreme Court.

The provisions of the bill apply only to accidents occurring after January 1, 1910.

Report of the Interborough Rapid Transit.

The report of the Interborough Rapid Transit Co. to the New York Public Service Commission for the year ended June 30, 1908, gives the following figures:

PASSENGERS CARRIED.

(a) By Months.

Month.	Total No.	Daily Av.	Month.	Total No.	Daily Av.
July, 1907..	34,247,071	1,104,757	Feb., 1908..	40,758,224	1,405,456
Aug., 1907..	34,007,461	1,097,015	Mar., 1908..	43,994,740	1,419,185
Sept., 1907..	35,424,663	1,180,822	Apr., 1908..	43,760,832	1,458,694
Oct., 1907..	42,925,194	1,384,684	May, 1908..	42,946,254	1,385,363
Nov., 1907..	41,131,899	1,371,063	Jun., 1908..	38,735,576	1,291,186
Dec., 1907..	42,548,192	1,372,522			
Jan., 1908..	42,805,534	1,380,824	Total. ...	483,285,640	1,320,453

(b) By Lines.

Elevated.	Passengers.	Car-miles.	Lines.	Passengers.	Car-miles.
2d Ave. ..	45,189,264	9,900,261	Sub. Div..	200,439,776	44,005,213
3d Ave...	122,624,928	26,074,326			
6th Ave...	84,054,338	16,343,768	Total ..	483,285,640	108,589,822
9th Ave..	30,977,334	12,266,254			

General Statistics.

Owned and leased:	1907.	1908.	Change.	
Miles of first track	59.80	62.31	Inc.,	2.51
Total track mileage..........	190.53	197.30	"	6.77
Thereof elevated (3d rail).	134.02	134.02	"	.....
Thereof subway (3d rail).	56.51	63.28	"	6.77
Trackage rights, single mlge..	.....	.....		...
Cars total No., all kinds......	2,270	2,510	Inc.,	240
Passenger, exclusive open cars	2,152	2,392	"	240
Total seating capacity.......	.....	120,824		...
Average No. operated.......	.....	.....		...
Total No. trips made	.....	1,783,452		...
Total (passenger) car-mile run.	98,792,770	108,589,822	Inc.,	9,797,052
Total No. (passgr.) car hours.	6,281,871	6,752,924	"	471,053
Passengers, No. of 5-cent. fares.	449,287,884	483,285,640*	"	33,997,756
No. of transfers collected....	....	14,962,300		....
Number carried free	No record.	No record.		.....
Accidents total number	.....	3,132		.....
No. causing personal injury..	.....	3,211		.....
No. of persons killed	39	53	Inc.,	14
No. of persons injured.........	85	3,868	"	3,783
Officers and employees, June 30	9,015	9,521	"	506
No. of motormen, June 30.....	557	595	"	38
No. of conductors, June 30....	531	530	Dec.,	1
Total pay officers and employees	$6,148,917	$6,610,722	Inc.,	$461,805

*16,415,372 of these paid 4-cent fares.

Income Account.

	1907.	1908.	Change.	
Pasgr. rev., inc. chartered cars.	$22,303,633	$24,000,128	Inc.,	$1,696,495
Freight and other car earnings.	60,169	59,171	Dec.,	998
Advertising, news privileges, etc	404,333	451,000	Inc.,	46,667
Rents	11,669	19,986	"	8,317
Sale of electric current	107,775	145,629	"	37,854
Telegraph privileges	15,000	15,000		.....
Miscellaneous	....	8,591	"	8,591
Total earnings st. ry. oprtns.	$22,902,580	$24,699,505	Inc.,	$1,796,925
Maint. of way and structures...	$1,169,165	$1,334,509	Inc.,	$165,344
Maintenance of equipment	1,515,431	1,798,336	"	282,905
Operation of power plant......	1,983,329	2,167,510	"	184,181
Operation of cars	3,907,878	4,244,492	"	336,614
Damages, incldg legal expenses.	202,535*	363,065	"	160,530
General expenses	814,993	814,782	Dec.,	211
Total st. ry. op. expenses	$9,593,331	$10,722,695	Inc.,	$1,129,364
Taxes accrued	$1,377,965	$1,586,466	Inc.,	$208,501
Operating income.†	$11,931,283	$12,390,344	Inc.,	$459,061
Non operating income	$277,055	$579,965	Inc.,	$302,910
Gross income.‡	$12,208,339	$12,970,309	Inc.,	$761,970
Interest on funded debt	$766,667	$1,250,000	Inc.,	$483,333
Rentals: Interest	1,809,680	1,809,680		....
Dividends	4,116,000	4,200,000	Inc.,	84,000
City of New York........	1,789,548	1,991,985a	"	202,437
Cash	10,000	10,000		.....
Amortization of debt discount and expense	....	7,985	Inc.,	7,985
Total charges to income.....	$8,491,895	$9,269,650	Inc.,	$777,755
Surplus for year	$3,716,444	$3,700,659	Dec.,	$15,784
Previous surplus	2,295,699	1,224,241	"	1,071,458
Total surplus	$6,012,143	$4,924,900	Dec.,	$1,087,243
Dividends on stock	3,150,000	3,150,000		.....
Credits to corporate surplus....	1,062,902b	56,843	Dec.,	1,119,745
Surplus June 30.............	1,799,241	1,831,743	Inc.,	32,502

*In 1907 the item "Legal expenses in connection with damages" was included in "Miscellaneous Legal Expenses" (under General Expenses).

† Gross earnings less operating expenses and taxes.

‡ Applicable to corporate and leased properties.

a Measured by the Interest and Sinking Fund on bonds issued by the City of New York for the construction of the rapid transit railway.

b Charges.

Income Statement for the Quarter Ended September 30th, 1908.

	Division. Elevated.	Subway.	Total.
Earnings from operation	$3,093,838	$2,235,049	$5,328,888
Operating expenses	1,587,198	1,088,511	2,675,710
Net earnings	$1,506,639	$1,146,538	$2,653,178
Other income	129,330	207,845	337,175
Gross income	$1,635,969	$1,354,383	$2,990,353
Deductions from Income:			
Interest on funded debt........	....	$500,000	$500,000
Taxes:			
On property used in operation	$30,000	15,000	45,000
On earnings and capital stock	42,626	......	42,627
On other than above	310,000	......	310,000
Rentals	1,462,655	*535,773	1,998,429
Amortization, debt discount & exp..	....	3,108	3,108
Total	$1,845,282	$1,053,881	$2,899,164
Net income	209,312†	300,502	91,189

*Rental due City of New York measured by interest and sinking fund on city bonds issued for construction of rapid transit railway.

† Loss.

New Freight Terminals for the Alton.

The Chicago & Alton is planning to build new freight terminals at three important points—Chicago, Kansas City and Joliet. The new Chicago yards will be at Summit, just outside the city limits and about 12 miles from the Union Station. The company bought 295 acres of land adjoining its right-of-way about four years ago for this purpose, as it was then evident that track elevation and the growing need for larger terminal facilities would compel the construction of yards outside the city. The new yards will relieve the Brighton Park yards of freight business, but the latter will continue to be used for passenger business as at present. As a result of the removal of the freight business from Brighton Park to Summit about 20 acres of the former yards will be abandoned and will be sold or used for manufacturing sites. The Summit yards will have capacity for 1,000 freight cars or more.

Track elevation at Joliet will compel the abandonment of the present yards, having a capacity of 800 cars. New yards are to be built at South Joliet with a capacity of 1,000 cars, 100 acres of land having been bought many years ago for this purpose.

At Kansas City such yards as the road has are at Twelfth street and Lydia avenue, near the Union Station. They are small and badly crowded, as well as inconvenient, it being necessary to turn passenger equipment on the locomotive turntable. A tract of 42 acres has been bought in East Bottoms, where yards having an ultimate capacity of 1,500 cars are to be built. The Twelfth street yards will be used only for local freight purposes. The present freight house at that point will be torn down and rebuilt to double the present capacity. The capacity of the Grand avenue freight house has recently been doubled. The cost of these three yards, exclusive of real estate, will be $300,000, $85,000 and $200,000, respectively, for Chicago, Joliet and Kansas City.

Queensboro Bridge to be Opened.

The Queensboro Bridge Celebration Committee has announced June 12 as the date for the official opening of the cantilever bridge across the East river at Blackwell's Island, New York City.

The New York State Barge Canal.

The annual report of the State Engineer and Surveyor of New York gives the present status of the barge canal. During the calendar year 1908 awards to the amount of $13,421,752 were made, so that there are now in force contracts for building 194 miles of canal, the contract price for these being $35,739,213, including all alterations to date. This means that nearly one-half of the whole project, both in length and in cost of construction, is at present under contract. Most of the important plans for the remainder of the barge canal are completed. During 1908 nearly $5,500,000 worth of construction work has been done, two and one-half times that of 1907.

The report speaks in favor of securing Federal aid for the

canalization of the Hudson between Congress street bridge, Troy, and Waterford, and points out the need of improved terminal facilities for canal traffic at the ports of Buffalo and New York, so that the capacity of the barge canal shall not be limited by the present inadequate provisions.

The Railway Business Association—An Inside View.

BY G. M. BASFORD,
Acting Secretary of the Association.

For 60 days out of the 120 days of the life of the Railway Business Association it has been the good fortune of the writer to be associated with this unique movement, and it is with regret that pressure of his own work makes it necessary for him to turn over to other hands the official duties of the position of Secretary. A pleasant obligation will be fulfilled if some additional light may be thrown upon the accomplishments and possibilities of the work of the association from the inside.

It is doubtful if any ascociation has ever before in such a brief period received such co-operation and recognition. Never before have the commercial interests dealing directly with the railways been organized in such a way as this.

For very well understood reasons the railways have not yet begun to share in the return of prosperity and while many commercial interests are busier than they were, those concerned in supplying railways with material and equipment have been unable to secure orders sufficient to put their men back on full time. This serious situation brought together our members in an effort to effect a change in public opinion which would lead to an improvement of the general railway situation and aid in restoring normal conditions.

This movement was not only necessary but timely. The pendulum of popular sentiment had swung adversely to the railways and swung too far, as indicated by a large amount of legislation, which affected the transportation interests by increasing the cost of railway operation, while curtailing revenues.

At a recent dinner in New York the statement was made that during the years 1906 and 1907 the British Parliament enacted 114 laws for the government of Great Britain and Colonies, whereas during the same time Congress and the state legislatures of the United States enacted 25,000 laws. It is reasonable to doubt that 12,000 wise laws, per year, can be enacted in any country. The thinking people who constitute the safeguard of the nation had begun to recognize that the railway interests could not be adversely affected by restrictive legislation without affecting all other human interests. There has been no general sentiment in favor of weakening restriction of railways, but there is a growing conviction that restriction must be intelligent.

The way in which the members of the Association rallied to the call is scarcely more impressive than the ready support of the commercial public. By a combination of very important manufacturing concerns into a good-natured association, public opinion has crystallized to a gratifying extent and legislators, both state and national, have heard from the people in a voice devoid of quavering.

Some of the largest commercial associations have been ready and willing at the suggestion of the Association to make pacific utterances. Responses from the largest cities and from national associations covering the entire country have been surprising. The voice asking for legislative quiet and for true statesmanship with respect to railway enactments has come from many directions and from many interests, some of them being entirely separated from railway affairs. Those, for instance, who make and sell shoes have co-operated through their national organizations to indicate appreciation of the fact that the welfare of those concerned in transportation is involved with their own welfare to such an extent as to justify a long step from their beaten paths to correct the unfortunate situation in which our members find themselves.

One reason for this co-operation lies in the recognition of the fact that the personnel of the Association is remarkable in including men known for the most successful engineering, manufacturing and commercial achievements. Some of our constitutent concerns are as large commercially as a fairly large railway. The number of men employed by such concerns as are represented in our membership is as great as the number employed by the railways. Our Association has conflicting competitive interests, all united in the bond of good fellowship to carry out the plan which makes for the common good. This plan is conducted absolutely independently of the railways. It has been shown for the first time to be possible for influence outside of the railways to band together to promote by organized action a realization of the inter-dependence between the public and the transportation interests.

Our activities are by this time very well known. In four months the fact has been demonstrated that the people are ready not only to acknowledge what the railways have done for the country, but to give transportation questions the consideration which they deserve. To turn the light on obscure questions affecting the relation between the people and the railways, tending to prevent extremes in legislation, constitutes a permanent work for this organization.

Not all the work already accomplished has been easy. The railways as well as the public have their part to do and the work of the Association will include efforts to bring about a permanent friendly relationship. This cannot be done in a short time.

One of the most effective elements of the success of this Association is the generous good fellowship of its members. The organization already extends into 16 states and often competitive interests in the same city are united in local achievement. No discordant notes are heard in the conduct of its affairs and it is inconceivable that any will be heard under the leadership of such a personality as that of the president of the Association, sustained by, and enjoying, the constant counsel of the able, energetic and potential men who compose its general executive committee. These two months in the executive office have been so crowded with important development that they have seemed exceedingly short.

At the outset, reasonable doubt of the possibilities of the movement may have been justified. Some may have felt that it was too intangible and experimental to win their instant support. Now there is no room for doubt. It is no longer experimental. The writer regrets that because of compelling business obligations, he cannot continue in direct co-operation with a work so inspiring. This brief time has convinced him that the need for the organization was great, the field for its efforts wide, the plan of its work effective.

It is equally clear that so much remains to be done as to justify the question: How can any concern engaged in supplying the railways with their requirements delay enrollment in the Railway Business Association?

Cost of the Cattle Quarantines.

Officers of the Pennsylvania Railroad are congratulating themselves on the extinction of one of the most remarkable epidemics among cattle in the history of the country, the hoof and mouth disease. The Secretary of Agriculture has lifted the general embargo on the interstate movement of cattle from the states of Pennsylvania, New York and Maryland, but to guard against the possibility of another outbreak, quarantine still applies to cattle moving from certain counties in those states, though even this embargo is likely to be lifted within a short time. On November 12 the Secretary of Agriculture placed the interstate embargoes and the Pennsylvania Railroad acted promptly to prevent any cattle moving out of or into the affected area. Shipments were also stopped outside the area, and cared for, facilities being hired when necessary. The quarantine was subsequently extended to the entire state of Pennsylvania, New York, Maryland and Michigan. Interstate traffic in cattle, hides, hay, straw and fodder was forbidden. Shortly afterward, Canada placed an embargo on New Jersey and Delaware in addition to the above states, and also imposed a quarantine to cover even goods packed in hay or straw.

As soon as the epidemic became apparent, the Pennsylvania set about an exhaustive inquiry to ascertain the source of infection. It was found that the disease had emanated from Buffalo. It was then comparatively easy to trace what had become of the shipments from Buffalo, and to locate the area

of possible infection. The state authorities actively co-operated in imposing legal obstacles to the movement of cattle between different parts of the states. The Pennsylvania not only issued the usual orders, but sent instructions to its agents by telegraph, and the amount of telegraphing exceeded that occasioned by any other similar event on record. To avoid delay in delivering Christmas packages, the company unloaded and repacked in sawdust and excelsior many packages destined to Canada. All animals which had been shipped from the infected areas to Pittsburgh, Lancaster, Baltimore and Philadelphia, as well as many other important points on the road, were segregated in separated pens.

About 2,100 stock cars have been cleaned each week since November 12, a total of 16,800 cars on the Pennsylvania Lines East of Pittsburgh, at a cost of about $3 for each cleaning. Railway companies have been required at their own expense after each trip to scrape all dirt out of each car, disinfect with a solution of carbolic acid, and when refuse on the floors of the cars was frozen, to steam them. All of this has been done under the direction of government inspectors, and every car has been marked and sealed by an inspector after each cleansing. To do all this the railway company had to increase largely its force of cleaners at Baltimore, Philadelphia, Lancaster, Harrisburg, Pittsburgh and Jersey City, and all cattle cars have been made practically aseptic at the beginning and end of each trip.

The Bureau of Animal Industry at Washington has had a force of 150 veterinarians, and as many more non-professional men, engaged in eradicating the disease, the cost of which, it is estimated, will be fully $500,000 in Pennsylvania, Maryland and Michigan. Many animals have been slaughtered.

Changes in Express Business.

The Chicago, Milwaukee & St. Paul has given up its plan for an express service of its own, and after May 1 next the express service on the new line to the Pacific coast, as well as on the company's existing lines, will be furnished by Wells, Fargo & Co. The United States Express Co. will continue to operate on the lines of the St. Paul proper until May 1. The Continental Express Co., organized by the railway company and which now is operating the new Pacific coast extension as far as Butte, will be dissolved.

The Wells, Fargo Co., whose concessions to operate over the Mexican Central expired on January 1, is now operating under a temporary agreement made in October with the understanding that at some time in the near future it will take over the express business on all government controlled railways in Mexico. The arrangement will probably become operative immediately after the merger of the National lines and the Mexican Central goes into effect.

The railways embraced in the new contracts lately made by the United States Express Co., to take effect July 1, or soon after, are the following:

Beaumont, Sour Lake & Western.	Fort Worth & Rio Grande.
Chicago & Eastern Illinois.	Orange & Northwestern.
Chicago, Rock Island & Pacific.	Paris & Great Northern
Chicago, Rock Island & Gulf.	St. Louis & San Francisco.
Chicago, Rock Island & El Paso.	St. Louis, San Francisco & Tex.
Colorado South., New Orleans & Pac.	Trinity & Brazos Valley.
Evansville & Terre Haute.	

Washington Letter.

Washington, Feb. 3.—The action of the House Committee on Interstate and Foreign Commerce in deciding not to bring out any amendments of the Hepburn law at this session was only in part due to the attitude of the Senate. It is true that Senators discouraged any attempts to amend the law at this short session of Congress, and this was given due weight in arriving at the conclusion not to report any of the bills now before the committee, but it was also felt that public sentiment at this time does not justify any legislation which might be construed as hostile to the railways.

This latter consideration, in fact, had perhaps more than anything else to do with the decision. Leading members of the committee held to the view that if any legislation were to be attempted it might readily be construed by the public as nothing more than a demagogic effort to bolster up the political fortunes of those behind the bill. Therefore it was thought wiser to wait until the people themselves cried for relief with a cry which could not be misunderstood, and if they did not so cry it might safely be assumed that the law was all right as it was.

In the meantime, however, it is the intention of the committee to collect a mass of material to show how well or how badly the law is operating. Also whether it is more useful to the carriers than to the public, as has been alleged. This will be done in the hope that public sentiment on the subject may be crystalized to show more certainly what, if anything, is the matter with the law, and how to remedy it.

At the same time the action of the committee makes it nearly certain that there can be no legislation affecting the railways until the long session of the new Congress, beginning next December, as there will be no committees named at the special session save those on Ways and Means, Mileage, Rules, Accounts, etc. That is, there will be only those necessary to pass the tariff bill. At least that is the present intention, and it is likely that nothing will change this unless some great emergency arises demanding the instant attention of Congress, and this is, of course, most improbable. So ends the Fulton bill with Senator Fulton, who goes out of the Senate March 3. G. G.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
Canadian Railway Club.—James Powell, Grand Trunk, Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.
International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth. ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburg, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.
Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

International Railway Fuel Association.

At the first annual meeting of the International Railway Fuel Association in Chicago in June next, reports will be made on the following subjects:

"Proper method of purchasing fuel." Thomas Britt (C. P.), Montreal, Chairman of Committee.

"Standard type or types of coaling stations." J. H. Hibben (M., K. & T.), Parsons, Kan., Chairman.

"Best method of accounting for fuel, including movement from mine through coaling station to engines up to monthly balance sheet." J. P. Murphy (L. S. & M. S.), Collinwood, Ohio, Chairman.

"Difference in mine and destination weights. Legitimate shrinkage allowable on car-lots." F. C. Meagley (A., T. & S. F.), Chicago, Chairman.

"Difficulties encountered in producing clean coal for locomotive use." Carl Scholz (Rock Island-Frisco Lines), Chicago, Chairman.

American Society of Civil Engineers.

At the meeting held on Wednesday, February 3, a paper by Robert Spurr Weston, Assoc. M. Am. Soc. C. E., entitled "The Purification of Ground-Waters Containing Iron and Manganese," was presented for discussion. This paper was printed in "Proceedings" for December, 1908.

Traffic News.

The Fort Worth Freight Bureau has adopted a resolution opposing two-cent fare legislation in Texas.

By the action of the Trunk Line Association, approved by all roads in interest, through first-class passengers heneceforth may stop over three days in Pittsburgh.

A meeting of the Transcontinental Freight Bureau was held in Chicago last week to receive protests from shippers against changes that have been made in freight rates to Pacific coast points. A large number of shippers appeared before the committee.

The Merchants & Miners' Transportation Company is to soon start a line of steamers between Jacksonville and Savannah, which ports for several years have been without regular water communication, although a decided demand has existed for such passenger and freight service. There are to be three ships a week.

The Buffalo, Rochester & Pittsburgh, having won its suits in the courts against the several counties along its line, has advanced its passenger rates to 2½ cents a mile. This restores the fares to the basis on which they were made previous to October, 1907, when the Pennsylvania 2-cent law went into effect.

Tariffs are being filed by various railways withdrawing special commutation rates for school children that they have had in effect. The Baltimore & Ohio has withdrawn the interstate rates for school children from Hammond, Gary and Whiting, Ind., to Chicago, but leaves the similar intrastate rates still in effect.

It is given out in Washington that the refunds which are to be made by the principal railways in the South on account of the decision of the Interstate Commerce Commission, disapproving the advance of two cents per 100 lbs. in the rates on lumber, which the railways put in effect in 1903, will amount to $165,000, this sum representing the overcharges claimed in 125 cases.

The Interstate Commerce Commission, which has been making a general investigation of the subject of free travel, has held a hearing at Boston, in what is called a "friendly inquiry" concerning the issuance of passes on the Boston & Maine. All persons receiving passes are being classified in great detail, and both the ethics and economy of these passes, as affecting the road, are being fully explored.

Steps are being taken to organize a Transportation and Traffic Club at Louisville, Ky. W. H. Newman, Division Freight Agent of the Chicago, Indianapolis & Louisville, is chairman of the committee on organization, and a committee has been appointed to draw up a constitution and by-laws. The proposed club will be composed of transportation and traffic representatives of railways and traffic managers of industrial concerns.

The readjustment of rates on grain moving from points in the Northwest via Chicago to points in the Southeast, which was announced a short time ago, has been balked by the dissent of some of the southern lines that were not represented at the meeting when the proposed change was decided on. Grain moving through Chicago has heretofore been charged a higher rate than grain moving through other gateways to the Southeast. It was proposed to put Chicago on the same basis as other gateways, but the Mobile & Ohio objected. It was found, for instance, that the differential in favor of St. Louis as against Memphis would be increased from 6 to 7 cents per 100 lbs., and the Mobile & Ohio heeded the protest of Memphis shippers.

The Boston & Maine has announced reductions in freight rates to western points (through Canada) to go into effect on March 4. The new rates are on the basis of 67 cents per 100 lbs., first-class, to Chicago. All lines taking freight west from New England have been agitated for many weeks past because the New York, New Haven & Hartford is said to be taking an unduly large share of freight for the west (sending it over the Canadian Pacific), some of it coming even from New York City; and it is said that the Boston & Albany will make reductions from Boston and other Massachusetts points to meet the reductions announced by the Boston & Maine. For many years the Boston & Maine rate was 10 cents (first-class) less than the standard rate of 75 cents. In 1901 the differentials were reduced to the basis of 5 cents, except on import traffic; later the rates on import shipments were also raised to the 70-cent basis. Complaint being made that Boston had advantage over Baltimore, the Boston & Maine adopted a new tariff on the basis of 67 cents. The other differential roads will, no doubt, make reductions to match those of the B. & M.

N. A. Stedman, attorney for all the principal railways in Texas, has issued a statement opposing 2-cent fare legislation in that state. He says that the gross earnings of Texas roads were 13 per cent. less, and their net earnings 40 per cent. less, in the year ended June 30, 1908, than in the previous fiscal year. Replying to a charge by F. O. Fuller, author of the pending 2-cent fare bill, that the railways have not made improvements which they promised when the 2-cent fare bill was dropped two years ago, Mr. Stedman denies that the railways made any promises; but he asserts that, since then, without any promise, they have spent for improvements and new equipment, in spite of the panic, about $7,000,000. He says the Texas lines in the fiscal year ended June 30, 1908, earned less than 3 per cent. on the commercial value of their property, whereas other lines of business in the state earn an average of 8 per cent. net; and that "if assurance can be given that investors in railways will be permitted to earn 8 per cent. on their properties, millions of Texas capital will go into railways." He says a 2-cent fare would reduce the earnings of Texas lines $4,000,000 a year and "so seriously cripple them, as a whole, as to bring them to the verge of bankruptcy."

INTERSTATE COMMERCE COMMISSION.

Evidence showing that a rate between two points is higher than other existing rates by other lines between these points is not sufficient proof that the given higher rate is unreasonable.

The act to regulate commerce provides that "all complaints for the recovery of damages shall be filed with the commission within two years from the time the cause of action accrues and not after * * * provided that claims accrued prior to the passage of this act may be presented within one year." The presentation in writing of a claim to the commission within a year after the passage of the act, when the formal petition in the case was not filed until after the expiration of a year, was held to conform to the law. The law does not prescribe the form in which the complaint shall be made.

Elevator Allowance.

Nebraska-Iowa Grain Co. et al. v. Union Pacific.—Opinion by Commissioner Prouty.

The various complainants herein seek reparation caused by alleged undue discrimination against them in favor of competitors in elevator allowances made by defendant at Omaha and Council Bluffs; defendant declined to pay these allowances, alleging that they were unlawful and that the terms of the tariffs were not complied with. This Commission cannot, without stultifying itself, make any ruling which will condemn as unlawful the payment of these allowances during the time they have been expressly sanctioned by its decisions.

The Commission finds with respect to all the shipments involved in these cases that the provision in the tariffs requiring a return to defendant of the car within 48 hours as a condition precedent to the payment of the allowance is unjust, unreasonable, unduly discriminatory, and unlawful; and that complainants are entitled to damages by reason of the maintenance of such unlawful provision which equal the amount which would have accrued to them by way of this elevation allowance, provided the tariff had contained no such provision. Defendant has paid to competitors of complainants this elevation allowance; it has at the same time declined to pay it to complainants. The Commission finds that defendant's reason for so declining is not a valid one, and that it has been guilty of undue discrimination against complainants, for which they are entitled to recover as damages the difference between what has been paid to their competitors and to them.

Centralizer Creamery Methods and Rates.

Beatrice Creamery Co. et al. v. Illinois Central et al. Blue Valley Creamery Co. et al. v. Michigan Central et al. Opinion by Commissioner Prouty.

Complainants, engaged in the operation of creameries and using the centralized method, whereby supplies of cream are obtained by railways as distinguished from the local creamery method which obtains cream by wagon, insist that defendants'. schedule of rates for the transportation of cream to Chicago between Detroit, Mich., and Port Huron on the east and Colorado common points on the west is too high, and asks the Commission to reduce it. On the facts disclosed in the record, the present rates are found excessive and defendants are ordered to establish a scale of rates prescribed as a maximum.

Several intervening associations, and representatives from the Department of Agriculture, claimed that the local creamery method of manufacturing butter should, in the interest of the public, be fostered and the centralizer method be discouraged; but such is not the impression left by the record. The centralizer is engaged in a perfectly legitimate business enterprise and affords to hundreds of thousands of farmers the only satisfactory means of disposing of their milk. It seems plain that the duty of this Commission is to establish just and fair transportation charges in so far as that can be done and allow these rival methods to operate under those charges. The Commission should not establish a scale of rates with a view and for the purpose of fostering or discouraging either form of this industry.

This Commission has several times held that where a particular industry has grown up under rates voluntarily established and maintained by carriers, these rates cannot be advanced without considering the effect upon that industry. There is no such thing as a contract between the railway and the shipper that a certain rate shall be charged, for the railway rate is a matter of public concern, which cannot ordinarily be made the subject of private contract, but in determining what is the just and reasonable thing to be done this Commission must consider the effect upon all parties.

STATE COMMISSIONS.

The Pennsylvania State Railroad Commission has dismissed the complaint of citizens along the line of the Pennsylvania's freight railway, from Atglen to Schoch's Mills, holding that, as the complainants are within three miles of railways doing a regular passenger and freight business, the public interest does not require that the new road, which was designed exclusively for heavy freight trains, should be provided with stations and other facilities to do a local business.

The Railroad Commission of Louisiana after a hearing on January 27 issued an order making a distance tariff on cotton seed, L.C.L. and C.L., to be used for planting, whether shipped in sacks, boxes, barrels or packages.

COURT NEWS.

The Legislature of Arkansas has appropriated $50,000 to defend the injunction suits instituted by the railways against the state to nullify the 2-cent passenger rate authorized by the last legislature and the freight schedules promulgated by the Arkansas Railroad Commission.

Hearings in the suit of the government to annul the practical consolidation of the Union and Southern Pacific Railways, which were begun in New York last month (see *Railroad Age Gazette*, Jan. 22, page 178), were resumed at Pittsburgh, January 27. Numerous representatives of shippers testified that previous to 1901, there was actual competition between the Union and the Southern Pacific, but that since then, joint agencies having been established, the competition was no longer apparent.

Hearing in Missouri River Rate Case.

Testimony was taken at Chicago last week by J. L. Bennett, Special Examiner for the federal court, in the Missouri river rate case. Freight Traffic Manager Crosby, of the Burlington, was asked if some of the large jobbing centers in the middle west had not been built up on rebates. He had admitted that rebates had at times been given. Mr. Walter, for the government, stated that his aim was to show that these trade centers had been built up by rebates and not by the adjustment of rates that the roads are now defending. F. P. Eyman (C. & N. W.), W. S. Kallman (N. Y. C.), and H. C. Martin (Grand Trunk) defended the present adjustment of rates, and said that if the Commission's order were enforced it would pull down not only the rates directly affected, but many other rates. John L. Williams, Traffic Manager of the Sherwin-Williams Company, Cleveland, Ohio, said that the reduction ordered by the Commission would compel the closing of mills of this company east of Buffalo unless reductions were made from the points where those mills are situated corresponding to the reductions ordered by the Commission in rates from seaboard points.

Railroad Regulation in Oklahoma.

The Missouri, Kansas & Texas has filed a petition in the Supreme court of Oklahoma, setting forth that the order of the State Corporation Commission requiring all railways to notify the Commission immediately by telegraph of any accident, is unjust and unreasonable, and asking the court to set aside the order. The Kansas City Southern has appealed from the order of the Commission requiring it to establish a depot at Ballard. It is expected that there will soon be a large number of appeals to the Supreme court from rulings of the Commission. The court recently held that any company or person affected by rulings of the Commission has one year in which to appeal to the court and that it is not necessary to precede such action with a motion before the Commission for a new trial. The provisions of the Oklahoma constitution creating the State Corporation Commission are substantially similar to the similar provisions in Virginia, so that the recent decision of the Supreme Court of the United States in the Virginia 2-cent fare case has a direct bearing upon railway litigation in Oklahoma, and establishes the principle that any appeals from the Commission must be made to the state supreme court before they can be taken to a federal court.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1908.

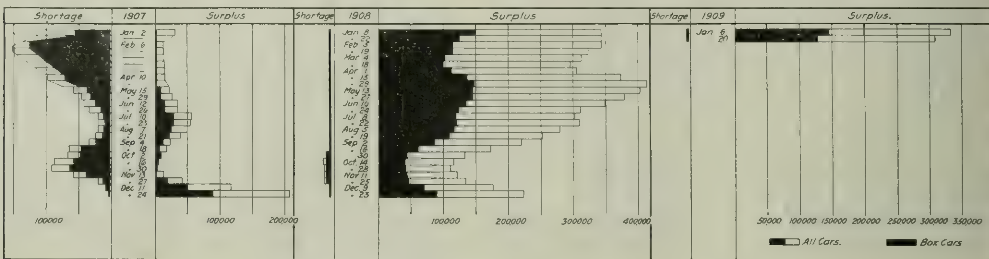
Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,458	$4,406,068	$1,591,869	$6,551,190	$822,450	$683,956	$136,854	$1,764,508	$148,404	$3,556,172	$2,995,018	.....	$59,524	$2,935,494	$860,905
Atlantic Coast Line	4,408	1,785,615	580,577	2,535,101	293,210	336,288	37,177	766,901	67,397	1,500,973	1,034,128	....	90,000	944,128	339,695
Buffalo, Rochester & Pittsburgh	568	481,372	69,128	566,122	48,518	129,570	7,594	180,513	14,114	380,309	185,813	$153	15,000	170,966	113,034
Central of Georgia	1,916	716,406	265,016	1,079,373	179,535	185,945	25,211	299,872	34,967	725,530	353,843	4,670	43,946	314,567	94,896
Chicago & Alton	998	673,434	319,961	1,078,413	107,434	129,947	53,187	372,854	38,420	701,842	376,571	220	30,000	346,791	76,441
Chicago & Eastern Illinois	966	778,037	149,820	980,821	94,887	184,506	16,120	354,346	36,504	686,363	294,458	1,377*	2,558	290,523	55,405
Chicago & North Western	7,635	3,394,607	1,398,726	5,234,347	525,276	645,741	84,880	2,150,570	81,891	3,498,358	1,735,989	3,117	230,000	1,509,106	420,213
Chicago, Burlington & Quincy	9,023	4,553,559	1,604,778	6,742,322	819,430	1,114,868	114,374	2,167,908	169,752	4,386,332	2,355,990	17,186*	212,600	2,126,204	969,655
Chicago, St. Paul, Minn. & Omaha	1,730	723,569	348,010	1,150,351	79,716	134,429	21,999	449,968	47,678	733,790	416,561	533*	52,969	363,059	71,574
Colorado & Southern	1,245	656,258	106,088	805,309	78,698	141,724	13,909	256,091	27,817	518,239	287,070	1*	21,225	265,844	17,316
El Paso Southwestern	867	524,784	79,067	632,801	68,122	73,901	11,024	165,517	27,577	346,141	286,660	12,341*	35,609	238,710	.....
Erie	1,902	2,524,176	618,803	3,406,390	285,798	627,365	77,496	1,297,118	84,452	2,372,229	1,034,161	23,871	105,994	952,038	656,261
Grand Rapids & Indiana	590	228,001	110,823	363,762	42,181	55,439	10,506	163,629	14,125	285,880	77,882	423*	20,693	56,766	49,038
Gulf, Colorado & Santa Fe	1,518	905,559	291,846	1,245,137	154,149	207,535	21,880	425,070	32,214	840,848	404,289	....	5,000	399,289	192,392
Illinois Central	4,518	3,324,285	950,479	4,907,837	389,945	948,549	93,507	1,629,604	91,916	3,153,521	1,754,316	3,670*	189,683	1,560,963	301,452
Kansas City Southern	827	530,597	123,144	719,751	71,600	82,587	21,569	232,018	27,947	435,721	284,030	.....	28,330	255,700	92,524
Lehigh Valley	1,446	2,234,570	281,275	2,605,387	289,167	522,887	63,340	876,684	63,859	1,815,937	789,450	13,912*	94,600	680,938	4,389
Louisville & Nashville	4,388	2,827,039	895,051	3,978,008	396,364	691,050	85,463	1,258,772	81,007	2,512,656	1,465,352	15,725*	112,338	1,337,289	1,074,216
Maine Central	931	388,057	179,340	613,836	64,650	106,026	6,922	256,453	34,203	468,254	145,582	2,573	30,206	117,949	19,689
Missouri, Kansas & Texas	3,072	1,402,990	667,783	2,208,875	297,101	315,828	45,335	840,913	71,037	1,570,214	638,661	268*	110,910	527,483	39,878
Mobile & Ohio	926	655,778	111,673	890,510	99,444	172,906	27,301	302,975	30,064	632,690	257,820	9,867*	16,000	231,953	59,092
New York, Ontario & Western	546	529,873	81,505	634,963	54,698	125,650	9,799	274,389	16,162	480,698	154,265	2,690*	15,417	136,158	23,318
Norfolk & Western	1,921	2,000,319	296,722	2,376,979	273,507	395,975	39,726	714,309	56,482	1,479,999	896,980	224*	82,300	814,456	331,686
Northern Central	463	720,324	156,393	937,089	35,174	257,162	12,102	449,650	21,965	776,053	161,036	507	19,515	142,029	‡17,652
Pennsylvania Co.	1,414	2,315,027	569,553	3,205,977	300,139	525,385	56,692	1,243,419	78,771	2,204,406	1,001,571	4,036*	215,878	781,657	553,050
Pennsylvania R. R.	4,024	8,780,180	2,310,713	11,972,892	1,477,911	2,459,822	145,980	4,225,233	297,554	8,606,500	3,366,392	73,969*	174,339	3,118,084	433,352
Pere Marquette	2,354	739,199	268,291	1,127,990	115,694	158,429	23,931	508,751	28,798	835,603	292,387	3,081*	51,325	237,981	15,726
Phila., Balto. & Wash.	714	637,217	571,312	1,379,098	90,996	294,233	24,008	590,786	33,894	1,033,917	345,181	....	31,142	314,039	27,254
Pitts., Cin., Chic. & St. Louis	1,471	1,838,026	551,639	2,730,523	204,968	471,691	61,134	1,014,407	56,256	1,808,456	922,067	795*	157,340	763,932	103,260
Texas & Pacific	1,885	1,015,302	387,877	1,636,052	124,810	154,782	17,003	522,677	34,017	853,289	782,763	10,909*	40,142	731,712	65,611
Toledo, St. Louis & Western	451	235,618	36,432	291,430	28,397	36,958	8,532	99,859	1,538	158,220	133,210	.....	11,500	121,710	31,296
Vandalia	829	481,696	178,435	743,255	109,638	116,352	20,774	306,591	17,806	571,161	172,094	.....	27,781	144,313	79,470
West Jersey & Seashore	363	120,125	156,035	300,444	44,132	65,009	7,645	168,121	8,322	293,229	7,215	980*	17,112	10,877†	21,559
Wheeling & Lake Erie	442	372,782	34,878	431,232	40,065	104,781	6,497	162,795	16,290	330,428	100,804	2,485	21,312	81,977	69,511
Wisconsin Central	1,023	401,540	111,013	567,779	50,464	88,383	25,084	233,503	20,074	417,508	150,271	89*	29,638	120,544	8,199
Yazoo & Mississippi Valley	1,370	833,663	247,645	1,135,705	110,861	148,091	14,867	363,002	23,496	660,317	475,388	2,707	34,590	443,505	79,032
SIX MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,458	25,779,944	$9,197,496	$37,927,561	$4,781,820	$6,297,403	$753,214	$10,084,694	$787,039	$22,710,170	$15,217,391	....	$1,164,262	$14,053,129	$2,061,612
Atlantic Coast Line	4,408	8,620,554	2,734,665	12,225,609	1,754,756	1,809,760	202,615	4,115,082	352,002	8,234,215	3,991,394	....	540,000	3,451,394	685,753
Buffalo, Rochester & Pittsburgh	568	3,080,477	486,542	3,732,298	519,548	859,844	50,034	1,092,375	83,810	2,605,611	1,126,687	263	90,000	1,036,950	‡236,883
Central of Georgia	1,916	3,956,547	1,514,115	5,978,805	819,646	1,077,248	157,424	1,815,593	219,913	4,089,824	1,888,981	31,134	230,178	1,689,937	161,655
Chicago & Alton	998	4,093,176	2,084,221	6,699,214	630,451	722,402	230,301	2,028,700	177,733	3,789,587	2,909,627	5,424*	180,000	2,724,203	670,044
Chicago & Eastern Illinois	966	4,154,478	901,107	5,357,950	613,821	995,897	96,563	1,843,239	210,333	3,759,853	1,598,097	8,563*	115,115	1,474,419	‡125,788
Chicago & North Western	7,635	23,227,764	9,428,673	35,333,129	4,307,175	3,816,693	555,483	12,486,829	548,185	21,714,365	13,618,764	26,838	1,380,000	12,265,602	1,353,465
Chicago, Burlington & Quincy	9,023	27,446,875	10,763,428	41,602,595	6,370,643	6,526,202	771,251	12,444,026	993,584	27,105,706	14,496,889	71,671*	1,275,600	13,149,618	126,936
Chicago, St. Paul, Minn. & Omaha	1,730	4,453,970	2,215,269	7,137,739	905,764	726,373	129,084	2,487,809	174,336	4,423,366	2,714,373	4,030	317,818	2,400,586	333,662
Colorado & Southern	1,245	3,448,877	865,557	4,547,298	579,702	754,523	85,065	1,371,652	157,703	2,948,645	1,598,653	2,207	125,522	1,475,338	‡1,163
El Paso Southwestern	867	2,786,521	467,761	3,417,007	408,964	472,669	55,715	907,758	128,918	1,974,024	1,442,983	12,341*	91,542	1,339,100	.....
Erie	1,902	16,412,530	4,363,893	22,294,280	2,405,893	4,501,227	458,283	7,435,736	459,275	15,260,414	7,033,866	262,353	588,610	6,707,609	1,483,435
Grand Rapids & Indiana	590	1,333,500	903,074	2,411,904	254,212	321,121	62,611	905,666	80,525	1,624,135	787,769	859	126,639	661,989	63,895
Gulf, Colorado & Santa Fe	1,518	5,123,347	1,575,067	7,012,984	1,020,239	1,149,973	119,267	2,307,714	198,499	4,795,692	2,217,292	.....	150,461	2,066,831	1,113,475
Illinois Central	4,518	18,445,068	5,754,359	27,568,003	3,403,774	6,308,409	586,182	9,263,002	579,656	20,141,023	7,426,980	17,760*	1,132,756	6,276,464	‡252,389
Kansas City Southern	827	3,335,207	687,594	4,412,557	484,618	515,470	128,545	1,388,106	156,859	2,673,598	1,738,959	....	169,979	1,568,980	‡45,573
Lehigh Valley	1,446	14,329,885	2,146,006	17,021,728	1,769,486	3,183,147	384,569	5,080,300	318,767	10,736,269	6,285,459	10,897*	531,600	5,742,962	‡1,122,372
Louisville & Nashville	4,388	16,730,604	5,995,924	23,449,625	2,632,881	4,011,854	490,521	7,394,555	466,006	14,995,817	8,453,808	66,210*	674,025	7,713,573	2,361,651
Maine Central	931	2,420,859	1,631,246	4,336,818	712,535	576,705	45,714	1,496,140	138,784	2,969,878	1,366,940	18,047	185,224	1,199,763	295,559
Missouri, Kansas & Texas	3,072	9,391,754	3,703,611	13,792,368	1,736,551	2,094,091	285,335	4,790,752	396,734	9,303,463	4,488,905	6,235*	667,550	3,815,119	‡616,652
Mobile & Ohio	926	3,602,709	635,700	4,924,822	567,092	789,534	163,644	1,669,843	173,961	3,364,074	1,560,748	49,172*	96,500	1,415,076	634
New York, Ontario & Western	546	3,209,233	955,378	4,340,200	478,046	725,299	58,717	1,536,778	88,481	2,887,321	1,452,879	19,011*	92,500	1,341,368	‡71,554
Norfolk & Western	1,921	12,359,926	1,851,370	14,700,576	1,602,544	2,433,248	231,217	4,209,223	316,926	8,793,158	5,907,418	1,245*	515,000	5,391,173	101,505
Northern Central	463	4,482,091	1,056,747	5,875,423	359,008	1,218,341	75,683	2,567,668	117,054	4,367,754	1,507,669	4,727	117,087	1,395,309	‡215,712
Pennsylvania Co.	1,414	16,292,670	3,569,986	21,675,345	1,837,424	3,313,032	363,538	7,029,874	431,008	12,974,876	8,700,469	12,557*	918,438	7,769,474	58,465
Pennsylvania R. R.	4,024	50,523,367	15,082,455	70,267,218	7,399,630	13,263,537	915,859	24,188,184	1,698,781	47,765,991	22,501,227	178,209	1,046,036	21,633,400	‡2,300,466
Pere Marquette	2,354	4,750,560	1,900,631	7,226,288	860,826	1,042,300	155,056	2,768,633	170,482	4,997,297	2,228,991	9,520	309,584	1,928,927	162,226
Phila., Balto. & Wash.	714	4,028,792	3,486,812	8,406,274	973,510	1,415,628	127,010	3,410,424	172,416	6,098,988	2,307,286		186,851	2,120,435	‡112,728
Pitts., Cin., Chic. & St. Louis	1,471	11,443,890	3,659,190	16,662,402	1,720,651	2,834,866	360,749	5,672,967	340,200	10,929,433	5,732,969	3,726*	735,596	4,993,647	84,809
Texas & Pacific	1,885	5,355,236	1,992,054	7,919,754	831,755	1,093,544	89,016	2,868,711	197,174	5,080,203	2,839,551	17,379*	382,740	2,439,432	202,538
Toledo, St. Louis & Western	451	1,421,754	260,852	1,806,238	202,005	243,746	35,281	585,347	47,174	1,113,556	692,682	..	69,000	623,682	‡86,092
Vandalia	829	2,947,913	1,170,638	4,592,660	704,896	726,602	125,157	1,702,085	99,985	3,358,725	1,233,935	....	154,192	1,079,743	47,934
West Jersey & Seashore	363	770,903	1,885,526	2,791,645	368,188	331,184	69,980	1,096,679	46,595	1,912,627	879,018	51,080	102,674	827,424	207,002
Wheeling & Lake Erie	442	2,540,690	271,620	3,004,813	379,420	663,844	31,974	997,367	86,429	2,159,034	845,779	5,547	132,048	719,278	67,696
Wisconsin Central	1,023	2,761,669	867,359	3,876,596	434,441	454,630	145,728	1,336,854	121,317	2,492,970	1,383,626	3,517	176,181	1,210,962	41,802
Yazoo & Mississippi Valley	1,370	3,701,902	1,126,106	5,137,306	1,036,622	920,222	96,115	1,948,359	142,825	4,144,143	993,163	18,814	207,540	804,437	42,449

*Deficit. †Loss. ‡Decrease.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 39-A, giving a summary of car surpluses and shortages by groups from December 24, 1907, to January 20, 1909, says:

"This report shows a decrease of 21,355 surplus available cars, bringing the total down to 311,664. The decrease is nearly all accounted for by the increased demand for box cars, there having been 19,051 of this class of cars restored to service since our last report. The continuation of mild weather has had an unfavorable effect on the coal business, and there was a decrease of only 1,000 in the number of surplus coal and gondola cars.



Car Surpluses and Shortages in 1907, 1908 and 1909.

"The most improvement is noted in Groups 2 (Eastern) and 6 (Northwestern), although Groups 4 (North Atlantic), and 5 (Southern), show a fair percentage of decrease, as does also Group 9 (Southwestern). There are slight increases in Groups 1 (New England), 8 (Middle Western) and 11 (Canadian). There is also a decrease of about 3,000 in the number of bad order cars. This item has now been reduced to normal on a number of the more important systems."

CAR SURPLUSES AND SHORTAGES, FROM DECEMBER 24, 1907, TO JANUARY 20, 1909, INCLUSIVE.

		Surpluses.					Shortages				
Date.	Number of roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
January 20, 1909	162	127,104	26,723	116,180	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724

The accompanying table shows the surpluses and shortages for the period covered by the report, and the chart shows the surpluses and shortages in 1907, 1908 and 1909.

Should the Mississippi be Deepened?

At the dinner of the Traffic Club of Chicago on the evening of January 27, Congressman Joseph E. Ransdell, of Louisiana, advocated a bond issue by the federal government of $500,000,000 for the development of internal waterways, not more than $50,000,000 a year to be issued. But another speaker, William J. Calhoun, who was President McKinley's special commissioner to South America, called attention to the fact that American merchants and steamships do not make use of the waterways already available. He said that there is only one through direct steamship line operating between the United States and South America, and this is owned by an Englishman in Venezuela. Since the Atlantic ocean, which had been provided by nature, is not used to handle the commerce of the United States with South America, Mr. Calhoun asked, was it probable that a lakes-to-the-gulf deep waterway and the Panama canal would be so used? He thought the first thing to do was to show that there would be commerce to move over the proposed waterways. Then, there is no doubt, they would be provided. He thought the advocates of waterways were over-enthusiastic regarding the immediate results that would be secured by their construction.

Recommendations of Wisconsin Railroad Commission.

In its annual report transmitted to the Governor December 7, the Wisconsin Railroad Commission recommends that all crossings of steam railways with one another, of steam and electric railways, and of steam and electric railways with highways, be placed under control of the Commission, so as to permit uniform and consistent action in solving the difficulties connecting with crossings. The act requiring public service corporations to get a certificate of "convenience and necessity" before building new properties should be amended so as to permit the Commission to consider the financial ability of the applicant. The Commission asks that its authority be extended over demurrage charges. With reference to advances in railway rates, the Commission says:

"Since under the railway law (of Wisconsin) the companies establish rates and classifications in the first instance, the Commission cannot assume jurisdiction and hear complaints before such modified rules, regulations or classifications effecting an advance in rates have actually gone into effect. The suggestion of requiring application on the part of railway companies to the public administrative body before a proposed advance in rates can take effect has been considered by the Interstate Commerce Commission as well as by some of the state commissions. The merits of such a plan deserve careful consideration. It is clearly complicated with grave objections. We have serious doubts regarding its feasibility or practicability. It is possible that an increase in the length of time from ten to thirty days before a proposed advance in rates or a change of classifications, rules and regulations resulting in an advance in rates can take effect may meet the situation fairly well. At the present time every change in rates (in Wisconsin) requires ten days' notice unless authorized otherwise. This appears to be ample notice for reduc-

tion, but it is probable that ordinarily thirty days' notice for advances in rates is not too long."

The Commission says that during the year 16 complaints relating to excessive freight charges were filed, which were heard, and 10 decisions were rendered ordering refunds. "Many complaints," the Commission adds, "were the result of a lack of ordinary care and diligence on the part of shippers."

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. B. Pollock has been elected Vice-President and General Manager of the Western Transit Co. and the Rutland Transit Co., with office at New York.

L. C. Gilman, formerly Attorney for the Great Northern, at Seattle, Wash., has been appointed Assistant to the President, with office at St. Paul, Minn.

L. J. Storey, Commissioner on the Board of Railway Commissioners of Texas, has been elected Chairman, succeeding Allison Mayfield, who remains a Commissioner.

F. W. Estabrook has been elected President of the St. Paul & Des Moines, succeeding G. A. W. Dodge, resigned. F. C. MacMillan, General Manager, has been elected also Vice-President.

H. H. Laughton, auditor of disbursements of the Southern Railway, has been appointed Auditor, with office at Washington, D. C., succeeding C. B. Hayes, resigned to accept promotion elsewhere.

E. N. Brown, President of the National Lines of Mexico, has been elected President of the National Railways of Mexico, which has taken over the operation of the National Lines of Mexico, the Mexican Central and other merged companies.

Lloyd E. Stafford, whose appointment as Auditor of the Orange & Northwestern has been announced in our columns, was born at Washington, La., on September 8, 1884. After an education in the public schools at Washington, he began railway work in November, 1902, as a clerk in the freight offices of the Morgan's Louisiana & Texas, at Morgan City, La. In May, 1903, he became agent and operator, and in December, 1907, was appointed local agent of the St. Louis & San Francisco, at Opelousas, La. On March 3, 1908, he was transferred to Eunice, La., as joint agent of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, and in November, 1908, was made Traveling Auditor of the St. Louis & San Francisco. His appointment as Auditor of the Orange & Northwestern was made on January 1, 1909.

Operating Officers.

Ernest Stenger, General Superintendent of the Rio Grande Western and the San Pete Valley, has resigned.

Raffe Emerson has been appointed Assistant to the General Manager of the Lehigh Valley, with office at South Bethlehem, Pa.

H. M. Taylor, formerly General Manager of the Interoceanic of Mexico, has been appointed General Manager of the Mexican Central, succeeding J. N. Galbraith.

W. C. Park has been appointed Superintendent of the New Orleans Great Northern, with office at Florenceville Junction, Miss. The office of Superintendent has been unfilled for some months.

J. W. Metcalf, Assistant Superintendent of the Los Angeles division of the Southern Pacific, has been transferred to the Tucson division. A. M. Jamison, chief clerk in the office of the General Superintendent, succeeds Mr. Metcalf.

C. M. Bryant, Trainmaster of the Dallas division of the Kansas City, Mexico & Orient of Texas, at Denison, Tex., has been appointed Superintendent of the Southern division, at Smithville, Tex., succeeding T. A. Wilson, resigned. George Spooner succeeds Mr. Bryant.

G. H. Olmstead, Superintendent of the Idaho division of the Oregon Short Line, who has been on a leave of absence on account of ill health since last November, has been appointed Superintendent of the Montana division, at Pocatello, Idaho, succeeding W. R. Armstrong, who has been Acting Superintendent of that division. W. H. Jones, Acting Superintendent of the Idaho division during Mr. Olmstead's absence, has been appointed Superintendent of that division, at Pocatello. W. R. Armstrong has been appointed Assistant Superintendent of the Idaho division, at Nampa, Idaho.

Traffic Officers.

L. R. Hayes has been appointed Commercial Agent of the Pere Marquette at Chicago.

Charles M. Davis has been appointed Soliciting Freight Agent of the Missouri Pacific, at Kansas City, Mo.

J. B. McGuire has been appointed Division Agent of the Chicago, Rock Island & Pacific, at Rock Island, Ill.

J. N. Anderson has been appointed Immigration Agent of the Missouri Pacific, succeeding T. C. Kimber, promoted.

A. W. Randall has been appointed Traveling Freight and Passenger Agent of the Chicago, Rock Island & Pacific, at Salt Lake City, Utah.

W. A. Scrivner has been appointed Commercial Agent of the Trinity & Brazos Valley at Fort Worth, Tex., succeeding J. B. Tewsberry, resigned.

S. C. Nash, Acting General Agent of the Texas & Pacific, at Los Angeles, Cal., has been appointed General Agent, succeeding T. D. Connelly, deceased.

F. D. Colby has been appointed Special Agent of the Coal Traffic department of the New York Central Lines East of Buffalo, N. Y., with office at New York.

R. C. Caples has been appointed General Agent of both Freight and Passenger departments of the New York Central Lines both east and west of Buffalo, N. Y., at New York.

Warren H. Miller, Soliciting Freight Agent of the Seaboard Air Line, at Memphis, Tenn., has been appointed Contracting Freight Agent, at St. Louis, Mo. Edgar Estile succeeds Mr. Miller.

H. A. Noble has been appointed Division Freight Agent of the Boston & Albany, at Pittsfield, Mass., succeeding G. C. Woodruff, who has been transferred to the New York Central & Hudson River.

Since the resignation of S. P. Shane, Freight Traffic Manager of the Erie, previously noted in these columns, the duties of freight traffic manager have been assumed by H. B. Chamberlain, Vice-President.

J. A. Martin, Commercial Agent of the Iowa Central and the Minneapolis & St. Louis, at St. Louis, Mo., has been appointed General Eastern Agent, with office at New York, succeeding E. B. Johns, resigned.

A. S. McAlexander, whose resignation as Commercial Agent of the Clyde-Charleston Fast Freight Lines has been announced in these columns, is now Vice-President of J. B. Wilkes & Co., incorporated grain dealers, Nashville, Tenn.

J. N. Stewart, formerly Assistant Advertising Agent of the Atchison, Topeka & Santa Fe and of the Chicago, Rock Island & Pacific, at Chicago, has been appointed General Advertising Agent of the Northern Pacific, with office at St. Paul, Minn.

W. H. Porter, Commercial Agent of the Boston & Albany, at Boston, Mass., has been granted leave of absence on account of ill health, and his duties are temporarily assumed by E. P. Gardiner, Commercial Agent of the New York Central Lines, at Boston.

Engineering and Rolling Stock Officers.

A. D. Page, Principal Assistant Engineer of the Chicago, Rock Island & Pacific, has resigned.

George F. Hennessey has been appointed Roundhouse Foreman of the Chicago, Milwaukee & St. Paul, at Janesville, Wis.

E. T. Reisler has been appointed Division Engineer of the

Lehigh Valley, at Auburn, N. Y., succeeding F. K. Bennett, resigned.

T. McHattie, Master Mechanic of the Grand Trunk at Montreal, Que., has been appointed Superintendent of Motive Power of the Central of Vermont.

O. Suthards has been appointed General Tie and Timber Inspector of the Missouri Pacific, succeeding W. T. Schultz, resigned to accept service with another road.

J. B. Berry, Chief Engineer of the Chicago, Rock Island & Pacific, has been appointed also Supervising Engineer of the St. Louis & San Francisco, with office at St. Louis, Mo.

F. J. Marcheck, Signal Supervisor of the Houston division of the Galveston, Harrisburg & San Antonio, has been appointed District Signal Foreman of the Houston division. P. V. Wright succeeds Mr. Marcheck.

B. J. Peasley, Master Mechanic of the St. Louis, Iron Mountain & Southern, at Ferriday, La., has been appointed Master Mechanic at De Soto, Mo., succeeding P. J. Conrath, resigned. W. S. Kenyon succeeds Mr. Peasley.

M. C. Byers, Engineer of Maintenance of Way of the St. Louis & San Francisco, has been appointed Chief Engineer, succeeding J. F. Hinckley, resigned. The position of Engineer of Maintenance of Way has been abolished.

R. G. Cullivan, General Foreman, Locomotive department, of the New York Central & Hudson River, at West Albany, N. Y., has been appointed Division Superintendent of Motive Power, at West Albany, succeeding E. A. Walton.

J. E. Irwin, Master Mechanic of the Marietta, Columbus & Cleveland, has resigned to become Superintendent of Equipment of the Indian Refining Co., Georgetown, Ky., and Lawrenceville, Ind., and the position of Master Mechanic has been abolished.

Louis C. Fritch, Assistant to the President of the Illinois Central, has been appointed Consulting Engineer, in charge of electrification work, of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, with office at Chicago, succeeding L. T. Moore, who continues as Chairman of the Board of Pensions. Donald Rose, General European Agent, succeeds Mr. Fritch.

W. M. Post, Assistant Supervisor of Signals of the Pennsylvania, at Pittsburgh, Pa., has been appointed Supervisor of Signals of the Chautauqua division, with office at Oil City, Pa.; G. E. McFarland, Assistant Supervisor of Signals at Altoona, Pa., has been appointed Supervisor of Signals of the Buffalo division, with office at Olean, N. Y.; J. H. Broadbent, Assistant Supervisor of Signals at Kittanning, has been appointed Supervisor of Signals of the Allegheny division, with office at Kittanning, Pa., and his former office has been abolished.

Storekeeper.

John J. Goodwin, General Storekeeper of the International & Great Northern, with office at Palestine, Tex., has resigned.

OBITUARY.

E. F. Hogle, Assistant Superintendent of the St. Louis & San Francisco, at Birmingham, Ala., died in Mexico January 20.

G. W. Kaiser, formerly Assistant Master Mechanic of the Juniata Shops of the Pennsylvania, died last week at his home in New York.

William Whyte, formerly Trainmaster and Superintendent of the Texas & New Orleans, died on January 28, at Dallas, Tex. He was 54 years of age.

T. S. Reilly, Superintendent of the Mechanical Department of the Canton-Hankow Railway, and formerly Mechanical Editor of the Railway & Engineering Review, died in China, on January 30.

A. B. Garner, formerly Vice-President and Treasurer of the Murphy Varnish Co., of Newark, N. J., and at one time Purchasing Agent of the Denver & Rio Grande, died at his home in New York January 28.

Railroad Construction.

New Incorporations, Surveys, Etc.

Big Bend Transit Company.—This company has obtained the greater part of right of way from Spokane, Wash., west along the Little Spokane river as far as Metre rapids. Grading has been completed for seven miles on the western end. Reference was made to this company in our issue of January 8 in connection with the Spokane & Inland Empire, to the effect that terminal rights were granted the Transit company by the Department of the Interior some time ago, but upon the rights lapsing, the Spokane & Inland Empire filed an application for the same site. This item was incorrect in saying that the rights of the Big Bend Transit Co. had lapsed. The company is now applying for additional terminal rights. Wm. A. Nichols, 105 Howard street, Spokane, Wash., President.

Chicago, Rock Island & Pacific.—Press reports say that this company is about to lay out large yards and terminals at Hulburt, Ark., which is six miles west of Memphis, Tenn. The yards are to cover about six acres of ground. The estimated cost of the improvement is $5,000,000. The report says that repair shops are to be put up, and a large brick and frame hotel, for the accommodation of the 400 shop employees.

Copper River Railway.—Press reports indicate that announcement has been made of the completion of this line from Cordova, Alb., through a point above the Abercrombie rapids of the Copper river. The Tidewater terminus is said to be located at Three Tree Point, just north of Cordova, where wharves have been built. (Nov. 13, p. 1773.)

Grand Trunk Pacific.—The following lines are to be built by this company in Saskatchewan and subsidized by the Provincial government at $15,000 per mile:

From near Township 22, range 6, to Yorktown, 40 miles.

From a point on the main line between the 108th and 109th parallels to Battleford, 45 miles.

From near Township, 22, range 6, to Regina, Sask., about 110 miles. This will give a direct line from Regina to Yorktown, via Melville.

Great Northern.—The Midland of Manitoba will ask the Manitoba legislature for power to construct, in connection with the authorized line between Winnipeg and the International boundary, a branch line from a point on the east side of the Red river in Township 1, range 2 or 3 east, to a point on the International boundary, on the west side of the river in range 2, and authorizing the company to sell to another company its lines from Gretna, Man., north to Portage la Prairie and from Morden south to the international boundary.

Application will also be made to incorporate a company with power to acquire and operate the existing constructed lines of the Midland of Manitoba in Manitoba (those above mentioned) and with power to construct lines of railway from Winnipeg, Man., in a general westerly direction to Brandon, thence westerly to a point near Elkhorn and thence to the western boundary of the province; from Morden in a northwesterly direction to a point near Rathwell, thence northwesterly to a point on the first mentioned line running westerly from Winnipeg. Fisher, Wilson, Battram & Hamilton, Winnipeg, Man., are the solicitors for the applicants.

Midland of Manitoba.—See Great Northern.

New York, Philadelphia & Norfolk.—See Pennsylvania.

Northern Pacific.—Press reports from Winnipeg, Man., say that as soon as weather permits the company will commence work on the line due south from Winnipeg, to the international boundary, and also that the line from the boundary to St. Paul, Minn., will be relaid with 90-lb. rails, and as soon as this work is completed fast trains will be run between Winnipeg and St. Paul.

Oklahoma Roads.—The Miller Lumber Co., Millerton, Okla., is building a standard gage line from Millerton, on the St. Louis & San Francisco, north for about 15 miles. This road is being built for use as a logging road at present, but it is intended that it shall be a public carrier eventually.

Orange & Northwestern.—See St. Louis & San Francisco.

PENNSYLVANIA.—With a view to further completing the four-tracking of the line from Altoona, Pa., to Pittsburgh, bids have been asked for widening the stone arch bridge over the Conemaugh river, just west of South Fork, on the Pittsburgh division, to hold four tracks instead of three as at present. This is the first piece of new construction work authorized by the Pennsylvania for more than a year. The addition to the South Fork bridge will increase its width from 38 ft. to 58 ft. The work will necessitate the excavation of 1,500 cu. yds. of earth for the foundations. The construction itself will require 5,500 cu. yds. of stone masonry.

The New York, Philadelphia & Norfolk is building three miles of second track between Keller, Va., and Olney. Recent reports to the effect that this company is about to build new freight yards at Cape Charles, Va., are incorrect.

PHILADELPHIA & READING.—Press reports say that this company began operating passenger trains recently over a portion of the elevated line on Ninth street, Philadelphia. The northbound track between Columbia avenue and Huntingdon street is finished, and the southbound track will be ready soon. The next section between Columbia avenue and Spring Garden street is also to be finished soon. The completion of this work will eliminate about a dozen dangerous grade crossings. (Aug. 21, p. 788.)

PORT O'CONNOR, RIO GRANDE & NORTHERN.—Press reports from San Antonio, Tex., indicate that the Port O'Connor syndicate of The Hague, through their American representatives, have made an agreement for building the road from Port O'Connor, Tex., on the Gulf Coast, north to San Antonio, about 234 miles. The estimated cost is said to be $5,000,000.

ST. LOUIS & SAN FRANCISCO.—B. F. Yoakum is quoted as saying that negotiations are under way for an extension of the Orange & Northwestern, now in operation from Orange, Tex., north to Newton, 61 miles, from the latter place north to Logansport, La., about 80 miles.

SPOKANE & INLAND EMPIRE.—See Big Bend Transit Co.

SUPERIOR & WESTERN ONTARIO.—Application will be made to the Canadian Parliament for the incorporation of this company, which intends to build a line of railway from a point on the Lake Superior branch of the Grand Trunk Pacific, about 154 miles northwest of Fort William, Ont., to a point on the same line north of Sturgeon lake. McDougall & Honeywell, Ottawa, solicitors.

SUSQUEHANNA RAILWAY, LIGHT & POWER COMPANY.—This company, which owns the Lancaster, Pa., trolley lines, has purchased the property and franchises of the Philadelphia, Coatesville & Lancaster Street Railway for $137,500. The latter company has a line in operation between Coatesville, Pa., and Parkesburg. The new owners will begin construction at once of the line between Christiana, Pa., and Parkesburg, which will give through trolley service between Lancaster and Coatesville.

TEHUANTEPEC NATIONAL.—It is reported from the City of Mexico that S. Pearson & Son, Ltd., London, England, who are operating this road, are interested in the proposed line from San Geronimo, Vera Cruz, southeast through the states of Vera Cruz and Chiapas, and northeast through the states of Tabasco, Campeche and Yucatan to Merida, about 450 miles. The Mexican government is said to have recently granted a concession for building the mountain division of this proposed line. It is provided in this concession that this division, about 80 miles long, is to be operated by electricity. It is said that a thorough investigation by experts shows that the division which runs across the mountains can be operated more economically and to better advantage by electricity than by steam. This division will extend between San Cristobal, Chiapas, and Tuxtle. A portion of the country through which the line will pass is very rough and it is said that serious engineering and construction difficulties will be encountered.

TOLEDO & MICHIGAN.—Considerable work is being done on the line of this company which extends from Adrian, Mich., through Clayton, Hudson, Pittsford, Osseo, Hillsdale, Janesville, Quincy and Coldwater, about 60 miles. The roadbed has been graded for a distance of about 32 miles and a number of concrete culverts and bridges have been built. This line will parallel that of the Lake Shore & Michigan Southern, which passes through the same town. The authorized capital stock of this company is $1,500,000. P. T. Duket, President, Ohio building, Toledo, Ohio.

WISCONSIN CENTRAL.—President Newman Erb announces that plans to shorten the main line between Chicago, Minneapolis and St. Paul are under way. It is said that the road eventually will build a new cut-off from Mukwonago, Wis., on the main line west of Milwaukee to Grand Rapids, 135 miles, and from Spencer, Wis., to Owen, 15 miles. This would connect with the present main line by the Portage and Grand Rapids branches and would reduce the distance between Chicago and St. Paul 45 miles. Mr. Erb, while admitting that the road considered building cut-offs and that it has surveyors in the field, declined to say if the cut-offs described were the ones contemplated.

YAQUI LAND & WATER COMPANY.—Incorporated in New Jersey, with a capital stock of $15,000,000, to build a line of railway from a point on the Gulf of California in Mexico to a point either in the state of Sonora or Chihuahua. The incorporators include E. L. Gruber, T. J. Regan, C. W. Davis and J. R. Turner. The principal offices are at 15 Exchange place, Jersey City, N. J.

Railroad Financial News.

ATLANTA, BIRMINGHAM & ATLANTIC.—The receivers have been authorized to issue $184,000 notes to pay installments of $60,000 and $80,000 that fell due on the first of last November and the first of last January respectively, being the principal of equipment trust notes.

BOSTON & MAINE.—John L. Billard, who some months ago bought $11,000,000 stock of the Boston & Maine, which the New York, New Haven & Hartford sold, has asked the Connecticut legislature to approve the incorporation of the Billard Company. The Billard Company is to have power to buy and sell or hold stock of the Boston & Maine.

CUBA EASTERN.—The property of this company, the Northeastern Cuba, Cuba Eastern Terminals and the Eastern of Cuba is to be acquired by a new corporation which will issue $600,000 first mortgage 6 per cent. 20-year bonds; $2,750,000 first preferred 7 per cent. non-cumulative stock; $250,000 second preferred 5 per cent. non-cumulative stock, and $2,750,000 common stock; these securities to be exchanged for the outstanding securities of the four companies. There are $4,927,000 first mortgage bonds of the four companies and $221,000 debentures outstanding in the hands of the public, and $8,200,000 stock outstanding.

CUBA EASTERN TERMINALS.—See Cuba Eastern.

EASTERN OF CUBA.—See Cuba Eastern.

LOUISVILLE & NASHVILLE.—The $23,000,000 collateral trust bonds of 1903-1923, redeemable after 1908, are to be paid on April 1 from the proceeds of a sale by the company to J. P. Morgan & Co., New York, of collateral aggregating $28,864,000. This collateral was held as security for the bonds.

METROPOLITAN STREET RAILWAY.—On January 28, Judge Lacombe, in the United States Circuit Court, ordered the foreclosure sale of the property of this New York street railway company under the general collateral trust mortgage unless interest is paid within 20 days.

The suit brought against Thomas F. Ryan, H. H. Vreeland and other directors charged with fraudulent acts in connection with the affairs of the company has been dismissed.

NEW YORK CENTRAL & HUDSON RIVER.—This company has been given permission by the New York Public Service Commission, Second district, to buy the stock of the Spuyten Duyvil & Port Morris Railroad at a price not to exceed $230 a share. The Spuyten Duyvil road, running from Spuyten Duyvil, N. Y., to Mott Haven, six miles, has been leased to the New York Central & Hudson River since 1871, the Central paying 8 per cent. dividends on its stock.

NORTHEASTERN CUBA.—See Cuba Eastern.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

Walter H. Gahagan has ordered two locomotives from the Baldwin Locomotive Works.

The Erie & Michigan Railway & Navigation Co. has ordered one locomotive from the American Locomotive Co.

The Grand Trunk Pacific has ordered 25 mogul locomotives from the Canadian Locomotive Co., Kingston, Ont.

The Chesapeake & Ohio has ordered 15 locomotives from the American Locomotive Co. and has an option on 15 more.

The Wenatchee Valley & Northern, under construction in Washington, has ordered one locomotive from the Baldwin Locomotive Works.

The Iowa Central, reported in the *Railroad Age Gazette* of January 22 as being in the market for from 15 to 30 locomotives, is now asking prices on 12 locomotives.

The Atchison, Topeka & Santa Fe has ordered two Mallet compound passenger locomotives and two Mallet compound freight locomotives from the Baldwin Locomotive Works.

CAR BUILDING.

The Minneapolis & St. Louis is in the market for 100 freight cars.

The Chicago, Burlington & Quincy is in the market for 31 passenger cars, including 26 coaches.

The San Antonio Traction Co., San Antonio, Tex., will place an order soon for ten semi-convertible cars for early delivery.

The Chesapeake & Ohio has ordered 187 miscellaneous freight cars from the American Car & Foundry Co. for replacement.

The Chicago, Milwaukee & St. Paul is asking prices on a number of passenger cars in addition to those reported in the *Railroad Age Gazette* of January 29.

The Pere Marquette, reported in the *Railroad Age Gazette* of January 29 as asking prices on 50 forty-ton box cars, has ordered this equipment from the Pullman Company.

The New York Central Lines, reported in the *Railroad Age Gazette* of January 29 as asking prices on from 50 to 80 passenger cars, is now asking prices on 140 passenger cars.

The Spokane, Portland & Seattle, reported in the *Railroad Age Gazette* of December 18 as asking prices on 200 forty-ton box cars, has indefinitely postponed the placing of this order.

The Illinois Traction Co., Champaign, Ill., reported in the *Railroad Age Gazette* of December 18 as in the market for 25 forty-ton box cars, has placed this order with the American Car & Foundry Co.

The Escanaba & Lake Superior, reported in the *Railroad Age Gazette* of January 1, as in the market for 50 forty-ton steel underframe flat cars, has ordered this equipment from the Fitz-Hugh, Luther Co.

The Cleveland, Akron & Columbus, as reported in the *Railroad Age Gazette* of January 29, has ordered 100 freight cars from the Standard Steel Car Co. These cars will be 50-ton box cars with steel underframes.

The Western Maryland, previously reported in the *Railroad Age Gazette* as being in the market for freight cars, has ordered 500 steel underframe box cars and 350 steel hopper cars from the Standard Steel Car Co.

The Pennsylvania, reported in the *Railroad Age Gazette* of January 29 as asking bids on 2,100 new freight cars for Lines West, has ordered 2,200 cars, divided as follows: Cambria Steel Co., 1,000; Pressed Steel Car Co., 500; American Car & Foundry Co., 600, and the Standard Steel Car Co., 100.

IRON AND STEEL.

The New York, Chicago & St. Louis has ordered 5,000 tons of Bessemer rails from the Illinois Steel Co.

The Chicago & Oak Park Elevated has ordered 1,225 tons of open-hearth rails from the Indiana Steel Co.

The New York, Chicago & St. Louis is said to have ordered 6,000 tons of heavy rails from the Illinois Steel Co.

The Pennsylvania is asking bids on 6,000 tons of structural steel for use on the Trenton avenue elevated lines in Philadelphia, Pa.

The Minneapolis, St. Paul & Sault Ste. Marie is said to be in the market for 500 tons of plate girders for a bridge at St. Paul, Minn.

The Baltimore & Ohio is understood to be about prepared to close contract for its 1909 rail requirements, said to be in the neighborhood of 60,000 tons.

RAILROAD STRUCTURES.

Baton Rouge, La.—The Texas & Pacific is said to have filed plans with the Louisiana Railroad Commission for a passenger station to be built opposite Baton Rouge. Part of the material for the building has been ordered and work is to be started within 30 days.

Beaver, Pa.—In connection with the rebuilding of the passenger and freight stations by the Pittsburgh & Lake Erie, the company proposes to build a subway, it is said, under the four track system at the Beaver end of the new bridge, now under construction over the Ohio river, also to build a boulevard from the new station to West Bridgewater. Shelter sheds are to be put up at either side of the four-track system. It is understood that similar plans have been outlined for the Beaver Falls Brighton passenger station, with the exception of the subway. (August 14, p. 733.)

Chicago, Ill.—The Board of Trustees of the Sanitary District of Chicago has given, to George W. Jackson, Inc., Chicago, the contract for the fabrication, erection and completion of the superstructure of the two railway bridges for the Chicago & North Western across the North Shore channel of the Sanitary District of Chicago. The contract price for both structures is $32,315. (Jan. 15, p. 141.)

See item in another column on Chicago & Alton freight terminals.

Dublin, Tex.—The Texas Central has begun the erection of a new freight depot, with dimensions of 106 ft. x 24 ft., to replace the one destroyed some time ago by fire.

Galveston, Tex.—The Gulf & Interstate has given the contract to Janssen & Zempter, Galveston, for a new passenger station, 85 ft. x 25 ft.

Hattiesburg, Miss.—The New Orleans & Northeastern has given the contract to the Jefferson Contracting Co., Birmingham, Ala., for the brick and stone work, costing approximately $63,500, for its new passenger station. The contract for the steel construction, to cost about $12,500, has been given to the Chattanooga Steel Co., Chattanooga, Tenn. The building of the express room, which is separate from the station, is included in the contract. Two train sheds, of the umbrella type, each 1,000 ft. long, will also be built. (Jan. 22, p. 189.)

Hulburt, Ark.—See Chicago, Rock Island & Pacific under Railway Construction.

Jacksonville, Ill.—The Chicago & Alton has asked bids on the construction of a new passenger station to cost $15,000. It will be one story high, 100 ft. wide and will be a brick structure on a concrete foundation. (July 24, p. 597.)

Joliet, Ill.—See item in another column on Chicago & Alton freight terminals.

Kansas City, Mo.—See item in another column on Chicago & Alton freight terminals.

North Yakima, Wash.—According to plans filed recently at North Yakima, the North Coast expects to build a large passenger station, freight house, repair shops, roundhouse and coal bunkers, and an ice house with a capacity of 10,000 tons.

River Forest, Ill.—The Chicago & North Western is having plans prepared by Frost & Granger, Chicago, for a new passenger station. It will be one story high and of brick construction.

Springfield, Ohio.—The Detroit, Toledo & Ironton expects to begin work soon on a new office building and passenger depot. The office building will be two stories high. The work will be done by the railway.

Street Car Fenders for New York City.

The New York State Public Service Commission, First district, which has made elaborate tests of fenders for street cars, held hearings this week with a view to ordering the use of fenders or wheel guards on all surface cars in New York City. The committee which made the tests recommends that all such cars have two automatic wheel guards, to be attached to the trucks, and that in addition, fenders of a projecting type be put on all cars except those running in the most congested streets. Cars running both in thickly settled and thinly settled parts of the city should have fenders to be used a part of the time, to be tied up out of the way when desirable to do so. At present the cars of the Metropolitan Street Railway lines in Manhattan have no projecting fenders, but they have wheel guards. On the Third avenue line the cars have neither guards nor fenders. The cost of the fender tests was about $8,000, an average of $4.44 for each test, which, in view of the large number of casualties reported in New York city—indicating great need of life-saving apparatus—the commission regards as a very moderate expenditure. The Commission has issued in pamphlet form a full and careful report of the tests.

United States Wood Preservers' Association.

The fifth annual meeting of the United States Wood Preservers' Association was held in the Auditorium Hotel, Chicago, January 19, 20 and 21. President Walter Buehler, Expert Engineer of the Kettle River Quarries Co., Minneapolis, Minn., was in the chair. This association now numbers 52 members, of which some thirty were in attendance at the meeting. Secretary C. W. Berry (Union Pacific R. R.) read statements he had prepared, giving the total amount of material treated by the different preservative processes in the United States in the year 1907, and a comparison of the material treated in 1906 and 1907, these statements being made up from information furnished by members. Following is a summary of these statements:

	1906.	1907.	Increase.	Av. amt. injected per cu. ft. in 1907.
Creosote.				
Cu. ft. of piling	5,358,827	6,024,169	665,342	13.00 lbs.
" " lumber	3,834,241	4,561,327	727,086	11.00 "
" " bridge timber	861,743	1,124,035	262,292	12.25 "
" " switch ties	....	563,415	563,415	8.33 "
" " paving blocks	1,764,233	2,874,560	1,110,327	14.00 "
" " cross arms	122,612	238,742	116,130	10.00 "
Net increase			3,444,592	
Number of ties treated	1,836,983	5,750,874	3,913,891	
Zinc-chloride				
Cu. ft. of piling	11,657	....	*11,657	.....
" " lumber	365,411	74,564	*290,847	0.51 lbs.
" " bridge timber	34,887	45,671	10,784	0.37 "
" " switch ties	404,736	280,215	*124,521	0.35 "
Net decrease			416,241	
Number of ties treated	14,168,784	9,864,765	*4,304,019	
Zinc-oil.				
Cu. ft. of piling	211,568	265,485	53,917	.....†
" " lumber	5,691	9,456	3,765	.....†
" " switch ties	....	47,356	47,356	.....†
Net increase			105,038	
Number of ties treated	918,691	2,345,670	1,426,979	
Zinc-Glue-Tannin.				
Number of ties treated	907,775	476,675	*431,100	0.50 lbs.

*Decrease.

†Zinc, 0.25-lb., oil, 3.0 lbs.: same amounts for all three materials.

Recapitulation.

Net increase, cubic feet of piling	707,602
" " " " " lumber	440,004
" " " " " bridge timber	273,076
" " " " " switch ties	486,250
" " " " " paving blocks	1,110,327
" " " " " cross arms	116,130
Total net increase, cu. ft., material treated*	3,133,389
Total net increase of cross ties treated	605,751

*Not including cross ties.

There were no committee reports or prepared papers, the programme, instead, consisting of topical discussions on various subjects of interest to the members. These subjects were as follows:

Heart woods which can be treated.

The treatment of dead timber.

The proper grouping of timber for treating.

Inflammability of treated timbers.

Quantity and quality of creosote for treating piling.

The use of crude oil as a timber preservative, and the best method of application.

Should an attempt be made to air-season timber before treating in the southern part of the United States?

What is the best power for moving ties and material throughout the yard and into the retorts?

Treating in open tanks.

Experience in injury to men from handling treated timbers.

Effect of timbers treated with creosote and zinc chloride on electric currents passing through other materials in contact with the timber.

In addition to the foregoing, Octave Chanute sketched briefly the history of timber preservation in America, and others made supplementary statements concerning the same.

Some of the subjects given were only briefly discussed, while others were gone into more at length. The object of the committee on subjects in introducing the first topic on the list, "heart woods which can be treated," was to get the experience of the members as to what heart woods can be treated. Carl G. Crawford (Amer. Creos. Co.), formerly chief of the office of wood preservation, United States Department of Agriculture, thought up to recently that treatment of heart woods with creosote was impossible, but had found that heart woods of certain species can be treated, some of them very easily—red oak and black gum, for instance. He also understood that hickory, maple and birch heart wood can be treated as easily if not more so than the sap wood.

In reference to the treatment of dead timbers, the committee had in mind the quantities of fire-killed timbers to be found in the West, and also certain kinds of bug-killed timber, said to be perfectly sound if cut soon after it is killed, and to make good ties. C. W. Berry (U. P.) said they did not consider it well to use dead timber unless obtained shortly after it is killed, before there is any sign of decay. Roadmasters and section foremen had confirmed his observations that it will not last as long in track as live timber; also the zinc chloride leaches out more readily. F. J. Angier (C., B. & Q.) said they treat a good many thousand ties from what is known as bug-infested timber. It takes the solution readily, as high as 110 per cent. absorption, and they expect a life of 10 or 12 years for these ties. Mr. Berry said that a good many railways won't accept dead timber ties, from unsatisfactory experience with them. Mr. Chanute said the bulletin of the Department of Agriculture on dead timber says it makes good ties.

On the topic of proper grouping for treatment, E. B. Fulks (Rock Island), for the committee, said that theoretically not only should each variety of timber be treated separately, but the different species should be separated, and even the same species grown under different conditions; but this, of course, was impractical. The grouping adopted at different plants depends on the locality. A. Gibson gave the grouping for the Brainerd, Minn., and Paradise, Mont. (creosoting) plants of the Northern Pacific. At the former, red oak and jack pine are treated alone; birch, ash, elm and maple together. At Paradise, red fir is treated alone; white fir, yellow pine and white pine together, and jack pine and lodge-pole pine together. Mr. Angier said the Burlington has three classes—A, B and C. Timber absorbing under 20 per cent. in volume of the preservative is in class A; between 20 and 30 per cent., class B, and over 30 per cent., class C. The first includes oaks, hickory, tamarack, beech, ash and hemlock. The second, gum, chestnut, hard maple, Douglas fir and sycamore; the third, loblolly pine, soft maple, elm, birch, poplar and cottonwood. These timbers come to them in mixed lots, it being considered cheaper to sort them at the plant than before shipment. The cost in the latter instance is about 1¼ cents a tie. Mr. Gibson said the Northern Pacific has its timbers separated before shipment.

It was pointed out that not only should timbers be grouped according to species, for treatment, but also with reference to sizes, to get uniform absorption. J. B. Card (Chgo. Tie Pres. Co.) said this was true for creosote, but with zinc chloride, where the timber was being treated to the refusal point, size was not a factor, as all of the timber would receive the same unit amount of the preservative. Mr. Chanute mentioned that the length of the pieces was a much more important factor than the cross-section, as two-thirds of the preservative goes in at the end of a piece.

The discussion of the topic "inflammability of treated tim-

bers" consisted mostly of citations of instances, coming under the observation of members, of creosoted timbers which had been exposed to fire and had not burned as readily as untreated timber. It was the opinion of the committee on subjects that properly seasoned creosoted timber is not as inflammable as untreated timber. Mr. Chanute said this was well known, but that when creosoted timber once got to burning it was very difficult to extinguish.

In the discussion of "the quantity and quality of creosote for treating piling," Mr. Crawford said that such instances as he knew of timbers failing through attacks of sea worms were due to the use of inferior qualities of oil. R. J. Calder (I. C. & C. Co.) said such failures also resulted from too light treatment with good oil. In regard to the quality of creosote, Mr. Calder said there is still so much uncertainty about this, that in all the experiences his company has had they have never been able to come to any satisfactory conclusions on this point.

Speaking of the use of crude oil as a preservative, G. E. Rex (Santa Fe) told of the results obtained thus far on his road. They use California (Bakersfield) oil having a heavy, 75 per cent., asphaltum base. On their 7-in. x 9-in. ties they get an absorption of 55 lbs. per tie, and on their sawed, 7-in. x 8-in. ties, about 40 lbs. The asphaltum is expected to exclude the moisture and thus prevent decay of the wood. As the method has not been in use long, the results are only experimental as yet, though they expect it to be a success and to grow in use. The species they treat are the pines of New Mexico and Arizona. This oil can be exposed in a pan for a year without perceptible evaporation.

The Texas oil, on the other hand, which has a paraffine base, is not a preservative. But Titusville (Pennsylvania) oil, also having a paraffine base, acts as a good preservative so long as the timber is kept saturated. The Texas oil has a great deal of sulphur, this being the difference between it and the Pennsylvania product.

The topic on "air seasoning" was limited to the southern part of the United States because of the fact that decay sets in so quickly in cut timbers in that section. According to members from that part of the country the limit of time for air seasoning there is three or four months, so that though they may prefer thorough air seasoning before treating, they must be governed by natural conditions.

On the topic of best motive power for use around preserving plants, J. B. Card said that in conjunction with the hoist and cable system they use a 10-ton locomotive crane for loading and unloading cars, piling ties, etc., and also for moving tram cars which are out of the zone of the cables and hoists to within reach of same. They can unload ties for about 75 cents a thousand, and pile them 30 ft. in the air and 100 ft. from the track. The latter is accomplished by chaining them in bundles after removal from the car, lifting them by the crane to the top of the pile, the men then skidding them across the top to whatever point desired. He pointed out the economy in yard space and tracks this means. Mr. Buehler said that after careful investigation of every system now in use (except the locomotive crane, which he hadn't previously known about) they had adopted an oil-burning industrial locomotive. He asked how the locomotive crane was used for loading ties into box cars. Mr. Card said that as these were creosoted ties they were not allowed to put them in box cars, therefore they use stock cars. These are cut, and separated far enough to put a supporting platform between. The crane lifts the loaded tram car on to this platform and the ties are shoved through the end door of the car.

Coming to the "open tank treatment," Mr. Fulks said that while it was a good method under certain special conditions, harm was going to result from it if continued in the direction now headed, as it was unsuited to many of the uses to which it is now applied. As to comparing it to the closed tank, or pressure method, he said such a comparison was impossible because of their total dissimilarity, there being no common basis for comparison.

The topic "experience in injury to men from handling treated timbers," Mr. Fulks explained, was prompted by the fact that the railways every now and then are made defendants in damage suits brought by section men and track laborers who claimed to have been injured—poisoned—by handling treated ties. If such a thing were possible or had ever occurred he did not know of it and he thought all of the members of the association should be on record in its Proceedings as to whether or not any such injury had come under their observation or within their experience. Accordingly, the following questions were prepared by a committee and all of the members asked to answer in writing:

How long have you been connected with the operation of a timber-treating plant?

What preservatives have you used?

To your knowledge have any employees been in any way injured by the action of the preservative: (a) At the treating plant? (b) After the treated material has been delivered at the place it is to be used?

The result of this canvass will not be known for some days as the questions must be sent to members not in attendance at the meeting.

The last topic on the list was discussed only briefly, and will be taken up in some form at the next meeting, none of the members present having any experience with or knowledge of the subject.

The officers of the association for the ensuing year are: President, Walter Buehler (Kettle River Quarries Co.), re-elected; First Vice-President, David Allerton (Amer. Creos. Co.); Second Vice-President, H. J. Valentine (E. & R. Creos. Co.); Third Vice-President, H. M. Rollins (T. & N. O. Wood Pres. Wks.); Secretary-Treasurer, C. W. Berry (Union Pacific R. R.), re-elected. Chicago was again chosen as the place of meeting.

Supply Trade News.

The McClintic-Marshall Construction Co., Pittsburgh, Pa., has opened an office in the Central building, Seattle, Wash. C. F. Boyce is the Sales Representative in charge.

The O. M. Edwards Company, Syracuse, N. Y., will furnish window fixtures for three passenger coaches for the Green Bay & Western, now building at the Hicks Locomotive & Car Works; design No. 13-01 will be used.

The Northern Engineering Works, Detroit, Mich., recently supplied traveling cranes to the Black Hills Traction Co., Deadwood, S. Dak.; one 3-ton crane to the New Phoenix Foundry & Machine Co., Springfield, Mo.; one 15-ton crane to the city of Oswego, N. Y.; and two 7½-ton traveling cranes to the Western New York Construction Co.

J. F. Hinckley, Chief Engineer of the St. Louis & San Francisco, has resigned to engage in private practice as a consulting engineer, with offices in the Syndicate Trust building, St. Louis, Mo. Mr. Hinckley is a member of the American Society of Civil Engineers, the American Railway Engineering & Maintenance of Way Association, and the Engineers' Club of St. Louis.

An inspection report from the Westinghouse turbine plant of the Hampton Company, East Hampton, Mass., covers a period of 2½ years of continuous service since August, 1905. The turbine was recently inspected internally and found in excellent condition. It is said that the blading was apparently in as good condition as when installed and showed no signs of wear or corrosion.

John Cargill has taken a position with Robert W. Hunt & Co., Chicago. His headquarters will be at the firm's New York office, 90 West street. He will devote particular attention to the examining and reporting on railway and other corporate properties, for which his experience gained while connected with the Pennsylvania Lines, the British Westinghouse Company, the Metropolitan Railway Co. of London, and other organizations, has prepared him.

David J. Evans, Manager of Sales of the Chicago office of the Rail Joint Company, New York, has resigned, effective March 1, and will give his personal attention after that date to the interests of the Andresen-Evans Co., Chicago, in which company he has been interested since its organization. Prior to his association with the Rail Joint Company, Mr. Evans was for a number of years connected with the Chicago office of the Lorain Steel Co., and also the North American Railway Construction Co. The Andresen-Evans Co., as engineers, has

developed new types of ore and coal unloading and conveying bridges, grab buckets, etc.

James E. Simons, Fisher building, Chicago, as reported in the *Railroad Age Gazette* of January 15, has been appointed Northwestern Representative of the Composite Board Co., Niagara Falls, N. Y. Through a typographical error, it was stated in the item referred to that the Composite Board Co. manufactured an inflammable board for the interior lining of steel cars. Of course, this should have read a "non-inflammable board." The company also manufactures a plain board for headlinings and interior decorations for passenger cars and steamboats that will take an excellent finish and can be furnished in large sizes.

Edward C. Brown, Manager of the Hawaiian office of the Dearborn Drug & Chemical Works, Chicago, is making a trip of three or four months to Japan, the important seacoast cities of China, Australia, the Philippines, Java, and other important islands in the Pacific ocean. Mr. Brown has handled the Dearborn company's business in the Hawaiian islands since that department was opened, some ten years ago. The company reports that the general business of the whole company for the last six months of 1908 was larger than for any six months in its history, indicating the quick return of prosperous business conditions.

Frank W. Noxon has been chosen Secretary of the Railway Business Association, succeeding George M. Basford, who, for the past two months, has been Acting Secretary. It has become necessary for Mr. Basford to devote his time exclusively to his duties as Assistant to the President of the American Locomotive Company. Mr. Noxon has had an extended experience in newspaper work both as editor and special contributor. He has been engaged for about fifteen years in newspaper work in Boston, having been connected with the *Advertiser*, the *Traveler*, and the *Herald*. He has acted as Assistant Secretary of the Railway Business Association since its formation.

The Inter Ocean Steel Co., whose organization was noted in our issue of January 8, has secured 80 acres of land at Chicago Heights, Ill., on which its plant will be built. The tract is on the line of the Elgin, Joliet & Eastern, fronting 3,000 ft. on the same, and also has direct connection with the Michigan Central and the Chicago & Eastern Illinois. The plans, which are being prepared by Julian Kennedy, who has resigned from the Railway Steel-Spring Co., New York, will be pushed as fast as possible. The capital stock of the company is $2,500,000, instead of $2,000,000, as previously noted, and the latter amount will be spent on the plant and equipment. In addition to the products mentioned in the previous note, the plant will also make rolled shells for crushing machinery, and rolled steel pipe flanges. W. V. D. Wright, formerly President of the Wright-Thiffault Co., Chicago, has been elected Treasurer of the new concern. The office of the company is in the Railway Exchange building, Chicago.

The Brighton Car Co., Chicago, as mentioned in the *Railroad Age Gazette* of November 27, has bought 40 acres of land at St. Louis Park, a suburb of Minneapolis, Minn., for a new car manufacturing plant. The plans include a blacksmith shop, machine shop, storeroom and mill. Work on these, except the mill, is now progressing rapidly, and it is expected the plant will be in operation by March 1. The mill, which is completed, is 100 ft. x 50 ft. Additional storeroom space has also been provided by turning a building already on the grounds into a storeroom. This structure is 90 ft. x 150 ft. There will be an initial trackage capacity for 125 cars, to be increased later as needed. From 250 to 300 men will be employed at the start. The company at first will confine its work to the repair and rebuilding of freight cars of all types, but it is probable that machinery will be installed soon after the plant is in operation that will enable it to build new cars. Most of the machinery required, including generators, motors, milling machinery, etc., has been bought. Frank Kellerman, President of the Brighton Car Co., will be President and General Manager of the new works, which will be known as the Minneapolis Car Co. W. J. Grogan will be Superintendent.

Samuel Addison Megeath was on January 27 elected Vice-President and General Manager of the Galena-Signal Oil Co., Franklin, Pa. He had formerly been Vice-President of the company but resigned this office in March, 1907, to take charge of the foreign department of the concern. He was born in Omaha, Neb., in 1869, soon after his parents had gone there from Virginia. After a college education he went into the stationery business. In 1895 he went to the Galena-Signal Oil Co. and became Vice-President. Mr. Megeath will have offices both at Franklin, Pa., and at 26 Broadway, New York.

S. A. Megeath.

TRADE PUBLICATIONS.

Calendar.—The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, is distributing a very handsome calendar on which the painting by Henry P. Smith of Washington's home at Mount Vernon is reproduced.

Thermit Repairs.—The Goldschmidt Thermit Co., New York, has recently issued a pamphlet which contains half-tone reproductions made from photographs of a number of specimens of repair work done by the use of thermit. These specimens cover both track and shop work.

Economy Short Sockets and Sleeves.

To meet the growing demands for a device to utilize the large number of taper shank drills which are rendered useless on account of broken or distorted tangs, caused principally by worn or poorly fitting sockets, the Standard Tool Co., Cleveland, Ohio, is making Economy short sockets and sleeves, shown in the accompanying Figs. 1 and 2. These are very similar to the regular sockets and sleeves now on the market, excepting that the slot for removing the drill or other tool is lower and of larger dimensions.

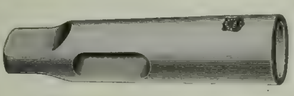


Fig. 1.

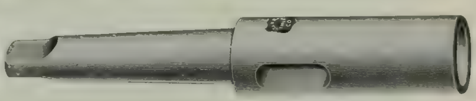


Fig. 2.

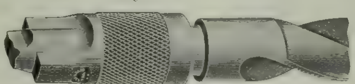


Fig. 3.

Fig. 4.

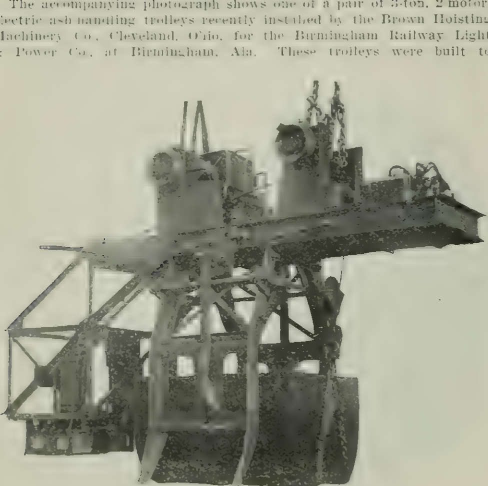
Economy Short Sockets and Sleeves.

To provide a new tang to fit these sockets, the Economy tang gage is used. By slipping it over the shank of the broken drill, as shown in Fig. 3, a new tang of correct size and position can be marked out. It is then shaped either by milling, planing, filing or grinding. The new tang is heavier and stronger than the old one, as shown in Fig. 4, and it also insures an accurate and powerful drive.

The shanks of the Economy sockets and sleeves are made of regular dimensions and will fit the spindles of all the leading makes of power drill presses. This method of using broken tang drills is inexpensive and should appeal to the practical mechanic.

Ash Handling Trolleys.

The accompanying photograph shows one of a pair of 3-ton, 2 motor, electric ash handling trolleys recently installed by the Brown Hoisting Machinery Co., Cleveland, Ohio, for the Birmingham Railway Light & Power Co., at Birmingham, Ala. These trolleys were built to



Ash Handling Trolley.

replace trolleys running on a single I beam and it was decided that more satisfactory results could be obtained by using a double line of rails fastened to the top of I-beams for the runway track. The capacity of the bucket is 50 cu. ft. As it was always possible to dump the load in its highest carrying position, it was decided to use a single rope system and suspend the bucket in carrying hooks when it was desired to dump. Because of this arrangement, the mechanism is very simple and constructed with the fewest possible number of parts.

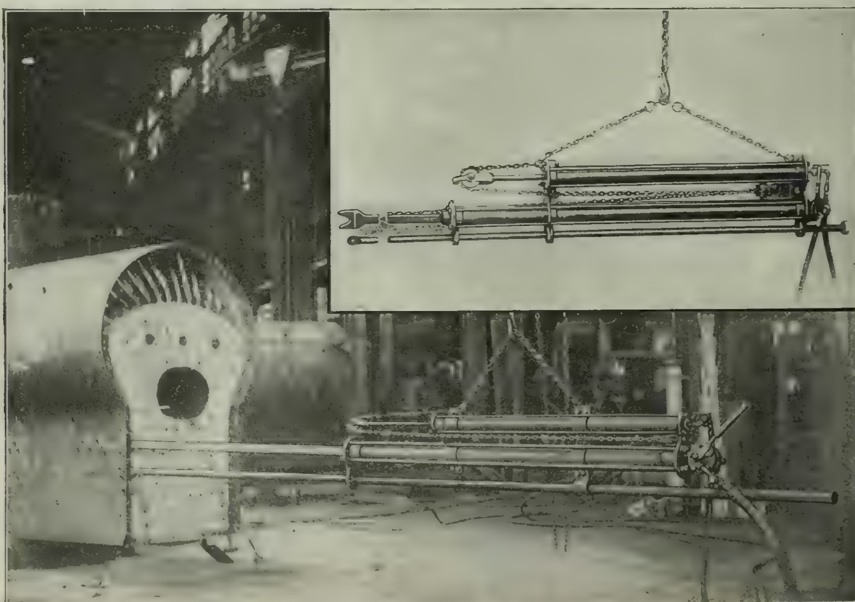
All gears are encased in cast-iron coverings, so as to be entirely protected from dust and dirt and at the same time the cases are arranged to allow easy access to all gears and bearings for lubricating. The machine is equipped with a safety lowering device, so that the load cannot be lowered without reversing the motor. In case anything should happen to the mechanism, the hoisting mechanism would be instantly stopped and the load safely suspended. There is also a solenoid brake which is set at all times, when the current is cut off, and which also serves to check the rotation of the armature when the bucket has reached the limiting position either in hoisting or lowering. The machine has speeds of 40 to 50 ft. per minute for hoisting the load, and 600 to 650 ft. per minute for trolley travel. In order to keep the motors alike, and make as many parts as possible interchangeable, the hoisting and racking motors are made the same size.

A hand-brake is used on the racking mechanism. This brake, together with two controllers, placed in the cage, allow the operator to control all movements of the bucket and trolley. To prevent the operator running the bucket into the bumper at the extreme height of the hoist, a safety limit switch is provided which cuts out the current when the bucket reaches a certain point and thus prevents it from running into the bumper with force enough to do any damage. To dump the load the bucket is simply hoisted into the carrying hooks, the hoisting ropes are then slackened off, the doors of the bucket open and the load is dumped. As the bucket had to be lowered through hatches between the rails of the railway tracks at the floor level to be filled, the corners of these hatches were protected by 6 x 6 in. angles flaring out at the top. These angles also serve to guide the bucket through the openings.

This equipment has proven thoroughly satisfactory in actual service and makes a simple and cheap arrangement for handling ashes where conditions are such as were found at this plant.

The Lowe Staybolt Breaker.

A pneumatic staybolt breaker which has been in use in the Silvis shops of the Rock Island for more than a year is shown in the accompanying illustration. There are two parallel cylinders, the upper one of which holds the device up to the work, advancing it automatically as the bolts are broken. This is done by the chain passing around the sheaves respectively on the take-up cylinder piston rod and at the back end of the device, thence to the boiler, to which it is attached. The guide bar under the driving cylinder is likewise fastened to the



The Lowe Staybolt Breaker.

boiler shell and is moved up or down to bring the breaker bar in line with the row of bolts to be broken.

Both cylinders are 4 in. in diameter, the upper one being 5 ft. 8 in. long and the lower one 7 ft. 9 in. long, the length of travel of the breaker bar at one setting being 9 ft. 6 in. The machine works under air pressures of 80 to 150 lbs., doing best at from 100 to 125 lbs. A pressure of 100 lbs. in the take-up cylinder brings a force of some 1,200 lbs. against the bolt in addition to the blow of the breaker bar,

assisting effectively in the work of the latter. The machine is operated by the valve at the back end of the driving cylinder. In the engraving the valve handle in the lower view is in position for the return of the ram after a stroke. To advance the ram the handle is thrown to the corresponding position forward. One to three blows are required to break a bolt. The blows are delivered as fast as the operator can move the handle, which is easy to move.

The device has a record of breaking a row of twenty eight $\frac{7}{8}$-in. staybolts in three minutes. A boilermaker and helper can break the staybolts in a boiler of the largest size in 11 to 14 hours, while the danger of personal injury is practically eliminated. The maintenance cost of the device is low. It has been run an average of four days a week for more than a year and has cost only about $5 for repairs, exclusive of breaker bars. Air is supplied through a 1-in. hose. The machine was devised by Grover S. Lowe, a machinist in the Silvis shops. Williams, White & Co., Moline, Ill., have the manufacturing and selling rights.

Roney Mechanical Stokers.

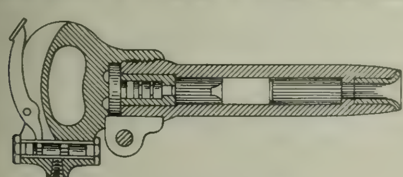
The Westinghouse Machine Co., Pittsburgh, Pa., builder of the New Model Roney mechanical stoker, reports a large business in boiler-plant equipment for the last three months. The more important orders cover some thirty or forty equipments for various types of boilers in many different classes of service. Of these, government and state institutions have contracted for 17 stokers. The Public Service Corporation, Jersey City, N. J., has adopted this type of stoker after competitive tests, 15 equipments being ordered for the present. Other orders from traction lines include: Kentucky Electric Co., Louisville, Ky.; Youngstown Heating Co., and the Nassau Light & Power Co. Further orders have come from the New York, New Haven & Hartford shops at Readville. The National Tube Co., Pittsburgh, Pa., which already operates a number of Roney stokers, has ordered more, as well as the Crescent Portland Cement Co., Wampum, Pa., the United Shoe Machinery Co., Boston, Mass., and the Newport Mining Co., Ironwood, Mich. There have been a number of orders for change-overs for remodeling present stoker equipments along the lines of the New Model stoker. A number of trial orders are also being made for the purpose of trying out the new improvements.

Helwig Pneumatic Hammer.

The Helwig pneumatic hammer shown in the accompanying illustration is designed to meet the demand for a pneumatic hammer of large capacity, simple design and substantial construction. It is said to be one which is convenient to handle, easy of operation and low in cost of operation and maintenance.

The valve, of piston type, is balanced and has a large wearing surface. It is made of solid tool steel, hardened and ground, and as it operates in the same direction as the piston the wear on it is claimed to be reduced to a minimum and the full power of the air is utilized for effective work. The one-piece valve chamber, also hardened and ground, is imbedded firmly in the barrel to prevent its being displaced while the hammer is in use and at the same time being readily removable for inspection or repair. The piston is a solid piece of tool steel, also hardened and ground. The drop forged steel handle is of the closed type. The hose connection is located at right angles with the barrel on the lower side of the handle and so placed as to be of the least hindrance to the operator. This is claimed to make a considerable saving in the wear and tear on the hose, as well as the threaded connection to the handle. A simple locking device is provided to prevent the handle from working loose.

The hard, metallic blow is said to be absent in this hammer and the ease of operation, in consequence of this fact, greatly lessens the



Helwig Pneumatic Hammer.

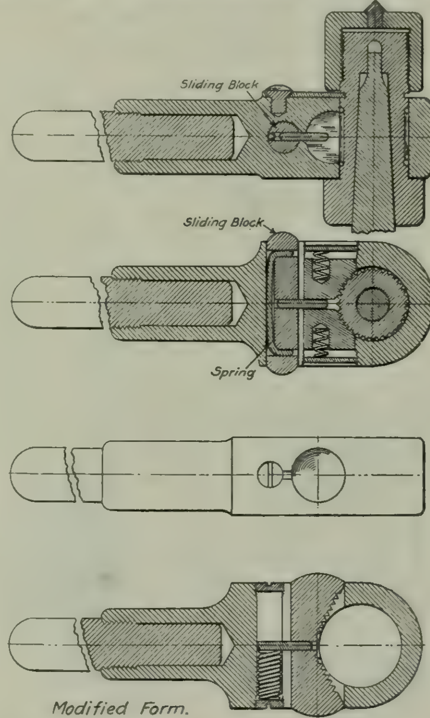
fatigue of the operator. The rivet hammer made by this company is designed to deliver a sharp, powerful and speedy blow. The chipping hammer, of faster cutting speeds than the other hammers, may be regulated as to speed and weight of blow. It is claimed that a 4-in. stroke chipping hammer, used for riveting, will drive $\frac{3}{4}$-in. rivets steam tight.

The Helwig Manufacturing Co., St. Paul, Minn., manufacturer of this hammer, claims its durability as a strong feature; also that its few parts, none of which are delicate, are of simple design and substantial construction.

Reversible Ratchet Wrench.

Arthur Munch, tool room foreman of the St. Paul shops of the Chicago, St. Paul, Minneapolis & Omaha, has patented the reversible ratchet wrench shown in the accompanying drawings. He provides two jaws, so engaging the tool holder as to turn it in opposite directions, with means for moving one or the other of the jaws out of engagement, depending on the direction of rotation of the tool holder. This is done by means of the slidable piece or block back of the jaws, having a pin projecting between the latter, and a friction spring to hold the slide to position. By pushing this slide to right or left the corresponding jaw is moved free of the tool holder and held so.

A modified form of this design has a single-piece jaw with a rearwardly projecting pin having a coil spring pressing against one side, as shown. To insert a tool holder the jaw must be pressed into a



Reversible Ratchet Wrench.

central position as shown in the lower illustration, the wrench being ready in this instance for left-handed operation. For use in the reverse direction the tool holder is simply inserted from the opposite side.

Nelson Valve Company Extension.

The Nelson Valve Co., Philadelphia, Pa., whose works are at Wyndmoor, in Montgomery county, just outside the city limits, has been incorporated in Pennsylvania, and given up its New Jersey incorporation. The company began in 1893 to manufacture valves of all kinds under the Nelson patents. It now employs from 200 to 250 men, the majority of whom are skilled mechanics, and it is now proposed to largely increase its facilities.

The new charter under the laws of Pennsylvania will empower the company to manufacture and sell pipe, valves, machinery, fittings and steam specialties. The authorized capital will be $1,000,000. The President of the new company, who was also President of the old one, is Samuel F. Houston, who is Vice-President of the Real Estate Trust Co., the Winifrede Coal Co., and the Winifrede Railroad Co. Carlisle Mason is the Vice-President and, as heretofore, General Manager; and Russell Bonnell is Secretary-Treasurer. Henry H. Bonnell is also one of the incorporators.

The company is now manufacturing a new valve calculated to stand the pressure of super-heated steam, no matter what degree of heat

the steam will register. The new valve, which will be of large diameter chiefly, is being made of high grade cast steel, reinforced with nickel, so as to protect it from the action of the steam.

The new buildings, now in course of erection at Wyndmoor, are of reinforced concrete. It is expected that the new buildings will be ready for occupancy very shortly. The company has a selling office in the Real Estate Trust building, Philadelphia, and will shortly open a general office in that city, where the principal office will be located.

Atlantic City Exhibits.

The accompanying diagram shows the arrangement of exhibit spaces on Young's Pier, Atlantic City, N.J., for the June conventions of the American Railway Master Mechanics' and the Master Car Builders' Associations. The table gives a summary of the space dimensions.

SUMMARY OF SPACE.

Annex Court and Annex.

Space Nos.	Frontage by depth in ft.	Area, each space, sq.ft.
400	Irreglr.	1,950
405	Irreglr.	1,490
407-411 (odd)	10x20	200
410	Irreglr.	1,070
413-451 (odd & even)	10x14.2	142
454	27x20	540
455	30x20	600
456-497 (odd & even)	10x15	150

Aquarium Court.

Space Nos.	Frontage by depth in ft.	Area, each space, sq.ft.
201	Irreglr.	208
203-209 (odd)	9x18	162
200	Irreglr.	1,500
210-211	"	700
212	"	120
214-230	10x15	150

Main Building.

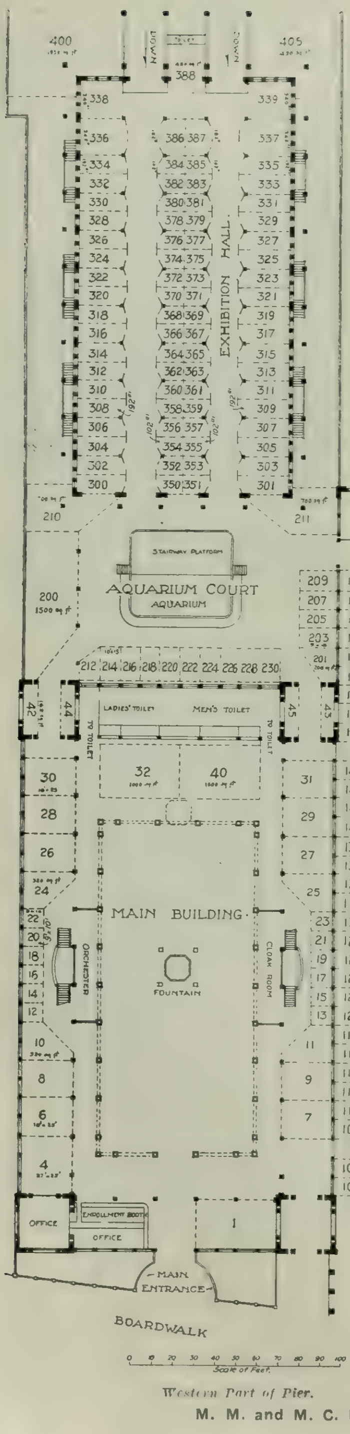
Space Nos.	Frontage by depth in ft.	Area, each space, sq.ft.
1	38x23	875
4	27x25	675
6-9 (odd and even)	18x25	450
10-11	Irreglr.	320
12-23 (odd & even)	9x10	90
24-25	Irreglr.	320
26-31	18x25	450
32-40	40x25	1,000
42-45 (odd & even)	24x7	162

Exhibition Hall.

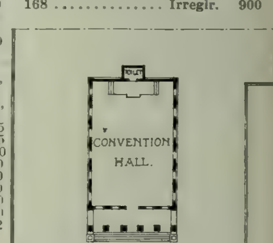
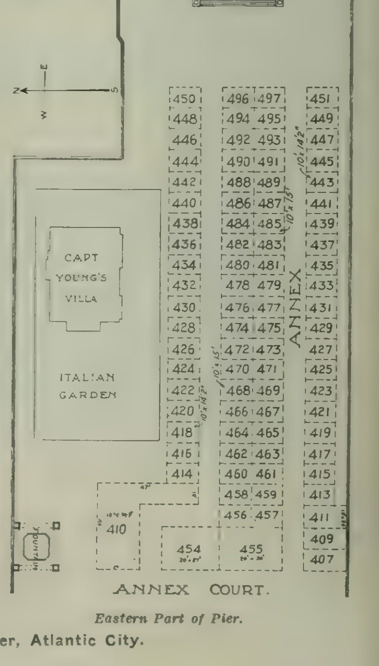
Space Nos.	Frontage by depth in ft.	Area, each space, sq.ft.
300-335 (odd & even)	Irreglr.	192
336-337	Irreglr.	342
338-339	18x20	360
350-385 (odd & even)	Irreglr.	102
386-387	Irreglr.	182
388	18x27	480

Machinery Hall.

Space Nos.	Frontage by depth in ft.	Area, each space, sq.ft.
100	Irreglr.	792
102-167 (odd & even)	9x18	162
168	Irreglr.	900



Western Part of Pier.

Eastern Part of Pier.

M. M. and M. C. B. Exhibit Spaces on Young's Pier, Atlantic City.

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Form I Motor
5 to 45 H. P.

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has been the study of **C-W** *engineers for the past twenty years. We build motors specially adapted to all kinas of work in Railway Shops and equip whole shops with the* **C-W** *system of motor-drive. See Flyer 285 W.*

Crocker-Wheeler Company

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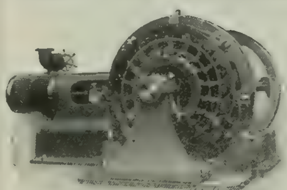

built as a direct-connected unit to generate more current with less attention, less repair and less power than any other generating set.

Write us.

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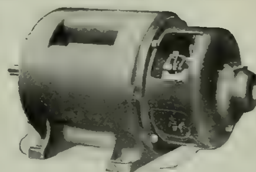
RIDGWAY, PA., U. S. A. 12



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Perfect commutation. Great overload capacity. Wide speed ranges. Instant response to field regulations. High efficiency and low temperature rise.

Bulletin No. 3659 tells, in a nontechnical way, reasons for these characteristics. Send for it.

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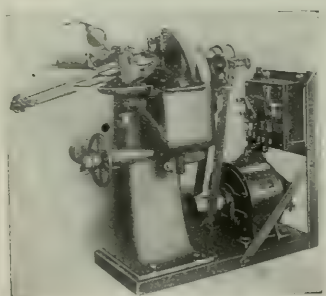

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A Westinghouse Motor is an independent unit.

It may be located wherever desired, on the wall, ceiling or floor, or, best of all, attached to and forming part of the driven apparatus. It is always ready for instant operation, day or night.

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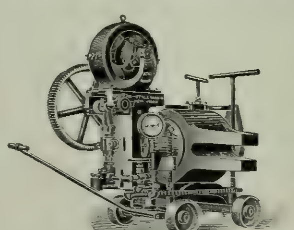

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CONTENTS

Colonel B. W. Dunn, who for the last 20 months has done such invaluable work for the railways as chief executive officer of their Bureau of Explosives, has gone back to the war department, the secretary of war having resisted the earnest appeals of the railway men to have his leave of absence extended. The ways of a Washington department are past finding out, and we shall not criticise; but it would seem as though the railways which, as well as the war department, constitute a great public interest, in this instance presented very strong grounds for being favored. The conditions surrounding the transportation of explosives and inflammable articles were very bad. Colonel Dunn has improved them immeasurably. In such a complicated business the attainment of simplicity and uniformity were of the utmost importance, yet on the one hand the railways were scattered and unorganized, not knowing exactly what they wanted, while on the other the manufacturers and shippers were strong and jealous. Col. Dunn, with his experience as an officer and his rare knowledge of explosives, proved to be the diplomat who successfully guided the organization of the railways and simultaneously secured the confidence of the shippers. But he is still in the midst of his work and a new man will be at a great disadvantage. According to the precedents Colonel Dunn will by next July have the privilege of retiring, so it is difficult for the outsider to see the grounds for the tenacity exhibited at the war department. In another month, however, there will be a new administration, and it may be hoped that broader views will then prevail.

SELLING RAILWAY SUPPLIES TO JAPAN.

As a technical journal in the transportation field, this paper is not concerned with the general news features of the absurd agitation which is being carried on by a small group of California demagogues against Japan and the Japanese; but there is one way in which this demonstration comes very close to us. In 1903 this country exported $23,000,000 worth of goods to Japan, and in 1905, following the temporary depression of 1904, it exported 52 millions worth. In 1906, with abundant prosperity at home and the shops crowded with orders, we exported $35,000,000 worth of goods to Japan, and in 1907 $40,350,000 worth. The figures for 1908 are not yet available, but they will doubtless show a large increase, due to the natural desire of manufacturers to keep their shops open by foreign business at a time when domestic business is slack. These figures do not take into account our large exports of manufactured articles to China, Korea and Manchuria, orders for which are placed in this country by the Japanese engineers in control of railways and other enterprises in those countries. The orders of rolling stock are especially significant. For example, the Japanese administration of the South Manchurian Railway Company placed orders in this country for machinery, locomotives, cars, bridges, rails, etc., which amounted in 1907 to over $10,000,000. During the same year the American Locomotive Company secured orders from Japan for that country itself and for railways in other countries which Japan influences, for 250 locomotives, while within the last few weeks the General Electric Company has received orders for three 1,000-kilowatt dynamos and other electrical equipment for complete installation of power-houses for the operation of a branch of the Imperial Railways of Japan.

Japan formerly bought her railway equipment from England. In fact, from the beginnings, in 1880, until about 1900 England dominated both railway construction and equipment in Japan. Since that time the United States, in competition with Germany, has done most of the business. In 1901 Japan bought 39 locomotives from the United States; in 1902, 14; in 1903, 32; in 1904, 80; in 1905, 151; in 1906, 182, and in 1907, 270, these figures including also the equipment ordered from Japan for Japanese dependencies. These locomotives in 1907 cost over $6,000,000.

Japanese and Manchurian railways are now buying Pullman cars and many other adjuncts to railway operation besides locomotives, and the market thus presented has become of the highest importance to American manufacturers. It has been built up at great pains and cost, and depends, like all such foreign markets, more on good will than on any other single factor.

Japan has done her share well in the effort to further the spread of this good will. We have at hand a pamphlet by the *Kihin Kai* which, being interpreted, means the Welcome Society of Japan. This society, with a prince at the head of it, maintains offices for information in all the large cities of Japan, and its objects are to welcome foreign visitors and to render them every assistance and convenience, thus directly promoting foreign intercourse and commerce. The traffic thus fostered is reaching very important proportions, the goods which we import from Japan exceeding the goods which we export to it, but being principally raw materials, which are worked up in this country at great profit to our own manufacturers and merchants.

The export trade to Japan has already been hurt by the unfriendly spirit manifested on the Pacific coast. It would not require very much more of the present sort of thing to

turn Japanese purchases away from America entirely. The American people love a demagogue and are willing to spend large sums for his support, but 40 or 50 million dollars a year seems an excessive contribution to that purpose. Yet things are now very close to the parting of the ways, when the American people must choose between the revenue accruing from a vast and profitable trade with Japan and the glory which a half-dozen California agitators will take upon themselves if this trade is destroyed. The case is one where manufacturers, East and West, ought to speak loud and speak often, until the California legislators begin to feel lonesome.

"BY THEIR FRUITS YE SHALL KNOW THEM" — A REVIEW OF THE TWENTY-SECOND ANNUAL REPORT OF THE INTERSTATE COMMERCE COMMISSION.

If we are right in supposing that the members of the Interstate Commerce Commission consider themselves important factors in the "moral uplift" of which we hear so much nowadays, they will be pleased at having applied to them the scripture verse, "By their fruits ye shall know them."

Especially should it be agreeable to the members of the commission to be judged by their report to the Senate and House of Representatives made on the 24th of last December, as there is no doubt that in the last twelve months the commission has made more progress in its legitimate work than in any previous year. We have therefore critically examined this report with a view to ascertaining from it what we can of the qualifications and views of the members of the commission and those who are working for them.

The report, like most reports, is twofold. It purports to give to Congress an insight into the situation of the commission and also to make recommendations. A report of this kind should so present the situation that it can be readily handled by the person to whom it is addressed, and the first criticism that we have to make upon the report of the Interstate Commerce Commission is that it seems hardly likely that any member of Congress will have time to read and digest the 96 pages of this report so as to ascertain what the situation is. Far less does it appear that any member can readily find proper reasons for the recommendations to Congress with which the report deals.

It happens that the Interstate Commerce Commission has in its files the annual reports of all the railways of the country, many of them models in their way. These reports generally present the situation in a few pages which can be readily perused by the stockholder. These few pages are, of course, accompanied by many more pages of statistics and data, but these are so separated from the main report that the busy stockholder need only consult them when he has time to go into details. The commission's report must be read through to be understood. We gather from this that the members of the commission are men unused to large affairs, and that they have not familiarized themselves, despite their great advantages, with the methods in which such affairs are handled.

The report begins with an attempt, which we noticed some weeks since, to show that the financial depression is temporary, and that the earnings of the railways through the panic compared favorably with the normal for several previous years. This statement appears to have been inserted in some haste as it includes a somewhat ludicrous misprint in the advance copy. Certain results are reached, it says, "by subtracting gross earnings from operating expenses." Fortunately, the situation is not so bad that expenses generally exceed earnings. The commission intended to subtract expenses from earnings, and corrected its error in the regular report.

The optimistic feeling of the commission appears to be based largely upon the fact that the net earnings per mile for 1908, although less than for 1907 and 1906, were $15 more than in 1905. Taxes are not included, and when we come to examine the figures in the latter part of the report, we understand why. Taxes have increased far more than $15 per mile. If they had been included, the Commission would have had to go back to 1904 to find a worse year than 1908, and 1904 was not a good year.

The statement ends with the following words:

"Railway traffic appears now to be rapidly approaching the normal level of the past few years, and this should be peculiarly gratifying to the public as a reliable assurance of the general business prosperity of the country."

As noted above, when taxes are considered, the figures noted appear to give very little ground for this statement. It appears to be especially insufficient when compared with figures shown on page 89, which indicate for the first quarter of the present fiscal year there was no improvement in the situation.

We may gather from the above that the commission is willing to make general statements as to facts without producing the figures to back them up.

This opening statement is followed by the somewhat mysterious caption "Operating Division," a term which we do not remember having seen in previous reports of the commission. After a careful examination of the whole report, we gather that the business of the commission is carried on by some five or six divisions, and the one in charge of general correspondence is termed the "Operating Division." The other divisions are "Division of Claims," the "Division of Prosecutions," the "Tariff Division" and the "Division of Statistics," recently promoted to be a bureau and now termed the "Bureau of Statistics and Accounts." From the unexplained appearance of this heading we gather that the members of the commission are in such frame of mind they think everyone interested knows that they term their general office their "Operating Division."

The Operating Division reports a vast increase in cases before the commission, in investigations for purpose of reparation and also in formal complaints. It is nowhere hinted that this increase in complaints is at all the result of hard times. We think, if the members of the commission had consulted any railway man on this question, they would have learned that this increase in complaints of more than 100 per cent. was to be expected whenever traffic fell off. Every railway claim agent has had this experience in hard times.

One of the phrases under this heading appears to be unfortunate, although possibly it may illuminate the point of view of at least some members of the commission. It reads:

"Many of these complaints are important and allege violations of every phase of the law, such as overcharges, excessive rates, discrimination, reconsignment rules, demurrage rules, validation of tickets, train service, car shortage, undercharge, Pullman rates, embargo, etc."

From this we can judge either that the members of the commission do not read their own report, or that they consider reconsignment rules, demurrage rules and even train service, violations of the law.

The report further states that in order to handle the informal complaints, it is necessary to consult the tariffs of the carriers. We are assured by a number of railway men that such of these complaints as have been reported to them have been sent without any reference to tariffs, and that they have often found it advisable to return copies of tariffs involved to the commission with correspondence. If this is so, it would seem that the habit of making general statements without absolute fact has spread to the Operating Department.

The report goes on to state that the number of letters prepared and mailed in the year has increased from 66,070 to 102,159, or 55½ per cent. We have spent some little time over this perhaps unnecessary percentage figure and cannot persuade ourselves that the arithmetic of the commission is correct. This error is not changed in the formal report. From this we might judge that the members of the commission, being unused to substantiate their statements by facts, are careless about such facts as they care to use.

In speaking of the informal complaints the report states that 4,640 were taken up with carriers and that 3,515 of these were adjusted. It would be interesting to know how many of these adjustments were in favor of the complainant and how many

in favor of the railway. The general feeling among railway men is that the result of most of these informal complaints is to justify the railway. If this be the case, it would seem that the commission is sometimes unwilling to do justice to the railways when it has an opportunity.

The work of the Division of Claims shows a large increase in business, reparation having been allowed in 1,012 cases, against 561 the previous year. Here the commission is candid enough to state that 864 claims were rejected, while the previous year only about 200 were denied. This increase is again an indication of the realness of the hard times. In hard times shippers make claims that they would not notice in good times.

In the report of the Division of Claims there is injected a somewhat self-laudatory statement to the effect that the commission is practically abreast of its work. This statement, in the final copy, is transferred to the Operating Division—another indication of haste in preparation. We are glad to agree with the commission that it is disposing of its cases more promptly than it did, but when it claims that ordinary reparation claims "are usually settled by it in from one-quarter to one-half the time in which similar claims are settled by the claim departments of the many railway companies," it is going a good way. No one has criticized the claim departments of the railways more severely than the *Railroad Age Gazette*, but we feel that it is possible to find more than one railway company which is handling its claims as promptly as if not more promptly than the commission. The commission appears to consider it safe to make such statements without particulars or details.

In this passage reference is made to an unexplained "unification and co-ordination" of the several branches of the commission's work. The paragraph closes with the following:

"In fact, the information necessary to intelligent action by the commission can frequently be obtained from a verbal interview with the head of the appropriate division, and in a great many instances no further research is necessary. In this connection it should be remembered that for the head of its tariff and statistical divisions the commission has chosen practical railroad men."

After gasping at the error in grammar in the last sentence, the average railway man will begin to wonder when Professor Adams graduated into the railway profession. Further reading of the report, however, suggests the possibility that Professor Adams, at the head of the Bureau of Statistics and Accounts, has a practical railway man under him in charge of what was at one time the Division of Statistics.

Here again we are confronted by the indication that the commission must be composed of gentlemen who do not read their own report. No member of the commission is capable of the error in grammar, and all of them must know of the change in their organization recorded on page 82.

The report continues by a reference of the commission to its settling cases on evidence that would not be considered in court, giving as a reason for this the fact that every decision of the commission involves rights of parties who are not present. What this has to do with it is not by any means clear. There is hardly a case in court involving the interpretation of a new law which does not affect many parties beside those present. Dealing as it is with the interpretation of a new law, it would seem that the commission should be unusually careful in the admission of testimony.

Before proceeding to the consideration of the work of its Tariff Division the report interpolates an argument for changing the law. The commission feels that it should have authority to restrain railways from advancing rates, pending proceedings. The argument is entirely from the point of view of the shipper. It appears to assume that any advance imposes "an additional burden." Does not the commission know that many rates are now so low as to impose excessive burdens on the railways? This is the first of the seven recommendations of the commission. They are summarized at the end of the report, but the arguments are so scattered that, as we have noted above, it is very hard to find them. Just why this argument should come in this particular place in the report it is hard to say.

It is followed by the report of the Tariff Division. There is no doubt that the Tariff Division of the Interstate Commerce Commission has done a great work in simplifying the tariffs, and especially the freight tariffs, of the roads, and while one might object to a phrase or two in its report, we must conclude from its business-like nature that the Tariff Division is, on the whole, well and efficiently conducted.

This report is followed by an account of the difficulties arising from misquotation of rates. That there are such difficulties we must all agree, but to get rid of these difficulties without opening the way for rebating is a hard thing to do. We therefore approach the commission's recommendation with great interest, and are correspondingly disappointed that the commission meets the question by urgently requesting Congress "that a suitable measure be promptly enacted." No details are given.

From this we may fairly judge that there are men on the commission who are willing to rid themselves of responsibility in a purely technical matter by a simple and easy reference to Congress.

The Commodities Decision is then discussed, and the following words are used, which necessarily are not backed up by facts:

"A considerable number of carriers are owners of and dealers in commodities carried by them. Such carriers succeeed, in practically every case, in monopolizing, or at least dominating, the markets in which they deal."

The commission appears to have had anthracite coal entirely in view, as the statement does not apply even to bituminous coal and much less to other commodities owned by carriers.

The discussion of the Harriman decision, which follows, shows that the commission is not at one with the Supreme Court. The lines are closely drawn:

"In the opinion of this commission, when Mr. Harriman assumes control of the Union Pacific Railroad he ceases to be a private individual to that extent and can no longer claim protection, which, as a private person engaged in a strictly private pursuit, he might insist upon.

"The Supreme Court, however, is of the contrary opinion, and the commission can, of course, only suggest to Congress that if there is to be any full investigation by the federal authorities of these financial dealings some action must be taken by the Congress."

The situation is grave. Nothing so grave has happened since the momentous event recorded in the "Bigelow Papers," "My, ain't it terrible! What shall we do?"

But, joking aside, it is serious if the Interstate Commerce Commission feels that under any circumstances, it should have the right to institute an inquisition into the proceedings of a private party who is not under suspicion of having broken any law. It is serious if the opinion of the Supreme Court has no weight with the commission.

The commission's only basis is a law. What excuse can it have for assuming a position above all law and above the Supreme Court?

To be sure, the members of the commission are removable by the President, but 'nterested as the President is in "moral uplift," superior to law as he may feel himself, he has never removed an officer of the government for any act except an illegal one. As we have noted in many cases, the report throws light upon the composition of the commission. Here it throws not only light but mystery.

It is a relief, of course, to find that the commission cannot give Congress any definite recommendation. "If there is to be any full investigation * * * some action must be taken." It sounds fierce, but if it is not a tumble it is rather a hasty dismount from the high horse. The Supreme Court is saved! This is the third so-called recommendation, and the second indefinite one.

We next have an account of the suits by carriers to annul orders of the commission. It is, as the commission states, a significant fact that while such a suit had only been filed once before July 1, 1905, sixteen suits have been begun since that date. This means that the Hepburn Act is being tried

out in the courts, or perhaps, that the assumptions by the commission of what is law under the Hepburn Act are being tried out. It will be remembered that when the original act was tried out in a series of legal tests, the railways won by far the larger portion of the suits, and we anticipate a similar outcome in the present procedures. The fact, so plainly stated in the account of the Harriman case, that the commission does not agree with the Supreme Court as to law, is possibly an indication in this direction.

The next 40 or 50 pages of the report, are, with few exceptions, accounts of legal proceedings of one and another kind. The Division of Prosecutions gives a full account of their work, and for the first time we find a real legal tone in the report and a thorough regard for the opinions of the courts, the prosecutors appearing to take their reverses in a professional way.

This report of the Division of Prosecutions is followed by one on the safety appliance law, which indulges in some curious grammar and still more curious assumptions. Speaking of the commission it says "their belief," which is not only ungrammatical but confusing, as the plural has heretofore been used for the railways as against the commission.

In this portion of the report the position is taken that the safety appliance law applies to all cars and equipment hauled by carriers engaged in interstate commerce. One judicial opinion given verbally is alluded to as in favor of this somewhat extreme view, but in the next, that of the Wheeling & Lake Erie, Judge Taylor is quoted distinctly as saying that the law only applies to cars whether they carry interstate traffic themselves or are hauled in a train which contains interstate traffic, which is quite a different thing. A number of other cases are quoted apparently without much regard to what is proven, and on page 46 we find the following opinion:

"162 Fed. Rep., 775." "If the defendant did not at such time and place have the requisite means to repair such defect, then it has the right, without incurring the penalty of the law, to haul such car to the nearest repair point where such defects can be repaired."

If this latter doctrine stands the law will become much more sensible than has generally been supposed. It is to be noted that no reference is made to the "interchange agreement" which has figured so prominently in the later reports of the commission. As we noted some months since, the commission has discovered that the "set back" at points of interchange, is illegal.

The report of the Block Signal Board we have already noticed, and there is little to say of the report on Railway Accidents and Transportation of Explosives, where the commission has closely followed the rules of the American Railway Association.

The other recommendations are as follows: That the commission's authority in respect to hours of service be made more definite. A third indefinite recommendation! A study of the report indicates that the commission wants to be assured of its power to demand reports and further that it wants certain explanations for failures to comply with the law ruled out. Among these "excuses" are "drawheads pulled out" and "broken air hose." Evidently this part of the report is not written by the commission's safety appliance expert.

After these three indefinite recommendations, it is refreshing to meet the fifth, on the block signal system—eight cogent lines covering the whole subject.

The sixth recommendation asks for power to allow carriers to destroy their records after a remarkable lapse of years, which is, of course, eminently desirable.

The last recommendation is a double-header. It asks for a physical valuation of railway properties and for the supervision and control of railway capitalization. There are three pages of familiar argument on these points, but no definite suggestion as to how the valuation can be fairly or even accurately made—no indication of a proper method for controlling capital—Congress must depend again upon its own wisdom.

The commission is then made of men who are willing to make in all seriousness, eight recommendations to Congress, of which only three are definite. In these three cases the commission knows what it wants, and two recommendations are certainly good. In the other five the commission is impelled to ask for something it knows not what: "Let us make a physical valuation of the railways," it says, "and tell us how." "Let us control the railways' capital," it says, "and tell us how." "Let us enforce the hours of service act better," it says, "and tell us how." "Let us relieve shippers, and shippers only, from the consequences of error," it says, "and tell us how." "Let us institute inquiries into all private acts of all railway men, even if they be legal," it says, "and tell us how."

In the discussion of the hours of service law, statement is made that the commission has required reports under oath rather than obtaining information through secret investigations by government inspectors, believing this method to be "more in consonance with American ideas and institutions." We gather from this that the commission still feels that its methods and desires are still American.

This seems strangely in contrast with the report of the Bureau of Statistics and Accounts, where on pages 82 and 84, the following statements are made, savoring of a European bureaucracy:

"It is regarded as a significant fact, and one which suggests the possibilities of supervisory control which lie in the administration of a prescribed system of accounting for public service industries, that the further accounting orders of the commission involve broad and comprehensive questions of public policy."

"When, however, all has been said along these lines that may properly be said, it nevertheless remains as a fundamental proposition that the actual investment in an enterprise needed for giving the public adequate transportation facilities is entitled to and should have a reasonable return, and no more than a reasonable return, in the form of a constant profit; and a reasonable schedule of rates is one that will produce such a result."

These passages indicate that the impression is prevalent even in the Bureau of Statistics and Accounts that the commission is above the law. There is nothing in the law giving the commission "supervisory control" of the railways. There is nothing in the law stating that a railway investment should have no more than a reasonable return, and yet these assumptions are calmly made as if covered by common or statute law. Apparently the bureau has not read or understood the opinion of the Circuit Court of the United States for the Northern District of Illinois. "In no proper sense is the public a general manager."

Enough has been said to show that the commission is still engaged in "sowing the wind." As we have indicated, we have little doubt as to the crop. We trust that in the whirlwind that is bound to encompass it, the commission will be able to hold to the good work it has done, especially in the last few years, that it will be able to maintain equal rates to all and that it can secure equal regulations and facilities for all. We trust that the whirlwind will only blow off the deadwood and will leave the commission its flourishing stock, amenable to all the laws of nature and of the land.

RAILWAY CHARTERS VERSUS STATE LAWS.

The basic line of a large railway system in this country, generally speaking, has been the localized property of a corporation operated at first within state bounds and under a single state charter. As the single line has taken to itself connecting and subsidiary lines and grown into a system often operating through several states, it has sometimes modified the original charter to fit, if possible, the extensions. It has sometimes taken out or held charters in more states than one. It often has formally assumed rights, privileges and, by implication at least, the charter responsibilities also, of the companies absorbed; and it has in other cases carried through consolidations under the express proviso that the rights of the parent charter shall control except as against state enactments relating merely in practice to such methods as intrastate operation, rates, lay-outs, physical condition and matters bearing directly on public convenience and necessity as dis-

tinct from such larger subjects as financing and consolidation. All the foregoing conditions have their legal and, as experience is proving, not seldom, their constitutional questions, state and national. But the situation becomes peculiarly complex when a railway system operates under double or multiple charters in two or more states.

The subject has been brought into sharp focus by the recent action of Attorney-General Malone, of Massachusetts, who has officially set before the Massachusetts legislature the question of compelling the New York, New Haven & Hartford to forfeit its Massachusetts charter. Stated with the utmost brevity and personifying the Attorney-General in the commonwealth, Massachusetts claims that when the railway corporation accepted some 37 years ago a Massachusetts charter—at the time of the merger of the lines from New York to Springfield—it accepted also Massachusetts law as applied to its whole policy and procedure, intra-state and extra-state, except, of course, as affected by federal law and jurisdiction. Such is not the exact form of the Massachusetts claim, but such is its logic and its clear implication. Certain things done by the New Haven corporation, it is therefore asserted, opens it to charter forfeiture. The corporation, on the other hand, asserts that, as a Connecticut corporation, it had a right to do those things, Massachusetts statute to the contrary notwithstanding; that the Massachusetts jurisdiction is localized not extra-state; and that the Massachusetts charter is a limited one, subordinate to the Connecticut (parent) charter, and, in fact, accepted by Massachusetts subject to the Connecticut charter powers and privileges. In other words, to put the case concretely, that Massachusetts has no purview of such general acts as an increase of capitalization, or the merger of a Connecticut or Rhode Island subsidiary line, or the financing of a New York terminal. It finds timely support for this contention in the resolution, aimed at the policy of Massachusetts, which is now before the Connecticut legislature.

The broad scope of the questions raised is obvious as well as their intricate character under the conditions where multiple charters are held in more than one state. In such cases does or does not the original charter control, and if not, what are its scope and bounds? A good deal, of course, depends upon the terms of multiple charters, but even when they are pretty specific, new railway statutes—and in these days they are abundant—make law and charter privileges in different states clash. It is often so with a single charter in one state, it is more so with double charter in two states. One can, of course, see natural and commonsense limitations, mostly physical. A state, within its own bounds, has natural and fundamental control of physical matters and legal regulation of rates. But what are its powers under a secondary charter, as contrasted with a primary charter, the latter, perhaps, giving extraordinary privileges? On the one hand we may have a railway corporation claiming under an outside charter powers *within* the state subversive of the whole policy of the state. On the other hand we may have the state asserting—as in Massachusetts—authority which not merely—if successful—would obstruct or check the natural policy of development of a great railway system, but arouse antagonism between states themselves when their statutory railway polities diverge. The same problems, to a certain degree, arise in the case of other corporations than railways with liberal, not to say licentious, charters, and doing business in non-charter states. But in such instances the question is not complicated by a big operating plant like a railway, with its relations of public service.

In a subject so big and broad, so cloudy in its precedents and policies, yet growing steadily in importance, the Massachusetts example introduces us to yet another phase of the question. The Attorney-General of that state says without qualification that the acts of the New Haven Company have, in law, forfeited its charter; yet, in deference to the great vested interests at stake, he shrinks from pushing the matter in the courts, and asks the legislature to act instead. It is no wonder that he pauses. The New Haven corporation, with only a half dozen miles of track actually owned in the state—between the state line and Springfield—has more than half of its 16,000 stockholders residents of Massachusetts, and probably an even larger ratio in the state holding its bonds and leased line shares combined. Yet primarily the question is a judicial one resting on existing statutes of the state of pretty long standing; and it is hardly a secret that the New Haven company would not be averse to surrendering its Massachusetts charter and falling back upon its "omnibus" charter granted by Connecticut. Here we have the new aspect of the matter, with its suggestion that a railway corporation of multiple charters may drop one or more of them with an actual increase of valid powers. An act of incorporation originally intended to strengthen has become, by one of the paradoxes of time, an element of weakness and a thing to be dropped. Such a policy tends to invite popular and legislative hostility and may not be prudential in the long run, even though it gives the corporation firmer foothold in the courts. But it raises another of those manifold railway problems bearing on interstate jurisdiction and policies which are making many people in these days talk of federal charters to replace those of the states.

SOUTHERN PACIFIC COMPANY.

Almost without exception, the annual reports for the fiscal year ended June 30, 1908, previously reviewed in these columns, have made some mention directly or indirectly of delays to extensions and additions caused by the general business depression. The report of the Southern Pacific Company not only makes no mention of the holding up of extension work, but the figures given indicate that this work was not delayed on account of hard times. The Southern Pacific and its financial management are strong enough to carry through a plan of extension once adopted, and leave the financing of the work to be done after the return of prosperity. There has been $61,146,399 advanced for construction and acquisition of new lines up to June 30, 1908, of which $21,268,403 was advanced in the 1908 year. The total sum advanced for new lines, terminal real estate and rolling stock up to June 30 amounted to $103,332,585. In this connection it is of interest to note that the sums required for temporarily financing the work of building the railways in Mexico were secured in part from the Union Pacific. On June 30, 1908, $45,376,389 had been thus obtained. Of this amount, $20,200,010 has since been repaid. It is obvious that only the strongest companies can build new lines and finance the work subsequently, but it is equally obvious that where this is possible it is an economy.

The total revenues of the Southern Pacific Company and its proprietary companies, after excluding all offsetting transactions between them, amounted in 1908 to $123,276,921, as compared with $126,194,360 in 1907. This is a decrease of $2,917,439, or a little over 2 per cent. The entire decrease came during the last six months of the fiscal year. Previous to that there was an increase of $6,975,042, so that the shrinkage in the six months of depression amounted to $9,892,482.

As was pointed out in the report for the 1907 year, the company was so burdened with new traffic offered that new business ceased to be profitable. Expenses mounted more rapidly than revenue, and this was particularly true of the first half of last year, so that when the business depression began to be felt, it naturally took some time to readjust expenses. Total operating expenses amounted to $84,663,052 in 1908 and $80,265,332 in 1907. This is an increase of $4,397,720, or about 5.5 per cent. The rail lines operated on 66.94 per cent. of gross revenue basis last year as against 61.52 per cent. in 1907. Not to be outdone by the demands of labor or the increase in cost of materials, the tax commissioners assessed the company $3,950,140 for taxes last year, as compared with $2,896,501 in

the previous year, which is an increase of over 36 per cent. These increases in expenditures and decreases in revenues left the company with $34,663,729 net revenue after the payment of taxes in 1908, as against $43,032,527 net revenue in 1907, a decrease of $8,368,798, or about 19.5 per cent. The income from sources other than transportation operations remained about the same, while fixed charges decreased slightly, leaving $19,893,473 earned on the preferred and common stock as compared with $27,698,593 available for dividends in 1907. This is a decrease of about 28 per cent. The dividend rate remained unchanged on the preferred stock, being 7 per cent. paid on $55,711,755 stock outstanding at the beginning of the year, and 7 per cent. on $19,154,708 stock issued during the year. The rate on the $197,849,259 common stock was 6 per cent. in 1908 and 5¼ per cent. in 1907.

The increased expenses were the result not only of the manner in which business was divided between the first and second half of the year, but also from the increased cost of materials and labor, and from the expenses incident to restoring to its former standard condition the roadbed damaged by disastrous floods in the spring of 1907. There had been a 23 per cent. increase in the cost of ties in 1907, and last year this cost increased from an average of 58 cents to 70 cents per tie; and there were also 1,164,705 more ties placed in roadbed in 1908 than in the previous year, making the total last year 3,948,608, equal to 1,410 miles of continuous track, or 11 per cent. of all ties in track. The cost of fuel per locomotive mile in revenue service and non-revenue service, "for which the expenses are charged to conducting transportation," was 17.813 cents per mile run against 13,353 cents in the preceding year. This was the result of an increase in the cost per ton of coal and fuel oil from $2.13 to $2.70, or about 27 per cent. It was in the unproductive expenses of conducting transportation that the largest increases came, but there was no attempt made to cut maintenance charges to the detriment of the up-keep of the property, as the following table shows:

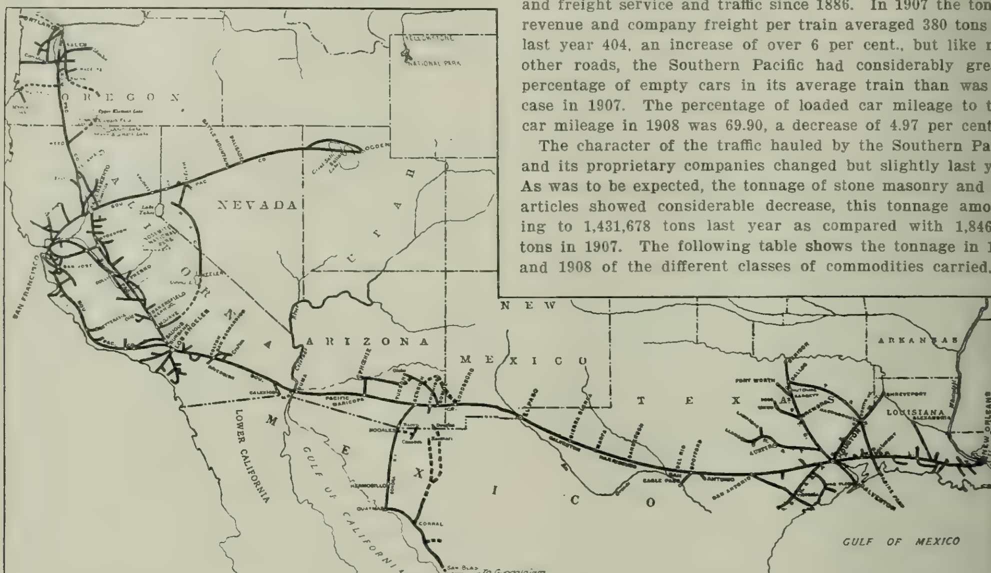
	1908.	1907.
Maintenance of way and structures*	$1,746	$1,674
Repairs of locomotives	3,090	3,444
Repairs of passenger-train cars	894	790
Repairs of freight train cars	92	87

*This is average per mile of main and second track.

In addition to these liberal maintenance charges, there was spent for building of new lines, for equipment, and for additions and betterments to completed lines, $7,312,882, and charged to capital account. Beside this sum, there was spent $6,557,263, of which all but $282,952, charged to the Southern Pacific Company's income account, was charged to capital account of the proprietary companies for additions and betterments. A part of this sum was spent for the installation of 760 track miles of automatic block signals and the rest for general betterment.

The accompanying charts show graphically the passenger and freight service and traffic since 1886. In 1907 the tons of revenue and company freight per train averaged 380 tons and last year 404, an increase of over 6 per cent., but like most other roads, the Southern Pacific had considerably greater percentage of empty cars in its average train than was the case in 1907. The percentage of loaded car mileage to total car mileage in 1908 was 69.90, a decrease of 4.97 per cent.

The character of the traffic hauled by the Southern Pacific and its proprietary companies changed but slightly last year. As was to be expected, the tonnage of stone masonry and like articles showed considerable decrease, this tonnage amounting to 1,431,678 tons last year as compared with 1,846,381 tons in 1907. The following table shows the tonnage in 1907 and 1908 of the different classes of commodities carried, together with the percentage of tonnage of each class to the total tonnage:



Southern Pacific.

	1908.		1907.	
	Tons.	Per cent.	Tons.	Per cent.
Products of agriculture	4,614,426	20.20	5,112,185	20.81
" " animals	905,444	3.96	888,228	3.61
" " mines	6,841,931	29.96	7,190,094	29.26
" " forests	4,314,329	18.89	4,703,781	19.14
Manufactures	3,694,071	16.17	4,088,507	16.64
Other commodities	2,470,203	10.82	2,588,697	10.54

There is no combined balance sheet shown for the Southern Pacific Company and the proprietary companies. A balance sheet for each proprietary company is shown separately and the fullest information is given. The Southern Pacific annual reports for years have been a model in respect to the completeness and frankness with which the company's affairs are shown. Current liabilities of the Southern Pacific Company as of June 30, 1908, amounted to $74,195,164, as compared with $48,330,482 on June 30, 1907, the large increase in liabilities being in the loans and bills payable, which amounted to $52,472,648 last year, an increase of $28,062,873 over the previous year. Current assets amounted to $25,918,748 on June 30, 1908, as compared with $23,773,761 on June 30, 1907, the largest increase in current assets being in the value of material, fuel and other supplies, which were carried at $10,541,985 last year as against $9,160,125 in the previous year. Cash decreased from $6,774,618 to $5,763,466.

The total current assets of the proprietary companies amounted on June 30, 1908, to $8,915,772, and the total current liabilities amounted to $4,553,403, both the liabilities and the assets showing a small decrease from the figures for 1907.

The growing floating debt of the Southern Pacific Company

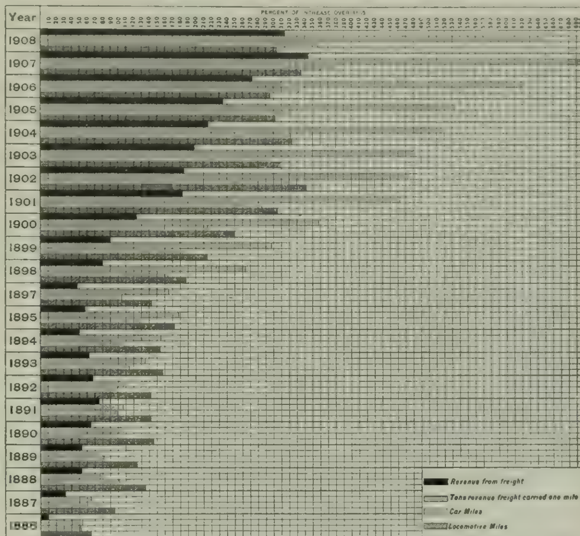
and the excess of current assets over current liabilities, with the decrease in cash, simply indicates that in the near future the company will necessarily issue new securities or sell some of those that it now holds in its treasury. On June 30 the company owned free $92,901,890 par value of stocks, of which $33,508,066 were stocks of proprietary companies and $59,393,824 were stocks of other companies, and it is interesting to note that $18,337,336 were stocks of oil companies. Bonds amounting to $38,662,300 are held free in the treasury, of which $21,428,000 are bonds of proprietary companies and $17,234,300 are bonds of other companies. In addition to these stocks and bonds there are $22,747,000 Southern Pacific Company 25-year 4 per cent. bonds held in the treasury. The amplitude of these resources is fully apparent, and it would seem that the permanent financing of the floating debt will finally depend largely on the securities' market.

There were sold during the year Central Pacific first refunding mortgage 4 per cent. bonds amounting to $14,903,000. These bonds were held as collateral for notes to the United States, of which the last was paid in February. The total payments on these notes during the year amounted to $5,881,272. In connection with this matter, President Harriman says:

"The discharge of this debt marks an epoch in the history of the Central Pacific. By an act of Congress in 1862, the 'Central Pacific Railroad Company was authorized to build a railway from Sacramento to a junction with the Union Pacific, and was given fourteen years to complete the road. This junction was effected in May, 1869, and in the fall of that year the entire rail line from Ogden to San Francisco Bay was in operation. The gross earnings in the year 1870 (the year following the opening of the entire line) amounted to $7,438,970 on the 894 miles operated; and in the year 1899, in which the final settlement with the United States government and readjustment of the company's bonded and other indebtedness was effected, the gross earnings amounted to $16,401,026 on the 1,359 miles operated. Since the readjustment of this debt, February 1, 1899, there has been expended to June 30, 1908, in straightening the line, in reducing grades and curvatures, and in other reconstruction, in the construction of the Ogden Lucin cut-off, referred to in the annual report for 1903, and for other betterments and additions by which the service and facilities to the public were increased, the sum of $34,270,680. The gross receipts for the year ended June 30, 1908, for the 1,495 miles of railway operated amounted to $33,456,141."

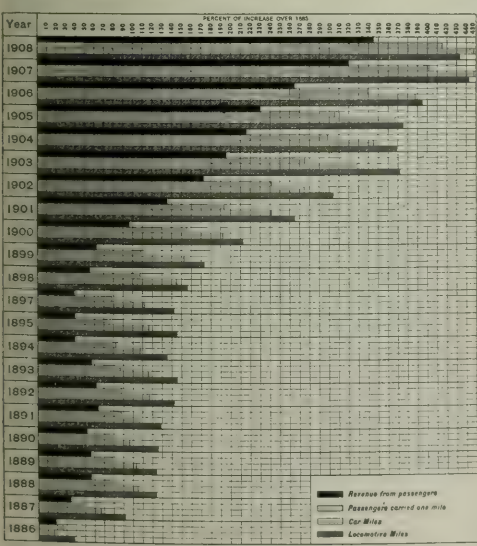
Since June 30, 1908, the Southern Pacific earnings have steadily increased and expenses have been reduced, making the prospect for the present fiscal year good.

The following table shows the results of operation for the fiscal years ended June 30, 1908, and June 30, 1907. The figures have been rearranged so as to make comparison between the two years possible:



Freight Service and Traffic on the Southern Pacific.

Locomotive miles include revenue freight train miles, three-fourths of mixed train miles and helping freight train miles.



Passenger Service and Traffic.

Locomotive miles include revenue passenger train miles, one fourth of mixed train miles and helping passenger train miles.

	1908.	1907.
Average miles operated	9,506	9,401
Freight revenue	$71,124,460	$75,710,299
Passenger revenue	35,647,534	33,551,889
Total operating revenue	123,276,921	126,194,360
Maint. of way and structures	61,936,162	16,011,358
Maint. of equipment	14,927,084	14,884,063
Conducting transportation	40,484,550	36,895,636
Total operating expenses	84,663,052	80,265,332
Taxes	3,950,140	2,896,501
Net revenue	34,663,729	43,032,527
Gross income	38,673,209	47,218,111
Net income	19,893,473	27,698,593
Dividends	17,112,700	13,157,013
†Surplus	2,761,746	14,408,585

*After the deduction of $282,952 for additions and betterments and $585,455 for reserve for depreciation of rolling stock in the 1908 year, and $603,972 and $609,251 for these accounts respectively in the 1907 year.

†After the deduction of $19,027 appropriated for surveys, etc., in the 1908 year, and $122,995 appropriated for losses in the San Francisco fire and for surveys in the 1907 year.

NEW PUBLICATIONS.

Why Freight is Lost or Damaged. By A. C. Kenly; printed under the auspices of the General Managers' Association of the Southeast by the Baughman Stationery Co., Richmond, Va. 32 pages; 6 x 9 in.; paper; fully illustrated.

This pamphlet is a concise and valuable exposition of the way certain kinds of goods ought and ought not to be packed, and is illustrated freely to that end. Some roads have placed orders for large blocks of the pamphlet for distribution among shippers, and we are inclined to think that it will do good. The cost of the pamphlet is not stated, but it is doubtless very small.

Letters to the Editor.

HIGH POWER MILLING MACHINES AND CUTTERS.

Rochester, N. Y., February 2, 1909.

To THE EDITOR OF THE RAILROAD AGE GAZETTE:

Your article on page 197 of the January 29 issue treats upon a very interesting phase of the progress recently made in shop practice.

The fact, however, that we now have at our command appliances for rapidly removing metal from forgings and castings has led in many cases to a lack of care and economy in the design of work requiring machine finish and the idea of bringing the amount of metal to be removed down to a minimum has largely been lost sight of. This feature is well worthy of the attention of engineers engaged upon mechanical design and I believe an article or articles upon this subject by some of your correspondents who are in touch with railway shops would prove interesting and instructive.

H. C. WHITE.

WANTED: A DIPLOMATIC CORPS.

Chicago, February 3, 1909.

To THE EDITOR OF THE RAILROAD AGE GAZETTE:

I think every right-minded railway manager does what you say W. J. Harahan was in the habit of doing. We have certainly taken newspaper comments as tips and investigated abuses before they became too irritating to the public for a number of years. Perhaps a specialist would do this better than the general operating staff, and I think your suggestion extremely valuable and opportune. A sermon that I think you cannot preach too often is one that has been preached in the *Railroad Age Gazette* before, and that is the necessity of settling claims promptly. The entire theory of settling claims, it seems to me, ought to be reversed. Many of them are fair and railways should seek means to pay them rather than delay them. In the past, the latter has unquestionably been almost standard practice. I am of the opinion if the centralization of claim payments were broken up, it would do much to remove this probably greatest cause of friction with the public. I do not see why under proper supervision division officers should not settle claims. They are the officers of the road who come in daily contact with the people making the complaints and claims, and they are best able to effect settlements. I am convinced that an overwhelming majority of claims could be successfully paid by division officers, and settlements could probably be made by a man in close touch with the public better than they can be made by a clerk in the general office hundreds or even thousands of miles away.

VICE-PRESIDENT.

CAR MOVEMENT AND ABSENCE OF MOVEMENT.

San Francisco, Cal., January 22, 1909.

To THE EDITOR OF THE RAILROAD AGE GAZETTE:

I have read with much interest the communication from Roy M. Baker published in your issue of January 8, entitled "A Car Record Criticism."

In speaking of the attention that is given to the *movement* of cars, and the lack of supervision bestowed upon them after they reach destination, Mr. Baker says, "from this it appears that the object is to get the car standing still just as quickly and safely as possible." While this is putting it somewhat bluntly, yet there are many who will be inclined to agree with this view of the matter.

The remedy which Mr. Baker proposes for the present condition of this is, however, not so readily understood. The essence of it appears to be the multiplying of records, or, as he puts it, "making two records grow where only one grew before." He then proceeds to outline a plan which, as I understand it, requires *three* records to grow where but one grew before. He would have the general office records kept in such a way as to show movements between divisions only. He would then have each division of a system keep a separate record of each car, sending copy to succeeding division. He would intrust a car to the division superintendent and "simply ask that he use it, keep a record of what it does, and return it promptly." Return it to whom? His plan appears to contemplate including only cars engaged in through service. What would happen in the case of a car engaged in local service on a division having anywhere from 500 to 1,000 miles of track, on which a car might remain continuously in such service for several months, or indefinitely? Would the general office be left without any record of such car until it moved to another division? It is very true, as Mr. Baker says, that the present method of recording the movement of cars serves only to show what they have done in the past; but I do not see that the scheme he proposes would have any other result. The movement of a car cannot possibly be recorded until after it has taken place.

The card system which Mr. Baker proposes is not new. It has been experimented with quite fully, and there are various modifications of this system, all intended to accelerate the movement of cars, or "get them standing still," as Mr. Baker puts it.

If, as he says, "the less a car stands still the more revenue it will earn," then it is obvious that the crying need is for something that will set it in motion again after it has reached its first destination. Instead of attempting to multiply records, would it not be more to the purpose to look closely after the current movement of the car itself—not through the medium of records or correspondence, but by actual personal supervision?

At present large numbers of men are employed throughout the country by car service associations to look after and figure out the amount of free time that is allowed shippers for use of cars. Instead of this why not employ an equal number of men to look after the prompt loading and unloading of cars, and cease for the most part according to shippers the free use of cars?

There can be no doubt about the importance of the car department of a railway, as Mr. Baker says, when properly viewed; and I think any observant reader of current railway literature will admit that of late there is a disposition to bestow upon this department a degree of attention somewhat commensurate with its importance. Surely the subject is worthy of all the study that is being given it, and a great deal more. The cars of a railway are the principal means—the tools so to speak—with which the vast earnings of the lines are made; and yet their owners apparently are content to have them handled with a degree of carelessness that would never be permitted in the case of equipment of equal value required in any any other line of business. It is well known, and will be admitted by all who have had anything to do with them, that car reports are for the most part inaccurate and unreliable, and that there are many cars of any railway from day to day that are not reported at all to the proper officer. There would appear to be no good reason why anything representing as much value as a railway car should not be accurately accounted for and its precise location known at all times; but it is equally clear from past experience that to accomplish this requires something more than the present style of records and reports. What is wanted is more personal supervision by those having authority to direct the movement and use of cars and put a stop to their misuse.

While the railways of the country are annually brought face to face with serious shortage of cars, and are expending vast sums to add to their equipment; while various measures are being proposed as a relief from present conditions, including "reciprocal demurrage" and other like regulations, it is the universal practice to allow shippers the free use of cars as warehouses to an extent that seems entirely unreasonable when

viewed from an independent standpoint. A shipper orders a car, and is allowed 48 hours in which to complete loading. The car may then be moved perhaps not more than ten miles, consuming about one hour's time, when it is again placed at the disposal of consignee, who is allowed 48 hours more in which to unload ("after first 7 a. m."); or he may retain the car under load indefinitely upon payment of $1 per day for the privilege. The owners of the car thus get one hour's use of it out of five days. While this may be an extreme case it is not by any means wholly imaginary. There are plenty of such instances. It has been computed that the average time consumed in loading and unloading freight cars throughout the country is nine days. This results in an absurdly low rate of mileage per car per day made by the freight equipment of the railways as a whole—about 24 miles per day.

How did railways fall into this apparently wasteful practice, and why can they not apply the remedy for car shortage by abandoning the custom of allowing shippers to use cars as warehouses upon payment of a nominal charge? Would the present practice with respect to freight cars be tolerated in connection with any other similar kind of business? Suppose a drayman were to drive up to a business house with a load of merchandise, and the head of the firm were to say to him: "Just unhitch your team and leave the dray here; we will unload it in a couple of days; or if we do not we will pay you $1 per day for the use of it thereafter." Fancy what would happen if a car-load of passengers, on arrival at their journey's end, should decide to remain in the car for a day or two, or until it suited their convenience to vacate it. Is there any difference between the principle involved in such cases and that underlying the demand for free use of freight cars?

Naturally the aforesaid drayman would protest against being required to give free use of his vehicle to accommodate the owner of the load. Would it be a sufficient answer to advise him to invest in some more drays? Hardly; yet this would be the equivalent of what the public expects of the railways; and the latter have attempted to comply with the demand to such an extent that to-day they find themselves with hundreds of thousands of idle cars on hand, costing many millions of dollars, which cars are required for only a brief period during the year—see reports of Committee on Car Efficiency of the American Railway Association.

There are not lacking shippers who are broad and fair-minded enough to admit that the principal cause of car shortage is the unreasonable extent to which the public makes free use of cars; and some of them are frank to the point of bluntness when expressing their views of this question. I know of one recent well-authenticated case where a shipper, in talking with the Manager of a Car Service Association respecting it, said: "The railway people are d——d fools"; and it probably would not be difficult to find others who hold the same opinion, minus perhaps the adjective.

So far as I am able to learn there is no obligation on the part of carriers to give free use of their equipment for storage purposes. The practice is entirely voluntary on their part. I fully realize that no one road, or one set of roads, could undertake to abolish the present practice; the move must necessarily be universal; but I am confident the remedy for car shortage lies in this direction. If it is not considered wise to wholly deprive shippers of free time, then by all means let us reduce the present allowance one-half. Even this would be equivalent to providing an enormous addition to the car equipment of the country, with no outlay whatever for new cars for some years to come, provided the charge for detention beyond the limit of free time be made sufficiently high to effect the release of cars.

If the foregoing should attract the attention of any of your readers, or call out a reply, I am quite prepared to hear that as a condition precedent to the suggested reforms there must be a change in train service, more regularity in movement of freight, more advance notice to consignees, more ware house room, etc., etc.—in short, all sorts of objections; nay more—I will endeavor to summon enough fortitude to withstand the shock even though some one shall say that this communication is sufficient to rank me among that type of railway men referred to by the certain shipper whose remark is quoted above. But the objections can be met, and the additional facilities provided at far less outlay than the millions of dollars annually spent for new freight cars to be used without recompense to their owners.

WOOLLY WEST.

OPERATING ORGANIZATION ON THE CANADIAN PACIFIC.

To the Editor of the Railroad Age Gazette:

The outcome of the new system of organization about to be inaugurated on the Union Pacific will be watched with considerable interest by operating officers who have felt for some time that an improvement in divisional administration was needed. There are some objections that will occur on reading the plan of the organization contemplated, but as it is much easier to criticize than to create, it is better that criticism be withheld until the new system has had a fair trial.

On Western Lines of the Canadian Pacific Railway a system is being introduced on several superintendents' districts, which is likely to be extended over the system. The Canadian Pacific is organized on the divisional plan. On Western Lines there are three general superintendents, each having a number of superintendents of districts reporting to them. The district organization consists of superintendent, resident engineer, trainmaster, district master mechanic, master of bridges and buildings, roadmaster for each section, and chief train despatcher.

The present staff of superintendents and general superintendents have been recruited from the ranks of civil engineers, clerks, telegraphers, trainmen, enginemen, and yard men.

A superintendent on a district is in general charge of maintenance and operation. The resident engineers, trainmasters, district master mechanics, roadmasters, etc., are required to take an interest in all branches, and though not expected to give orders outside of the special department they are in charge of unless in emergencies, are required to advise the superintendent and their fellow officers of matters coming under their notice, affecting the service generally. They are all required to make efficiency tests.

The average mileage of superintendents' districts is 475 miles. All the officers of a district are required to spend most of their time on the road, as that is felt to be the only way to produce the best results.

Under the scheme being inaugurated at district headquarters the offices will be divided as follows: One for the superintendent, one for the district master mechanic and trainmaster, jointly, a joint office for the master of bridges and buildings and roadmasters. The chief despatcher has a desk with the despatchers, and the resident engineer in his drafting office. Across the hall from these offices is a large room in which all the clerical work for the district is handled. In one end of the room is located the chief clerk, stenographers, file clerk and clerk in charge of requisitions, etc. In the other end the accountant, timekeepers and statistical clerk, the staff in this office being regulated according to the size of the district and the density of the traffic handled. All correspondence (unless marked personal) is opened in the clerical office. The routine letters are dictated by the chief clerk and placed for signature before the officer controlling that branch of the service, or in the officer's absense, signs them himself. Other than routine letters the chief clerk shows to the various officers concerned, who either dictate replies themselves, or indicate to the chief clerk how they should be dictated.

For example, a letter might be received from the general offices by the superintendent, requiring certain data, which

could only be supplied by a section foreman. The ordinary method would be for the superintendent to dictate a letter to the roadmaster, who in turn would send one to the section foreman, the replies following the same channel back. Under the new system, on receipt of the letter from headquarters the chief clerk would dictate a letter direct to the section foreman, signing the roadmaster's name, and on receipt of reply from the section foreman, would dictate a reply to the head office, signing the superintendent's name. The file would be complete, and two letters would take the place of five. This may be considered possibly an extreme case, but if the work of the different district officers be looked into, it will be found that in spite of all that can be done, more or less red tape is allowed to creep in, and useless correspondence indulged in.

This proposed system reduces expenses of clerical staff, stationery, etc., brings the officers closer together, and as it will minimize the office work, will afford the officers more opportunity to be out on the line. The end in view was, while improving the service, reducing red tape, and cutting down expense, nothing will be taken away from the individuality and standing of the various officers.

It will be interesting to watch the working out of the two systems.

SIMPLIFICATION.

THOMAS LOWRY.

Thomas Lowry, president of the Minneapolis, St. Paul & Sault Ste. Marie and of the Twin City Rapid Transit Company, died at his home in Minneapolis, Minn., on February 4.

Mr. Low y was one of the men who made possible the development of the Northwest by providing it adequate transportation facilities when it was much more uncertain than it is now whether investments in the city traction lines and steam railways would pay. He ranked among the leaders of transportation and finance of the West and was a figure of no mean importance in the country at large and in Wall street.


Thomas Lowry.

But it is notable that the men and the newspapers that have paid tribute to him have dwelt more on Lowry, the man, than on Lowry, the business man. Genial, witty, warm-hearted, generous and democratic without ostentation, he was one of the most lovable natures among the prominent business and railway men of the country. The Minneapolis *Tribune* of February 4 published a page of eulogies by his intimate friends in Minneapolis and elsewhere, and it is significant that repeatedly in these tributes he is compared, because of his tall figure, his homely humor, and his gentle and generous character, combined with great ability, to Abraham Lincoln.

It is related that when Mr. Lowry first went to Minneapolis in 1867 he wore a worsted suit, worn threadbare, an old-fashioned, high plug hat, and carried a carpet bag. He first stopped at a boarding house kept by a widow. At the end of a week he walked in with his carpet-bag and said to his landlady: "I have come to say 'good-bye.'" She asked why he was leaving. He replied: "I cannot stand $8 a week." It is said that when he arrived in Minneapolis to begin building his fortune he had only $7 in cash as a foundation for it.

In later years when the working men of Minneapolis decided to try to build a "Labor Temple" Mr. Lowry contributed generously toward the project. The promoters were not able to get as much money as they expected and the building committee again called on him and told the state of affairs. He gave his secretary a slip of paper and the latter soon returned with a check for $1,000. Mr. Lowry handed the check to one of the committeemen, saying: "Boys, I wish you the greatest success in your undertaking, and if you have any more trouble come back to me and I will give you another boost." Someone remarked: "Mr. Lowry, you are a pretty good Samaritan." "O, no," he replied, "We are all here to help one another and I am only thankful that I can do my share."

This incident was indicative not only of the prosperity Mr. Lowry had achieved, but was also characteristic of the man from the time that he got his fortune firmly established. No legitimate enterprise in the Twin Cities sought his aid in vain.

While Mr. Lowry's kindliness and generosity stood out in the minds of many of his acquaintances as his most marked characteristics, one of his friends says that the two traits that impressed him most were the man's powers of persuasion and his memory for names and faces.

His persuasiveness undoubtedly was one of the elements in his success. It was of course a great aid to his success as a lawyer; and it was subsequently a factor in his success as a financier. He got capital in many cases where a man with an equally good case but with fewer gifts of speech would have failed. As for his memory for faces and names, his friends say that, judged by the number of people he knew and remembered, he must have had more acquaintances than any other man in the United States. He was fond of calling his friends and employees by their given names, and this tended to augment his popularity with all grades of the service on his railway and traction lines.

Mr. Lowry was born in Logan county, Illinois, on February 27, 1843. His early years were spent in hard work on a farm. After getting a common school education he entered Lombard University at Galesburg, Ill., but ill health forced him to leave before graduating. After spending a year in the country bordering the Missouri river, he began the study of law at Rushville, Ill. Immediately after his admission to the bar in 1867 he went to Minneapolis. He foresaw perhaps more clearly than any other man the future of the city and gradually withdrew from the practice of law and invested his savings in real estate. He rapidly became one of the largest owners and dealers in real estate in the city. He also represented large investments in real estate that he had made for eastern capitalists whose confidence in the future of the city he had won. At the time of the panic, in 1873, it was believed by Mr. Lowry's friends that he was ruined, but they under estimated his resources. He came through the panic with his fortune more firmly established than before.

About this time some citizens organized a puny street rail-

way company. Mr. Lowry, being a large owner of suburban real estate, was keenly interested in this project and soon became one of the largest holders of its stock and finally its dominant factor, representing not only his own holdings but those of eastern investors. He became president of the Minneapolis street railway company in 1876 and ten years later was chiefly instrumental in consolidating the street railway lines in Minneapolis and St. Paul in the Twin City Rapid Transit Company, of which he became president. Under his management this company became one of the best traction companies in the country, both in point of the service rendered to the public, and of financial strength. It was one of the pioneers in the adoption of electric traction, and it has been a pioneer among street railways in the fullness, cleanness and honesty of its annual reports to stockholders.

Mr. Lowry became a director in the Minneapolis, Sault Ste. Marie & Atlantic in 1886. In 1888 this road, the Minneapolis & St. Croix, the Minneapolis & Pacific and the Aberdeen, Bismarck & Northwestern were consolidated as the Minneapolis, St. Paul & Sault Ste. Marie, and the next year Mr. Lowry was elected president of the consolidated property. He resigned in 1890, but was elected president again in 1891, and continued to hold that office until his death. In 1890 the road had a mileage of 788 miles. At the time of his death it was operating 2,340 miles. Meantime it had been reconstructed into a first class property physically, and its shares from a merely nominal value had risen in the market until preferred sold normally for over 150 and common for more than 140. By the recent purchase of the control of the Wisconsin Central the road became one of the most important trunk lines in the Northwest, reaching the Twin Cities, Sault Ste. Marie, Duluth, Winnipeg and Chicago, and constituting a very important part of the system of the Canadian Pacific, by which it is controlled.

The practical operation of the Soo, it is believed, was left chiefly to Mr. Lowry's very competent officers, E. Pennington, vice-president and general manager, and W. L. Martin, second vice-president and traffic manager; but it was Mr. Lowry's foresight and enterprise as a typical business man of the Northwest, and his great ability as a financier, that made possible and gave direction to the work of those under him.

ANNUAL REPORT OF BUREAU OF EXPLOSIVES.

Secretary W. F. Allen, 24 Park Place, New York City, has issued the annual report of the Chief Inspector of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles—the bureau maintained by the principal railways for the purposes named in the title. As our readers are aware, this bureau was established in 1907 by the action of prominent members of the American Railway Association. The president of the bureau is Dr. C. B. Dudley, chemist of the Pennsylvania Railroad, Altoona, Pa. The other roads represented on the executive committee are: The Erie, the Reading, the Norfolk & Western, the New York Central, the Illinois Central, the Missouri Pacific, the Union Pacific, and the Grand Trunk.

The number of roads in the bureau is 158, operating 202,186 miles. During the calendar year the 22 inspectors and agents of the bureau made 7,413 inspections of factories, magazines and stations where explosives are handled, and about 1,000 inspections of stations where inflammable articles (not explosives) are handled. *Four thousand eight hundred and fifty-two* boxes of high explosives were condemned as unsafe for transportation. These were found in 197 shipments. The losses of lives and property by explosions and by accidents in transporting explosives by rail were very much less in 1908 than in 1907. The laboratory maintained by the bureau has examined 778 samples of explosives and inflammables and has made reports on 542. Some of the examinations have brought out information which resulted in improvement in the manufacture of the article tested. A half dozen pages of the report are taken up with accounts of accidents, with a statement of the causes, so far as they could be ascertained. Appendix A gives the report of the chemist, C. P. Beistle, filling ten pages; and another appendix tells of the large number of addresses and lectures given to railway men and others by Chief Inspector Dunn and Special Agent Taylor. Special Agent Conreye and the local inspectors have also given many addresses.

The report contains full reprints of addresses given by Colonel Dunn and of the instructions to the local inspectors. These have been noticed heretofore in the columns of the *Railroad Age Gazette.*

TEMPERANCE IN PRUSSIA.

Some three years ago the Prussian Railway Minister issued orders forbidding large classes of employees, chiefly those engaged in train and switching and signal service, to take any alcoholic stimulant while on duty, or while waiting to go on duty. A newspaper devoted to the interests of the employees sums up the results as follows: Without doubt, the men have gone to their work fresher and more capable, and have done their work more calmly, thoughtfully and willingly to the advantage of their own health and safety. Discipline has been better; resistance to superiors and quarrels among equals have decreased. There have been fewer cases of illness attributable to alcoholic excesses, and the younger employees especially have a realizing sense of their dangers. There has been no decrease in the number of employees punished for drunkenness, but this has been due to the fact that such cases are much more strictly dealt with.

RECIPROCAL DEMURRAGE.*

BY ARTHUR HALE.

Chairman of the Committee on Car Efficiency of the American Railway Association.

I have come here to ask you not to pass any of the bills you are considering covering what is called reciprocal demurrage.

The railways of this country are having a pretty hard time nowadays. They have had a hard time since the panic well over a year ago, and it looks as if the hard times would continue, at least till next fall. There has been a great deal of criticism of the railways in the nation and in this state; a great deal has been said against the railways that we railway men don't understand; but granting that it is all so, haven't we taken our medicine like men, and is this the time to give us another dose?

I am not going to burden you with figures showing the financial condition of the railways. I am a transportation man and I don't know too much about finances. I only want to call your attention to these statements and diagrams showing the surplus cars—the idle cars in the country, and I am sure you will agree with me that the railways have suffered enough.

You see there are over 300,000 cars idle, in addition to the cars in shops. That is about 15 per cent. of the whole.

You will find on that diagram a record of the car situation in this country since January, 1907; since the middle of the great car shortage of 1906 and 1907.

I understand that great car shortage began the agitation which led up to the introduction of these bills. It also led to the reports which show us what the car surplus is. During that car shortage the American Railway Association appointed the Committee on Car Efficiency, and the first duty of that committee was to ascertain what the shortage was and where it was.

There had been a great deal of talk about the car shortage

*Address before the Railroad Committees of the Nebraska Legislature, February 3, 1909.

before that, and each railway knew the situation on its own line, but no one knew what the total shortage was until January 2, 1907.

It was over 100,000 cars on that day, a very serious shortage. It increased to over 150,000 cars in February. It was reduced in the summer and then increased again till October. 1907, and then the panic came.

And since the panic there has been no shortage worthy the name. Our troubles have all been the other way.

The surplus was over 400,000 last spring, and with the shop cars the cars that needed repairs, nearly one-third of the equipment of the country was idle. It is not so bad now, but we have about the same surplus as the one that scared us so last winter.

I do not want you to think the only thing the railways did during the shortage was to get figures together. On the contrary, they exerted themselves in every way to increase their facilities and to use what they had to the best advantage. In especial they ordered cars, hundreds of thousands of them. Every car shop in the country was running full. The railways were paying the highest prices for cars and borrowing money to pay for them at the highest rates. And what is the result? Three hundred thousand idle cars.

The last 300,000 cars the railways bought cost $300,000,000—the other facilities that came with them, engines, tracks and the like cost as much again. There is over half a billion dollars of useless expenditure by the railways incurred solely to postpone car shortage. With this showing I cannot believe that you will add another burden to what the railways are carrying already.

For this reciprocal demurrage proposition would be a burden to the railways. It is reciprocal only in name. It does not give the railways one right or privilege that they do not already possess, which the courts have not confirmed to them again and again. On the other hand, it allows the shipper to collect of the railways certain fines in addition to any damage he may receive. I need not tell you, gentlemen, that whenever a railway actually damages a shipper by an unreasonable failure to supply cars or move cars, the shipper can collect damages. These bills give the shipper a dollar or so per car per day extra whether he is damaged or not. And they call them reciprocal.

The necessity of some sort of car demurrage is now admitted by almost every one. The last car shortage would have been much worse if there had been no demurrage rules anywhere, and it would have been somewhat relieved if the demurrage rules had been more widely applicable. During the worst of the shortage there were thousands of cars of export freight standing at our ports because there was no demurrage on them. The congestion was worst at Galveston. It was so bad there that the railways there have now succeeded in covering export freight with their demurrage rules and there will never be that trouble there again. But there are many other points that should be covered.

The whole demurrage question is a serious one. The railways are trying to get together on it, and the government bodies are taking it up. The National Association of Railroad Commissioners has appointed a very able committee to consider the question. Mr. Lane, of the Interstate Commission, is chairman and your Mr. Clarke represents Nebraska.

It is hoped that this committee will do much to bring the laws on this subject into line.

For it is essential that if there are to be state laws on the subject they should be uniform. They cannot, of course, touch interstate business, but even on state business it would be unfortunate if, for instance, Iowa should give the man in Council Bluffs privileges which Nebraska does not give in Omaha.

And this is not the only chance for discrimination offered in the bill. The bill gives the railway the right to pay a shipper a dollar a car a day whenever it likes. Let the favored shipper only ask for more cars than he wants or let him ship ahead of time so that the railway can delay the cars a little, and what can stop such a legalized rebate?

Recent legislation has done a good many things *to* the railways, but it has done one thing *for* the railways and the honest shipper alike. It has wiped out rebating. Don't, gentlemen, I urge you, pass a bill that will bring the rebate back.

I hesitate before speaking of the future. A year ago I spoke on a similar occasion to a committee of the Massachusetts Legislature, and I told them that I hoped good times would come back in the fall. I need not say that they did not, but with all that, I cannot help feeling that good times must come again this fall. I want to see, and you want to see times that will start every industry and will put in use every one of our idle cars and more. I believe such good times are coming and I want the railways ready for them. The railways are standing still now—they don't know what to expect, they want to buy cars, they want to extend their lines, but they don't dare to. I think they ought to extend their lines. A study of the map of Nebraska shows that many railway lines ought to be extended if this state is to develop. You want those lines built, you want the railways to pluck up courage and prepare for the development that is sure to come. Why consider bills like this when you can join to help the railways to bring back good times?

TRAIN ACCIDENTS IN DECEMBER.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of December, 1908. The monthly records are intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. They are based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details or for information:

TRAIN ACCIDENTS IN THE UNITED STATES IN DECEMBER, 1908.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
†6.	G., C. & S. F.	Haney.	bc.	P. & P.	2	3
*22.	C. & A.-B. & O.	Chicago.	xc.	P. & P.	0	1
24.	Terminal	St. Louis.	rc.	P. & P.	1	6
25.	Gt. Northern	Elmira.	bc.	P. & Ft.	1	4
*28.	Gt. Northern	Mid Canon.	bc.	Ft. & Ft.	8	4

Derailments.

Date.	Road.	Place.	Cause of accident.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
4.	Rock Island	Keers, Ark.	d. switch.	Pass.	2	2
9.	Nor. Pacific	McKenzie.	b. rail.	Pass.	0	11
24.	L. S. & M. S.	Pleasant Lake.	b. wheel.	Pass.	0	5
26.	G. C. & Piedmt.	Reidsville.	unx.	Pass.	0	12
27.	Southern	Lumber City.	d. switch.	Ft.	0	6
29.	Southern	Stokesland.	ms.	Pass.	1	2

Other Accidents.

Date.	Road.	Place.	Cause of accident.	Kind of train.	Kil'd.	Inj'd.
4.	N. Y., O. & W.	Middletown.	boiler.	Ft.	0	1
12.	Sou. Pacific	Beaumont.	boiler.	Ft.	3	1
24.	L. S. & M. S.	Laporte.	boiler	Ft.	1	1

The trains in the butting collision at Mid-Canon, Mont., on the twenty-eighth, were a northbound freight and a work-train running south. The work-train consisted of an engine, pile driver and caboose, the caboose being in front and the engine at the rear. Six bridge carpenters in the caboose and a brakeman on the engine of the freight train were killed, and seven employees were slightly injured. The caboose immediately took fire and most of the wreck was burned up. The body of one of the men who were killed was destroyed in the fire. The collision was due to disregard of a "run-late" order by the northbound train. The order specified 1 hour 30

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

minutes late, but the train was only 1 hour 10 minutes behind its time.

The train derailed at Stokesdale, Va., on the twenty-ninth was southbound fast mail train No. 35, and the engine, baggage car and two mail cars were overturned. The switch leading to the Danville & Western track had been left misplaced, but it would appear that the fact should have been discovered by the engineman, as, according to the best evidence, the signal light showed red. The derailment occurred at 5.50 p.m. The engineman was killed, and the fireman and one postal clerk were injured.

The train derailed at McKenzie, N. Dak., on the ninth is said to have been running at the rate of 50 miles an hour, and the cars were occupied by about 200 passengers, and yet the three day cars and three sleeping cars are said to have fallen down a bank without fatal results to any of the occupants. This fortunate result is attributed to the presence of a deep snow drift in which the cars lodged with so little shock that the couplings were not separated.

A blood curdling story of a wreck of 72 freight cars in a runaway at Addison, N. Y., on the twenty-fourth in which a factory and several passenger cars were said to have been destroyed by fire, is characterized by an officer of the road as a gross exaggeration. There was a runaway of freight cars, but the damage was moderate and no one was seriously hurt.

The only fatal electric car accident which we find in the newspapers in December was a butting collision at Worcester, Mass. One of the two motormen was killed and two other persons were badly injured.

The German Railway Union has changed its method of designating classes of locomotives. Heretofore an American locomotive, four drivers with 4-wheeled truck in front, was designated as follows: o o O O; and others in a corresponding way, truck wheels, or rather axles with truck wheels, by small circles and drivers by larger ones. With the increase of wheels, this becomes a long expression, not quickly written. By the new method, truck axles are designated by Arabic figures and driving axles coupled by capital Roman letters, A for one, B for two and so on. Thus an engine with 10 driving wheels coupled is designated simply by "E"; one with eight drivers coupled, a pony truck in front and a 4-wheeled truck behind by "1 D 2." In case driving axles are not all coupled, the numbers coupled are given separately. For instance, a Webb three-cylinder compound, with pony truck in front, the driving axles not being coupled, is designated by "1 A A." When there is more than one set of driving-axles coupled, each set is designated with "+" between them. Thus a Mallet locomotive with two sets of three driving-axles coupled is "C+C."

LOUISVILLE CAR WHEEL FOUNDRY.

The Louisville Car Wheel and Railway Supply Co. was organized in 1871. It had the first car wheel plant south of the Ohio river, although some wheels had been made in ordinary soft iron foundries with the usual equipment of such foundries. The plant was quite small and was enlarged in 1882 to a capacity of 100 wheels a day, which was stretched from time to time until the capacity reached 150 wheels per day, as it now stands. In 1907 they began the erection of a new plant, located some three miles from the old plant, and on the main line of the Louisville & Nashville.

Annealing Pits Served by Electric Hoist.

The plant was designed and equipped by the Whiting Foundry Equipment Co., Harvey, Ill., with their straight line system, similar in detail to that supplied the Chicago, Milwaukee & St. Paul. The building is of brick and steel construction throughout. The main building is 200 ft. long and 120 ft. wide, with a side bay of 30 ft. x 60 ft., containing

cupola and blower rooms. It is equipped with 15 floors of 25 wheels per floor, making a total capacity of 375 per day.

The cupola is a No. 10 Whiting, 96 in. in diameter, and 52 ft. 6 in. high. It is lined to a diameter of 78 in. inside. This cupola will melt at a rate of 24 tons per hour. Located at the side of cupola is the blower or power room, equipped with a No. 12 Sturtevant positive blower and a Chicago Pneumatic Tool Co.'s air compressor with a capacity of 250 ft. of air per minute; both being driven with a 50 h.p., a.c. General Electric motor. The charging floor, 30 ft. x 60 ft., is served by two 3-ton Whiting Pneumatic elevators, fitted with 20-in. balanced air hoist. The floor is provided with four sets of tracks with a transfer car at each end, the idea being to provide for the storage of loaded cars before the heat; then to gradually work them off through the charging machine, and then down to the ground floor for fresh charges. In front of the cupola is placed a Whiting pneumatic charging machine.

This machine consists of a platform hinged at a level above the charging platform on the side toward the cupola, provided with a track for the charging car in line with stationary tracks as shown. It has guard angles and a hook for holding the car to the platform when being dumped. A dumping cylinder is properly supported by framing attached to the charging floor and pivoted to allow the alinement re-

View Showing Ladle Truck at Cupola.

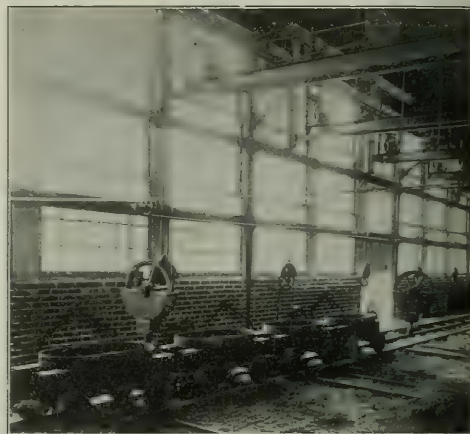
quired. The piston rod is pivoted in a bracket attachced to the under side of the platform. The platform is built of structural shapes and all joints are strongly riveted. The hinge pins are of ample size and arranged for easy removal and replacement. An apron plate is hinged to the platform and laps over an inclined chute in front of the cupola door. The controlling valve is located at any convenient point and is piped to the cylinder and connected with air supply.

In operating, the car is run on the platform and the hook engaged with an eye attached to the car frame. Then the valve is opened to admit air into the operating cylinder and the platform is raised to the dumping position. Iron charges are put on cars with ends about 12 in. high, but open on both sides. Coke cars have their ends and sides enclosed, one side being fitted with a hinged door.

By manipulating the valve, the charge may be distributed as desired. The level of the charge must be maintained from 3 ft. to 4 ft. below the level of the door sill to get the best results.

The floor cranes are equipped with a balanced air hoist. This type of hoist having air under pressure on both sides of piston makes it especially suitable for molding floors, its action closely resembling that of a hydraulic hoist. The valves for these hoists are attached to the structural work independent of the hoist and are of special heavy construction to withstand the heavy usage necessary for this work.

The core room and ovens are located in a separate building 30 ft. wide and 80 ft. long. There are two core ovens with space for a third. One oven is 9 ft. wide x 16 ft. long, without side racks, and the other 13 ft. wide x 16 ft. long, with side racks; both being 8 ft. high. They are fitted with



View Showing Pneumatic Hoists for Flasks.

counter-balanced sliding doors. Both are fired from a pit in the back. The heat from the fire-box being distributed by special arrangement of flues insures an equal distribution, the steam and gas escaping in stack from an opening located at the floor line. For firing up they are provided with a damper located at top of oven which opens to allow the escape of smoke and closed as soon as they obtain a clear fire. Each oven is provided with two lines of tracks, and

Pneumatic Charging Machine.

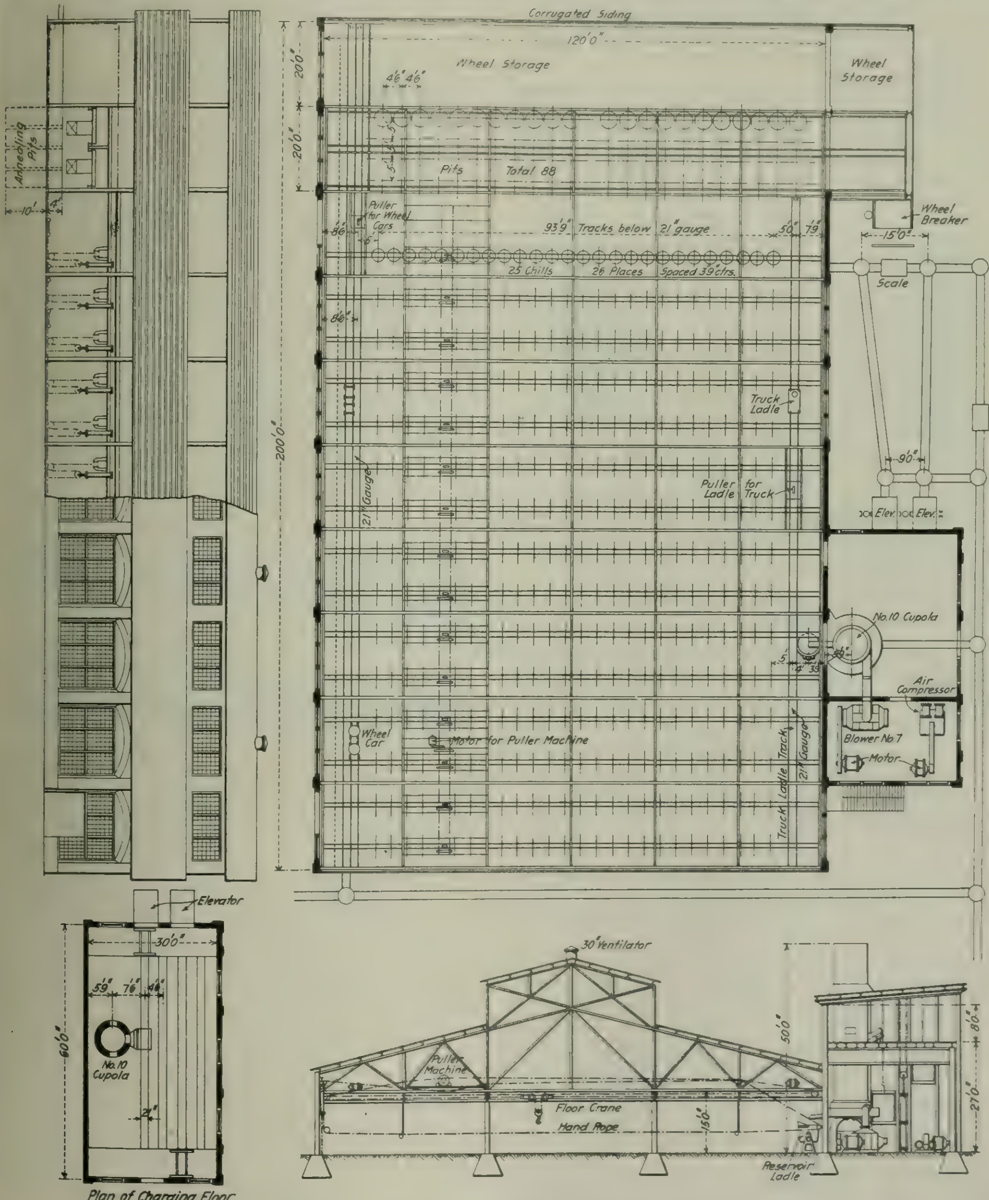
can accommodate 6 cars each. These cars are built of channels, angles and plates, and are 4 ft. x 4 ft. 6 in., with perforated plate shelves. This type of shelf makes it especially convenient for this class of work, making it easy for sliding on and off cores. In order to facilitate the handling of these cars, a transfer car is provided in front of the ovens. The annealing pits are served by two standard Whiting pitting

trolleys with built up structural frames, each trolley handling two wheels at once and thereby serving two rows of pits. They are each fitted with two 5-h.p., a.c. General Electric motors. They are also fitted with the Whiting semi-automatic pitting tongs.

The operator's platform, reservoir, ladle, the train distributing iron, the hot wheel train delivering wheels to annealing pits, are practically duplicates of equipment furnished the C. M. & St. P.

The 3-phase, a.c., motors were supplied by the General Electric Company. The motors are distributed as follows: Reservoir ladle, 5 h.p.; ladle trains, 5 h.p.; hot wheel train, 5 h.p.; pitting trolleys, two 5 h.p.; floor cranes, 15 h.p.; blower and compressor, 50 h.p. The power for this foundry is supplied by the Louisville Lighting Company. The structural steel work was constructed and erected by the Sneath Architectural Iron Works, Louisville, Ky.

The plant was designed and equipped by the Whiting Foundry Equipment Company, Harvey, Ill., which make a specialty of complete foundry plants.



Plan and Elevations of Louisville Car Wheel Foundry.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XIII.

An accompanying table gives leading particulars of the existing rolling stock which is run in the present suburban service. The total number of bogie coaches is 305, and the total number of fixed wheel-base coaches, 316.

Of this stock, neither the six nor four-wheeled stock with fixed wheel-base is at all suitable for the electric service, but such bogie stock as is constructed with all-steel underframes could be utilized, if it were not for its varying length which results in considerable variation both of weight and of seating accommodation.

Coaches of different lengths are very undesirable, especially for multiple-unit working, the essence of which is uniformity among the different sections making up the train, as regards capacity and interchangeability of motor equipment. Further, as already stated, the maximum accommodation per ton weight of coach is secured by the longest practicable coach; for your suburban lines and with ordinary compartment doors opening outwards, the limit of length is about 60 ft.

I have inspected the design and condition of this bogie stock in the sheds at Melbourne, and the chief mechanical engineer has handed me drawings showing in detail the construction (which is quite in line with the best current steam practice) and how it is proposed to lengthen the stock to the limiting dimension and, although certain alterations would be necessary in order to make the underframe suitable for carrying the electrical equipment with the clearances required, these are not calculated to increase the weight or to complicate the underframe to any appreciable extent.

As a result of the discussion on these matters, which took place while I was in Melbourne, complete estimates of cost were got out by the chief mechanical engineer for lengthening nearly all these coaches and for a corresponding strengthening of the underframes and trucks and also for the provision of driving compartments. These estimates, summarized in a table, show that the carrying out of these alterations would be a much cheaper matter than building entirely new stock.

If all the suitable bogie coaches given in the table of existing stock, and also the 10 new coaches,* were dealt with in this way, there would be a total of 305 coaches, each capable of seating from 70 to 80 passengers, depending on whether motormen's and guards' compartments were required or not.

Existing Suburban Rolling Stock.†

Type of stock.	Description.	No.	Length in ft.	Av. seating capacity.
Bogie	AA	155	45	61
	BB	29	45, 50	73
	ABab	21‡	44, 45, 50	66
	ADad	82	45, 50	52
	BDbd	18	50	70
Fixed wheel base	A	36	30	32
	B	220	24, 25½, 27½, 30	47
	BH	12	25¾	50
	ABD	1	24	25
	BD	43	24, 26	26
	D	3	24	Van
	AB	1	30	50

*Ten coaches completed subsequent to the report of the electrification committee and treated as additional stock (see table of costs of new rolling stock, alterations, etc.).

†Excluding stock required for Frankston, St. Albans, Werribee and Eltham.

‡Ten ABab stock are not suitable for conversion.

Since a total of 496 coaches of this size would be required for the proposed service, there is, for Stage III, a balance of 191 coaches to be provided, and these could all be of the new type referred to, or, if it be desired to provide corridor stock for all the country lines, there are 124 bogie coaches at present in use in this service which might be replaced by corridor stock and altered in the same way as the present suburban coaches for electric working, thus leaving only 67 new coaches to be provided. I assume that the latter course will be adopted and give in a table a summary of the cost of carrying out the alterations. The amount to be credited to the country service for the loss of this stock is included in another table under "Additional rolling stock."

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

In order that a high schedule speed may be maintained, the advantage gained by the quick acceleration of the electric trains must not be lost in long stops at stations, and the public should be induced to assist the operation of the railway by entering and leaving trains as quickly as possible. It is in connection with this station stop that the outward swinging side-door stock is at some disadvantage as it is essential that the doors should be closed before the train leaves the platform.

Cost of Lengthening and Altering Suburban Steam Stock.

No.	New class.	Cost.
2	Motor coach with 2 driving compartments	£981
2	" " " 2 " "	1,179
73	" " " 1 driving compartment.	33,393
85	" " " 1 " "	47,297
21	Trailer coach with 1 " "	9,516
9	" " " 1 " "	4,009
4	" " " 1 " "	2,144
60	" " without driving compartm't.	24,747
39	" " " " "	16,619
10*	" " " " "	2,447
305	Total	£142,332

* Completed subsequent to Report of Electrification Committee and treated as additional stock. See later table of "Cost of New Rolling Stock, etc."

The duty of closing the carriage doors, at present devolving on the station staff, will be rendered more difficult by the higher acceleration. With an acceleration of .9 miles per hour per second and the maximum length of train proposed, the speed at which the last door will pass a point at the end of a 360-ft. platform, would be 21 miles per hour—too high to contemplate the effectual closing of swing doors from the platform. It must be arranged, therefore, either to close the doors before the train starts, or if with the present staff, this would mean increasing the stopping time required, to provide additional men at the more busy stations. This applies only at such times as six-coach trains are in service; on the majority of the branches this would be during the heavy morning and evening traffic only, and I recommend that such additional staff should be provided at such times and places.

Cost of Lengthening and Altering Country Steam Stock.

No.	New class.	Cost.
45	Motor coach with 1 driving compartment	£25,039
20	Trailer " " 1 " "	10,721
58	" " without driving compartm't.	29,176
1	" " " " "	458
124	Total	£65,394

Alternative ways of dealing with the matter are either to close the doors automatically or to convert them from outward swinging doors to sliding doors. Neither of these methods can, however, be recommended, the former on account of the complication, the latter on account of the cost.

I therefore recommend that if any electrification scheme be proceeded with, such of the existing stock as is suitable for the purpose be lengthened and altered for the electric service and that on routes where this is used additional staff be provided at the busier stations during rush hours of traffic and that new stock be provided to make up the required number of coaches. In order, however, that ample experience of the proposed new type of coach may be obtained before building it in large quantities, I consider sufficient coaches should be built to form two six-coach trains for Stage I of the conversion; this has been allowed for in the estimates.

The existing trucks, while they can conveniently be made suitable for use as trailer trucks, are not suitable for carrying the motors themselves. I, therefore, recommend that new motor trucks be built according to the design discussed in Melbourne, and the cost of these is included in the tables showing cost of lengthening and altering steam stock.

I have assumed that all the work in connection with the rolling stock for the electric service would be carried out in your own workshops. I have, however, fully allowed in the estimates for the cost of this work, basing my figures on the information prepared by your chief mechanical engineer.

(*To be continued.*)

A NEW DEPARTURE IN FLEXIBLE STAYBOLTS.*

BY H. V. WILLE, M. A. S. M. E.

There is practically no literature on the subject of staybolts and this is particularly true of flexible staybolts. The increaseing size and pressure of boilers make this subject of vital importance to railways and to those responsible for the management of that type of boiler in which the firebox is stayed by a large number of bolts. The boiler of the consolidation locomotive, now the prevailing type in freight service, contains 1,000 bolts less than 8 in. long and about 300 of greater length. The large types of Mallet compound locomotives now meeting with much favor have a much larger number, there being 1,250 short and 300 long bolts in locomotives recently constructed. In recent years some form of flexible staybolt, that is, one having a movable joint, has been very extensively used in the breaking zone of locomotive boilers, but their high cost and the difficulty of applying them, their rigidity from rust and scale, and the fact that their use throws an additional service on the adjacent bolts because of lost motion has militated against their more general use.

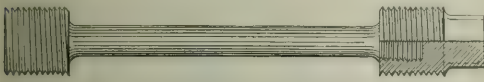


Fig. 1—Flexible Spring Steel Staybolt.

It is well known that staybolts fail, not because of the tensional loads upon them, but from flexural stresses induced by the vibration resulting from the greater expansion of the firebox sheets than of the outside sheets, but notwithstanding the general acceptance of this theory, engineers have designed staybolts solely with respect to the tensional loads. It is quite general practice, it is true, to recess the bolts below the base of the thread, and this has effected a slight reduction in the fiber stress, but practically no effort has been made to design a bolt to meet the flexural stresses or even to calculate their magnitude. This is surprising in view of the simplicity of the calculations to which the ordinary formulae for flexure apply.

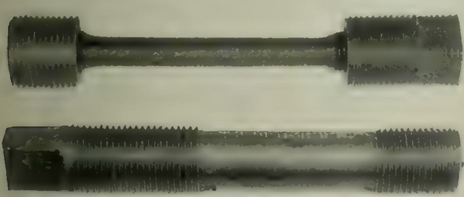


Fig. 2—Flexible Spring and Regular Iron Bolts of Same Tensile Strength.

Let F = fiber stress. N = deflection.
E = modulus of elasticity. L = length.
I = moment of inertia. W = load.
D = diameter.

We then have

$$W = \frac{2\ F\ I}{D\ L} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$N = \frac{W\ L}{3\ E\ I} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

substituting

$$N = \frac{2\ F\ L^2}{3\ E\ D} \quad \ldots\ldots\ldots\ldots\ldots (3)$$

$$F = \frac{3\ E\ D\ N}{2\ L^2} \quad \ldots\ldots\ldots\ldots\ldots (4)$$

†Testing of Staybolt Iron. H. V. Wille, A. S. T. M., Vol. IV, 1904.

*From a paper to be presented before the American Society of Mechanical Engineers.

This formula shows that the stress increases in direct proportion to the diameter and decreases as the square of the distance between the sheets. The application of the formula to service conditions gives the following stresses:

Conditions: Bolt spacing, 4 in. centers.
Assumed expansion, 4/100 in.
Length of bolt, 6 in.

Type.	Diameter of Bolt.	Flexural Stress.
Iron	1⅛ in.	51,500
Iron	1 "	45,000
Iron	⅞ "	39,400
Spring steel	1 in. ends, ⅝-in. stem.	19,700

Iron is universally employed in the manufacture of these bolts and it is not good practice to exceed a fiber stress of 12,000 lb. per sq. in. It is apparent that staybolts in the zone which meets the expansion of the sheets are stressed above the elastic limit and must necessarily fail from fatigue. Fractures always originate at the outside sheet at the point where the bending moment due to the movement of the furnace sheets is greatest. The fractures are in detail, usually starting from the base of a thread and gradually extending inward.

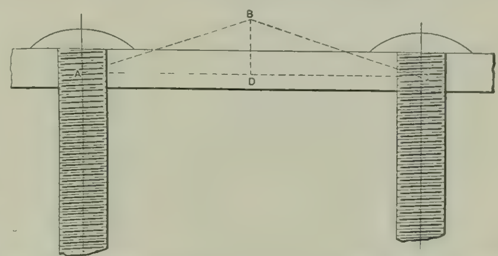


Fig. 3—Showing Manner in Which Plates Buckle With Rigid Stays.

Manufacturers of staybolt material have endeavored to minimize failures and to meet the unusual conditions of an iron stressed beyond its elastic limit by the supply of specially piled iron arranged with a view to breaking up the extension of the initial fracture. For this reason, iron piled with a central section of small bars and an envelop of flat plates has met with much success for this class of service. In a further effort to secure an iron specially adapted to this class of work various forms of shock, vibratory and fatigue tests have been imposed. No design has yet been produced, however, which permits the employment of material of elastic limit sufficiently high to resist the flexural stresses, although a large class of material particularly adapted to the purpose is available.

It is obvious that the remedy does not lie in the use of a slow-breaking material, but in the employment of material of sufficiently high elastic limit to meet the conditions of service. It is also possible to reduce the diameter of the bolt greatly by the use of such a material, thus proportionately reducing the fiber stress in flexure. Staybolt material, however, must possess sufficient ductility to enable the ends to be readily hammered over to make a steam-tight joint and to afford additional security against pulling through the sheets. To meet these conditions the bolt illustrated in Fig. 1 has been designed. The stem is of the same grade of steel as that used in the manufacture of springs. It is oil-tempered and will safely stand a fiber stress of 100,000 lbs. per sq. in. Its high elastic limit makes it possible to reduce the diameter to ⅝ or 7-16 in. or even less. The ends are of soft steel, and it is thus possible to apply and head up the bolt in the usual manner. The employment of a stem of the diameter indicated reduces the fiber stress in flexure to less than one-half that in the ordinary type of bolt and it is of material capable of being stressed to a high degree. It has hitherto been impossible to employ in staybolts any of the steels containing chromium, nickel, vanadium or other metaloid possessing properties especially

adapted to this class of work, but these steels can readily be used in the stem of the bolt described. The stem of the bolt can be flexibly secured to the end in one of the customary ways, but the flexibility of the bolt does not depend upon a flexible connection. A type of bolt with a relatively inflexible connection, usually one in which the stem screwed into the ends with a running fit, met with the most favorable consideration. Such a bolt is flexible as a spring is flexible, in that it can be deflected to meet the requirements of service without exceeding the elastic limit. In fact, the stem may be of a number of pieces, either of plates or small rods, thus increasing its flexibility.

The actual breaking strength of the bolt sizes ordinarily employed is shown in the following statement. These bolts were recessed to the base of the thread and tested in the same form as that in which they are employed in service. For comparison the approximate weights of the usual length of bolt are also given. These weights are for bolts over the entire length, including the squared ends for screwing the bolts into the sheets.

Type	Nominal Diameter	Actual Breaking	Weight	Vibrations
Iron	1 in.	32,500	20 oz.	6,000
Iron	⅞ "	24,500	15 "	5,200
Spring steel stem	1-in. ends, $\frac{7}{16}$-in. stem.	32,000	10 "	500,000

ACTUAL BREAKING STRENGTH OF STAYBOLTS.

The vibrating test was made by clamping one end of the bolt in a machine and revolving the other end through a radius of 3-32 in., the specimen being 6 in. long from the end of the right head to the center of the rotating head. A tensional load of 4,000 lbs. was also applied to the bolts. The best grades of iron bolts break on being subjected to from 5,000 to 6,000 rotations, whereas the spring steel bolts were vibrated 500,000 times without failure, and on some of them the test was continued without failure to 1,000,000 vibrations. These tests demonstrated that the bolt is not stressed beyond the elastic limit under these severe conditions and that the probability of its failure in less severe conditions is very remote.

The extent of the expansion which can take place in the firebox of a boiler can readily be calculated.

Distance between staybolts, 4 in.

Temperature of inside sheet, 400 deg. Fahr.

Temperature of outside sheet, 100 deg. Fahr.

Coefficient of expansion, 0.0000066.

Then the expansion between two bolts will equal: $0.0000066 \times (400 - 100) \times 4 = 0.0079$, and each bolt will deflect 0.00395 in. It has been shown that this amount of deflection will stress the usual type of bolt beyond the elastic limit. In practice, however, one bolt may hold rigidly, throwing the entire deflection on the adjacent bolt, or neither bolt may deflect and the sheet will then buckle. Under this condition the neutral axis will assume the form *ABC*, Fig. 3, and the length *AB* will equal 2.00395 in. and the sheet will buckle to an extent, $BD = \sqrt{2.00395^2 - 2^2} = 0.125$ in. It is obvious that the repetition of a force sufficient to buckle a sheet ⅛ in. must ultimately lead to a crack in the furnace sheets. If, however, the bolt deflects, allowing the sheet to normally expand, the latter will be relieved of these extraneous loads. A bolt of sufficient flexibility to deflect under the forces following expansion, and of material which will not be stressed beyond the elastic limit in resisting these forces, will greatly assist in reducing the cost of boiler maintenance by eliminating broken staybolts and reducing the stresses in the furnace plates. If in addition the bolt has a smaller diameter the life of the furnace plates should be further increased, as such a bolt will interpose less obstruction to the circulation of the water in the water legs.

TRACK CIRCUIT SIGNALS WITHOUT INSULATED JOINTS.

A few months ago, the Hall Signal Company, New York, announced a track circuit arrangement which does without insulated joints and which is applicable to electric railways without the use of reactance bonds; and now, the scheme having been in use on the Long Island road for six months or more, a description is issued. From this we make the following extracts:

With the advent of the electric locomotive the insulated joint became a difficult problem; for reasons of economy in installations of third rail systems, the running rails are used as conductors for the return of the propulsion current. With the standard track circuit with insulated joints it is necessary, if the running rails are to be thus used for the return power current, to supply reactance bonds to bridge the insulated joints.

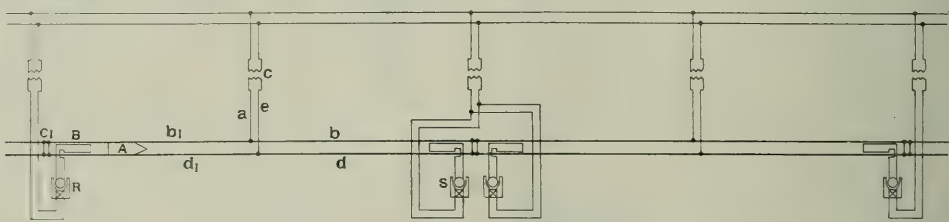


Fig. 1—Alternating Current Track Circuits—Long Island Railroad.

The system here described does not require the use of either insulating joints or reactance bonds. It was put in service on the Rockaway Beach Division of the Long Island Railroad in June, 1908, between Ramblersville and The Raunt station. On this line the electric trains are operated by the third rail system, with 500 volt D. C. current as the operating power. At the sub-stations an A. C. current is transformed from 6,600 volts, 25 cycles, to 2,200 volts A. C., 25 cycles, at which voltage it is carried through the different sections of the road where automatic signals are used, on two No. 2 bare copper wires, for the signal supply current. As the territory through which the new signals were installed is on a trestle over Jamaica Bay, it was considered objectionable to use a high voltage, and accordingly a step-down transformer of 3 K. W. capacity was placed in the signal supply line at the west end of the trestle, to reduce the voltage to 220, which is the voltage used for the signal supply for the new system. The blocks are approximately 2,700 feet in length, and home and distant signals are used as on other sections of the road.

At each signal location, a storage battery of five cells in duplicate of the Standard Electric Accumulator Company's battery, charged from the third rail through resistances, is used for the operation of the motors and slots. At one of the signal locations, however, the storage battery is not used, but in its place is substituted a rectifier of special design, which is connected to the A. C. supply through the regular relay transformer, which provides direct current at 12 volts for the operation of the motors and slot magnets at this location.

By the use of this rectifier, a direct current supply is provided from the same A. C. source as that used for the track

circuit, which allows the use of standard signal apparatus with D. C. motors and slot coils.

Figure 1 shows the arrangement for the operation of the track circuit. At each signal location, two No. 4-0 copper cross bonds connect the rails, forming a short circuit between the rails at these points. At the center of each block there is a track transformer, the primary of which is connected to the signal supply wires and the secondary to the two rails. This supplies A. C. current at 25 cycles, at approximately 4 volts, to

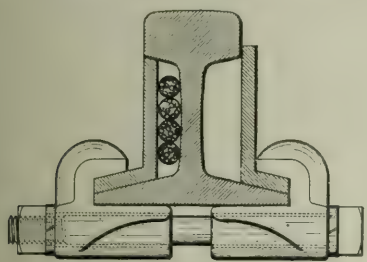


Fig. 2—Section Through Induction Coil.

the track. The path for this current is from secondary connection a to rail b, cross bonds c, rail d, connection e, to other side of the transformer secondary. At the same time a current of equal value passes from the secondary connection a, rail b-1, cross-bonds c-1, rail d-1, to the transformer; so that the A. C. current passes continuously through both rails throughout the block. At each end of the block, a coil of wire is placed along the rails with its terminals connected to the armature of an A. C. relay of the two circuit type. This coil is composed of 40 turns of No. 10 insulated copper wire, wound continuously, as in a transformer or magnet coil, along and between the rails. The wire is protected from mechanical injury by angle irons along the rails and clamped to them; and by wood trunking between the rails. Angle irons are also clamped to the outside of the rails. These angle irons, in addition to forming protection to the coils, increase their electrical efficiency by providing a core. A sectional view of the rail, coil and angles is shown in Fig. 2. The coil is 13 feet 6 inches in length, and is made of well insulated flexible wire, the insulation being impregnated with a weatherproof compound. This coil can be placed between track joints when the ordinary 30 ft. rails are used. Where the coil passes between the rails, it is placed below the base of the rail, and so that the top of the trunking which protects it is no higher than the top of the ties, providing ample protection from mechanical injury from parts dragging from cars.

The A. C. current which passes along rails induces a current of the same frequency in the coil, and this induced current is carried through the armature winding of the two-circuit relay, R. This action on the coil is the same as the action of a transformer; the rails through which the initial current passes constitute the primary of the transformer, the angles and clamps form the core, and the coil forms the secondary of the transformer. The fields of the relay are connected directly to the main signal supply wires through a field transformer, which reduces the supply from 220 volts to 55 volts, and in addition to supplying A. C. current at 25 cycles, 55 volts, to the fields of the relays at this location, also provides current at the same voltage, for the rectifier.

The relay is designed on the principle of the D'Arsonval type of electrical instrument, with a moving coil enclosed in a stationary field. The contact fingers of the relay are attached to the moving coil or armature, and in order to have a closed contact, it is necessary to have a current of the same frequency pass through both field and armature coils in synchronism. As the A. C. current from the supply at 25 cycles passes through the field coils continuously, the operation of the relay is dependent upon the current from the same source, through the track coils. A train entering a block, as at A, Fig. 1, cuts off the supply of track coil B, which is supplied from track transformer C, and in consequence the armature of track relay R is de-energized and the contact opens. As the train proceeds in the block and approaches the center, where the connections are made to the track transformer, this transformer is short-circuited to such an extent that the relay S at the opposite end of the block, as well as relay R, is de-energized, and its front contacts open.

The signal circuit, diagram of which is shown in Fig. 3, is a normally clear wire circuit with home and distant control. The wire for each home signal is carried the whole length of the home block in order that the home signal may be controlled by the relay at each end of the block, in series circuit. The breaking of a cross bond causes the signal to go to stop because the circuits from the transformers on each side of the bond are thus broken. When, however, a train is between two adjacent track transformers it completes a circuit from each. The connections of the transformers and relays are made in such a manner that the train approaching the broken bond clears the signal in advance, but the current to the train from a source to the rear will not give a clear indication. Protection against broken rails is also afforded on both rails, since a break in a rail will cut off the supply to the track coil at one end of the block and de-energize the relay at that end. The proprietors say that it is also feasible with this system to cross-bond between tracks on a two-track or four-track road at each signal location without interference with the operation of the system or the protection afforded by it.

The amount of energy consumed for each track circuit will vary according to the length of section, condition of ballast, etc. On this installation the track transformer delivers 30

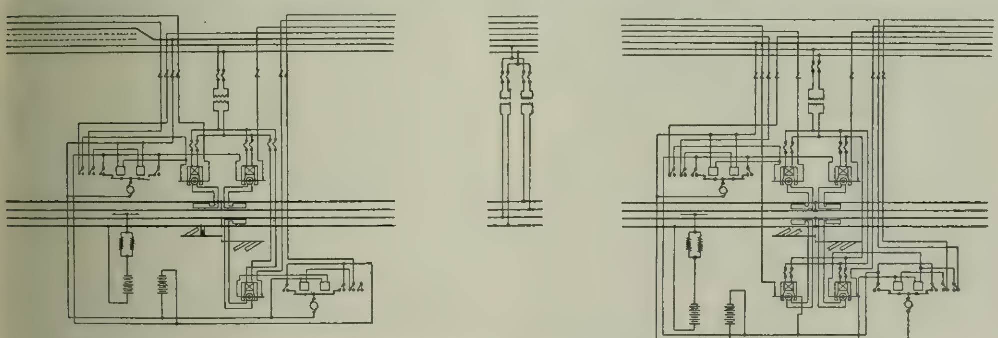


Fig. 3—Signal Circuits for Hall Automatic Block Signals—Long Island Railroad.

amperes at 3.3 volts or 99 volt amperes, and the field transformers deliver 2 amperes at 55 volts or 110 volt amperes. The power factor of the transformers, however, is low, and the actual consumption of energy for each section is only approximately 90 watts.

This system is equally applicable to steam roads.

This track circuit was originated by C. J. Coleman, the designer of the Hall electro-gas signal.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.*

BY W. F. M. GOSS.

Dean of the College of Engineering, University of Illinois.

SUMMARY OF CONCLUSIONS.

The results of the study concerning the value of high steam-pressures in locomotive service, the details of which are presented in succeeding pages, may be summarized as follows:

1. The results apply only to practice involving single-expansion locomotives using saturated steam. Pressures specified are to be accepted as running pressures. They are not necessarily those at which safety valves open.

2. Tests have been made to determine the performance of a typical locomotive when operating under a variety of conditions with reference to speed, power and steam-pressure. The results of one hundred such tests have been recorded.

3. The steam consumption under normal conditions of running has been established as follows:

Boiler pressure	steam per indicated horse-power hour
120 lbs.	29.1 lbs.
140 "	27.7 "
160 "	26.6 "
180 "	26.0 "
200 "	25.5 "
220 "	25.1 "
240 "	24.7 "

4. The results show that the higher the pressure, the smaller the possible gain resulting from a given increment of pressure. An increase of pressure from 160 to 200 lbs. results in a saving of 1.1 lb. of steam per horse-power hour, while a similar change from 200 lbs. to 240 lbs. improves the performance only to the extent of 0.8 lb. per horse-power hour.

5. The coal consumption under normal conditions of running has been established as follows:

Boiler pressure	coal per indicated horse-power hour
120 lbs.	4.00 lbs.
140 "	3.77 "
160 "	3.59 "
180 "	3.50 "
200 "	3.43 "
220 "	3.37 "
240 "	3.31 "

6. An increase of pressure from 160 to 200 lbs. results in a saving of 0.16 lbs. of coal per horse-power hour, while a similar change from 200 to 240 lbs. results in a saving of but 0.12 lbs.

7. Under service conditions, the improvement in performance with increase of pressure will depend upon the degree of perfection attending the maintenance of the locomotive. The values quoted in the preceding paragraphs assume a high order of maintenance. If this is lacking, it may easily happen that the saving which is anticipated through the adoption of higher pressures will entirely disappear.

8. The difficulties to be met in the maintenance both of boiler and cylinders increase with increase of pressure.

9. The results supply an accurate measure by which to determine the advantage of increasing the capacity of a boiler. For the development of a given power, any increase in boiler capacity brings its return in improved performance without adding to the cost of maintenance or opening any new avenues for incidental losses. As a means to improvement, it is more certain than that which is offered by increase of pressure.

10. As the scale of pressure is ascended, an opportunity to further increase the weight of a locomotive should in many cases find expression in the design of a boiler of increased capacity rather than in one for higher pressures.

11. Assuming 180 lbs. pressure to have been accepted as standard, and assuming the maintenance to be of the highest order, it will be found good practice to utilize any allowable increase in weight by providing a larger boiler rather than by providing a stronger boiler to permit higher pressures.

12. Wherever the maintenance is not of the highest order, the standard running pressure should be below 180 lbs.

13. Wherever the water which must be used in boilers contains foaming or scale-making admixtures, best results are likely to be secured by fixing the running pressure below the limit of 180 lbs.

14. A simple locomotive using saturated steam will render good and efficient service when the running pressure is as low as 160 lbs.; under most favorable conditions, no argument is to be found in the economic performance of the engine which can justify the use of pressures greater than 200 lbs.

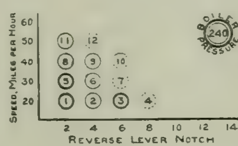


Fig. 1.

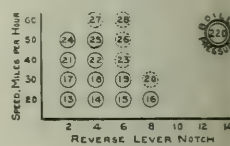


Fig. 2.

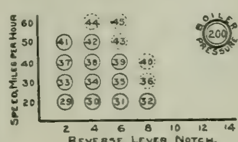


Fig. 3.

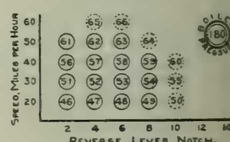


Fig. 4.

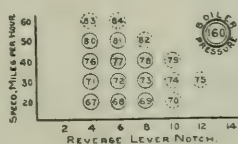


Fig. 5.

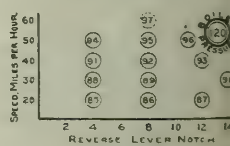


Fig. 6.

High Steam-Pressures in Locomotive Service.

I. THE RESEARCH AND THE MEANS EMPLOYED IN ITS ADVANCEMENT.

1. *Steam-Pressures in Locomotive Service.*—For many years past there has been a gradual but nevertheless a steady increase in the pressure of steam employed in American locomotive service. Between 1860 and 1870 a pressure of 100 lbs. per sq. in. was common. Before 1890 practice had carried the limit beyond 150 lbs. At the present time 200 lbs. is most common, but an occasional resort to pressures above this limit suggests a disposition to exceed it.

High steam-pressure does not necessarily imply high power. It is but one of the factors upon which power depends. The forces which are set up by the action of the engine are as much dependent upon cylinder volume as upon boiler-pressure, and when the pressure is once determined the cylinders may be designed for any power. The limit in any case is to be found when the boiler can no longer generate sufficient steam

*The Report on High Steam Pressures in Locomotive Service issued by the Carnegie Institution, of Washington, as Serial No. 66, is a publication of 144 pages dealing with a research which was carried on in the laboratory of Purdue University during the writer's connection with that university. It illustrates and describes the locomotive and other apparatus employed, and presents in tabulated and graphical form the full record of observed and derived results. In this review, the text of the report has been freely quoted, and the conclusions and arguments by which they are sustained appear as given in the original publication. The review, therefore, takes the form of a résumé of the research and its results, the complete record of which is available elsewhere. In the editorial work incident to the preparation of this review Paul Diserens has had an important share.

to supply them. The relation between pressure and power is therefore only an indirect one. But anything which makes the boiler of a locomotive more efficient in the generation of steam, or the engines more economical in their use of steam, will permit an extension in the limit of power. If, for example, it can be shown that higher steam-pressure promotes economy in the use of steam, higher steam-pressure at once becomes an indirect means for increasing power. The fact to be emphasized is that an argument in favor of higher steam-pressures must concern itself with the effects produced upon the economic performance of the boiler or engine.

2. *Preparations for an Experimental Study.*—In view of the facts stated, and with the hope of ascertaining a logical basis from which to determine what the pressure should be for a simple locomotive, using saturated steam, it was long ago determined to undertake an experimental study of the problem upon the testing plant of Purdue University. A few experiments involving the use of different steam-pressures in locomotive service were made at Purdue as early as 1895, but as the boiler of the locomotive then upon the testing-plant was not capable of withstanding pressures greater than 150 lbs., these early tests were limited in their scope.* The matter was, however, regarded as of such importance that in designing a new locomotive for use upon the plant, a pressure of 250 lbs. was specified—a limit which then was and still is considerably in advance of practice. Thus equipped, an elaborate investigation was outlined, involving a series of tests under six different pressures, representing a sufficient number of different speeds and cut-offs to define the performance of the

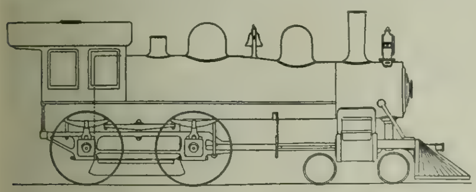


Fig. 7—Outline Elevation of Locomotive.

locomotive under a great range of conditions. But the expense of operating the locomotive under very high steam-pressures proved to be so great that the limited funds which could be devoted to the operations of the laboratory, in combination with the demands of students, which could be most easily satisfied by work under lower pressures, made it impracticable for a time to proceed with the work. A grant from the Carnegie Institution of Washington was announced late in the fall of 1903. The first test in the Carnegie series was run February 15, 1904, and the last August 7, 1905. A registering counter attached to the locomotive shows that between these dates the locomotive drivers made 3,113,333 revolutions, which is equivalent to 14,072 miles.

3. *The Tests.*—The tests outlined included a series of runs for which the average pressure was to be, respectively, 240, 220, 200, 180, 160 and 120 lbs., a range which extends far below and well above pressures which are common in present practice. It was planned to have the tests of each series sufficiently numerous to define completely the performance of the engine when operated under a number of different speeds and when using steam in the cylinders under several degrees of expansion. As far as practicable, each test was to be of sufficient duration to permit the efficiency of the engine and boiler to be accurately determined, but where this could not be done cards were to be taken. A precise statement of the conditions under which, in the development of this plan, the tests were actually run, is set forth diagrammatically in Figs. 1 to 6 accompanying, in which vertical distances represent speed, and horizontal distances the point of cut-off as determined by the notch occupied by the latch of the reverse lever, counting from the center forward. Each complete circle in these diagrams represents an efficiency test, and each dotted circle, a shorter test under conditions involving the development of power in excess of that which could be constantly sustained. The numerals within the circles refer to the laboratory numbers by which the several tests are identified.

4. The locomotive upon which the tests were made is that regularly employed in the laboratory of Purdue University, where it is known as Schenectady No. 2. It was ordered of the Schenectady Locomotive Works in 1897. In selecting a second locomotive which should serve the purposes of the Purdue testing-plant, it was decided to have the boiler of substantially the same capacity as that of the locomotive previously employed in the laboratory and which in later years has been known as Schenectady No. 1. In some other respects the new locomotive differed from its predecessor. Its boiler was designed to operate under pressures as high as 250 lbs., a limit which was then 25 per cent. higher than the maximum employed in practice. Horizontal seams are butt-jointed with welt strips inside and out, and are sextuple-riveted. The design of its cylinders and saddle is such as readily to permit the conversion of the simple engine into a two-cylinder compound. The driving-wheels of the new locomotive are of larger diameter than those of Schenectady No. 1.

The principal characteristics of the locomotive are as follows:

Type	4-4-0
Total weight	109,000 lbs.
Weight on four drivers	61,000 "
Valves: Type	Richardson balanced
Maximum travel	6 in.
Outside lap	1 1/8 "
Inside lap	0 "
Ports: Length	12.0 "
Width of steam port	1.5 "
Width of exhaust port	3.0 "
Total wheel base	23 ft.
Rigid wheel base	8.5 "
Cylinders, diameter	16 in.
Cylinders, stroke	24 "
Drivers, diameter of front tire	69.25 "
Boilers, style	Extended wagon top
Diameter of front end	52 in.
Number of tubes	200
Gage of tube	12
Diameter of tube	2 in.
Length of tube	11.5 ft.
Length of firebox	72.06 in.
Width of firebox	34.25 "
Depth of firebox	79.00 "
Heating surface in firebox	126 sq. ft.
" " in tubes, water side	1,196 "
" " in tubes, fire side	1,086 "
Total heating surf., inc. water side of tubes	1,322 "
" " " " fire side of tubes	1,212 "
" " " value accepted for use in all calculations	1,322 "
Ratio of total heating surface based on water side of tubes to that based on fire side of tubes	1.091
Grate area	17 sq. ft.
Thickness of crown sheet	[illegible] in.
Thickness of tube sheet	[illegible] in.
Thickness of side and back sheets	[illegible] in.
Diameter stay bolts	1 in.
Diameter of radial stays	1 1/8 in.
Driving-axle journals: Diameter	7 1/2
Length	8 1/2

5. *An Alternative for Higher Steam-pressures.*—Previous publications from the Purdue laboratory have shown the possibility under certain conditions of finding a substitute for very high boiler-pressures in the adoption of a boiler of larger capacity, the pressure remaining unchanged. If, for example, in designing a new locomotive, it is found possible to allow an increase of weight in the boiler, as compared with that of some older type of machine, it becomes a question as to whether this possible increase in weight should be utilized by providing for a high-pressure or for an increase in the extent of heating-surface. The results of tests, supplemented by facts concerning the weight of boilers designed for different pressures and for different capacities, supply the data necessary for an analysis of this question. Such an analysis is presented elsewhere. (See Chapters VI. and VII.)

(*To be continued.*)

*Results of these tests will be found published in Locomotive Performance, John Wiley & Sons.

THE VALUATION OF RAILWAYS.

IV.

In the opinion of the Court of Common Pleas with respect to the constitutionality of the Pennsylvania 2-cent fare law, it was held that a public service corporation is entitled to a return of not less than the legal rate of interest.

By implication the Massachusetts law establishes a rate of 10 per cent.:

" . . . The Commonwealth may, at any time during the continuance of the charter of a railway corporation after the expiration of twenty years from the opening of its road for use, purchase of the corporation its road and all its franchise, property, rights and privileges by paying therefor such amount as will reimburse to it the amount of capital paid in, with a net profit thereon of ten per cent. a year from the time of the payment thereof by the stockholders to the time of the purchase." (Revised Laws, Chap. III., Sec. 6.)

The New York law specifies a rate of 10 per cent.:

"The legislature may, when any such railroad shall be opened for use, from time to time, alter or reduce the rate of freight, fare or other profits upon such road; but the same shall not, without the consent of the corporation, be so reduced as to produce with such profits less than ten per centum per annum on the capital actually expended; nor unless on an examination of the amounts received and expended, to be made by the board of railway commissioners, they shall ascertain that the net income derived by the corporation from all sources, for the year then last past, shall have exceeded an annual income of ten per cent. upon the capital of the corporation actually expended." (Laws of New York, 1890, Chap. 565, Sec. 38.)

The laws of Virginia provided for a rate of from 10 to 15 per cent.:

"When the net profits of any company heretofore or hereafter incorporated, which may be governed by this chapter, shall be such that, but for this section, dividends might be declared out of the said profits exceeding the rate of fifteen per centum per annum on the capital stock invested, laws may be passed for reducing the tolls of the company. But no law shall reduce the tolls so as to prevent dividends of fifteen per centum per annum, within thirty years from the time the first dividend of profits of the said company was declared, or so as to prevent dividends of twelve er centum per annum after the said thirty years and before fifty years from the same time, or so as to prevent dividends of ten per centum per annum after the said fifty years." (Code of Virginia, 1887, Chap. LI., Sec. 1242.)

Some of the laws bearing upon this point have been repealed; but it is a consensus of opinion that is sought, rather than the law. It seems probable that a 10 per cent. rate of income from such a business undertaking is not excessive, and it is doubtful if capital would be available in quantity for transportation uses if a minimum substantially lower were definitely established.

When, it is asked, should a carrying company be privileged to realize a stated equitable rate of return—when traffic is moving in large volume and when the stimulus of diminished rates is least needed, or when business is in a depressed condition and when an advance in rates might be highly injurious in its effects? The obvious answer to this question is, at neither of these extremes, but at a mean between them. In years of prosperity a surplus should be created, to be drawn upon in times of depression and relative inactivity. Thus with the growth of traffic will a general and continuous reduction in transportation charges be possible, without violent fluctuation, until the capacity of the transportation system is reached and a minimum cost of rendering the service is established.

It is pertinent to inquire what a valuation of the railways is likely to show—whether nominal capitalization is greater or less than actual investment. President Roosevelt in his speech at Indianapolis May 30, 1907, said:

"There has been much wild talk as to the extent of the overcapitalization of our railways. The census reports on the commercial value of the railways of the country, together with the reports made to the Interstate Commerce Commission by the railways on their cost of construction, tend to show that as a whole the railway property of the country is worth as much as the securities representing it, and that in the consensus of opinion of investors the total value of stock and bonds is greater than their total face value, notwithstanding the 'water' that has been injected in particular places. The huge value of terminals, the immense expenditures in recent years in double tracking, improving grades, roadbeds, and structures, have brought the total investments to a point where the opinion that the real value is greater than the face value is probably true. No general statements such as this can be accepted as having more than a general value; there are many exceptions; but the evidence seems ample that the great mass of our railway securities rest upon safe and solid foundations; if they fail in any degree to command complete public confidence, it is because isolated instances of unconscionable stock-watering and kindred offenses arouse suspicion, which naturally extends to all other corporate securities so long as similar practices are possible and the tendency to resort to them is unrestrained by law. While there have been many instances of gross and flagrant stock inflation, and while, of course, there remain cases of overcapitalization, yet when the statistice of the weaker roads, the overcapitalized roads, are combined with those of the stronger roads, and considered in the aggregate, in my judgment they will not be found to impair the wholesome financial standing and position of the railways as a whole; and while those railway owners and managers who have enriched themselves by loading their properties with securities representing little or no real value deserve our strongest condemnation, on the other hand our hearty commendation is due those owners and managers—representing, I believe, the large majority—who have year after year worked faithfully, patiently, and honestly in building up our great system of railways, which have knitted together in close commercial and social intercourse widely removed sections of the country and stand second only to the great business of agriculture itself in contribution to national growth and development."

Mr. Taft, in his Cincinnati address, alluded to above, gave this expression of his views:

" . . . Take for instance the so-called 'physical valuation of railways.' It is clear that the sum of all rates or receipts of a railway, less proper expenses, should be limited to a fair profit upon the reasonable value of its property, and that if the sum exceeds this measure, it ought to be reduced. The difficulty in enforcing the principle is in ascertaining what is the reasonable value of the company's property, and in fixing what is a fair profit. It is clear that the physical value of a railway and its plant is an element to be given weight in determining its full value; but as President Roosevelt in his Indianapolis speech and the Supreme Court have in effect pointed out, the value of the railway as a going concern, including its good will, due to efficiency of service and many other circumstances, may be much greater than the value of its tangible property, and it is the former that measures the investment on which a fair profit must be allowed. Then, too, the question what is a fair profit is one involving not only the rate of interest usually earned on normally safe investments, but also a sufficient allowance to make up for the risk of loss both of capital and interest in the original outlay. These considerations will have justified the company in imposing charges high enough to secure a fair income on the enterprise as a whole. The securities at market prices will have passed into the hands of subsequent purchasers from the original investors. Such circumstances should properly affect

the decision of the tribunal engaged in determining whether the totality of rates charged is reasonable or excessive. To ignore them might so seriously and unjustly impair settled values as to destroy all hope of restoring confidence and forever to end the inducement for investment in new railway construction which, in returning prosperous times, is sure to be essential to our material progress. . . .

"I am confident that the fixing of rates on the principles suggested above would not materially impair the present market values of railway securities in most cases, for I believe that the normal increase in the value of railway properties, especially in their terminals, will more than make up for the possible overcapitalization in earlier years. In some cases, doubtless, it will be found that overcapitalization is made an excuse for excessive rates, and then they should be reduced; but the consensus of opinion seems to be that the railway rates generally in this country are reasonably low. This is why, doubtless, the complaints filed with the Interstate Commerce Commission against excessive rates are so few as compared with those against unlawful discrimination in rates between shippers and between places. . . . "

Perhaps it will be objected that these opinions are too general; that after all they may be little more than mere hazards, and that therefore they are of little if any real importance. Confessedly, they are only general in their nature; under the conditions of the present no similar expression can be more. Whether they are intelligent estimates, meriting reliance pending ascertainment of their accuracy, the further available indications will go far in determining. The subjoined table is commended to the study of the reader:

ing at the end of a given year as if they had been issued at the beginning of the year (resorted to in order to show all the figures relating to one year on a single line), is not entirely proper, and if so the criticism will be accepted. Nevertheless many mortgages provide for the completion of construction by sections before bonds are released by the trustees; it frequently occurs that issues are made to reimburse the treasury for expenditures made months, or it may be years, in advance; and as the object is to illustrate the operation of a principle rather than definitely to establish a fact, the point is not highly important.

The review for nine years upon the premises specified leads to one or more of the following conclusions:

1. That the railways of the country, in their entirety, are not earning an equitable return upon their bona fide investment.

2. That fictitious value in the capital stock of railways, in their entirety, has long since given place to actual value, it would appear considerably in excess of par.

3. That 10 per cent. of capital invested is an excessive annual return for an enterprise of like hazard.

4. That the railways have been guilty of the flagrant and reckless dissipation of their resources.

There is reason to infer that both conclusions 1 and 2 are justified. As regards conclusion 4, it is doubtful if abuses of this character have been practised or permitted on a scale that would materially affect the combined results.

Finally, the probabilities as regards the correctness of the hypothesis that in 1898 one-half of the nominal value of railroad stocks was fictitious rest, in no small measure, upon the

RAILROADS OF THE UNITED STATES CONSIDERED AS A COMBINED SYSTEM.

Year.	Bonds, notes, etc.	Stocks.	Total capital.	Interest on bonds, notes, etc.	Dividends on stocks.	Total int. and divs. disbursed.	Assumed cost.	Return of 10 per cent. on assumed cost.	Balance, 10 per ct. return undisbursed.
1898...	$5,060,763,613	$4,236,404,163	$9,297,167,776	$244,652,659	$83,995,384	$328,648,043	$7,178,965,695	$717,896,570	$389,248,527
1899...	5,124,528,304	4,307,513,427	9,432,041,731	248,760,382	94,273,796	343,034,178	7,667,533,545	766,753,355	423,719,177
1900...	5,172,623,990	4,375,360,621	9,547,984,611	247,911,177	118,624,409	366,535,586	8,173,272,005	817,327,201	450,791,615
1901...	5,412,750,189	4,069,898,993	9,482,649,182	258,121,380	131,626,672	389,748,052	8,711,459,005	871,145,901	481,397,849
1902...	5,611,608,220	4,314,055,951	9,925,664,171	268,012,950	157,215,380	425,228,330	9,513,793,364	951,379,336	526,151,006
1903...	5,924,362,481	4,357,235,824	10,281,598,305	277,891,209	166,176,586	444,067,795	10,374,288,567	1,037,428,857	593,361,062
1904...	6,314,753,108	4,397,040,970	10,711,794,078	296,063,447	183,754,236	479,817,683	11,377,942,829	1,137,794,283	657,976,600
1905...	6,682,601,049	4,484,504,943	11,167,105,992	306,255,284	188,175,151	494,430,435	12,447,499,357	1,244,749,936	750,319,501
1906...	7,125,356,355	4,546,584,294	11,671,940,649	316,990,830	213,555,081	530,545,911	13,671,613,839	1,367,161,384	836,615,473
Total				$2,464,659,318	$1,337,396,695	$3,802,056,013	$14,508,229,312	$8,911,636,823	$5,109,580,810

Balance of 10 per cent. returned undisbursed........	$5,109,580,810
This amount is sufficient to extinguish:	
Assumed inflation at 50 per cent in $4,236,404,163 of stocks outstanding in 1898	$2,118,202,082
Assumed inflation at 50 per cent. in $310,180,131 of stocks issued from 1899 to 1906....................	155,090,065
And leave a balance* of...........................	2,836,288,663
Total	$5,109,580,810

In explanation of the table it is remarked that the annual statistical reports of the Interstate Commerce Commission show, in addition to the outstanding capital debt of carriers reporting to it, the amounts of bonds and stocks held by other railway corporations so far as known. From 1898 to 1906, both inclusive, the reports contain an income account of the railways of the United States considered as a system; that is, with intercorporate payments and accruals eliminated. The foregoing figures dealing both with capital issues and disbursements on account of interest and dividends, are net; the object being to show the fiscal relations of the railways of the country to the public.

The assumed cost of the railways is made up of bonds, notes, and other like obligations outstanding and not held by other carriers, at par; capital stock outstanding and not held by other carriers, at 50 per cent. of par; and the undisturbed balance of a 10 per cent. return on the assumed cost for the previous year. With these exceptions, the exhibit is self-explanatory.

It may be urged that the treatment of securities outstand-

*Equal to 39.81 per cent on $7,125,356,355 of bonds, notes, etc., outstanding June 30, 1906.

exhibit itself. If this be deemed inconclusive, let the preceding decade be taken, it being predicted that in 1888 the issues of bonds and stocks were equal in amount and that the latter represented no value. The ratio of stocks to bonds (not including short-term notes and miscellaneous obligations), outstanding in the hands of the public, in 1889 was 1.00 to 1.16; in 1894 it was 1.00 to 1.13; in 1899 it was 1.00 to 1.01, and in 1904 it was 1.00 to 1.18. During that period the maximum average rate of interest paid in any year was 4.33 per cent., and the maximum average dividend 2.17 per cent. (Reference: Statistical Abstract of the United States, 1907, p. 225.) At a return of 10 per cent. per annum on the par value of bonds, the stock should have earned 5.67 per cent. annually. As the highest average dividend rate paid was 2.17 per cent., there must have been an undistributed balance of at least 3.50 per cent. annually. Now 3.50 per cent. of a given amount invested annually for ten years, each instalment bearing compound interest at 10 per cent. for the remainder of the term, will aggregate 61.37 per cent. of that amount. This places a rather definite maximum upon the proportion of "water" remaining in railroad stocks at the end of the year 1897, if it be true that 10 per cent. is a fair annual return and that the railways realized that rate upon the cost of their properties.

If the foregoing is not convincing, recourse may be had to the decade next preceding (ended with the year 1887), when the maximum average interest rate was 4.65 per cent. and the maximum average dividend rate was 2.94 per cent. (Reference: Statistical Abstract, etc., as above.) When the minimum of undistributed earnings subject to re-investment an-

nually would have been 2.41 per cent., with compound interest at 10 per cent., as before; and so on back to the beginning of the railroad history of the country in about the year 1830.

Perhaps no well-informed person would contend that the totality of railway stocks was ever entirely valueless. It would be superfluous, therefore, to do more than allude to the improbability that a railway property can normally be mortgaged for an amount in excess of the sum invested in it. Moreover, there are State laws and internal corporate regulations which in some instances prohibit the sale of stocks at a price less than par. There is given below a partial list of railway stocks issued from the fiscal year 1901 to that of 1906, both inclusive, together with the prices at which the offerings were made to shareholders or at which the issues were underwritten:

	Amount.	Price.
Atlantic Coast Line R.R.	$13,500,000.00	125 per cent.
Baltimore & Ohio R.R.	92,314,829.00	100 "
Boston & Maine R.R.	3,633,700.00	165 "
Chicago & North Western Ry.	36,102,710.00	100 "
Chicago, Milwaukee & St. Paul Ry.	2,645,000.00	100 "
Great Northern Ry.	25,000,000.00	100 "
Illinois Central R.R.	35,040,000.00	100 "
New York Central & Hudson River R.R.	29,839,560.00	100 "
Pennsylvania R.R.	126,864,600.00	120 "
Pennsylvania R.R.	20,980,350.00	140 "
Southern Pacific Co.	39,569,840.00	100 "
Union Pacific R.R.	93,376,000.00	100 "
Total	$518,866,589.00	

Issues since June 30, 1906, include the following:

	Amount.	Price.
Atlantic Coast Line R.R.	$4,557,600.00	100 per cent.
Chicago & North-Western Ry.	24,401,600.00	100 "
Chicago, Milwaukee & St. Paul Ry.	124,492,800.00	100 "
Great Northern Ry.	60,000,000.00	100 "
Illinois Central R.R.	14,256,000.00	100 "
Northern Pacific Ry.	93,000,000.00	100 "
Southern Pacific Co.	35,295,123.00	100 "
Total	$356,003,123.00	

It was shown in a previous table that but $310,180,131 of railroad stock was issued and reached the hands of the public from 1899 to 1906. It is here shown that an amount $208,686,458 greater was issued within a considerably shorter time. This is susceptible of explanation on the score that not all the stocks issued pass into the possession of the public, some going into the treasuries of other carrying companies.

Some of the above issues were devoted, wholly or in part, mediately or immediately, to the retirement of convertible bonds. The prices realized for the stock in a number of representative instances, under the option of conversion, are as stated below:

Atchison, Topeka & Santa Fe	4s	1905-55	100 per cent.
Atchison, Topeka & Santa Fe	5s	1907-17	100 "
New York, New Haven & Hartford	3½s	1906-56	150 "
Pennsylvania	3½s	1902-12	140 "
Pennsylvania	3½s	1905-15	150 "
Union Pacific	4s	1907-27	175 "

The railways have contributed in no small measure to the evils which have come upon them. There is connection between the reckless, unrestrained and mutually destructive competition of a few years ago and the level of rates that has since obtained. Railway managers have not entertained a uniformly exalted estimate of their public obligations. With a large number of honorable exceptions, they have been secretive, avaricious, and in many respects unscrupulous. Legitimate claims against them have been treated with exasperating indifference. In litigation they have sought to win by exhausting their weaker antagonists. They have attempted to influence legislation by means that would not bear scrutiny. They have favored shippers, commodities and places, to the detriment of others. Common carriers in name and in law, they have not been so in fact. Too often they have despised the authority that created them, and the prerogatives of those upon whom they depend for the means of existence. Nominally public servants, they have so far forgotten their province as to become in too real a sense public masters.

The people neglected their duties in the matter of corporate regulation too long, and slept upon their rights; and to the extent that they have acquiesced in these wrongs, they have participated in the perpetration of them. Such wrongs ought to meet with the firmness of authority; not in a spirit of vindictiveness to wreak vengeance, as there is reason to suspect has been the case, but in a judicial temper to enforce justice. If the state is conscious of its power it should also be conscious of its dignity and its responsibility; always remembering that wherein it works injustice it injures itself more than its victim.

The preponderance of evidence is to the effect that the railroads have not been permitted to participate equally with other business interests in the prosperity to which they have perhaps been the largest single contributor; that the country owes its railways a debt, and that this debt is long overdue. This is a new and a strange doctrine, and it will not be popular; but immediate popularity is of small importance if the doctrine be true.

The phrase "watered stock," time honored but time-worn, the ever-ready answer to criticism and the keystone of a thousand arguments, will no longer suffice. The day is in sight when, if we are to burden and oppress railway investment, we must justify our action in our own estimation and in the estimation of the world by a new and more sufficient reason, and be prepared to accept the logical and necessary consequences.

PENNSYLVANIA STATE RAILROAD COMMISSION.

The State Railroad Commission of Pennsylvania has submitted to the Governor its first annual report. The commissioners recommend the enactment of a better law for the punishment of trespassers on railway rights-of-way, both steam and electric; a law for regulating the increase of capital stock and bonded indebtedness, and one to empower the commission to regulate safety appliances at grade crossings of railways and highways. The commission is about to inquire into the practice of the railways in the matter of boiler inspection, reports having been received that many companies are careless.

The commissioners say that their experience has already shown that a commission having ample powers looking to the promotion of publicity, can give to the state valuable service. The public has been quick to recognize the benefits of a tribunal which does away with the delays heretofore suffered because of the slow movement of the machinery of the courts. The railways generally have given prompt attention to the demands made by the commission.

The commission proposes to classify and investigate industrial railways, believing that such lines should not have the privileges of common carriers, though they ought to be allowed to connect freely with lines which are common carriers.

The negotiations long pending between the several German State Railway administrations have resulted in an agreement to pool their whole freight car stock, amounting to nearly half a million cars. The distribution of these cars will be directed from one central office. Cars will be sent where needed without regard to their ownership and repaired at the nearest shops. The indications are that there has been much more waste by empty mileage of cars sent home in Germany than here; but the Prussian railways, even while most of them belonged to corporations, had a combination for their freight cars which effected most of the advantage which is expected from this new organization for all Germany—a more complete utilization of the freight car stock, resulting in a greater average mileage, and eventually in supplying the requirements of transportation with a smaller stock of cars than would otherwise be necessary. This agreement of the railway authorities will have to be submitted to the several governments, whose approval is regarded as certain. It will take effect April next, which is the beginning of the fiscal year of most of the railways.

JOSEPH M. GRAHAM.

Joseph Marshall Graham, Vice-President of the Erie, died of acute indigestion on February 3. He was one of the greatest locating engineers in this country. His most notable work, probably, was on the Baltimore & Ohio from 1899 to 1904, when he was chief engineer under the presidency of L. F. Loree, F. D. Underwood being second vice-president from 1899 to 1901.

Mr. Graham's mind was of a judicial character. He was quick to see the point of view of those who differed with him and careful to weigh all opinions before arriving at a final conclusion. He possessed to a high degree engineering courage, one of the rarest and most admirable forms of courage. An engineer who adopts new methods and improves on the methods of his predecessors and contemporaries stakes his reputation on his judgment. There is no possibility of concealment in case of failure; it is as if the first operation for appendicitis had necessarily been performed on a prominent man; if any mistake is made, the world cannot very well help knowing about it.

J. M. Graham.

An instance of such courage was shown when Mr. Graham was building the Bellaire bridge across the Ohio river. The United States government objected to falsework being placed in the river, and Mr. Graham planned to strengthen the old structure in such a way that it bore not only its own load but the load of the partially completed new bridge, a very unusual engineering achievement.

Mr. Graham was born at Crawfordsville, Ind., in 1850 and received his education at Lexington. He began railway work in 1873 as assistant engineer on the Grayville & Matoon, now part of the Illinois Central. By 1875 he had become chief engineer of the Bedford, Springville, Owensburg & Bloomfield, now part of the Chicago, Indianapolis & Louisville. After being employed in various engineering capacities, he was appointed in 1883 superintendent of the Dakota division of the Northern Pacific, and in 1888 was made general manager of the Northern Pacific & Manitoba Railway, of the Northern Pacific system. Two years later he became assistant general superintendent of the Northern Pacific lines east of Livingston, Mont. In 1891 he became superintendent of the Ohio and Midland divisions of the Baltimore & Ohio, with offices at Newark, Ohio, and in 1898 was made general superintendent of the Trans-Ohio division. In 1899, when the so-called Hill interests went into the Baltimore & Ohio, he was made chief engineer, and the low-grade improvements that were made on that line, some of which have not yet been completed, were made on his recommendation.

Of a genial disposition, he made friends easily and held them permanently. He was a man of large ideas, and held broad views of the railway questions of his time. His habits of mind, mature judgment and sound conclusions on all practical topics of railway economics made him an invaluable addition to any organization.

Combined with his brilliant mental resources, he was of a modest and unassuming nature, and possessed the traits which made him honored and respected of men.

Mr. Graham in 1880 married Miss Evelyn Norton, of Cleveland, who survives him. Miss Norton was the daughter of the Reverend Albert Norton.

TESTING THE CONSTITUTIONALITY OF THE COMMODITY CLAUSE.

The brief in behalf of the railways in the commodity clause suit now being tried by the Supreme Court divides the legal points discussed under seven heads:

1. The commodities clause is not applicable in the case of carriers who do not own or mine coal, but simply own shares of stock in coal companies.

2. The commodities clause is unconstitutional, because its penalties are so prescribed as practically to bring about a denial of an opportunity by railway companies to obtain a judicial determination of the questions involved.

3. The commodities clause is unconstitutional, because, making illegal discriminations, it is not "due process of law."

4. The commodities clause is unconstitutional, because it forbids a railway company, obeying every rule of transportation prescribed by Congress, to transport an article, of commerce which not only is harmless, but is one of the necessities of life. The act is not a regulation, but a prohibition.

5. The commodities clause is unconstitutional, because it was intended to violate, and does actually violate, a right reserved to the states.

6. The commodities clause is unconstitutional, because in violation of constitutional restrictions upon the exercise of the right to regulate commerce it deprives of "liberty and property."

7. The commodities clause is unconstitutional, because it is, in effect, a taking of private property for public use, without just compensation.

The brief concludes "with the establishment of this doctrine, imperialism will have replaced federalism."

The brief in part says:

We are quite willing, for the purpose of this case, to concede the vesting in Congress of the power to regulate interstate commerce; and that, included in this power to regulate, is the power to regulate carriers.

There can be no Federal divorce of the dual relation of public carrier and private transporter. The divorce of the dual relation cannot be made within the state of Pennsylvania, which brought the same about. We contend that to forbid the carrier who has reached the state boundary line with his goods the right to transport them into another state, because such goods, at the moment they are so ready

to be transported, are owned by him, is a prohibition of commerce in articles universally recognized as proper subjects of commerce. It far transcends a "regulation."

If a power exists, to the extent claimed, an individual who acquired horses and wagons, for use in transporting his goods, could, after he had consented to carry a small quanity of goods for other persons, be forbidden to carry any other than the goods of such third persons. More than this, the doctrine would cover the case of such individual who had never carried any goods, other than his own.

The ability of the inhabitants of other states to obtain coal, and of independent coal miners to have their coal transported, has resulted from the construction of railways by companies for the express purpose of transporting their own coal. It seems an anomaly to use the railway for the benefit of other persons and to close it against those for whose benefit it was built.

Between two owners, in the state of Pennsylvania, neither charged with any public duty, discrimination is made to such an extent that one owner is forbidden to have his coal transported. Is there any possible justification for such exercise of power to be found in that of regulation of interstate commerce?

As we have said, the right of an owner of coal to sell the same, and, after sale, to transport into another state, is one not derived from the Constitution of the United States. It is inherent right. The exercise of this right may be regulated. It cannot be prohibited.

If Congress can forbid the common carrier from transporting coal belonging to it, or belonging to coal companies in whose shares it is interested, because of the power to "regulate," it is difficult to so limit the right as not to extend it to a prohibition of carriage by the common carrier of coal owned by one of its stockholders, or by majority stockholders.

The government brief has been filed. The railways made party to the 12 suits are: Delaware & Hudson, Erie, Central Railroad of New Jersey, Delaware, Lackawanna & Western, the Pennsylvania and the Lehigh Valley.

The counsel for the government in part says: These cases involve two questions, namely: (I.) Is the commodities clause constitutional? (II.) Does the commodities clause, properly construed, apply to these several defendants?

I.—An act of Congress duly passed is presumed to be constitutional and the burden of argument rests on those who deny its constitutionality to show that, in fact, the legislative branch of the government has exceeded its powers. The constitutionality of the commodities clause is and can be assailed on one or the other, or both, of only two grounds, namely: First, that it is not within the grant of power of Congress to be professedly exercised in its enactment, or second, that its enactment falls within one of the prohibitions of the Constitution. The commodities clause is enacted in the professed exercise of the clause of the Constitution reading: "The Congress shall have power to regulate commerce with foreign nations and among the several states and with the Indian tribes."

The commodities clause does not prohibit the transportation in interstate commerce of any commodities, nor does it prohibit any common carrier from engaging in interstate commerce. It prohibits the transportation in interstate commerce of commodities having certain incidents by common carriers belonging to a particular class, and occupying to the commodities in question certain specific relations. The commodities to which it refers may be transported in interstate commerce in any way except by railways, and by any railways, except such as are directly or indirectly interested in them, own them, wholly or in part, or have mined, manufactured, or otherwise produced them. It constitutes, therefore a regulation of commerce among the several states in the form of a prohibition applicable to the transportation in such commerce of some designated commodities by some designated common carriers engaged in such commerce.

All regulation involves partial and limited prohibition, and the Supreme Court has repeatedly upheld regulations of interstate trade which involved partial and limited prohibitions of such trade.

No case can be found wherein this court has declared an act of the Congress, otherwise valid, unconstitutional because of a similar objection to the validity of the acts of other legislative bodies. When legislation fixing the rates of public service corporations deprives those directly affected thereby of all profit or any return whatever on investment it may be void, not becaues in itself unreasonable and therefore beyond a constitutional grant of legislative power, but because confiscatory or spoliatory, and therefore void by virtue of express constitutional prohibitions.

What is said above as to the objection that this enactment is unreasonable is still more clearly true with respect to the objections that it is harsh or inequitable. Granted the existence of the power, all questions of public policy connected with its exercise are for the legislative, and not the judicial branch of the government. It is therefore respectfully submitted that the moral or economic characteristics of the legislation involved in this case do not affect us constitutionally.

The terms of Article 4, Section 1, of the Constitution declare: "Full faith and credit shall be given in each state to the public acts, records and judicial proceedings of every other state." It is claimed that the charters of certain of these defendants conferring on them powers to engage in interstate commerce, constitute "public acts" of the states granting such charters, to which "full faith and credit" is not given by the commodities clause. That this objection is without merit would seem to be so plain on the face of the constitutional provision itself as to render any discussion beyond its mere statement inappropriate.

The terms of the fifth amendment, declaring, "No person shall be * * * deprived of life, liberty or property without due process of law," it is alleged that this prohibition is infringed. First, because the commodities clause makes of little or no value large investments legally made and thus deprives the defendants and others of their property without due process of law. If this is the consequence of a legitimate exercise of the power to regulate interstate commerce or any other constitutional power by the Congress, then it is one of the incidental hardships involved in having a Federal government and which should have been foreseen by the defendants when they made the investment; second, because the enactment of the commodities clause has rendered contracts already made unprofitable or commercially impracticable of performance and interfered with the course of the defendant's business, thus conventionally depriving them and others of both their "liberty" and their "property" without due process of law. The same reply may be made to this claim as to the one last considered: Some measure of individual hardship is incidental to the enforcement of all laws. The rights asserted are neither "liberty" nor "property," according to the true construction of the fifth amendment, and it is to be noted that the defendants and other parties interested were given two years wherein to adapt their business to the new legislation; third, because the clause excludes from its prohibition a certain class of commodities—that is to say timber and its manufactured products—and thus becomes discriminatory as against the owners of other commodities. This objection appears to assume that the term "due process of law" in the fifth amendment, which is repeated in the fourteenth, is equivalent to the words "the equal protection of the laws" also found in the last named amendment. The soundness of this position is not conceded, but in this case, it would seem sufficient to point out the inapplicability of the prohibition to a case where only a particular kind of property is exempt from the operation of a statute and the exemption of its owners is a mere incidental consequence.

As to the terms of so much of the same (fifth) amendment

as declares, "nor shall private property be taken for public use without compensation," no "property" is "taken" in this case at all. If the value of property is incidentally diminished as an indirect consequence of the legislation in question no claim for compensation can be founded upon such loss of value.

To the terms of the eighth amendment, which declares that "excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted," the argument is that the enforcement of the commodities clause would expose the defendants to the payment of enormous fines, because every time they violated it, they would be subject, at least, to the minimum penalty imposed by Section 10 of the act to regulate commerce, and as they might be construed to violate it every time they transported any of the prohibited commodities, all of them would be quickly bankrupted. It is sufficient to say in answer to this contention that all they have to do to avoid these consequences is to obey the law. In any event, however, the provision of an unconstitutional penalty in one clause would not invalidate a constitutional prohibition contained in another clause of the act and which can be enforced by other remedies.

It was urged that the enormity of the fines which might accumulate before a litigation could be determined would deprive these defendants of an opportunity to test the constitutionality of this section. Without discussing the merits of this connection, the form of the present suit is sufficient to show that it has no place here.

Finally, on this branch of the case it is further submitted that in the enactment of the commodities clause Congress exercised a power fully and clearly conferred by the Constitution and did not infringe any of the prohibitions therein contained, and that the commodities clause is undoubtedly constitutional.

At the opening of the trial it was agreed between counsel and allowed by the court that there should be six hours for argument, the government to consume three hours and the railways three hours.

Counsel for the government asserted that the railways are corporations of the state of Pennsylvania, or of other states, but doing business and maintaining offices in Pennsylvania, and are common carriers within the interstate commerce laws; that the transportation here is interstate commerce; that the defendants' own coal and coal lands through conveyances and leases, or own the entire capital stock, or a large majority of the capital stock of certain coal companies which are corporations of the state of Pennsylvania, and by reason of this stock ownership exercise full control and direction over the operations of these coal companies, or own all or some part of the capital stock of other corporations of the state of Pennsylvania which own coal lands and mine and sell coal under the direct management of officers and directors who are also officers or directors of the defendant companies.

The answers show in substance as follows: The Delaware & Hudson was incorporated under a law of New York, and the claim of authority thereunder to construct a canal from the anthracite district in Pennsylvania to the Hudson river, to purchase coal in Pennsylvania and to transport to the market the coal mined in the latter and supplemental acts of New York and various acts of Pennsylvania between 1823 and 1871 are alleged to authorize the defendant to purchase and hold coal lands and to mine and transport the coal mined from such lands. Because of the supported public policy of Pennsylvania and New York fostering the coal trade and state legislation towards this end it is claimed that defendant is a coal mining company and not a railway company within the meaning of the commodities clause, although having power to acquire canal and railways principally for the transportation of its own coal and only incidentally as a common carrier for others.

It is admitted that the defendant owns all the shares of the capital stock of the three coal mining companies referred to in the petition and bill, but it is averred that their stocks were acquired before any of the interstate commerce laws were enacted, although it does not appear when they were acquired.

It is claimed that, except as to steam sizes, the coal mined is sold at the mines to third persons before the interstate transportation begins; and as to the steam sizes, they are transported into the state of New York, and there stored until sold or used. As to the coal sold at the mines, therefore, it denies that it owns it when the interstate transportation begins, or during the transportation.

As to the steam sizes it is denied that such transportation of such coal for its own account over its own railway constitutes interstate commerce or is within the commodities clause.

The defences based upon various arguments are thus summed up; that the commodities clause is invalid because it would deprive defendant of the valuable enjoyment of property lawfully acquired and held without compensation and without due process of law contrary to the fifth amendment to the Constitution; that the right to engage in interstate commerce is not a right created either by the Constitution of the United States or by Congress, but one which existed previous to and independently of both; and that the investments made by the defendant under the authority of the state laws have resulted in vested rights beyond the power of Congress to impair or take away; that the legislation is invalid under the fifth amendment because it discriminates between common carriers which are corporations, and those which are not; between carriers which are railways and those which are not; between common carriers of timber and common carriers of other commodities; that the legislation is invalid between its operations and effect are not merely to regulate interstate commerce but to prohibit it; that it is invalid under the eighth amendment because it imposes excessive fines for its violation; that it is invalid under the tenth amendment because it seeks to exercise a power which has been expressly reserved to the states and the people thereof.

The government in its argument says no case can be found wherein this court has declared an act of the Congress otherwise valid unconstitutional, because the court held it unreasonable. What is said as to the objection that this enactment is unreasonable is still more clearly true with respect to the objections that it is harsh or inequitable. It is therefore respectfully submitted that the moral or economic characteristics of the legislation involved in this case do not affect us constitutionally.

The opinion of the lower court, which held the commodities clause unconstitutional and from whose decision (*Railroad Age Gazette*, September 18, 1908, page 935) the present case is an appeal by the government, said: "The general claim, then, common to the defendants is this: That by force of their state charters, and of supplemental powers derived from these states by later legislation, and through the other corporation franchises so acquired, they have vested rights of property and of free commerce in property which cannot be impaired; and that the exercise of federal power over interstate commerce by the commodities clause is not a regulation, but a prohibition of commerce, and deprives them of their property, in violation of the Constitution.

In considering whether the commodities clause does, in fact, violate this inhibition of the Constitution, the opinion alludes to the enormous agregate of property affected, its possession by defendants for a long period, the harmless character of the ownership, the inviolation and encouragement by the state to the defendants, so to invest their funds; finds the transportation right to the most valuable and important of the righs of property and to the coal owners, and details and emphasizes the enormous losses which will occur if defendants either do not mine and ship their coal, or throw their coal properties on the market; and the conclusion is

that the statute is a practical and substantive violation of the letter and spirit of the fifth amendment.

In reply to the argument that the exercise of police power by the states has been exempted by judicial decision from the similar inhibition of the fourteenth amendment and that the power of Congress to regulate commerce is the equivalent of state police powers in this respect, it is said that the Federal commerce power is complete in itself, distinct and substantive, while state police power comprises an indefinite mass of powers, and that there is no equivalent between them and the power to regulate commerce which does not pertain to other powers granted to Congress; that the reasonableness of the exercise of the police power is the position in every case, and on the one hand the courts will not permit these powers to constitute palpable invasion of rights, or, on the other hand, allow indirect and incidental consequence to personal or property rights to affect adversely their validity.

Attorney-General Bonaparte in closing the oral argument for the government contends that if the commodity clause is prima facie a valid regulation of interstate commerce, it must be void, if at all, because it contravenes an express prohibition of the constitution.

The prohibition forming the real ground of the decision in the lower court is contained in the due process clause of the fifth amendment.

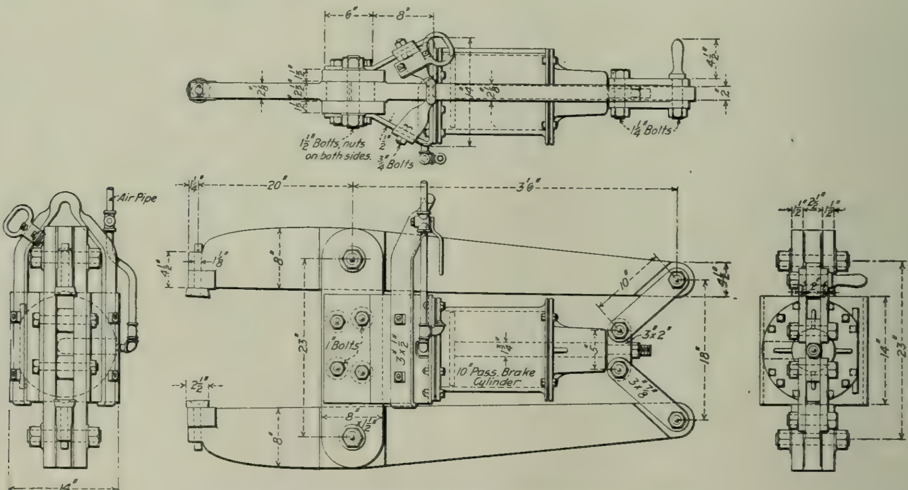
These guarantees were placed in the constitution by amendment as safeguards against the exercise by the government of arbitrary power. Whether, therefore, a law is free from objection based upon the due process clause depends on the meaning of the word "arbitary use," whether or not it operates harshly, is not the question. Any law may impose inequalities and hardships. A thing is done arbitrarily when done without cause or reason shown.

Something more is required to render the due process clause effective to defeat legislation than to show that a complaining party will be deprived of a market for his property, or that the legislation deprives him of some of the uses of which, without such legislation, he might devote it. The legislation must more nearly affect the value of ownership than would an act, otherwise constitutional, closing to him particular markets. In the Monongahela bridge case an act of Congress did directly and absolutely deprive the corporation, without compensation, of that which all must concede was property, namely, certain profit-producing franchises rightfully granted by a state [and this was held constitutional]. Here the defendants lose neither their franchises nor the title to any of their property, and if the value of that property is affected, such effect results only indirectly from the legislation assailed.

PNEUMATIC RIVETING MACHINE.

There is in use at the Detroit shops of the Michigan Central Railroad a simple pneumatic riveting machine that is very efficient, which was designed and made on the premises. It consists of two heavy straps to which are pivoted the two working levers, and between these is the operating cylinder. The method of working is exceedingly simple and is clearly shown by the engraving. Compressed air admitted back of the piston forces out the rod, and by operating the toggles separates the levers at the back and closes them in front.

In order to adapt it to various thicknesses of metal and lengths of rivets, the adjustment is made in the size of the rivet sets, which can be adjusted to take stock varying from 1 in. to 8½ in. All of the forgings for the machine were made from scrap axles and the cylinder is an old 10 in. passenger air brake cylinder. It is used for all classes of work, but principally for riveting truck bolsters and the yokes to drawbars. It has strength and power sufficient to close rivets up to 1½ in. diameter, and is used for all the smaller sizes. It will operate and do satisfactory work with an air pressure of from 65 to 70 lbs. per sq. in., but for the large rivets a pressure of 100 lbs. per sq. in. is to be preferred.



Pneumatic Riveter; Detroit Shops of the Michigan Central.

The machine is suspended from a crane by a chain hoist, with which it can be raised or lowered to meet the requirements of the work in hand. Beneath there is a revolving table 16 in. high and 2 ft. in diameter, upon which the articles to be riveted can be placed, so that the whole forms a very convenient and efficient machine for the work for which it is adapted and one whose original cost was low.

Austria is about to incorporate some of the most important corporation railways into its state system, and it is purposed, when that is done, to raise the State Railway rates. The railways which are to be absorbed have rates higher than the present State Railway rates; and it is urged that the average rates will remain lower than at present after the contemplated advance is made.

General News Section.

A bill has been introduced in the Idaho legislature to create a State Railroad Commission of three members, to be elected for terms of two years.

The Belen cut-off of the Atchison, Topeka & Santa Fe will be opened for through freight traffic on March 1. The arrangements for passenger traffic have not yet been fully decided upon.

A bill has been introduced in the Colorado Senate to prevent the removal of the general offices of the Colorado & Southern from Denver. It has been rumored that the headquarters of the road may be consolidated with those of the Chicago, Burlington & Quincy at Chicago.

Beginning on February 1, the receivers for the Cleveland Railway and the Municipal Traction Co., operating street railways in Cleveland, adopted 5-cent fares on about 80 per cent. of the lines under their charge, the court having ordered this action because of the very low income derived from the business done on the 3-cent basis. The 3-cent fare is continued on certain lines where the franchises require it.

The agents at the stations on the Pittsburgh division of the Pennsylvania were recently taken by the Superintendent on an excursion over the branches in the coke region in order to acquaint them with the lay of the land and the situation of the numerous connections; but the report that this excursion marks a new departure in the practice of the company is not true. The regular meetings of the agents will be continued on the same plan as in the past.

A bill has been introduced in the Montana legislature to give the State Railroad Commission full authority to regulate the equipment of trains, cars or engines with safety appliances and to inspect the same and enforce its regulations. The bill practically requires the railways to report the condition of locomotive boilers and engines in service, and to provide for their inspection, and to make and enforce regulations concerning the making up of trains, the establishment of the block system, etc.

Train auditors are to be employed on the trains of the Southern Pacific in Louisiana and Texas. The Pacific system of the company has them on some divisions. A "train auditor" takes the place of the conductor in gathering tickets and fares occasionally, as distinguished from a "train collector" who supplants the conductor in this work regularly. With the train-auditor system a few men can attend to many trains, boarding a train as a surprise to the conductor; whereas the collector system requires a collector for each train.

A reciprocal demurrage bill is pending in the Nebraska legislature. On February 3 arguments for and against it were made before a joint sub-committee of the joint railway committee. The principal argument against the bill was made by Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association. A. W. Dickson (Burlington), Edson Rich (Union Pacific), and C. C. Wright (C. & N. W.), also opposed it. Arguments for the bill were made by representatives of the state lumber nd coal dealers' associations.

The executive committee of the Oklahoma Federation of Commercial Clubs has memorialized the legislature urging an amendment to the constitution to eliminate that provision which prohibits any transportation or transmission company organized under the laws of the state to consolidate with any similar company organized under the law of any other state or of the United States. The memorial says that railways in Oklahoma should be domestic corporations in order that the state may have control of their construction, but that their operation thereafter as independent lines is a practical business impossibility in most instances, and that therefore consolidation with existing lines should be allowed.

The Railroad Commission of Indiana has prepared a bill to be presented to the legislature to authorize the Commission to gather information regarding grade crossings outside of cities and incorporated towns, to examine the condition of highways, and, when found expedient to notify the railway and the County Commissioners of a hearing to determine if the crossing should be abolished. One-fourth of the cost of separations would be borne by the county and three-fourths by the railway or railways. When a railway desired to make a new crossing at grade it would first have to get the consent of the Commission. Another bill proposes to provide a fine of from $5 to $100, or imprisonment from 5 to 30 days, for trespassing on the tracks of steam or electric roads.

A wide difference of opinion appears to exist between H. A. Fairchild, Chairman of the Railroad Commission of Washington, and Commissioners Jones and Lawrence, regarding the proper basis of division of the valuation of the railways in that state as between intrastate and interstate business. They are trying to find an equitable basis for a division so as to make a valuation to be used as a basis for the readjustment of intrastate rates. The majority of the Commission favors dividing the valuation on the basis of cost of operation, but Chairman Fairchild favors dividing on the basis of net earnings. Mr. Fairchild contends that the theory of the majority would lead to the confiscation of the railway properties of the state. A road performing a dual service, intrastate and interstate, may carry interstate greatly in excess of its state business, but if it cannot earn on its interstate business any substantial net return, and it can and does earn from its intrastate business a return on substantially the value of its entire property, and its intrastate rates per se are not unreasonable, it most follow that the state value is practically the entire value.

The Pennsylvania state railway commission, at the suggestion of Forestry Commissioner Conklin, has asked the railways of the state 11 questions as to the precautions they are taking to prevent fires on state and other forest lands. Among the questions asked are: How many fires occurred along the railways' rights of way in 1908 which were attributable to operations of the road and the amount of damage resulting; the details of settlements and suits as a result, and whether any of the employees of the road have been paid by county commissioners for fighting fires along the lines; means taken by railways to prevent forest fires; what system of inspection is followed; what devices are employed to keep down sparks or to prevent dropping of hot coals on tracks; whether the devices are on all locomotives, and whether they are maintained as carefully as if they were a part of the operating machinery; what penalties are imposed for failure to use spark arresters and dumping of hot ashes; if they allow maintenance of way men to burn ties along the tracks and to supply copies of the rules for fighting fires.

The Hine system of organization, described in the *Railroad Age Gazette* on January 22, page 150, in its application to the Nebraska division of the Union Pacific, has now been extended to Morgan's Louisiana & Texas Railroad & Steamship Co., to the Louisiana Western Railroad and the Iberia & Vermillion Railroad Co., these properties jointly constituting the Louisiana division of the Harriman lines. Effective February 8, the Louisiana division discontinued among its officers the use of the titles master mechanic, resident engineer, trainmaster and traveling engineer. The circular says that G. C. Scarlette, H. N. Norton, L. Mims and C. F. Bradshaw are designated assistant superintendents, and will be obeyed and respected accordingly. Heretofore Mr. Scarlette has been assistant superintendent at Lafayette, La.; Mr. Norton has been traveling engineer; Mr. Mims resident engineer at Lafayette, and Mr. Bradshaw trainmaster. Each of these officers continues charged with the responsibilities heretofore devolving upon him and, in addition, assumes such other duties as may from time to time be assigned. Those of the assistant superintendents who are located in the same building have one consolidated office file in common with the superintendent. The circular says that all communications on the company's

business originating on this division, intended for the superintendent or for any assistant superintendent, should be addressed simply "Assistant Superintendent" (Telegrams, "A. S."). The further details of this plan are identical with those printed Jan. 22 on page 150. At the same time that the change is made the jurisdiction of J. P. Nolan, Master Mechanic, is confined to the Algiers shops and the Mississippi terminals.

A public utilities bill has been introduced in the Utah legislature. It proposes to create a public service commission and gives it comprehensive powers of control of all kinds of public utilities. The Salt Lake *Tribune* says of the measure: "It will, if it becomes a law, enable the executive to find places for impractical men, but who are good churchmen and tithe payers."

On February 5 Representative J. G. Miller, Saline county, introduced in the Missouri legislature 20 bills for the regulation of railways, all at the request of the state railway commission. About a dozen other members also introduced measures to regulate railways. The Miller bills contain provisions requiring railways to get the approval of the commission before putting new tariffs into effect; freight houses to be established at all grade crossings; railway managers to swear under oath regarding contracts with other lines to discover whether or not they own competitors; prohibiting railways from charging a higher rate for double-decked sheep cars than is charged for cars for cattle; wiping out the one-half of 1 per cent. shrinkage on grain now allowed railways and other things too numerous to print. One other measure would compel railways to report personal injury wrecks by telegraph.

Howard Elliott, President of the Northern Pacific, was the guest of honor and principal speaker at a dinner given by the Spokane (Washington) Chamber of Commerce on January 27. Mr. Elliott said that in the five years that he has been president of the Northern Pacific the company has spent $100,000,000 for new branches, new track and grade revision. In the last three years it has spent more than $3,000,000 between Helena and Spokane, to restore damage caused by floods and washed out tracks and to provide better safeguards for the future. This was done when the cost of labor and materials was extremely high and the volume of business greater than the railway could handle. It seemed to him that in the last five or six years western people had put the cart before the horse in discussing the relations of railways to the public. There had been a hurricane of attacks on railway owners and operators when what the western country needs is that encouragement be given to the railways so that they will provide more facilities. It would be a good thing if all who desire a little fairer treatment would consider the desirability of devoting their brain power to building up their cities instead of harassing some one interest.

Chaos in Car Fares.

It looks like a period of needlessly high fares on many of the street railway lines of the city [Cleveland], needlessly high-priced transfers on others, and needless confusion on the entire traction system—all as the fruit of Mayor Johnson's unwillingness to admit the failure of his old vote-getter and office-winner—three-cent fare.

He cannot bear to face the facts and confess the truth. He clings desperately to the dream of recovering his political strength and maintaining his grip upon the municipal government through the instrumentality of his old battle-cry. And so his obedient councilmen, helpless without him and hanging to his wobbling machine as their one chance for reelection, will doubtless refuse the temporary, revocable franchise grant asked by the street railway receivers.

It must be confessed that the request for permission to charge five cents for cash fares and sell tickets at the rate of six for 25 cents strikes the average Clevelander unfavorably. He remembers too well the offer made by the old Cleveland Electric Railway Company of seven tickets for a quarter, with free transfers and the best of good service. That offer may have been excessively liberal. It may have overshot the boundary of prudence and good business judgment, but it was made in good faith, and it is hard to convince the people of this city that it ought not to be repeated.

Yet the fairest and safest way is to follow Judge Tayler's advice, grant a revocable franchise which the council can withdraw at any time, let the receivers charge more than the lowest fare which will make it possible to maintain the property in their care and give good service, and then, after past losses are made good and the debts incurred in the last few months are paid, cut down the fare, in a permanent franchise, to whatever may prove the lowest limit consistent with good service, reasonable expansion of the traction system and no more, at any time, than 6 per cent. for the owners of the property upon their actual investment—the real value of their lines.

That is the road to lasting satisfaction for reasonable citizens. It is the highway of justice. It is not, it appears, Mayor Johnson's way. He is quite certain to obstruct the path of civic progress in that direction. The obvious remedy is to remove him from the city's road to street railway peace with honor.—*Cleveland Leader.*

Fires on P. R. R.

The Pennsylvania Railroad Insurance Department reports that 274 fires, occurring in 1908 on property valued at more than $6,750,000, were extinguished by the railway's own employees with the company's apparatus. During the past year additional equipment for extinguishing fires has been placed at many points. The organization has been further developed by special training of employees, and locomotives in yard service have been equipped with special pumps.

A circular is to be issued giving the causes of all the fires on the system in 1908. Including the fires to which city fire departments have been called, a total loss of only $346,149 has resulted from 1,397 fires of railway property in 1908; the property endangered was valued at more than $260,000,000.

Loading hot ashes or coke in cars caused 658 fires, and damage to as many cars. Fifty fires, entailing a loss of $59,019, started on adjacent property. Spontaneous combustion was responsible for a loss of $3,300. Sixteen fires resulting from careless handling of lighted cigars, cigarettes and matches, caused a loss of $3,586. Seventeen fires were due to tramps, with a loss to the company of $14,350; and 34 fires, with a loss of $16,450, were incendiary.

Washington Letter.

WASHINGTON, Feb. 10.—With the abandonment of railway legislation for this session of Congress there has come a complete rearrangement of plans on the part of those legislators interested in the common carriers. The most important fact to develop in connection therewith, so far, is that all hands will look to President Taft for guidance in regard to this matter, and this causes it to be predicted that if any attempt is made during the Taft administration to amend the Hepburn law it will mean a return to some of the principles laid down in the original Esch-Townsend bill.

This conclusion is forced on all who have given the subject attention for the reason that Mr. Taft and Mr. Townsend have already had one conference relating to business in the house and for the further reason that they are known to be practically in accord regarding what, if anything, ought to be done in the way of revamping the Hepburn law. They agree that there should be a court of commerce, a sort of national court of first instance, to try all cases affecting the rate and other questions now handled by the Interstate Commerce Commission. Mr. Taft has gone so far as to indicate that he would be inclined to make over the Interstate Commerce Commission into such a court, placing the work of making up the cases, collecting evidence, receiving complaints, etc., in the hands of the commissioner of corporations, and requiring the department of justice to detail an assistant attorney-general to act for the government in cases to be prosecuted.

The Esch-Townsend bill, which was not as radical as the Hepburn act, provided for a court to be made up of certain circuit judges, to be designated by the president. But Mr. Townsend is disposed to believe Mr. Taft's plan has points of superiority over any other suggested. The trouble with the Interstate Commerce law as now amended is that it is

too clumsy. Neither the railways nor the shippers can be assured of action within a reasonable time. And the volume of business offered is so enormous that there is danger of injustice unwittingly inflicted upon one side or the other of a controversy.

Mr. Taft's idea is that under the commissioner of corporations the whole force of the department of commerce could be thrown behind the business of investigation, many minor and unjustifiable complaints be rejected, and the Interstate Commerce Commission asked to pass on only such cases as fully warranted the effort. In this way he expects to quickly bring the carriers and the shippers into harmonious relations by defining their relative rights so as to give much less cause for friction than now exists.

Letters have been written to all organizations of shippers and other commercial bodies that have been asking for legislation amending the Hepburn law, advising them of the situation, and the possible radical revision of the law under the new administration. They have been assured that this may in the end be for the best, since the law as it stands has not yet had time to show its points, good and bad. G. G.

Strike on North Western Passenger Station.

Work on the new passenger station of the Chicago & North Western in Chicago has been suspended by a strike of union workingmen employed by sub-contractors of the George A. Fuller Company, which has the contract for building the station. The strike was ordered by Martin B. Madden, head of the Associated Building Trades of Chicago, and familiarly known as "Skinny" Madden. Precisely why it was declared the public has not yet been able to find out. It has been openly charged in the Chicago daily press that such strikes frequently have been called in Chicago for purposes of blackmail. State's Attorney John E. W. Wayman has asked that everyone having evidence of such blackmailing operations lay it before him, indicating that he will cause indictments of any men whose guilt probably can be proved.

Advertising Up to Date.

The arm of the model semaphore illustrating the block signal system of the Union Pacific on exhibition in the window of the office of that road, rises and falls every minute, attracting a great crowd of interested Seventeenth street pedestrians constantly. It has been on exhibition since Saturday evening, and the interest of the public is clearly shown. As an advertisement the model rather lays over anything exhibited here for some time.—*Denver Republican.*

Despatching by Telephone on the Santa Fe.

The Atchison, Topeka & Santa Fe will begin installing the necessary equipment for despatching by telephone on 1,124 miles of its road as soon as the material can be supplied. The territory to be equipped includes the line from Chicago to Emporia, Kan., via Ottawa, Kan.; from Bakersfield, Cal., to Oakland, on the Valley division of the Coast Lines, and from Sommerville, Tex., to Beaumont, on the Gulf Lines. The company already has a portion of its road from Kansas City, Mo., to Newton, Kan., operated by telephone despatching. The entire line from Kansas City to Newton will be ready for service very soon. This, with the proposed addition of 1,124 miles, will make a total of 1,350 miles of road that will have telephone train wires.

English Railway Chairman on Electric Traction.

Lord Claud Hamilton, speaking as chairman of the East London Railway, was also expressing the views of other English railway men on the subject of electrification. The conversion of the railway from steam to electric traction has long been recognized as its only possible salvation, but the managers do not recommend it at present because they are awaiting the result of the London, Brighton & South Coast single-phase experiment in South London. Experience therewith might, if it were satisfactory, make matters assume a different shape, but he remarked that unfortunately there was no reason at present to think that it was certain to be satisfactory, because the contract had taken much longer to complete than was anticipated, and it was rumored that the estimates had been greatly exceeded. It remained to be seen whether that line could be worked more cheaply than by the third rail or low-tension direct current. It was too early to tell what were the advantages or disadvantages of the working with single-phase alternating current on the Lancaster & Morecambe line of the Midland company. Lord Claud thought that there must be some good reason why low-tension direct current working had made such tardy progress in England. He suspected that it was that electrical working on that system compared with steam had proved too costly. They had to wait and see whether the Brighton company's experiment was going to show that the single-phase system would be more economical.

Western Canada Railway Club.

A railway club of western Canada has been organized with headquarters in Winnipeg, Man. The following officers have been elected: Hon. President, William Whyte; Hon. Vice-Presidents, M. H. McLeod, G. J. Bury, G. W. Caye and Wilford Phillips; President, Grant Hall; First Vice-President, L. B. Merriman; Secretary, W. H. Roseberry; Treasurer, T. Humphries; Secretary of Committee, E. W. DuVal; Executive Committee, R. J. Hungerford, C. W. Cooper, J. McKenzie, W. Smith, R. McNeil and L. O. Moody. The club will meet on the second Monday of each month, excepting June, July and August.

American Society of Mechanical Engineers.

The next monthly meeting will be held on February 23, the fourth Tuesday of the month instead of the second Tuesday, as usual. Frederic M. Whyte, General Mechanical Engineer of the New York Central Lines, will discuss the principles of the application of safety valves to steam boilers with special reference to locomotive practice, including questions of design and construction and the requirements and limitations of valves. His paper will be followed by a general discussion covering marine and stationary practice and conditions existing in connection with low-pressure heating boilers.

Stevens Institute of Technology.

The alumni of Stevens Institute of Technology will have their annual dinner Feb. 19 at the Hotel Astor, New York. Among the speakers will be President Humphreys, of Stevens Institute; Alfred Noble, who will speak on the Panama Canal; Colonel H. G. Prout; John A. Bensel, Commissioner of the Board of Water Supply of New York City, and Colonel George Harvey.

Central & Western Association of Car Service Officers.

The annual meeting will be held at the Great Northern hotel, Chicago, on February 18.

International Railway General Foremen's Association.

The fifth annual convention of the International Railway General Foremen's Association will be held at the Lexington hotel, Chicago, June 1 to 5, 1909, inclusive.

The meeting in 1908 was the most successful in the history of the association. It is expected that the next meeting will be still better.

On January 1, 1908, the association had a total active membership of 160, and 48 per cent. of the membership attended the convention last June. The membership is now 216. The association has set aside half a day to visit the exhibits that will be made by the Railway Supply Men's Association. Last

year 29 supply houses were represented with exhibits, and it is expected that the representation will be still larger this year. Membership in the Supply Men's Association costs $25 a year, and each concern paying this assessment is entitled to 25 sq. ft. of space free. J. Will Johnson, of the Pyle National Electric Headlight Co., 1427 Monadnock block, Chicago, is Secretary of the Railway Supply Men's Association, and checks in payment of membership fees and for exhibit space should be sent to him.

St. Louis Railway Club.

The February meeting will be held on February 12. W. E. Harkness, a telephone engineer of New York City, will present a paper on Train Despatching by Telephone, furnishing in connection therewith a practical demonstration of selectors and telephones as used in the various offices of railways so equipped.

Canadian Society of Civil Engineers.

A meeting of the Electrical Section was held on February 11. There was a demonstration of the Oscillograph by J. A. Johnson, of the Ontario Power Co., Niagara Falls, N. Y.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Pl., New York, May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc. E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Lohis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo. 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Rock Island is running experimentally "all-night" suburban passenger trains between Chicago and Blue Island.

A bill has been introduced in the Senate of the state of Washington to reduce passenger fares to 2½ cents a mile.

The Iowa Railway Commission will on February 18 hold a public hearing to consider proposed changes in its freight rates and classifications.

The Pennsylvania and the Baltimore & Ohio are reducing westbound freight rates on import traffic to meet the reduction lately made by the Boston & Maine.

The Traffic Club of Chicago has voted to change its constitution so as to make eligible for membership all railway men above the grade of clerk in the traffic, the operating and the legal departments. The club has under consideration but has not settled, a proposition to have permanent club rooms.

The Transcontinental Freight Bureau is still in session at Chicago hearing protests from shippers against the advances in rates that went into effect on January 1 last. Committees representing almost every commercial interest that ships goods to and from the Pacific coast have appeared to argue against the higher rates.

Newspaper reports about traffic arrangements between the Harriman lines and the Kansas City Southern are exaggerated. These roads recently have made some new through routes and through rates for the handling of freight, but it is stated that they are not materially different from arrangements that the Harriman lines have with a number of their other connections.

The Interstate Commerce Commission will give a hearing at Chicago February 17 to determine whether the Northern Pacific ought not to be required to open the Portland gateway to passengers traveling over the Harriman and other lines from the east to Portland and bound for Seattle and other Puget Sound cities. The Northern Pacific has heretofore refused to make joint routes and through rates with other lines through this gateway.

The New Orleans Board of Trade has adopted resolutions protesting against alleged discrimination in steamship rates against New Orleans and in favor of Galveston. Competitive steamship conditions from the eastern seaboard to Galveston give "the port of Galveston and distributive territory reached by it rates of freight that are gradually throttling New Orleans commerce" and "the transportation lines doing business in Texas are controlled by the Texas State Railroad Commission in such a manner that their rates are so adjusted as practically to exclude New Orleans and Louisiana from that territory." Mercantile interests of the state of Louisiana are appealed to to invite steamship competition.

The Western Classification Committee devoted a large part of its time during its recent meeting at Mobile to the subject of stronger packages for shipments of freight. One proposition that was considered by the committee was to require all second-hand cases in which goods are shipped to be sealed, both to prevent goods from being stolen and to better locate losses. It is estimated that many jobbers ship 90 per cent. of their goods in second-hand cases. A strong delegation of shippers appeared and protested against the proposed rule and consideration of the subject was continued until the next meeting. The shippers' associations will try to have only good boxes used in re-shipping. It was also proposed to require rugs to be boxed. Manufacturers of rugs told the committee that this would be very expensive as rugs constitute about 80 per cent. of their shipments and carpets only 20 per cent., whereas, ten years ago these percentages were reversed. It was also proposed to require such light freight as breakfast foods, crackers, etc., to be shipped in packages made of fiber or pulp board. Shippers also protested against this.

The Interstate Commerce Commission replying to the House resolution calling on the Commission to state what advances

in rates had been made since the passage of the amendments to the Interstate Commerce law in June, 1906, says that it is impossible to give the desired information even approximately. The law requires the railways, when they change a rate, to file the new tariff, but it does not require the railways to explain whether the change is an increase or a decrease. Moreover, the railways can make the maximum car load weigh one thing to-day and another to-morrow, and in other ways manipulate the charges so that it will take endless time, patience and skill to discover just what has been done. Between the periods fixed by the resolution July 1, 1906, and Jan. 15, 1909, there were filed nearly 600,000 tariffs, varying in size from one to 700 pages, making 3,000,000 pages in all. On each page there are on an average 50 rates, making in all during that time 150,000,000 items. To determine what changes have been made it would be necessary to compare these 150,000,000 items with the corresponding items in effect previously. Nor does this take into account the changes that have been made by means of varying the proportional parts of joint rates, nor the difference in carload minima, nor the changes of rates wrought by means of changes in classifications. The Commission, largely out of curiosity, undertook to have a comparison made of the tariffs filed on a single day, aggregating about 2,000 pages of manuscript. Eight clerks were put on the work. At the end of seven days they had not finished. Among the important advances which have been made are those in rates on coal from Pennsylvania, Maryland and West Virginia fields to southeastern territory; on pig iron, cast iron pipe, iron and steel articles, lumber, grain and grain products, packing house products and sugar. Rates have been advanced from Kansas City and St. Louis, and points basing thereon, to Texas points. Also the rates on transcontinental freight, east and westbound.

COURT NEWS.

Joseph M. Hill, Chief Justice of the Supreme Court of Arkansas, has resigned to become Chief Counsel for the state in the litigation now pending in the Federal court over freight and passenger rates.

Judge Lewis, of the United States District Court, on February 1 at Denver, Colo., ruled that the selling of a railway pass is not a violation of the Interstate Commerce Law unless and until somebody uses the pass.

Wilbur Stith, formerly Freight Traffic Manager of the Missouri Pacific and Iron Mountain, pleaded guilty in the Federal court at Little Rock, Ark., on February 6 to having given rebates in 1905 to T. H. Bunch, and was fined $2,500 and costs. Mr. Stith appeared in court and said he had paid the rebates only on the orders of his superiors. He is now Traffic Manager of the Waters-Pierce Oil Company.

The United States Circuit court at New York City has refused to restrain the Interstate Commerce Commission from enforcing its order of June 24, 1908, requiring the New York Central to cease discriminating against the Hecker-Jones-Jewell Co. in rates on wheat. This firm complained that flour milled at interior points was brought to New York for export at rates lower than those charged complainant.

The Fulton Bill, postponing the going into effect of rate increases in the discretion of the Interstate Commerce Commission until their reasonableness shall have been determined by the Commission, has finally been rejected by the Senate committee. The disposition of Senator Fulton's measure has not completely taken the matter out of the official discussions, since Representative Needham, of California, has introduced in the House a bill embodying the same principles.

Supplementary suits have been entered by the government in the Federal court at Portland, Ore., to reinforce the claims made in the suits entered a few weeks since to recover land alleged to have been wrongfully sold by the Southern Pacific and its controlled railways. The main basis of the suits is that the several railway companies, in selling land granted to them by the government, had violated the condition that sales should be made only to actual settlers, in limited amounts, at a fixed price. The total area of land sued for is over 350,000 acres.

Judge Carland, of the Federal District Court at Sioux Falls, S. Dak., issued a temporary injunction on February 3, restraining the enforcement of the 2-cent passenger fare act of South Dakota. The injunction was sought by counsel for the railways within 15 minutes after the act was signed by the Governor. A hearing on the question of making the injunction permanent will be given on March 1. The act contained an emergency clause making it effective immediately. Almost simultaneously with the issuance of the injunction by the Federal court the attorney-general of South Dakota got an alternative writ of mandamus from the Dakota State Supreme Court to compel the railways to comply with the law. The writ is returnable on March 3.

In the United States Circuit Court of Appeals at Chicago on February 3 Judge Grosscup held that the federal safety appliances act applies to all cars, on an interstate road, whether engaged in interstate commerce or not at the particular time when an appliance is defective. Three cases involving alleged violations of the act by the Wabash, the Elgin, Joliet & Eastern and the Belt Railway of Chicago were passed on by the court. In each it was contended that the car with the defective appliance was being used at the time in intrastate commerce and therefore did not come within the act. Judge Seaman dissented in the Wabash and Belt cases. He said he believed that the Belt, which operates entirely within the state of Illinois, was not subject to the act, because it appeared that it was an independent railway which only transferred cars between the terminals of trunk lines in Chicago and had no interest in shipping bills or rates charged nor was it concerned in the ultimate destination and delivery to the consignee.

INTERSTATE COMMERCE COMMISSION.

The rates of the Baltimore & Ohio on phosphate rock shipped from Mount Pleasant and Centerville districts in Tennessee to fertilizer manufacturers in cities in Illinois, Indiana, Ohio, Michigan, New York and Pennsylvania were raised in November, 1907, while the rates south from the same originating points were not raised. The new rates were found unreasonable in themselves and were ordered lowered by the commission.

No Jurisdiction Over All Water Rates.

In the matter of jurisdiction over water carriers. Opinion by Chairman Knapp.

On May 4, 1908, the Commission in Conference Rulings, Bulletin No. 2, decided that where a steamboat line agreed on a joint rate with a rail line for certain passenger and freight traffic, it could not unite with a railway company in making a through route and joint rate on a particular traffic without subjecting all its interstate traffic to the provisions of the law and to the jurisdiction of the Commission. Some time thereafter a large number of water carriers petitioned the Commission to reconsider this ruling.

After full investigation the Commission has come to the conclusion that carriers of interstate commerce by water are subject to the act to regulate commerce only in respect of traffic transported under a common control, management or arrangement with a rail carrier, and in respect of traffic not so transported they are exempt from its provisions. It was accordingly ordered that the administrative ruling in question should be modified to conform to these views.

This construction gives workable effect to every provision of the act and is in harmony with its remedial purposes. It controls the all-rail and the part-rail-and-part-water transportation, which is the subject of "common arrangement," and leaves all other water carriage open to free competition. We do not undertake to say what relations or practices constitute or are evidence of common arrangement, for that question is not now presented. We merely hold that as to transportation which is not under common control, management or arrangement, the act does not apply and the Commission is without jurisdiction.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1908.
(See also issue of February 5.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Ann Arbor	301	$93,413	$36,290	$137,542	$17,927	$19,462	$2,707	$66,654	$3,783	$110,533	$27,009	$2,761	$11,369	$18,401	†$7,080
Bangor & Aroostook	515	164,638	40,723	215,870	42,482	28,514	2,541	70,169	11,328	155,034	60,836	.....	1,500	59,336	67,598
Bessemer & Lake Erie	201	298,680	21,342	325,203	34,094	92,416	8,619	121,227	24,457	280,813	44,390	.....	35,000	9,390	31,536
Boston & Maine	2,242	1,946,669	977,593	3,189,130	316,497	398,172	39,803	1,698,961	102,164	2,555,597	633,533	10,745	157,699	486,579	45,537
Buffalo & Susquehanna	373	185,194	16,295	207,741	29,241	47,562	2,430	82,477	8,200	169,909	37,832	114*	4,000	33,718	26,537
Central of New Jersey	668	1,442,260	327,563	1,871,582	167,332	314,313	23,805	530,768	42,620	1,078,838	792,744	8,648*	Cr.38,361	822,457	27,733
Chesapeake & Ohio	1,896	1,789,848	357,521	2,255,594	210,976	434,808	35,556	656,543	49,962	1,387,845	867,749	8,781	67,100	809,430	306,591
Chicago, Indianapolis & Louisville	616	270,347	103,030	412,018	56,212	75,318	12,643	149,536	15,775	309,484	102,534	.....	21,500	81,034	49,862
Chicago, Lake Shore & Eastern	630	281,672	....	311,711	24,566	67,234	1,201	109,484	12,192	214,677	97,034	.....	3,000	94,034	72,103
Chicago, Milwaukee & St. Paul	7,516	3,504,360	1,001,814	4,933,892	445,674	637,066	119,101	1,815,340	96,342	3,113,523	1,820,369	10,713	198,567	1,632,515	138,622
Chicago, Rock Island & Pacific	7,461	3,318,615	1,449,269	5,053,504	795,595	655,004	112,104	1,894,852	135,183	3,592,738	1,460,866	11,518*	196,267	1,253,081	132,471
Colorado Midland	338	137,107	23,850	195,317	17,626	28,647	10,257	88,210	5,618	150,358	44,959	955*	4,500	39,504	19,438
Delaware & Hudson	845	1,351,588	183,864	1,564,899	10,308	109,356	18,364	559,195	37,556	734,779	830,120	999*	31,749	797,372	177,700
Delaware, Lackawanna & Western	893	2,073,813	534,661	2,783,493	165,284	377,985	42,072	822,395	53,233	1,460,969	1,322,524	23,402	......	1,345,926	212,099
Detroit, Toledo & Ironton	438	110,826	14,142	132,740	23,182	21,385	2,309	65,253	3,968	116,097	16,643	321	6,979	9,985	43,438
Duluth, South Shore & Atlantic	593	122,333	77,492	213,228	26,732	31,274	7,995	91,329	6,006	163,336	49,892	63	26,783	23,172	8,232
Fort Worth & Denver City	454	285,811	157,741	461,238	68,524	68,865	6,823	140,202	17,893	302,307	158,931	600	8,867	150,664	†46,403
Galveston, Harrisburg & San Antonio	1,339	689,100	190,754	925,561	118,686	119,780	25,823	347,833	25,061	637,183	288,378	417	Cr.23,914	312,739	127,319
Great Northern	6,899	3,009,456	863,537	4,135,634	586,241	556,675	61,989	1,292,279	79,571	2,576,755	1,558,879	10,072	221,151	1,347,800	†106,350
Hocking Valley	347	359,036	67,465	442,117	40,161	139,380	7,581	160,148	12,210	359,480	82,637	2,718*	18,921	60,998	55,740
Houston & Texas Central	789	393,049	128,637	553,227	80,419	71,294	14,213	206,985	19,798	392,709	160,518	.....	2,467	158,051	†75,623
Long Island	392	205,906	319,122	538,752	67,109	110,713	11,829	299,712	13,963	503,326	35,426	73,357	21,714	87,069	157,990
Minneapolis, St. Paul & S. S. Marie	2,395	623,325	224,227	898,469	75,057	134,159	33,163	292,905	18,858	554,142	344,327	20,248	65,133	299,442	62,189
Nashville, Chattanooga & St. Louis	1,230	624,650	221,140	910,509	134,019	137,166	36,866	331,562	23,358	662,971	247,538	756*	20,000	226,782	32,768
New York, Chicago & St. Louis	556	727,898	119,350	873,353	37,427	63,256	43,219	363,329	13,269	520,500	352,853	1,412*	45,510	305,931	†372,233
New York, New Haven & Hartford	2,004	2,133,221	1,788,122	4,355,090	552,955	548,362	25,476	2,006,250	94,936	3,227,979	1,127,111	112,171	300,000	939,282	†78,503
Norfolk & Southern	582	131,002	56,520	199,646	21,318	21,074	3,776	68,554	13,502	128,224	71,422	1,615*	5,200	64,607	36,465
Northern Pacific	5,681	4,031,339	1,265,889	5,640,601	413,395	664,605	67,510	1,779,536	96,822	3,021,868	2,618,733	97,885	253,827	2,462,791	†319,140
Oregon Short Line	1,456	1,096,951	310,710	1,493,104	65,940	152,564	20,606	298,479	34,787	572,377	920,727	1,274*	55,955	863,498	253,785
Philadelphia & Reading	1,007	3,010,626	499,486	3,647,227	221,667	725,072	27,032	1,090,592	63,404	2,127,767	1,519,460	47,787	61,132	1,506,115	396,012
St. Louis & San Francisco	4,727	2,114,408	840,223	3,170,823	469,842	416,178	63,445	1,072,386	102,344	2,124,194	1,046,629	.....	148,427	898,202	275,999
St. Louis, Brownsville & Mexico	454	74,343	30,869	112,946	15,066	15,421	2,788	43,516	7,058	83,849	29,097	343	13,360	16,080	†1,799
San Pedro, Los Angeles & Salt Lake	1,099	354,079	206,483	601,136	83,070	79,031	23,517	190,060	16,068	391,746	209,390	2,537*	25,796	181,057	122,634
Southern	7,294	3,150,913	1,285,734	4,840,574	552,847	821,980	110,894	1,656,421	160,615	3,302,757	1,537,817	21,213	169,142	1,389,918	594,914
Texas & New Orleans	450	219,880	77,100	318,960	62,822	54,287	7,082	121,353	7,997	253,541	65,419	33*	5,277	60,109	†11,840
Union Pacific	3,309	2,814,976	788,618	3,938,452	262,168	415,223	103,728	1,010,989	169,011	1,961,119	1,977,333	2,451*	112,407	1,862,474	476,589

SIX MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Ann Arbor	301	$593,756	$258,907	$912,380	$129,198	$122,147	$18,406	$347,923	$24,099	$641,773	$270,607	$18,224	$68,213	$220,618	†$35,461
Bangor & Aroostook	515	1,012,972	314,738	1,396,382	266,055	163,776	16,831	417,930	61,883	926,475	469,907	.....	9,000	460,907	193,109
Bessemer & Lake Erie	201	3,419,820	175,850	3,627,857	320,611	592,363	35,192	918,161	57,423	1,923,750	1,704,107	.....	55,000	1,649,107	†39,395
Boston & Maine	2,242	11,465,291	7,474,954	20,472,503	2,549,696	2,197,268	241,934	8,957,035	457,363	14,403,296	6,069,207	67,212	859,778	5,276,641	†171,075
Buffalo & Susquehanna	373	1,024,478	110,532	1,172,196	205,065	254,665	15,226	417,318	41,043	933,317	238,879	740*	24,000	214,139	73,356
Central of New Jersey	668	8,231,513	2,256,433	11,092,452	1,119,103	1,845,059	159,054	2,959,645	222,355	6,305,216	4,787,236	293,697	533,989	4,546,944	†619,144
Chesapeake & Ohio	1,896	10,466,418	2,387,152	13,402,921	1,553,487	2,482,370	216,916	3,589,870	253,536	8,096,179	5,306,742	3,652*	399,000	4,904,090	57,301
Chicago, Indianapolis & Louisville	616	1,797,588	719,021	2,767,047	442,888	413,062	75,620	876,028	81,991	1,889,589	877,458	.....	129,000	748,458	†38,733
Chicago, Lake Shore & Eastern	630	1,880,277	....	2,049,050	170,708	452,563	6,649	639,131	38,919	1,307,970	741,080	.....	18,000	723,080	†99,966
Chicago, Milwaukee & St. Paul	7,516	22,884,057	7,162,550	32,507,799	4,106,104	3,764,780	657,072	10,981,708	528,863	20,038,527	12,469,272	164,784	1,188,855	11,445,201	255,288
Chicago, Rock Island & Pacific	7,461	19,072,348	9,170,710	30,016,508	4,710,304	3,828,326	660,661	10,769,161	755,805	20,724,257	9,292,251	61,424*	1,105,714	8,125,113	162,225
Colorado Midland	338	861,038	214,438	1,229,782	154,898	158,389	58,894	494,490	35,140	901,811	327,971	1,482*	46,500	279,989	†2,302
Delaware & Hudson	845	7,763,047	1,625,034	9,610,577	672,715	970,486	114,465	3,232,116	211,178	5,200,960	4,409,617	408	206,749	4,203,276	†526,007
Delaware, Lackawanna & Western	893	12,589,751	3,580,897	17,226,298	1,824,972	2,180,995	286,681	4,671,430	330,449	9,294,527	7,931,771	135,338	504,000	7,563,109	112,424
Detroit, Toledo & Ironton	438	738,435	88,957	874,580	142,318	183,232	14,626	363,511	27,047	730,734	143,846	97	41,873	102,070	111,507
Duluth, South Shore & Atlantic	593	796,933	502,834	1,383,858	220,320	163,747	55,394	506,838	40,963	987,262	396,596	9,524	101,783	304,337	†67,649
Fort Worth & Denver City	454	16,191,117	936,512	2,670,777	408,055	360,176	45,612	784,409	86,248	1,684,500	986,277	3,808	52,400	937,686	†7,081
Galveston, Harrisburg & San Antonio	1,339	4,010,647	1,064,613	5,331,204	629,451	621,968	126,348	2,076,219	158,731	3,612,717	1,718,487	15,321*	92,686	1,610,480	560,936
Great Northern	6,899	23,175,892	5,997,694	30,805,545	5,312,668	3,356,974	353,281	7,681,408	507,449	17,211,780	13,593,765	146,721	1,248,386	12,492,100	†366,612
Hocking Valley	347	2,894,386	465,303	3,458,169	337,573	809,924	45,520	978,769	71,021	2,242,807	1,215,362	48,075	121,581	1,141,856	83,550
Houston & Texas Central	789	2,391,172	778,535	3,354,300	441,882	428,389	88,602	1,169,992	116,545	2,245,410	1,108,890	.....	55,640	1,053,250	130,613
Long Island	392	1,334,551	2,895,384	4,406,307	512,484	608,388	90,495	1,879,264	105,725	3,196,356	1,209,951	548,648	130,282	1,628,317	400,662
Minneapolis, St. Paul & S. S. Marie	2,395	4,811,982	1,643,008	6,788,103	651,704	716,568	118,575	1,948,500	135,359	3,570,706	3,217,397	167,798	483,159	2,902,036	599,599
Nashville, Chattanooga & St. Louis	1,230	3,831,923	1,339,558	5,544,266	790,608	1,019,248	203,123	1,985,205	136,583	4,134,767	1,409,199	6,653*	120,000	1,282,846	†88,622
New York, Chicago & St. Louis	556	3,761,444	792,532	4,712,437	491,266	424,219	260,467	1,829,071	76,518	3,081,541	1,630,896	4,735*	185,510	1,440,650	†338,728
New York, New Haven & Hartford	2,004	13,200,637	12,010,899	27,650,795	3,473,368	3,252,265	147,726	11,323,206	545,241	18,741,806	8,908,980	680,905	1,717,000	7,872,894	†523,532
Norfolk & Southern	582	717,918	336,307	1,140,518	179,656	127,629	25,517	374,081	92,161	799,044	341,474	598	39,200	302,872	108,955
Northern Pacific	5,681	26,195,355	9,392,493	37,645,175	4,018,520	4,102,267	420,526	10,223,294	518,024	19,282,631	18,362,544	313,651	1,602,447	17,073,748	†164,346
Oregon Short Line	1,456	6,616,876	2,128,165	9,280,067	887,803	798,590	109,907	1,704,339	175,776	3,676,415	5,603,652	2,180	298,048	5,307,784	777,822
Philadelphia & Reading	1,007	15,790,914	3,169,228	19,788,826	1,546,151	3,934,279	216,923	5,933,005	329,536	11,959,894	7,828,932	172,634	365,689	7,635,877	†1,114,997
St. Louis & San Francisco	4,727	12,185,777	4,821,472	18,376,595	2,977,617	2,534,615	374,144	6,234,082	576,116	12,696,574	5,680,021	.....	776,805	4,903,216	†176,421
St. Louis, Brownsville & Mexico	454	362,851	165,554	568,867	98,701	76,042	16,395	211,469	31,538	434,145	134,722	415	28,360	106,777	†1,698
San Pedro, Los Angeles & Salt Lake	1,099	2,062,941	1,211,443	3,496,295	608,305	447,171	138,900	1,139,086	103,963	2,437,425	1,058,870	13,707*	144,024	901,139	230,223
Southern	7,294	17,632,779	7,288,405	27,105,652	3,237,257	4,091,631	600,554	9,289,247	863,947	18,082,636	9,023,016	80,084	959,565	8,143,535	1,908,537
Texas & New Orleans	450	1,308,318	414,307	1,835,624	300,646	261,673	33,238	739,027	49,112	1,383,696	451,928	5,631*	49,845	396,452	30,762
Union Pacific	3,309	18,263,692	5,257,688	25,483,948	2,530,190	2,392,315	494,837	5,628,324	605,331	11,650,997	13,832,951	2,068*	650,720	13,180,163	3,494,434

*Deficit. †Decrease.

Charge for Out-of-Line Service Reasonable.

Celina Mill & Elevator Co. v. St. Louis Southwestern et al. Opinion by Commissioner Harlan.

The direct route from the wheat fields on the line of the St. Louis & San Francisco in Oklahoma to points on the St. Louis Southwestern in Texas is through their junction at Sherman. The complainants flour mill at Celina is 28 miles south of Sherman; the haul of its wheat to Celina and of its flour back to Sherman therefore involves an extra service of 56 miles in order to get the benefit of the through milling-in-transit rate applicable via Sherman. The defendants cannot be required to perform this back haul free of charge and its present tariff rates for back hauls and out-of-line service are not unreasonable.

If the milling-in-transit rates over a through route from the Oklahoma wheat fields to points where the flour is consumed are made available to one milling point not on such through route, by giving it a back haul or out-of-line service at reasonable rates, no reason is perceived why the same opportunity should not be accorded to another milling point, even though more distant from such through route, at rates that are relatively reasonable.

Freight Car Balance and Performance in August, 1908.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting statistical bulletin No. 38, covering car balance and performance for August, 1908, says:

"The number of surplus cars during this month averaged 267,312 daily, or 12.44 per cent. of the total cars reported by the roads included in this statement. The bad order cars averaged 9.99 per cent., making a total of 22.43 per cent. of the total equipment out of service during the month. Adjusting the averages as in previous statements we secure the following:

		Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
		Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December,	1907	21.9	23.9	289	316	$1.98	$2.17
January,	1908	20.8	24.9	277	325	1.81	2.17
February,	1908	19.7	23.8	271	328	1.82	2.20
March,	1908	21.2	25.5	290	348	1.95	2.34
April,	1908	19.6	24.5	258	324	1.83	2.29
May,	1908	19.3	24.8	254	329	1.72	2.22
June,	1908	19.6	24.7	276	347	1.88	2.37
July,	1908	20.0	24.8	275	342	1.84	2.26
August,	1908	20.8	25.1	292	354	1.98	2.40

"As will be noted from these averages, the performance was quite satisfactory, the ton miles per car per day and the earnings per car per day showing increases, whether compared on the basis of all cars or only such cars as were in active service during the month. The shop cars, after increasing steadily for eight months, show a slight decrease, reflecting the activity in car repairs which closely followed the reduction in the number of surplus cars. There is a marked improvement in the per cent. of loaded mileage, the figure for August reaching 68.8 per cent., the highest since November, 1907, and only two points below the August, 1907, average. This increase is natural in connection with the outward flow of cars indicated in the car balance figures, which show a continued decrease in the number of cars on their home lines. It is probable, however, that the return to a normal use of foreign equipment will not be brought about until the surplus is practically wiped out or at least quite materially reduced."

The accompanying table shows by groups car balance and performance for August, 1908.

Private Siding Policy at Chicago.

The City Council of Chicago has passed a resolution to adopt a new policy in dealing with "switch track" ordinances. The situation had grown very unsatisfactory, and, at the suggestion of representatives of the Chicago Association of Commerce, Mayor Busse appointed a commission to investigate the entire subject. The commission made a report and recommendations, and the resolution adopted by the Council provides for the carrying out of these recommendations.

The policy of the Council in the past has been to refer ordinances for tracks to committees of the council repre-

Freight Car Balance and Performance in August, 1908.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	72,285	662,643	279,891	134,332	174,813	369,327	15,711	138,322	26,470	113,219	98,343	2,085,356
Average number system cars on line	58,848	494,880	226,389	98,176	131,379	302,914	6,591	106,791	15,936	63,025	81,073	1,586,002
Railroad owned cars: Av. foreign on line	20,741	136,794	64,249	22,192	31,036	73,567	10,792	33,791	17,351	43,688	14,015	468,216
Total cars on line	79,589	631,674	290,638	120,308	162,415	376,481	17,383	140,582	33,287	106,713	95,088	2,054,218
Excess	7,304	....	10,747	....	....	7,154	1,672	2,260	6,817	....	....	....
Per cent. cars on line to total owned:												
Home	81	75	81	73	75	82	42	77	60	56	83	76
Foreign	29	20	23	17	18	20	69	25	66	38	14	23
All railroads	110	95	104	90	93	102	111	102	126	94	97	99
Private cars on line	2,012	37,067	12,578	2,130	5,304	13,548	1,890	8,016	2,008	6,280	4,032	94,865
Total, all cars on line	81,601	668,741	303,216	122,498	167,719	390,029	19,273	148,598	35,295	112,993	99,120	2,149,083
Per cent. of cars in shop	7.19	11.40	9.91	10.22	10.34	6.39	4.81	16.55	7.06	7.20	9.67	9.99
No. of freight engines owned	1,125	9,776	3,800	2,216	2,570	6,291	440	2,486	684	2,355	2,120	33,863
Av. cars on line per freight engine owned	73	68	80	55	65	60	44	60	52	48	47	63
Total freight car mileage	37,380,640	428,179,825	171,034,900	69,405,330	104,677,554	264,095,171	28,406,053	83,175,451	26,370,894	97,421,188	67,083,842	1,377,230,848
Average miles per car per day	14.8	20.7	18.2	18.3	20.1	22.0	47.5	18.8	24.1	27.8	22.0	20.8
Per cent. loaded mileage	71.9	65.9	65.2	66.5	68.6	73.4	68.5	70.7	67.9	71.1	73.6	68.8
Ton miles of freight, Inc. Co. freight	377,590,667	6,401,066,033	2,511,852,784	964,232,029	1,385,843,771	2,142,337,619	389,520,163	1,097,840,186	310,357,537	1,359,757,735	829,103,871	17,769,502,395
Average ton miles, including Co. freight:												
Per car mile	10.1	14.9	16.0	13.9	13.5	13.4	14.0	13.2	11.9	14.0	12.0	14.1
Per loaded car mile	14.1	22.7	24.6	20.9	18.3	18.3	20.6	18.8	17.5	19.6	16.7	20.7
Per car per day	149	309	294	254	270	288	691	249	286	389	270	292
Gross freight earnings	$1,464,311	38,834,360	14,806,323	6,203,326	8,811,739	18,875,884	3,084,650	$9,543,278	$3,082,309	$12,619,620	$5,901,713	$126,237,513
Average daily earnings: Per car owned	$1.99	$1.89	$1.71	$1.49	$1.65	$2.14	$6.33	$2.23	$3.76	$3.60	$1.94	$2.04
Per railroad owned car on line	1.81	1.98	2.20	2.99	3.83	2.00	2.08	1.58	1.63	1.72	2.04	5.16
All cars on line	1.76	1.87	1.64	1.66	1.78	2.13	5.72	2.08	2.82	3.61	1.92	1.98

senting the parts of the city where the proposed tracks were to be laid, which led to a good deal of corrupt log-rolling. The city's policy was also criticized upon the ground that there was too much delay in the granting of applications and that the term of the grant, which usually was ten years, was too short to warrant an investment of money in plants. As to compensation, it has been the policy of the city to make an annual charge for the privilege of maintaining and operating a track, the basis being one dollar a foot for the first 50 lineal feet and 50 cents a foot for each additional foot of public space occupied. Since this policy went into effect, 122 track ordinances have been passed and the annual aggregate payment required is $12,228, or about $100 per year per track.

The new policy of handling this matter will be as follows: The Council will create a standing committee on local industries, consisting of seven aldermen from west side wards, five from south side wards and three from north side wards. To this committee will be referred all ordinances for special privileges in public ways or for vacating them. The grant for a track will be for 20 years, subject to revocation by the passage of a repealing ordinance. The compensation will be the same as heretofore.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. G. Goodrich has been elected President of the Twin City Rapid Transit, succeeding Thomas Lowry, deceased.

J. R. Cottingham has been appointed Attorney for Western Oklahoma of the Kansas City Southern, with office at Guthrie, Okla.

W. C. Brown has been elected President and E. L. Rossiter Treasurer of the Western Transit Co. and the Rutland Transit Co.

W. C. Brown, President of the New York Central & Hudson River, has been elected President and a director of the Toledo, Canada Southern & Detroit, succeeding W. H. Newman, resigned.

C. B. Hayes, whose resignation as Auditor of the Southern Railway we have previously announced, has been appointed Comptroller of the Mobile & Ohio and of the Southern Railway in Mississippi, with headquarters at Mobile, Ala.

Frank V. Whiting, Chief Claim Agent of the Chicago, Indiana & Southern and the Indiana Harbor Belt, has been appointed General Claim Attorney of the New York Central & Hudson River, with office at New York. F. A. Hruska succeeds Mr. Whiting.

M. M. Stallman has been appointed General Attorney of the Delaware, Lackawanna & Western, with general supervision of legal matters in the state of New Jersey. F. W. Thompson has been appointed General Attorney, with general supervision of legal matters in the state of New York.

On February 1, W. C. Nixon was elected First Vice-President of the Orange & Northwestern. W. H. Stark, Vice-President, was elected Second Vice-President; J. H. Elliott, Vice-President, was elected Third Vice-President; L. E. Stafford, Secretary and Auditor; F. H. Hamilton, Assistant Secretary and Assistant Treasurer; J. W. McCullough, Assistant Auditor, and F. J. and R. C. Duff, General Counsel.

Operating Officers.

F. H. Dever, Superintendent of Terminals of the Houston Belt & Terminal Co., has resigned.

F. C. Runnels, Trainmaster of the Chicago & Alton, at Dwight, Ill., has resigned, effective March 1.

J. B. Chandler has been appointed Superintendent of Dining Car Service of the Chicago, St. Paul, Minneapolis & Omaha, at Minneapolis, Minn.

F. J. Avery, Trainmaster of the Osawatomie division of the Missouri Pacific, at Hoisington, Kan., has been transferred to Coffeyville, Kan., succeeding E. C. Wills, who has been transferred to Hoisington, succeeding J. N. Pemberton, Acting Trainmaster.

Edwin T. Douglass, General Manager of the Western Transit Co. has been elected also General Manager of the Rutland Transit Co., succeeding George T. Jarvis.

F. J. Norris, Trainmaster of the Trinity & Brazos Valley, at Teague, Tex., has been appointed Chief Despatcher of the Chicago, Rock Island & Pacific, at Little Rock, Ark. J. W. Carnes, chief clerk to the Superintendent of the Trinity & Brazos Valley, succeeds Mr. Norris.

J. C. Dailey, General Superintendent of the International & Great Northern, has been appointed General Superintendent of the Denver & Rio Grande, with office at Salt Lake City, Utah, succeeding Ernest Stenger, resigned, and the office of General Superintendent of the former road has been abolished.

The titles of Master Mechanic, Resident Engineer, Trainmaster and Traveling Engineer have been discontinued on the Louisiana division of Morgan's Louisiana & Texas. C. F. Bradshaw, Trainmaster at Lafayette, La., has been appointed Assistant Superintendent; Louis Mims, Resident Engineer at Lafayette, has been appointed Assistant Superintendent; H. M. Norton has been appointed Assistant Superintendent, and G. C. Scarlette remains Assistant Superintendent. (See an article in another part of this issue.)

C. E. Baker has been appointed Passenger Trainmaster in charge of electrified lines of the Long Island Railroad, with office at Flatbush avenue, Brooklyn, N. Y. E. K. Morris, Assistant Passenger Trainmaster at Brooklyn, has been transferred to Long Island City, where he will perform such duties as are assigned to him by the Passenger Trainmaster. A. Broughton, Assistant Trainmaster in charge of station agents, has been appointed Inspector of Station Agents, with office at Long Island City, and his former office has been abolished.

C. E. Grasemann, recently appointed Goods Manager of the London & North Western Railway, has made himself widely known to American railway officers through his visits and studies of methods here. He began as a clerk in the goods department at the Euston headquarters about 30 years ago; served in different London branch offices until he had his chance in the great Broad street station, the busiest and in most respects the most interesting freight station in England. For more than 15 years he has been Outdoor Goods Manager. He is now next in line to the highest position in the corporation, and his training for it has been singular in two respects: It has been entirely in the service of one company and in one department of that company. This is commonly recognized as a limiting feature, a chance to make an uncommonly bigoted manager of narrow views, and yet it is not easy to find in British railway service an officer of broader views, of more keen appreciation of the work of every department than is Mr. Grasemann. This is probably due to the fact that his work has always kept him in direct and daily communication with the public which his company serves. His method of defending the company has been a continuous study of its customers' transportation needs and an undertaking to fulfil them. An editorial under the heading: "Wanted, a diplomatic corps," in these columns, January 29, indicates the kind of work needed on American roads, and which he has been doing successfully: "Discovering the kind of service

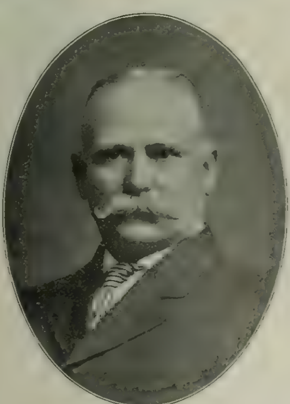
C. E. Grasemann.

which the railway was really giving its patrons and the way in which that service could be performed better and existing friction removed." Mr. Grasemann could not have succeeded in qualifying as a general officer, under his limiting conditions, without unusual physical and mental qualities. Only a powerful man with good digestion could have maintained his administrative activities and his continual study of the different departments of the art of transportation.

E. J. Chamberlin, whose appointment as General Manager of the Grand Trunk Pacific has been previously announced, was born in Lancaster, N. H. He received his education at the Montpelier Methodist Seminary, and began railway work in 1871 as timekeeper in the car shops of the Central Vermont at St. Albans, Vt. The next year he was made clerk in the paymaster's office, working as clerk in this office and in the Transportation Superintendent's office for three years. In 1875 he became corresponding secretary for the General Superintendent, and two years later was made private secretary to the General Manager. In April, 1884, he was appointed Superintendent of the Ogdensburg & Lake Champlain and of the Central Vermont line of steamers running from Chicago to Ogdensburg. On September 1, 1886, he was made General Manager of the Canada Atlantic, and in 1905, when the Grand Trunk actually, though not formally, took over the Canada Atlantic, Mr. Chamberlin acted for a year as Manager in the interest of the Grand Trunk. When the formal transfer of the property was made, Mr. Chamberlin went into business as a contractor, and for the last two years and a half has been engaged in contract work for railway construction in Mexico.

E. J. Chamberlin.

Charles W. Jones, whose appointment as General Superintendent of the Chicago, Rock Island & Pacific, with office at Topeka, Kan., has been announced in these columns, was born on November 6, 1860, at Milton, Ind. He received his education in the public schools at Des Moines and Mitchelville, Iowa, and at the Mitchell Seminary, at Mitchellville. He began railway work May 15, 1875, for the Chicago, Rock Island & Pacific and has been in the employ of that road ever since. In 1876 he was a station agent's helper and in 1877 telegraph operator. In 1881 he was made a station agent and operator and in 1884 Train Despatcher. In 1892 he was appointed Trainmaster and in February, 1895, Assistant Superintendent. In August, 1895, he was appointed Superintendent, at Herington, Kan., and in October, 1897, he was made Superintendent of the Eastern division, at Horton, Kan. In May, 1902, he was made Superintendent of the Kansas division, at Topeka, Kan. In August, 1905, he was appointed Superintendent of the Iowa division, at Des Moines, Iowa, which position he held until his recent promotion.



C. W. Jones.

Traffic Officers.

G. A. Perry has been appointed Traveling Tariff Inspector of the Southern at Louisville, Ky.

A. V. Harger has been appointed Traveling Passenger Agent of the Baltimore & Ohio at Chicago.

C. R. Nethercot has been appointed Traveling Freight and Passenger Agent of the Mexican Central at Chicago.

B. C. Tucker, Commercial Agent of the Canadian Pacific at Cleveland, Ohio, has been appointed District Passenger Agent at Cleveland.

G. L. Whitney, Commercial Agent of the Louisiana Railway & Navigation Co., at Dallas, Tex., has been appointed General Agent for Texas.

W. H. Johnson has been appointed Immigration Agent of the White River division of the Missouri Pacific, with office at Springfield, Mo.

On January 1, the traffic officers of the El Paso & Southwestern assumed charge of the Traffic Department of the Morenci Southern.

J. C. Smith, Contracting Freight Agent of the Canadian Pacific, at Pittsburgh, Pa., has been appointed Traveling Freight Agent at Pittsburgh.

H. H. Sparks has been appointed General Live Stock Agent of the Kansas City, Mexico & Orient, with offices at Kansas City, Mo., and Sweetwater, Tex.

M. L. Akers has been appointed General Agent of the Chesapeake & Ohio, at Louisville, Ky., with general supervision over business in Louisville and vicinity.

E. O. Eckhart has been appointed Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, at St. Paul, Minn., succeeding Raymond Kelly, promoted.

W. P. Hinton, General Passenger Agent of the Grand Trunk, has been appointed Assistant Passenger Traffic Manager of the Grand Trunk Pacific, with office at Winnipeg, Man.

C. A. Forrest, Traveling Freight Agent of the St. Louis & San Francisco at Atlanta, Ga., has been appointed Commercial Agent at Chattanooga, Tenn. J. E. Bell succeeds Mr. Forrest.

James R. Hurley, Traveling Passenger Agent of the Lake Shore & Michigan Southern, at Milwaukee, Wis., has been appointed General Agent of the New York Central Lines at Milwaukee.

J. H. Mallory, Commercial Agent of the Illinois Central, at Memphis, Tenn., has been appointed General European Agent, with office at London, England, succeeding Donald Rose, promoted.

F. L. Comstock, General Freight Agent of the Kalamazoo, Lake Shore & Chicago, has resigned to become associated with the Dunkley Williams Co., and the position of General Freight Agent has been abolished.

John J. Carroll, Assistant General Baggage Agent of the Chicago & Western Indiana, has been appointed General Baggage Agent, with office at Chicago, succeeding J. D. Phillips, deceased. John T. Conlon succeeds Mr. Carroll.

D. F. McDonough, Commercial Agent of the St. Louis & San Francisco at Birmingham, Ala., has been appointed Division Freight Agent at Birmingham, succeeding J. C. La Coste, promoted. B. R. Starnes succeeds Mr. McDonough.

Charles M. Wilkinson, Soliciting Freight Agent of the Kansas City Southern, at Houston, Tex., has been appointed Commercial Agent, Freight Department, of the Kansas City Southern and the Texarkana & Ft. Smith, at 423 Navarro street, San Antonio, Tex. This is a new office, opened on February 1. George Riley succeeds Mr. Wilkinson.

H. F. West, Division Freight Agent of the Mohawk district, of the New York Central & Hudson River, at Albany, N. Y., has been appointed Division Freight Agent of the Middle district, with office at Syracuse, N. Y. G. C. Woodruff succeeds

Mr. West. Seneca Kelly has been appointed Traveling Freight Agent of the Middle district, with office at Syracuse.

R. H. Morris, Commercial Agent of the Southern Railway, at Cincinnati, Ohio, has been transferred as Commercial Agent to Chicago, succeeding D. E. Williams, Jr., transferred. H. B. Stafford, Traveling Freight Agent, at Cincinnati, succeeds Mr. Morris. C. C. Woodworth, Traveling Freight Agent, at Nashville, Tenn., succeeds Mr. Stafford, and C. A. Russel succeeds Mr. Woodworth.

Engineering and Rolling Stock Officers.

William Doyle has been appointed Assistant Superintendent of Structures of the Northern Railway, with office at San Jose, Costa Rica.

E. G. Osgood has been appointed Master Mechanic of the Williamsville, Greenville & St. Louis, succeeding O. D. Greenwalt, resigned.

L. H. Long has been appointed Chief Engineer in Charge of Construction of the Cananea, Yaqui River & Pacific, with office at Empalme, Sonora, Mexico.

The jurisdiction of J. P. Nolan, Master Mechanic of Morgan's Louisiana & Texas, has since February 8 been confined to the Algiers shops and Mississippi terminals. (See article in another part of this issue.)

J. C. Garden has been appointed Master Mechanic of the Eastern division of the Grand Trunk, with office at Montreal, succeeding T. McHattie, whose appointment to a position with another company we have previously announced.

The title of A. J. Himes, Assistant Chief Engineer of the New York, Chicago & St. Louis, has been changed to Engineer of Grade Elimination, and all employees in the engineering department connected with the work of eliminating grade crossings in Cleveland, Ohio, will be under his jurisdiction, and all questions relating to construction work involving train service and requiring action by the engineering department will be referred directly to the Engineer of Grade Elimination.

Charles L. Gaspar, Mechanical Engineer of the Wisconsin Central, has been appointed Superintendent of Motive Power of the Canton-Hankow Railway, China. He sails from San Francisco on February 16. Mr. Gaspar, who is about 32 years old, was born in Waukesha, Wis. He was educated at the University of Wisconsin, and then took a mechanical course in railway engineering at Purdue for two or three years. In the fall of 1899 he went into the Wisconsin Central shops as a special apprentice. He worked through different grades, becoming a machinist in 1902. From 1902 to 1903 he was chief draftsman, and in 1904 was made Mechanical Engineer in charge of the motive power department, reporting to the Superintendent of Motive Power and Cars. The Canton-Hankow at present operates about 40 miles of road, and it is now probable that much more will soon be built, so as to connect with the Pekin-Hankow at Hankow, making a north and south trunk line. The road is equipped with American cars and locomotives, so it is natural that the management should want an American motive power man to take charge of this equipment. Mr. Graham succeeds the late Mr. Reilly, whose work was highly appreciated.

C. L. Gaspar.

Albert W. Newton, Superintendent of the Creston division of the Chicago, Burlington & Quincy, with office at Creston, Iowa, has been appointed General Inspector of Permanent Way and Structures, with office at Chicago. William A. Card, Assistant Superintendent at Galesburg, Ill., succeeds Mr. Newton.

George P. Smith, whose appointment as Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis has been announced in these columns, was born on March 7, 1859, at South Deerfield, Mass. He graduated from the Worcester Institute of Technology, Worcester, Mass., in June, 1885. He began railway work in 1886 as a draftsman for a locating party of the Burlington & Missouri River, now a part of the Chicago, Burlington & Quincy, and continued in the service of that road in various positions in the Engineering Department, including location, construction and maintenance of way, until January 1, 1896, when he became draftsman for the Lassig Bridge Co., Chicago. In June, 1897, he was appointed Chief Engineer of the St. Joseph & Grand Island. In October, 1900, he was made First Assistant Engineer of the Lake Shore & Michigan Southern, and on April 1, 1902, he was appointed Engineer of Maintenance of Way of the Indiana, Illinois & Iowa, now a part of the Chicago, Indiana & Southern. In July, 1905, he was appointed Chief Engineer of the Lake Erie & Western, which position he held until his recent appointment.

G. P. Smith

Edward Williams Pratt, whose appointment as Assistant Superintendent of Motive Power and Machinery of the Chicago & North Western was recently announced in these columns, was born at Fort Atkinson, Wis., on June 2, 1869. His father, George A. Pratt, was at the time of his death the oldest in point of service of any agent on the Chicago & North Western, and his uncle was the late Dr. William H. Williams, of the Baldwin Locomotive Works. When he was 13 he learned telegraphy in his father's office. He received his education from the public and high schools in his home town and completed the course in Mechanical Engineering at Lehigh University. During his several vacations, he took up field work in civil engineering on the Chicago & North Western and the Elgin, Joliet & Eastern, the latter being under construction. After graduating from Lehigh he entered the employ of the Western Electric Co., Chicago, and a short time later he was appointed Superintendent of the Chicago Hardware Manufacturing Co. In 1892 he again entered the employ of the Chicago & North Western, in the air-brake repair room, and later the same year he was appointed General Air-Brake Inspector. During his more than seven years in that position he was an active member of the Air-Brake and the Traveling Engineers' Associations and was recognized as one of the best authorities on the air-brake. He was one of the first to instruct on the double brake applications for passenger trains and also helped to develop the

E. W. Pratt.

system of progressive examinations for firemen and engimen. On January 1, 1900, he gave up the air-brake work and became Roundhouse Foreman, at Chicago, in order to learn more of the duties of the Mechanical Department. In June, 1900, he was made General Foreman of the Ashland division, at Ashland, Wis. In November, 1901, he was appointed Master Mechanic of the Iowa and Minnesota division, at Mason City, Iowa. In January, 1903, he was appointed Master Mechanic of the Fremont, Elkhorn & Missouri Valley, now a part of the Chicago & North Western. He was also given charge of the car and locomotive departments of the Wyoming & North Western, a subsidiary line in Wyoming.

Louis Charlton Fritch has been appointed Consulting Engineer of the Illinois Central, Indianapolis & Southern and the Yazoo & Mississippi Valley, as previously announced in these columns. He was born in August, 1867, at Springfield, Ill. He was educated at the University of Cincinnati, where he took a course in Civil Engineering and later took a law course and was admitted to the bar in Ohio. He began railway work in 1884 as supervisor's assistant on the Ohio & Mississippi, now a part of the Baltimore & Ohio Southwestern. On January 1, 1886, he was made Assistant Engineer of the Ohio & Mississippi, and in October, 1892, Engineer of Maintenance of Way, succeeding to the position formerly filled by the Chief Engineer and Master of Maintenance of Way. He was also made Chief Engineer of the Cincinnati & Bedford. On November 1, 1893, he was appointed Division Engineer of the Baltimore & Ohio Southwestern, and in September, 1899, Superintendent of the Mississippi division. From February, 1904, to March 1, 1905, he was conducting some special work for the Illinois Central, at Chicago. On March 1, 1905, he was appointed Assistant to the General Manager of the Illinois Central, and in November, 1906, was made Assistant to the President. As Consulting Engineer, Mr. Fritch will have charge of the proposed electrification work at Chicago.

Louis C. Fritch.

Walter William Colpitts, Assistant Chief Engineer of the Kansas City, Mexico & Orient, has been appointed Chief Engineer, succeeding M. P. Paret, resigned. Mr. Colpitts was born September 17, 1874, at Moncton, N. B. He graduated from McGill University, Montreal, in 1899, with the degrees of B.S. and C.E., and in 1901 he received the degree of M.S. from the same university. During his university education he led his class each year and graduated with honors, winning the British Association Gold Medal. He began railway work in 1890 as a draftsman in the office of the Chief Engineer of the Intercolonial of Canada. In 1891 and 1892 he was rodman, levelman and transitman for a surveying corps of the same road, and in 1893 he was appointed Resident Engineer in charge of construction of the train ferry service at Strait of Canso, Nova Scotia. In 1894 and 1895 he was transitman on surveys for branch lines, and in 1896 he was in the office of the Chief Engineer, designing bridges, buildings, etc. In 1897 he was appointed Assistant Engineer of the Murray Harbor branch of the Prince Edward Island Railway. In 1898 he was made Resident Engineer of the Midland Railway of Nova Scotia and in 1899 Chief Clerk in the office of the President of the Canadian Pacific at Montreal. In 1900 he was made Assistant Engineer of the Construction Department of the Canadian Pacific, at Winnipeg, Man. In 1901 he was appointed Assistant Engineer of the Kansas City, Mexico & Orient, and in January, 1902, was made Division Engineer. In December, 1903, he was appointed Assistant Chief Engineer of the same road, this being his position until his recent appointment.

Special Officers.

A. S. Maynard has been appointed Chief Commissary Agent of the Canadian Pacific, with headquarters at Montreal, Que. This is a new department and is for the purpose of facilitating the purchase of supplies for the company's hotels. Assistants will be appointed and will be stationed at St. John, N. B.; Toronto, Ont.; Winnipeg, Man.; Calgary, Alta.; Vancouver and Victoria, B. C.

Purchasing Officers.

A. F. Hull has been appointed Purchasing Agent of the Rock Island-Frisco Lines at Ft. Worth, Tex.

OBITUARY.

Thomas E. Newman, Road Foreman of Engines of the Baltimore & Ohio, died last week.

William Purcell, President and Treasurer of the Coahuila & Zacatecas, died February 5 at San Antonio, Tex.

A. G. Yates, President of the Buffalo, Rochester & Pittsburgh, died of apoplexy at New York on January 12.

Charles P. Adams, Superintendent of Telegraph of the Southern Railway, died at Washington, D. C., February 9.

James A. McLain, General Live Stock Agent of the Cincinnati, Hamilton & Dayton, died of pneumonia on February 1.

William J. Kealey, General Freight and Passenger Agent of the Chicago, Kalamazoo & Saginaw, died on Wednesday, February 3.

John D. Phillips, General Baggage Agent of the Chicago & Western Indiana, died at Chicago on February 2. He was 50 years old.

Railroad Construction.

New Incorporations, Surveys, Etc.

Arkansas Southeastern.—This company, operating 57 miles of railway from Randolph, La., east and southeast to River Junction, is said to have given contracts to S. R. Neal and N. M. George, of Farmerville, La., to build an extension south to Farmerville, five miles.

Canadian Pacific.—The Manitoba & Northwestern is applying for an extension of time to build the following lines: From Sheho to Prince Albert, Sask.; extension of the Shell River branch from Russell, Man., to the northern or western boundary of Manitoba; branch line from the main line between Portage la Prairie, Man., and Arden, via the Riding mountains to the northern or western boundary of Manitoba; branch line from a point between Westbourne, Man., and Beautiful Plains, northwesterly in the direction of Lake Dauphin or Duck mountains; branch line from the main line between Theodore, Sask., and Insinger in a westerly and northwesterly direction to a junction with the Quill Lakes branch at Township 32, range 18 or 19, west of the second meridian, about 80 miles; branch line from Bredenbury, Sask., on the main line northerly to Kamsack, about 42 miles.

Construction will be commenced in the spring on the line from Weyburn, Sask., and it is expected that about 25 miles will be completed during the current year. Grading on the gap between Saskatoon, Sask., and Edmonton, Alb., has been completed and track will be laid during the year. An 80-mile line from near Lethbridge, Alb., to join the line between Macleod and Calgary, is also in contemplation. It is intended to build at once to the Little Bow river, a distance of 30 miles. Another line of about 100 miles will be built from Cheadle, Alb., on the main line north to connect with the Lacombe-Stettler extension. Work on this section will be carried only to Ghost Pine creek, about 40 miles, during the present year.

Wm. Whyte, Second Vice-President of this company, is quoted as saying that the company will spend $6,000,000 in

constructing new lines in the West, including those on which work was begun last year. The total mileage to be built will be between 250 and 300 miles.

The Outlook branch of the Western division has been extended from Conan, Sask., northward to Outlook, 28 miles; a new branch called the Broomhill branch has been opened for business on the Central division from Lauder, Man., westward to Tilston, 28 miles.

CENTRAL CALIFORNIA.—See Southern Pacific.

CHAMPLAIN & SANFORD.—Surveys have been completed from Lake Sanford, N. Y., to Riverside for this line, which is to be approximately 58 miles long, to run from Lake Sanford to Schroon Lake, and along the west shore of Schroon Lake to Pottersville, thence through Chester to Raparious on the Adirondack division of the Delaware & Hudson.

CHESAPEAKE & OHIO.—Work is under way at the present time on an extension of the Coal River Ry., from Clothier, Va., to the mouth of Laurel fork along Laurel fork, a distance of five miles; also along Spruce fork for a distance of five miles. G. E. McComas, Contractor, Madison, W. Va.

COAL RIVER RAILWAY.—See Chesapeake & Ohio.

COLORADO & SOUTHERN.—Press reports from Denver, Colo., indicate that between May and September of this year this company will build the proposed extension from Pueblo, Colo., south to Walsenburg, 56 miles, on which grading has been completed. (Nov. 6, p. 1321.)

Press reports from Denver, Colo., indicate that between May 1 and September 1, this company will build the proposed extension from Fort Collins, Colo., north to Cheyenne, Wyo., about 40 miles, surveys for which, it is said, are now being made. (Oct. 23, p. 1226.)

DAYTON, LEBANON & CINCINNATI.—This company, building a steam line from Dayton, Ohio, south to Lebanon, where connection will be made with the Cincinnati, Lebanon & Northern, expects to let contracts within the next 30 days for the line from Lambeth, Ohio, to Dayton, two miles, which has been surveyed. (Nov. 6, p. 1321.)

ELIZABETH & AMBOY TRACTION.—The Traction Development Company was recently incorporated in New Jersey with a capital of $100,000, for the purpose of securing franchises, rights of way and engineering plans for this company. The incorporators include former United States Senator R. F. Pettigrew, R. M. Montgomery, of the East Linden Development Co.; Dr. H. B. Hogeland, W. J. Lansley, of the Hudson & Mddlesex Telephone Co.; P. A. Peterson, of Perth Amboy, and C. A. Trimble, of Elizabeth. Actual work on the proposed electric line from Elizabeth to Perth Amboy will probably be started at Linden within the next two months. From Linden the company has a private right of way for several miles. J. A. McClary, of Rahway, N. J., has charge of the rights of way and engineering plans of the company. P. E. Jones, 27 Pine street, New York, is General Counsel.

ERIE.—See Hudson & Manhattan.

FLORIDA EAST COAST.—An officer is quoted as having said that trains will be in operation into Key West within six months, and that the work of laying the concrete road between Knight's Key and Key West is being pushed with all possible speed.

GRAND LAKE & BEND RIVER.—Incorporation is to be asked for in Quebec to build from a point on the Grand Trunk Pacific (National Transcontinental) to Twenty-one-Mile Bay, an arm of the Grand Lake, or to Rabbit lake on the Ottawa river; also a 12-mile branch line. E. B. Devlin, Hull, Que., is solicitor for the applicants.

GULF, COLORADO & SANTA FE.—An officer writes that work is now in progress and will probably be completed in June on the line building from Center, Tex., via Tenaha to Zuber, 21.3 miles. John Scott & Sons, Contractors, St. Louis, Mo. Work of reballasting the Beaumont division from Rayburn, Tex., east, 16 miles, is now in progress. C. F. W. Felt, Chief Engineer, Galveston, Tex. (Aug. 7, p. 693.)

HOLSTON RIVER RAILWAY.—See Virginia & Southwestern.

HUDSON & MANHATTAN.—This company was incorporated in 1906 in New York and New Jersey as a consolidation of the Hoboken & Manhattan Railroad Co., of New Jersey; the New York & Jersey Railroad Co., of New York, and the Hudson & Manhattan Railroad Co., of New York, the new corporation becoming owner of all the tunnels, franchises and properties of the several constituent companies.

The company now owns, and is operating, a double-tube tunnel from Sixth avenue and Twenty-third street, New York, under the Hudson river to the Delaware, Lackawanna & Western passenger station in Hoboken, N. J., a distance of about three miles. The first trains were operated February 26, 1908. The line under Sixth avenue, New York, is being extended from Twenty-third to Thirty-third street. A branch will also be built from Sixth avenue, under Ninth street, to a connection with the subway at Fourth avenue. A double-tube tunnel, which will be the main line of the system, is being built from Hoboken in a southerly direction through the Erie and Pennsylvania stations in Jersey City, and thence under the Hudson river to the Hudson Terminal buildings, Church street, New York. These terminal buildings extend from Cortlandt to Fulton street, two blocks. It is expected that the main line will be in operation about July 1, 1909. The south tube was holed through on January 27, 1909. An extension is to be built from the Pennsylvania station in Jersey City west to connect with the present main line of the Pennsylvania beyond Bergen Hill, and upon its completion, in 1910, trains will be run through between the Hudson Terminal buildings and Newark, N. J., the trains running through the tunnels and over the Pennsylvania's present main line into Newark. The Pennsylvania will maintain ticket offices in the Hudson Terminal buildings and baggage will be checked there for points throughout the entire system. A traffic agreement has been entered into with the Erie.

IOWA & OMAHA SHORT LINE.—An officer writes that the section of this line from Council Bluffs, Iowa, to Traynor, 15 miles, is under contract to George W. Adams & Co., Walnut, Iowa. Grading on the remaining 115 miles will be undertaken this spring. J. H. Mayne, Chief Engineer, Walnut, Iowa.

JOPLIN UNION DEPOT COMPANY.—Capitalized at $500,000 to build and operate a union station in Joplin, Mo. Capital stock is divided into 5,000 shares of par value $100, to be held as follows: W. B. Jansen and Robert Dunlap, of Chicago, one share each; J. A. Edson and S. W. Moore, of Kansas City, Mo., one share each; Charles Gilbert, of St. Louis, one share, and the remaining shares to be divided, in proportions to be hereafter agreed upon, among the Atchison, Topeka & Santa Fe, the Missouri & North Arkansas, and the Kansas City Southern. No work has yet been done as plans are not yet completed. J. A. Edson, President; S. W. Moore, Vice-President and Secretary, and H. Visscher, Treasurer, all of Kansas City, Mo.

KAPITCHOUAN RAILWAY.—Application will be made to the Canadian Parliament for the incorporation of this company, which intends to build a line of railway from a point on the Grand Trunk Pacific near Lake Kapitchouan, Que., in a southeasterly direction to Montreal, with branches about 12 miles long each. G. Desaulnies, Montreal, solicitor.

KANSAS CITY, MEXICO & ORIENT.—Reports from Austin, Tex., indicate that this company has asked the Legislature to enact a special law giving it an extension of five years' time in which to carry out the terms of its charter, which provide for the completion of its line through Texas, including the building of a branch line from San Angelo, Tex., to either Del Rio or Brownsville, on the Rio Grande.

KOKOMO WESTERN TRACTION.—An officer writes that this company, which will build a traction line from Kokomo, Ind., west to Young America, 17 miles, is now ready to receive bids from responsible construction companies. C. C. McFann, President and General Manager, Kokomo, Ind. (Dec. 11, p. 1560.)

LAKE ARTHUR, JENNINGS & NORTHERN.—Incorporated in Louisiana, with $500,000 capital stock to build a road from Lake Arthur, La., north, 10 miles, to Jennings and possibly further north to some point on the Colorado Southern, New Orleans & Pacific. W. D. Conover, President, Lake Arthur.

LAKE ERIE & YOUNGSTOWN (ELECTRIC).—An ordinance was recently passed by the City Council of Youngstown, Ohio, granting permission to this company to build its line into that city. The company was organized to build an electric line from Conneaut, Ohio, south to Youngstown, 60 miles. (Nov. 13, p. 1374.)

LOUISVILLE & ATLANTIC.—A new branch called the Sturgeon Creek branch has been opened for freight service from Heidelburg, Ky., to Ida May.

MANITOBA & NORTHWESTERN.—See Canadian Pacific.

MEXICAN CENTRAL.—A new branch of the Torreon division has been opened for business from San Pedro, Coahuila, to Hornos, 14.3 miles.

MILWAUKEE NORTHERN (ELECTRIC).—An officer writes that this company, which finished work in September on an extension from Cedarburg, Wis., north to Sheboygan, 30 miles, will double-track the line in operation from Milwaukee north to Cedarburg, and build a single-track branch from Cedarburg west to West Bend in 1909. The company's plans call for a line from Milwaukee north to Cedarburg, where it forks, one branch extending north to Sheboygan and the other northwest via West Bend to Fond du Lac, in all 120 miles. (Oct. 16, p. 1177.)

NASHVILLE, FAYETTEVILLE & BIRMINGHAM.—This company is said to have been incorporated in Alabama with $50,000 capital to build a line from Nashville, Tenn., south to Birmingham, Ala., 200 miles. J. C. Diemer, President, and J. M. Robertson, Treasurer. The headquarters of the company are to be at Huntsville, Ala.

NATIONAL LINES OF MEXICO.—Press reports from Durango Mex., indicate that surveys have been started on the proposed extension of this line from Durango, Dur., southwest to Mazatlan, Sin., on the Pacific coast. This extension will give the National Lines a direct outlet to the Pacific coast and through connections with the International & Great Northern and the Missouri Pacific to Kansas City, Mo. (Jan. 29, p. 236, Mexican Roads.)

NEVADA & CALIFORNIA.—See Southern Pacific.

NEW YORK, AUBURN & LANSING (ELECTRIC).—This road has been extended from Tarbell, N. Y., south to Ithaca, 11.3 miles, and the entire road is now in operation from Auburn, N. Y., to Ithaca, 37 miles. The road is being operated by steam power from Auburn to South Lansing, and electrically operated from South Lansing to Ithaca. The entire road is to be equipped with the third-rail system during the coming summer.

OHIO ROADS (ELECTRIC).—B. B. Putnam and D. A. Bartlett, of Marietta, Ohio, are interested in a project to build electric lines to connect Athens, Ohio, with Nelsonville and Glouster, about 14 miles.

OREGON & WASHINGTON.—According to press reports, a contract has been let for the construction of the Gray's Harbor branch, from Cosmopolis, Wash., on Gray's Harbor, to the main line of the O. & W. Portland-Seattle line, about 40 miles. Work is to be started at once.

PENNSYLVANIA.—See Hudson & Manhattan.

PORTLAND, BAKER CITY & BUTTE ELECTRIC.—Incorporated in Oregon with $2,000,000 capital and headquarters at Portland. The company proposes to build a line from Portland, Ore., east through Clackamas, Wasco, Wheeler and Grant counties to Baker City, Baker county, thence east across Idaho to Butte, Mont., about 500 miles. The incorporators include C. D. Charles, M. W. Gill and H. J. Martin, of Rowe & Martin, all of Portland.

RALEIGH & SOUTHPORT.—Surveys are being made, it is said, for an extension from the present southern terminus to Fayetteville, N. C., south to Hope Mills, five miles.

SACRAMENTO SOUTHERN.—See Southern Pacific.

SOUTHERN PACIFIC.—The annual report of this company for the year ended June 30, 1908, says that during the year there was a net increase in sidings of 153.61 miles. The average number of miles of railway operated for the year was 9,50[illegible] miles.

On the Nevada & California extension from Keeler, Cal., to Mojave, a distance of about 146 miles, about 36 miles are completed and work on the remaining 110 miles is now in progress.

On the line of the Central California from Niles, Cal., to Red Wood City, a distance of about 16 miles, about seven miles are completed and the grading on the remaining two miles is nearing completion.

On the line of the Sacramento Southern, from Sacramento, Cal., to Antioch, a distance of about 54 miles, about two miles of track and about 10 miles of grading are completed, and work is now in progress on the remainder of the line.

SOUTHERN TRACTION COMPANY.—Plans are said to have been made by this company to build an interurban line from Fort Worth, Tex., south via Burleson and Joshua to Cleburne, about 30 miles. Location surveys to be made soon. Address F. H. Peters and S. P. Hovey, both of Fort Worth.

TEMISKAMING & NORTHERN ONTARIO.—The main line of this road has been extended from Matheson, Ont., northward to Cochrane, 47 miles, and a new branch called the Charlton branch has been opened for business from Englehart, Ont., to Charlton, eight miles.

TENNESSEE NORTHEASTERN.—This company is said to be making surveys for a line to be built from near Winfield, Tenn., on the Cincinnati, New Orleans & Texas Pacific, southwest through Scott, Fentress, Cumberland and White counties, to the Nashville, Chattanooga & St. Louis, near Ravenscroft, about 90 miles. D. L. Fickes, President, and P. C. Chesbrough, Treasurer, both of Scranton, Pa.

TEXAS & GULF.—This road has been opened from Watterman, Tex., to Emmons, 3.6 miles.

VERA CRUZ TERMINAL.—According to press reports work has been started on the large terminal improvements at Vera Crūz, Mex. Contract for the construction of two large custom warehouses, a bonded warehouse, office building, roundhouses and machine shops has been given to S. Pearson & Sons, Ltd., for a union passenger station, coach sheds, tool houses and a concrete viaduct 1,200 ft. long, to the Compania Bancaria de Obras y Bienes Raices of Mexico City. A representative of the latter company is quoted as saying that a reinforced concrete fence about 3,280 ft. long has been built, and work started on the concrete viaduct. The passenger station is to be of reinforced concrete construction, also most of the buildings to be erected by this company. The work will be rushed through to completion, and it is hoped that the Terminal company can occupy the new structures before the expiration of two years allowed by the contract. Track, aggregating 35 miles, is to be laid in freight yards included in the improvements. J. W. Richardson is Chief Engineer. (R. R. G., May 15, p. 688.)

VIRGINIA & SOUTHWESTERN.—An officer is quoted as saying that the Holston River Railway, building a 38-mile line from the V. & S., at Persia, Tenn., south to Moccasin Gap, Va., has about 75 per cent. of the grading finished. Additional contracts to finish the line, it is said, are to be let shortly. (Jan. 1, p. 37.)

VIRGINIAN RAILWAY.—Track has been laid from Altavista, Va., west to Roanoke, and trains are now in operation from Norfolk, Va., west to mile 320.6 at Rich Creek, also from Princeton, W. Va., northwest to Deepwater, W. Va., 101 miles. There remains a gap between Rich Creek and Princeton of about 21 miles yet to be put in operation.

VIRGINIA ROADS.—H. W. Walters, of the Commonwealth Lumber Co., of Pennsylvania, and W. H. Landes, of Staunton, Va., are planning to build a line through timber lands from Christian, Va., west to Deerfield, 20 miles.

WABASH-PITTSBURGH TERMINAL.—An officer for the Receivers of this company writes that the work being carried out includes replacing old timber trestles with steel bridges and viaducts, on concrete masonry in a few cases, and with concrete arches and embankments in the majority of cases. About half a dozen structures were wholly or partially com-

pleted in 1908, and this work is to be finished in 1909. About 75 existing steel bridges are to be repainted in 1909, and the lining of two tunnels with concrete will be finished by the company's forces. Contracts for lining seven tunnels with concrete during 1909 have been let, and the remaining five tunnels will be completed by the company's forces. W. F. Purdy, Chief Engineer, for the Receivers.

Railroad Financial News.

BALTIMORE & OHIO.—The company has sold $13,000,000 Pittsburgh, Lake Erie & West Virginia system refunding mortgage 4 per cent. bonds of 1901-1941 to Speyer & Co. and Kuhn, Loeb & Co., New York, and Alexander Brown & Co., Baltimore, Md. There was previously outstanding $31,347,000 of these bonds.

BROOKLYN RAPID TRANSIT.—An initial dividend of 1 per cent. has been declared on the $45,000,000 capital stock. In declaring the dividend the directors said "that as dividends are declared, they will be made payable on the first days of April, July, October and January. The present declaration of 1 per cent. is not considered as necessarily establishing a 4 per cent. yearly rate.

James M. Wallace, George F. Porter and J. Horace Harding have been elected directors, succeeding the late Anson R. Fowler, H. H. Porter and the late J. C. Jenkins respectively.

CHESAPEAKE & OHIO.—The stockholders have authorized $30,000,000 5 per cent. 20-year general funding and improvement mortgage bonds, of which $11,000,000 bonds have been sold to New York bankers. The proceeds of the bond sale are to be used to fund $7,500,000 6 per cent. collateral notes, due January 1, 1910, and for other capital requirements for additions and extensions.

CHICAGO & MILWAUKEE ELECTRIC.—The Illinois division bondholders' committee say that sufficient bonds have been deposited to permit the beginning of foreclosure proceedings.

GREEN BAY & WESTERN.—The directors have declared the regular 5 per cent. dividend on the $2,500,000 stock and on the $600,000 A debentures, and in addition, three-eighths of 1 per cent. on the $7,000,000 B debentures. Five per cent. has been paid yearly on both the stock and the A debentures since 1904. In February, 1908, one-half of 1 per cent. was paid on the B debentures.

INTERCOLONIAL RAILWAY.—George P. Graham, Canadian Minister of Railways, in reply to questions in Parliament in regard to the operation of the Intercolonial Railway for the last nine months of 1908, as compared with the corresponding period of 1907, gave the following figures: April-December, 1907, earnings $6,439,174, expenditures $6,061,007, surplus $378,167; April-December, 1908, earnings $5,976,433, expenses $6,313,732, deficit $337,299.

INTER-STATE RAILWAYS.—Edward B. Smith & Co., Philadelphia, Pa., ask the deposit of bonds of the Inter-State Railways with the Philadelphia Trust Safe Deposit & Insurance Co., and say:

"If bonds to the amount of $5,000,000 are deposited, the depositing bondholders are to elect a committee of five, which in conjunction with the firm, are to obtain expert reports upon the physical and financial condition of the several properties and then prepare a plan for the reorganization of the company. This plan is to be submitted at least 60 days before the sale, and dissenting bondholders can then withdraw their bonds upon paying their pro rata share of the expenses, not exceeding 1 per cent. of the bonds deposited. Unless 40 per cent. of the deposited bonds dissent within 30 days, it is then to be binding upon all."

IOWA CENTRAL.—Tailer & Co., New York, are offering $400,000 Iowa Central first refunding 4 per cent. bonds of 1901-1951 at 81½. This is part of an authorized issue of $25,000,000, of which there is outstanding $4,970,000.

LAKE SHORE & MICHIGAN SOUTHERN.—E. H. Harriman has been elected a director of this company, succeeding Samuel F. Barger, resigned.

MANISTEE NORTHEASTERN.—The receivers of the Buckley & Douglas Lumber Co. have been authorized to mortgage the property of the Manistee Northeastern to secure an issue of $1,500,000 5 per cent. bonds to be dated January 1, 1909. The proceeds of the sale are to be used to pay debts of Ruggles & Buckley, lumbermen, and the floating debt of the railway, and for the purchase of new equipment and extension of the road. The main line of the road runs from Manistee, Mich., to Traverse City, and the company operates in all about 180 miles.

MICHIGAN CENTRAL.—E. H. Harriman has been elected a director of this company, succeeding Samuel F. Barger, resigned.

MINNEAPOLIS & ST. LOUIS.—First and refunding mortgage 4 per cent. bonds of 1899-1949, amounting to $1,015,000, are to be issued to retire a like amount of Iowa extension 7 per cent. bonds due June 1, 1909. Of the first and refunding bonds, the New York Stock Exchange has listed $350,000, making the total listed to date $10,855,000.

MISSOURI PACIFIC.—Collateral trust convertible 6 per cent. notes, $6,000,000 authorized, dated February 10, 1908, redeemable at the option of the company at 101, have been called for payment on March 12.

NATIONAL RAILWAYS OF MEXICO.—The board of directors has been increased from seven to 21, and H. Clay Pierce has been elected chairman. The new members of the board are: Jose Yves Limantour, E. N. Brown, Julio M. Limantour, S. M. Felton and Jose Signoret, of Mexico City, and Wm. H. Nichols, H. Clay Pierce, Henry S. Priest, Bradley W. Palmer, Clay Arthur Pierce, Eben Richards, James Speyer, Ernst Thalmann and James N. Wallace, of New York; these last named members to constitute the local board in New York. It is understood that of the local board in New York, Messrs. Speyer, Nichols, Thalmann and Wallace were elected to represent the interests of the Mexican Government.

NEW ORLEANS, FORT JACKSON & GRAND ISLE.—An injunction secured by Charles D. Haines some time ago to prevent the New Orleans Southern from holding a controlling interest in the stock of the N. O., F. J. & G. I. has been vacated. A controlling interest in the outstanding $247,000 stock was pledged by Mr. Haines to secure a loan. Arthur Kennedy and associates, having obtained possession of this stock, organized the New Orleans Southern, to which the Grand Isle was leased, prior to October, 1908.

ST. LOUIS, ROCKY MOUNTAIN & PACIFIC.—Fisk & Robinson, New York, are offering the unsold portion of the $7,500,000 first mortgage 5 per cent. bonds of 1905-1955 at 95½, yielding 5¼ per cent. The bonds are secured by a first mortgage on 106 miles of standard gage road, connecting the company's coal mines and coke ovens with the Atchison, Topeka & Santa Fe, the Colorado & Southern and the El Paso & Southwestern, and on 299 square miles of coal lands in Colfax county, New Mexico, owned in fee simple, and 513 square miles of coal lands in the same county, wherein coal rights and surface necessary for mining are owned.

WABASH.—The injunction granted in the suit brought by James Pollitz preventing the Wabash from retiring its debenture bonds has been vacated by Judge Ray in the United States Circuit court. The Wabash offered to exchange first refunding and extension mortgage bonds for the $30,000,000 outstanding debenture A and debenture B bonds of 1889-1939. For each debenture A bond, holders received $795 in new 4s and $580 in prefred stock and $580 in common stock, and for each debnture B received $720 in new 4s, $520 in preferred stock and $520 in common stock. All of the debentures except $389,000 of the A and $1,281,000 of the B have been exchanged.

WISCONSIN CENTRAL.—Under the plan of control of the Wisconsin Central by the Minneapolis, St. Paul & Sault Ste. Marie (itself cont.olled by the Canadian Pacific) annual dividends of 4 per cent. on the preferred stock of the Wisconsin Central have been guaranteed for 99 years by the Soo, and the preferred stockholders at the same time surrender their rights to share profits with the common stock above 4 per cent.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Burlington & Quincy is asking prices on 25 locomotives.

The New York, Chicago & St. Louis is asking prices on 20 locomotives.

The Juragua Iron Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Augusta Southern has ordered one locomotive from the Baldwin Locomotive Works.

The Georgia & Florida has ordered two locomotives from the Baldwin Locomotive Works.

The Gilchrist-Fordney Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Michigan Alkali Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Eddy Manufacturing Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Northwestern of Brazil has ordered three locomotives from the Baldwin Locomotive Works.

The Delaware, Lackawanna & Western has ordered 40 locomotives from the American Locomotive Co.

The Nevada Northern has ordered one locomotive from the American Locomotive Co. to be built at the Brooks Works.

The Minneapolis, St. Paul & Sault Ste. Marie, reported in the *Railroad Age Gazette* of January 22 as asking prices on eight locomotives, has ordered four from the American Locomotive Co., to be built at the Schenectady works.

The Canadian Pacific, reported in the *Railroad Age Gazette* of January 22 and January 29, has ordered 30 Pacific locomotives from the Locomotive & Machine Co., of Montreal. These locomotives will have the following special equipment:

Bell ringer	Little Giant
Boiler lagging	Magnesia and asbestos
Brake beams	Simplex trussed
Brake shoes	Canadian Pacific standard
Couplers	Tower
Driving boxes	Cast steel
Firebox	Otis steel
Headlight	Pyle-National
Injector	Hancock
Journal bearings	Canadian Bronze Co.
Piston and valve rod packings	Lewis & Kunzer
Safety valve	World
Sanding device	Leech, A-10 double
Lubricators	Detroit
Steam gages	Star
Steam heat equipment	Gold
Superheater	Vaughan-Horsey
Tubes	National B and Mannesman
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The Rutland Railroad is in the market for six milk cars.

The Chicago, Burlington & Quincy is asking prices on 25 chair cars.

The Chicago Railways Co. is asking prices on 350 pay-as-you-enter cars.

The Chicago & Southern Traction is in the market for two interurban cars.

The Mississippi River & Bonne Terre has ordered 100 fifty-ton freight cars from the American Car & Foundry Co.

The Corvallis & Alsea River, building a logging road in Oregon, expects to ask bids for rolling stock about March 1, 1909.

The Dinwiddie & Gary, building a steam line in Indiana, is in the market for rolling stock. C. J. Hobbs, Chief Engineer, Kersey, Ind.

The Chicago, Milwaukee & St. Paul, reported in the *Railroad Age Gazette* of February 5 as being in the market for a number of passenger cars, is asking prices on 25 coaches, 15 baggage cars, 10 sleeping cars and four dining cars. This is in addition to the two buffet library cars reported in our issue of January 29, contract for which has not yet been placed.

The Chicago, Burlington & Quincy, reported in the *Railroad Age Gazette* of January 15 as in the market for four dining cars and four observation smoking cars, has ordered five dining and four club cars from the Pullman Co. The club cars are to be of a new design.

The Chicago, Rock Island & Pacific was reported in the *Railroad Age Gazette* of November 27 as preparing specifications for 70 passenger cars. The apportionment of these cars was noted in our issue of December 4. Sixty-nine of these cars, which have been ordered from the American Car & Foundry Co., will have all steel exteriors. The one observation car has also been ordered.

The Seaboard Air Line's specifications for the 500 box, 200 phosphate and 50 ballast cars that appeared in the *Railroad Age Gazette* of January 29, should have included Andrews side frames and American Steel Foundries truck bolsters for all the cars, and American Steel Foundries truck and body bolsters for the phosphate cars. The brake-beams and couplers will be of the Simplex type.

The Pennsylvania cars, reported in the *Railroad Age Gazette* of February 5, will have the following dimensions: Cambria Steel Co., 1,000 fifty-ton, center dump coke cars will be 40 ft. 2 in. long, 9 ft. 6 in. wide, 6 ft. 6 in. high, inside measurements, and 43 ft. 11 in. long, 10 ft. 1⅜ in. wide, 11 ft. 2 in. high, over all. The bodies and underframes will be of steel. Pressed Steel Car Co., 500 fifty-ton stock cars will be 35 ft. 11¼ in. long, 8 ft. 5¼ in. wide, 8 ft. ¼ in. high, inside measurements, and 40 ft. 5 in. long, 9 ft. 10 in. wide, 13 ft. 2⅝ in. high, over all. The bodies will be of wood and the underframes of steel. American Car & Foundry Co., 600 fifty-ton gondola cars will be 40 ft. 8 in. long, 8 ft. 9¼ in. wide, 2 ft. 6 in. high, inside measurements, and 44 ft. 11½ in. long, 10 ft. ⅞ in. wide, 6 ft. 10⅝ in. high, over all. The bodies will be of wood and the underframes of steel. Standard Steel Car Co., 100 fifty-ton flat cars will be 40 ft. 2 in. long, 9 ft. 3 in. wide, inside measurements, and 41 ft. 11 in. long, 9 ft. 11½ in. wide, 6 ft. 7⅝ in. high, over all. The bodies will be of wood and the underframes of steel.

IRON AND STEEL.

The Chicago Great Western will be in the market soon for about 5,000 tons of rails.

The Chicago, Milwaukee & St. Paul will be in the market soon for about 40,000 tons of rails.

The Chicago, Rock Island & Pacific has issued specifications for the manufacture of the 28,000 tons of Bessemer rails ordered from the Illinois Steel Co. late last year and is now in the market for 18,000 additional tons.

The Chicago & North Western, reported in the *Railroad Age Gazette* of November 13 as being in the market for 32,000 tons of rails, has ordered 10,000 tons of open-hearth rails from the Indiana Steel Co. to be rolled at Gary, Ind., and has released specifications on 20,000 tons of Bessemer rails ordered last year from the Illinois Steel Co.

The Baltimore & Ohio, reported in the *Railroad Age Gazette* of February 5 as preparing to close contracts for 1909 rail requirements, has ordered 37,000 tons of 90 and 100-lb. rails divided among the following companies: Maryland Steel Company, Bethlehem Steel Company, Carnegie Steel Company, and Illinois Steel Company. These rails are for delivery within 30 days. The B. & O. has also ordered 10,000 kegs of spikes, 5,000 kegs of bolts and a large quantity of angle plates and other track fixings.

RAILROAD STRUCTURES.

BATON ROUGE, LA.—The Texas & Pacific is building a new passenger station at a cost of about $2,500. (Feb. 5, p. 284.)

BIG SPRING, TEX.—The Texas & Pacific has prepared plans

for a new passenger station. An officer writes that although no appropriation has been made for this structure, it is thought it will be built during the next six months. It is to cost $16,000.

Houston, Tex.—The Houston Belt & Terminal Co. has decided to locate its new passenger station at Texas avenue and Crawford street. At a meeting of the directors on January 22, it was decided to prepare plans immediately for the new station and terminal buildings, including two roundhouses. It will probably be two or three months before bids are asked. (June 26, p. 406.)

The Houston Belt & Terminal Co. has retained Warren & Wetmore, of New York, as the architects to design the new union passenger station. (July 26, p. 406.)

Las Vegas, Nev.—The San Pedro, Los Angeles & Salt Lake will build machine and repair shops at a cost of about $300,000. Plans are being prepared for shops that will give an initial employment to 400 men. It is expected bids will be asked in about 40 days.

Melville, Sask.—Plans and specifications have been completed for the freight sheds which will be 160 ft. long, and for yards which will contain 25 miles of track.

St. Joe, Idaho.—The Chicago, Milwaukee & Puget Sound will let the contracts soon for building two powerhouses to provide power for operating its line by electricity through the Bitter Root mountains. One of the structures will be built at St. Joe and the other on the Missoula river, about half way between Missoula and Taft, Idaho.

Seattle, Wash.—The Great Northern expects to begin construction at an early date on a new viaduct over the canal at Twenty-sixth avenue, Northwest.

Vera Cruz, Mex.—See Vera Cruz Terminal under Railroad Construction.

Victoria, B. C.—The Esquimalt & Nanaimo will build a new freight depot and terminal facilities to cost about $150,000.

Winnipeg, Man.—Sealed bids will be received by P. Ryan, Secretary of the National Transcontinental Railway Commission, Ottawa, Ont., until March 10, 1909, for all work in the several trades necessary in the erection of terminal shops. Plans and specifications may be seen at the office of Hugh Lumsden, Chief Engineer, Ottawa, or at the office of S. R. Poulin, District Engineer, Winnipeg, Man. A bond of $100,000 must accompany all bids. (April 3, p. 492.)

The Canadian Northern shops will be enlarged this spring.

SIGNALING.

The Delaware, Lackawanna & Western has just put in use at the west end of the tunnel, Jersey City, an electro-pneumatic interlocking plant, taking the place of mechanical interlocking, which has been abandoned on account of the rearrangement of tracks made in connection with the establishment of the new tunnel and additional tracks to the Hoboken terminal. The new machine is in a temporary tower, which will be superseded a year or more hence when the tracks of the New York, Susquehanna & Western have been depressed to go beneath those of the Lackawanna. The machine at present has levers for 39 switches and signals (23 levers) but will then be doubled in capacity. The permanent tower will be of concrete. A new electro-pneumatic machine has recently been installed in a concrete tower at Grove street, Jersey City, and one was this week put in service at Scranton, Pa. This has 35 levers.

"Limited" Refrigeration.

A successful experiment by the Northern Pacific in shipping pre-cooled fruit from Washington to New York in a special refrigerator car having flax fiber insulation and Bohn ice tanks (White Enamel Refrigerator Co., St. Paul, Minn.), was noted in these columns October 30 last, page 1243. Last month an experiment was made with this car in cold weather to see if the insulation would keep the inside temperature from going below 32 deg. On the 9th the car was heated to a temperature of 59 deg. It was then closed, and opened on the following morning; and the temperature was found to be 50 deg. It was again closed without re-heating and on the following morning registered 38 deg. The thermometers were placed about 12 in. above the floor of the car. The outside temperatures for the corresponding periods were 10 deg. below zero on the 9th and 19 deg. below zero on the night of the 10th. A strong northwest wind blew a part of the time. In an ordinary refrigerator car subjected to a similar test the temperature was 32 deg. on the 10th and zero on the 11th. The first named car has six thicknesses or sheets of flax fiber insulation.

South Fork Bridge on the Pennsylvania.

For more than a year the engineering department of the Pennsylvania Railroad has been preparing to widen the South Fork bridge and to add a fourth track on the line between South Fork, Pa., and Conemaugh, about 3.7 miles. As announced recently, bids have been asked. With the completion of the bridge and the four-tracking of the line between South Fork and Conemaugh, the Pennsylvania will have all of its Pittsburgh division between Altoona and Pittsburgh four-tracked, with the exception of 2.10 miles, between Greensburg and Radebaugh. At these points there are two-track tunnels which must be widened before the other two tracks can be added.

A single span stone arch bridge was built over the Conemaugh river on the line of the original Portage Railroad. This bridge was used by the Pennsylvania until June, 1889. When the South Fork dam gave way, causing the Johnstown flood, this bridge with many others was washed away. When it was rebuilt by the company it was made a three-track bridge, with two 60-ft. spans.

Supply Trade News.

L. P. Mercer has been appointed Resident Manager at Chicago of the Parkesburg Iron Co., Parkesburg, Pa.

J. J. Keefe, well known in the pneumatic tool trade, has been appointed a salesman of the Independent Pneumatic Tool Co., Chicago, with headquarters at Chicago.

C. M. Aikman & Co., New York, makers of mohair plush for coach seat covering, have moved their New York office from 91 Fifth avenue to 135 Fifth avenue.

The specifications for the 200 phosphate cars and 500 box cars recently ordered by the Seaboard Air Line call for paint made by the Frazer Paint Co., Detroit, Mich.

The Mason Safety Rail Joint Co., Kansas City, Mo., has been incorporated with $100,000 capital. The incorporators are Ben H. Barr, Smith Baker, Howard L. Mason and others.

The Isthmian Canal Commission is asking bids until February 23 on car wheels, snatch blocks, band saws, valves, tees, gages, hose and nozzles and belting. (Circular No. 492.)

Farlow draft gear, made by the Farlow Draft Gear Co., Baltimore, Md., has been specified on the 750 cars recently ordered by the Seaboard Air Line and the 850 ordered by the Western Maryland.

Seeley Dunn, Manager of the Southern Storage & Demurrage Bureau, at New Orleans, La., has resigned to become Vice-President and General Manager of the International Car Co., New Orleans.

Royal D. Hawley, 911 Crocker building, San Francisco, Cal., has been appointed Pacific Coast Sales Agent of Paul Dickinson, Incorporated, Chicago, for the sale of its smoke jacks, chimneys and ventilators.

The Crane Co., Chicago, has given the general contract for building its new warehouse at Canal and 15th street, Chicago, to the Lanquist & Illsley Co., of Chicago. It will be a fireproof six-story structure, with dimensions 190 ft. x 241 ft. It will cost $500,000.

J. A. Foulks, 29 Broadway, New York, has been appointed Eastern representative of the Indianapolis Switch & Frog Co., Springfield, O., maker of frogs, switches, crossings and special track material for steam and electric railways, industrial, mining and smelter tracks.

The Union Malleable Iron Co., East Moline, Ill., has just completed its seventh melting furnace, putting it into operation on February 8. This involves the employment of from 75 to 100 additional men. Sales of Heald chain, a specialty of the company, have been increasing.

The Long & Allstatter Co., Hamilton, Ohio, has just built for the Pullman Company a large punching and spacing machine, with automatic feed table, which will carry material 75 ft. long. The machine has several features which have never been put on a machine of this kind before.

The S. Flory Manufacturing Co., Bangor, Pa., last week shipped four carloads of hoisting engines to the Atlantic coast. A cableway is to be installed at Norfolk, Va., as soon as the machinery arrives. The company is getting out machinery for another cableway to be installed at Baltimore, Md., for Coleman Brothers, Boston, Mass., contractors.

The Williams Boltless Rail Joint Manufacturing Co. has been organized to make and sell the Williams boltless rail joint, with headquarters at 1202 Great Northern building, Chicago. The officers are: Frank Williams, President; Frank Condren, Vice-President; W. M. Clark, Secretary and Treasurer; Willis D. Williams, General Manager; Emil Meyer, Assistant Manager.

Edward H. Chapin, New York Sales Agent of the National Car Wheel Co., Pittsburgh, Pa., has been elected Vice-President and Director of the company. When the National company was formed, in 1903, Mr. Chapin was Secretary of the Rochester Car Wheel Co., Rochester, N. Y., which was taken over by the National company. At that time he went to New York as Sales Agent for the company, where he has since remained.

The annual convention of officers and branch managers of the Crocker-Wheeler Co., Ampere, N. J., has been in session at Ampere. The managers of the various company branches brought in favorable accounts of the present situation in their respective territories with regard to the market for electrical machinery. Everywhere manufacturers seem to be willing to consider improvements, such as the electrification of their plants or the installation of further electric motors where their plants are already using electric power. The convention dinner, attended by 35 men, took place in New York at the Machinery Club, in the Hudson Terminal buildings, where the company has its New York offices.

The American Specialty Co., Chicago, has contracted with the High Speed Drill Co., of Dubuque, Iowa, to become the exclusive Sales Agent for the Collis flat and flat twisted high-speed drills, comprising machine shop, blacksmith, structural, track drills, ratchet drills, etc. These drills are made with both the common straight shank and taper shank, the latter design permitting a perfect fit to any standard drill. The "Use-'Em-Up" drill socket, which is a well-known product of the American Specialty Co., has been specified for use in the United States Navy, bids having recently been asked for 12 dozen. This, with previous purchases, makes a total of 27 different places this socket is being used by the government.

The January business of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., increased about $250,000 over the December business, while December orders were considerably in excess of those for November, 1908. The outlook in all departments is encouraging. In the railway motor field there is for the first time a decided pressure noticeable, the number of orders on hand for railway motors is now larger than it has been for a year. In addition to the large orders received recently from two of the New York City street railway companies, contracts have been recorded from the Cincinnati Traction Co., the Washington Railway & Light Co., and the Capital Railway Co. of Washington, D. C., the Oil City Railway Co. and the Spokane & Inland Empire Railroad.

The United States Equipment Co., Chicago, was organized last April to rent to contractors, at reasonable rates, any plant needed for carrying out a contract. It took over the plant of McArthur Bros., the railway contractors, as well as that of some other concerns, and has otherwise added to its equipment. The company has $1,000,000 worth of plants distributed over the country, comprising everything needed in building railways, such as tunneling outfits, cableways, air compressor plants, 30 steam shovels, 50 locomotives and several hundred cars of all sizes and descriptions. The home yards and shops are at McCook, Ill., and the offices are at 1207 Fisher building, Chicago. Herbert E. Reagan is President; Samuel J. Mills, Vice-President, and John Everett, Secretary and Treasurer.

The Davis-Bournonville Co., 90 West street, New York, maker of oxy-acetylene welding and cutting apparatus, has engaged W. R. Noxon as General Sales Manager. Mr. Noxon was formerly sales manager for Noxon Bros., Ingersoll, Ont. J. Edward Fennell, formerly with Menzie Company, Toronto, Ont., has gone to the Davis-Bournonville Co. as traveling representative. The company has completed its plant at Marion, N. J. Heretofore the tools have been made at the works of the Davis Acetylene Co., Elkhart, Ind., and the eastern works are designed to supply the increased demand. The government has equipped the Boston Navy Yard with these torches, making the second complete outfit bought for the use of the navy. The Pennsylvania has equipped the Altoona shops with these torches and apparatus, and the plant of the Goldie & McCollough Co., Ltd., Galt, Ont., has been equipped with a complete oxy-acetylene welding and cutting apparatus.

Charles T. Malcolmson has been appointed to a position with the Roberts & Schaefer Co., Chicago, and will have charge of its recently organized Briquetting Department. Mr. Malcolmson was for three years Engineer in charge of the government fuel testing plant at St. Louis, Mo., where he gave special attention to the manufacture and testing of briquetted coals and lignites. These briquets were made from samples collected from every important coal field in the country and were tested in steam boilers and house heating plants, while over 100 road tests were made with locomotives on the principal railways in the United States. When the plant was moved to Norfolk, he continued these investigations, paying special attention to the testing of briquetted coals for navy use. At the conclusion of this work he went to the Rock Island Mining Co. to design, build and operate a briquetting plant at Hartshorne, Okla. His new connection offers added facilities for designing and building this class of structures.

Charles E. Morrill, President of Valentine & Co., Chicago, has just celebrated the fiftieth anniversary of his continued business connection with Valentine & Co., manufacturers of high grade varnishes.

C. E. Morrill.

Mr. Morrill first entered the employ of Stimson, Valentine & Co., of Boston, Mass., in January, 1859, and has been actively associated with this concern ever since. Shortly after he became connected with the company the firm name was changed to Valentine & Co., and the main offices moved to New York. Mr. Morrill's territory was New England, which was at that time the center of the carriage trade, but in the seventies it shifted west, and in 1878 he came to Chicago and took charge of the western territory. Shortly after coming west, he organized the Lawson Varnish Co., which soon became successful. In May, 1899, the Lawson company was consolidated with Valentine & Co., and in January, 1900, Mr. Morrill was made President of the enlarged corporation. During the years before he was elected President he made several trips abroad and established agencies in several countries. Last month Valentine & Co. presented him with a handsome loving cup inscribed "Charles E. Morrill, from Valentine & Company, 1859-1909." Mr. Morrill's broadmindedness, generosity in all dealings and executive ability have won for him general respect.

The plant of the Ohio Seamless Tube Co., Shelby, Ohio, will be ready for operation early in March. This company was originally formed in July, 1908, as the Shelby Tube Co., and bought from the United States Steel Corporation the site and ruins of the Shelby Steel Tube Co.'s plant, which had been destroyed by fire a month before. At the same time the new company agreed to change its name to the Ohio Seamless Tube Co. The best experience in tube-making has been brought to bear in the construction and equipment of the new plant. The company will make a specialty of locomotive, marine and stationary boiler tubes, and will also produce specialties for automobile construction and other mechanical uses. There will also be special equipment for turning out the high-grade of material used in government work. The officers are: J. C. Fish, President; G. M. Skiles, First Vice-President; Chas. S. Hook, Second Vice-President; A. C. Morse, General Manager; H. E. Brubaker, Superintendent; Howard Seltzer, Secretary; Jas. A. Brubaker, Treasurer.

TRADE PUBLICATIONS.

Manganese Steel Castings.—The American Brake Shoe & Foundry Co., New York, has just issued a pamphlet containing a list of the high quality manganese steel castings which it manufactures.

Tonopah & Tidewater.—A wall map, 26 in. x 45 in., showing the Tonopah & Tidewater line and tributary country, has just been issued by that company. The map includes the greater portions of Nevada and California.

Atchison, Topeka & Santa Fe.—The California Limited is attractively brought to the attention of the public by a recent pamphlet. The description of the luxurious features of the service on this transcontinental train are accompanied by appropriate drawings.

Electric Pump Governors.—The Westinghouse Traction Brake Co., Pittsburgh, Pa., has just issued instruction pamphlet No. T 5042 on the subject of electric pump governors. This is a standard Westinghouse instruction pamphlet and contains a number of detailed line drawings and half-tones of electric pump governors.

Missouri Pacific-Iron Mountain Lines.—The Traffic Department of the Missouri Pacific and the St. Louis, Iron Mountain & Southern has just issued a 30-page pamphlet containing complete information for a tour through Mexico, including traveler's equipment, railway service, stop overs, points of interest, etc. Over 125 illustrations in colors show a few of the sights to be seen. A copy of the publication may be obtained upon request.

Motor Lubrication.—The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a 24-page 5-in. x 8-in. booklet entitled "Lubricating the Motor," which deals with the subject of lubrication of automobiles, motor boats and motor cycles. The booklet is divided into chapters which deal with the individual parts of motor mechanism. Cylinders, transmissions, bearings, etc.

Seamless Cold Drawn Steel Tubing.—A pamphlet of the Ohio Seamless Tube Co., Shelby, Ohio, gives a history of the seamless cold-drawn steel tube industry in America. This is a new company which bought the site and ruins of the plant of the Shelby Steel Tube Co., which was destroyed by fire. The new plant is to be ready for operation early in March. The pamphlet also briefly describes the manufacture of seamless cold-drawn steel tubing.

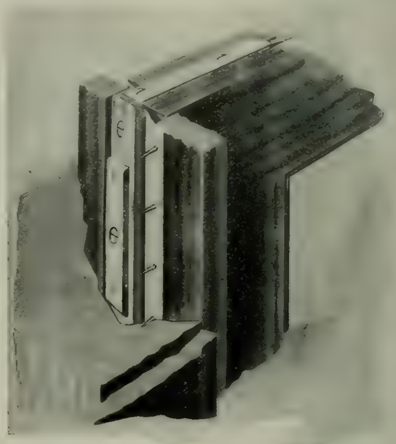
Co-Operation in Contracting.—This is the title of a little pamphlet of the United States Equipment Co., Chicago. This company was organized last year to rent to contractors any plant needed to perform a contract. The purpose of the pamphlet is to show the advantage to contractors of being able to secure plant in this way on short notice without having to increase their plant investment, and making the cost come out of the job itself.

Car Heating and Lighting.—The Gold Car Heating & Lighting Co., New York, has just issued a supplement to catalogue 1905, which contains a complete description of the Gold combination pressure and vapor car heating system. A number of line cuts show positions of the piping and valves for passenger coaches. This system is said to afford an opportunity to heat the car at different temperatures without increasing the manipulation or attention required from trainmen. It is also applicable to the use of hot water. This system was described in the *Railroad Age Gazette* of December 4, 1908.

Producer Gas.—R. D. Wood & Co., Philadelphia, Pa., have just issued a new edition of their catalogue entitled "Gas Producers and Producer Gas Power Plants." This catalogue has been rewritten and newly illustrated, with a number of half-tone and line engravings. It is practically a text book on the subjects of gas producers and producer gas power plants, producers for metallurgical use and various applications of producer gas. It contains a large amount of data and general technical information and is one which should be very useful and instructive to engineering students, as it contains this information in very concise form, similar to the manner in which it is presented in the best technical text books on the subjects.

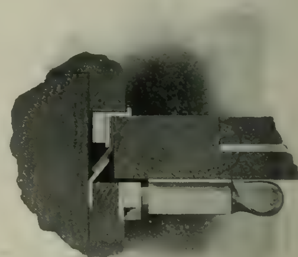
Universal Car Window Fixtures.

A device for applying side weather strips to car windows is shown in the accompanying engravings. It is claimed that it not only keeps out all smoke and dust, but is air tight. The weather strip is held



Universal Side Weather Strip for Car Window.

firmly against a strip of spring brass by a pressed brass angle, which also acts as a dust deflector, centralizes the sash and holds it in equilibrium. Friction is minimized by two 3 in. steel shoes on the edge of the sash, bearing on the window posts. The sash is said to work so easily that sash balances are not necessary, unless the window is extra heavy. As a usual thing it is not the weight of the window that makes it hard to operate, but the wood swelling in damp weather. With these fixtures, besides the flexible weather strips, there are only two points of contact, the two polished steel shoes 3-in. long, which form the runners. At no point does wood touch wood, so that sticking from the above-mentioned cause cannot occur.

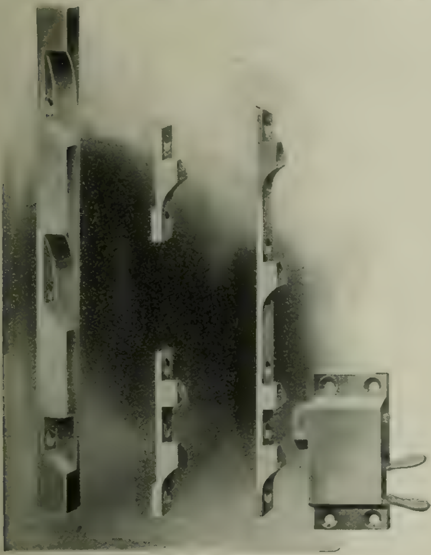


Cross Section Showing Side Weather Strip.

Another device is a gravity wedging lock, to prevent rattling. The lock is beveled 45 deg. and the rack openings are correspondingly beveled downwardly and outwardly, causing the sash to wedge outwardly against the stops, preventing all rattle. On each side of the sash there is always a 3/32-in. space, except when the gravity wedg-

ing bolt forces the sash against the outer brass angle bars, to prevent rattling. As soon as the sash is lifted ¼ in., it centralizes and slides without friction except that due to the rubber weather strip, which is covered (vulcanized) with a heavy linen on the inside, sliding on the brass compression strip. The linen covering also strengthens the rubber weather strip and minimizes friction. The outside part of the rubber weather strip is not covered.

There are various designs of the racks, the pressed form shown being especially neat, as it sets flush with the stop. It costs no more than the ordinary continuous rack. The individual stops have the anti-rattle wedging feature, and are reinforced by extra thickness at the bottom to prevent splitting the wood and pulling out the screws. Channel-holding top and bottom weather strips are also included in these devices. They are called "Universal" window fixtures and are made by the Grip Nut Co., Old Colony building, Chicago.



Racks for Gravity Wedging Lock.

Steel Sheet Piling for Sea Wall.

Fort St. Philip is on the left bank of the Mississippi River, about 74 miles below New Orleans, 34 miles from the head of the Passes and about 47 miles from the jetty or mouth of the river.

While quite a distance from the mouth of the river, it is only about one mile from Breton Sound, which is an arm of the Gulf of Mexico. The surrounding country is marsh land, frequently flooded by the backwater of the Gulf. The river levee gives the Fort ample protection at all times from high water in front, but to protect the Fort on the back, or Gulf side from the seepage or backwater, which is especially dangerous at high tide, and particularly so at storm tides, it was found desirable to construct a more stable and permanent sea wall than the earth levee. It was accordingly decided by the War Department to convert the levee on the Gulf side into a sea wall by extending it and raising it to a net elevation of 8 ft. above the Gulf level. To prevent seepage of the sea water, the plans called for a reinforcement of the levee with a row of interlocking steel sheet piling with their tops capped by concrete.

Steel Piling Core.

The length of the sea wall is 4,400 ft., and the contract involved the enlargement of 3,670 ft. of old levee, the building of 730 ft. of new levee, the driving of 4,400 lineal ft. of steel sheet piling and the placing of the reinforced concrete. The steel piles were 19 ft. long, driven 14 ft. into the levee and extending 5 ft. above its top. The piling was specified to be not less than ⅜ in. thick, to be driven vertically and in straight lines from angle to angle of levee. United States Steel Sheet Piling, 12 in., No. 35, was chosen as being peculiarly fitted for the work in hand, and 4,476 pieces were driven, weighing in all 1,508 net tons.

Work was begun Dec. 1, 1907, and after the enlarged and newly built levee had settled sufficiently the driving of piling was commenced. The piling was shipped by barge on the river, the first lot arriving in March and the second in May. The piles were driven by a drop hammer weighing 2,800 pounds, with which was used a cushion hood, which prevented any battering of the ends. The drop of the hammer was 10 ft., and the average number of blows was eight. While the soil was almost all silt, several obstructions were encountered in the shape of live oak stumps buried deep underground. Through these the piling was driven without much difficulty. Only one pile driver was used, and new high records in driving steel sheet piling were made; the minimum number of piles driven per 8 hour day was 113, and the maximum 281.

Detail of Reinforcement.

As above mentioned, the object of the steel piling curtain wall was to prevent seepage into the reservation from the Gulf side, and it was, therefore, necessary that this wall be made watertight. Under ordinary conditions United States Steel Sheet Piling can be made practically watertight by wooden packing strips driven with the piling, but in order to avoid all possibility of leakage, the specifications required all piles to be heavily coated with asphaltic pitch and this coating to be thoroughly dry before the piles were driven. After the piles were driven the voids in the interlock were filled with grout composed of three parts of sand and one part of ce-

ment. the result of which was to make an absolutely impervious structure.

The 5 ft. of piling projecting above ground was capped with concrete made in blocks 10 ft. long. Reinforcement was of plain round steel bars, showing an ultimate strength of 60,000 pounds per sq. in., and an elastic limit of not less than one-half the ultimate

Completed Structure; Fort St. Philip Sea Wall.

strength. Vertical and horizontal reinforcing rods were securely fastened with clamps. The cement used was furnished by the Universal Portland Cement Co., Chicago, and the concrete was composed of one part cement, three parts sand and five parts of gravel or broken stone. The concrete forms were so constructed as to give a perfectly smooth surface and no plaster or outside covering was allowed to be applied to the concrete surface after removal of forms.

The contract for the entire sea wall was awarded to Richard M. Murphy, of New Orleans, and the work was executed under the direct supervision of Richard Quinn, assistant engineer, and, after his transfer to Cavite, under the supervision of John L. Dickey, assistant engineer. The steel piling was furnished by the Carnegie Steel Co., Pittsburgh, Pa. The work was finally accepted by the Government on August 1, 1908.

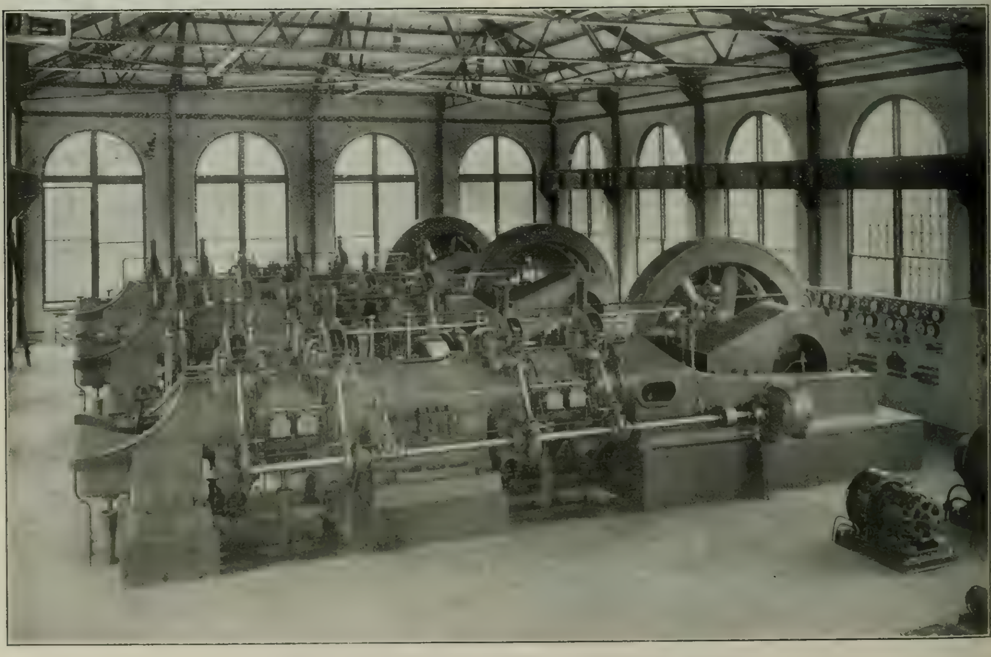
Power House of the Union Switch & Signal Company.

The large addition to the plant of the Union Switch & Signal Co. at Swissvale, Pa., consisting of iron and brass foundries, smithshop and power house, was illustrated in *The Railway Age*, Jan 31, 1908, page 170. The power house, which has since been equipped with gas engines and placed in service, is here illustrated by an interior view. It has an engine floor 60 ft.x160 ft., and a basement 60 ft.x160 ft., giving a total area of 19,200 sq. ft.

The equipment includes: Three 350-kw. a.c. generators; three 500-h.p. horizontal gas engines; direct connected; two 75 kw. a. c. generators; two 125-h.p. vertical gas engines, direct connected; one 75-kw. motor generator set (exciter); one 25-kw. motor-generator set for Cooper-Hewitt light; one air compressor for starting gas engines; one 15-ton electric traveling crane, using alternating current; one 12-panel switchboard. A system of gravity lubrication and filtration is used throughout the power house.

An additional foundation for one 500-h.p. engine and generator unit was erected and the power house is large enough to accommodate two more units of the same size; when completed it will be able to deliver 3,250 electrical h.p. All piping and electric wiring inside the building will be placed in the basement and are open for inspection at all times. The cooling water used for the gas engine cylinders is taken from a large cement reservoir containing 450,000 gals., and, after being pumped up to a height of 94 ft., is circulated through the different cylinder jackets back to the reservoir, where the temperature is reduced to about 80 deg. Fahr.

The fuel is natural gas, costing 15 cents per cu. ft. The cost of power at the old plant,—which used vertical engines and natural gas at the same price including a charge of 4 per cent. of plant valuation for repairs and maintenance, was 0.58 cent per k.w.h.; and, including 5 per cent. interest and taxes 1 per cent., it was 0.71 cent per k.w.h. It is expected that this cost will not be exceeded in the new plant when delivering its full normal load. At present it is lightly loaded and has not been in operation a sufficient length of time to yield a fair average for obtaining actual cost of output.



Power House of Union Switch & Signal Co., Swissvale, Pa.

ANNUAL REPORT

TWENTY-FOURTH ANNUAL REPORT OF THE SOUTHERN PACIFIC COMPANY AND PROPRIETARY COMPANIES FOR THE FISCAL YEAR ENDED JUNE 30, 1908.

INCOME FOR THE YEAR.

The gross receipts and disbursements of the Southern Pacific Company in respect of its leased lines and of the Proprietary Companies in respect of lines not leased, and the other receipts and disbursements of the Southern Pacific Company and of such Proprietary Companies, after excluding all offsetting transactions between them, were as follows:

	Year Ended June 30, 1908.	Year Ended. June 30, 1907.
Average miles of all rail lines operated -proprietary and non-proprietary	9,505 61	9,400 59
TRANSPORTATION OPERATIONS.		
Gross operating revenues	$113,545,566 52	$115,630,176 22
Outside operations—revenues	9,731,354 25	10,564,183 91
Total	$123,276,920 77	$126,194,360 13
Operating expenses	$76,005,494 05	$71,135,261 37
Outside operations —expenses	8,657,557 84	9,130,070 74
Taxes (rail lines and properties dealt with as outside operations)	3,950,140 02	2,896,501 03
Total	$88,613,191 91	$83,161,833 14
Revenues over expenses and taxes	$34,663,728 86	$43,032,526 99
INCOME OTHER THAN FROM TRANSPORTATION OPERATIONS.		
Interest on bonds owned of Southern Pacific Co. and of Proprietary Companies	$1,033,881 67	$1,002,712 23
Interest on bonds owned of companies other than Proprietary Companies	823,958 72	199,070 71
Dividends on stocks owned of companies other than Proprietary Companies	1,081,491 88	778,300 40
Income from lands and securities not pledged for redemption of bonds	729,366 50	715,931 84
Income from sinking funds pledged for redemption of bonds	181,531 85	164,714 44
Balance of interest received on loans and of interest accruing to June 30, on open accounts other than with Proprietary Companies	124,148 61	1,327,423 24
Miscellaneous income	35,101 30	97,431 31
Total	$4,009,480 53	$4,285,584 17
Surplus	$38,673,209 39	$47,318,111 16
FIXED CHARGES.		
Interest on outstanding funded debt of Southern Pacific Co. and Proprietary Companies	$15,868,709 87	$15,991,034 47
Interest on C. P. R. R. Co. 3 per cent. notes to U. S. of America	235,250 88	411,689 04
Sinking fund contributions and income from sinking fund investments	548,531 85	531,714 44
Hire of equipment	874,614 05	1,159,865 04
	$17,527,106 65	$18,094,302 99
Less rentals for lease of road, for joint tracks, yards and other facilities, viz.: Collections ....$745,339 56; Payments 487,847 18	257,492 38	372,782 72
Total fixed charges	$17,269,614 27	$17,720,520 27
Surplus over fixed charges	$21,403,595 12	$29,597,590 89

OTHER CHARGES.		
Land department expenses	$110,788 64	$158,577 26
Taxes on granted and other lands	233,836 15	206,852 78
Miscellaneous expenses	26,991 72	69,293 56
Taxes and other expenses of Southern Pacific Company	270,098 98	251,050 61
Additions and betterments payable from income of Southern Pacific Company	282,952 06	603,972 14
Reserve for depreciation of rolling stock owned by Southern Pacific Company and leased to other companies	585,454 76	609,251 32
Total other charges	$1,510,122 31	$1,898,997 67
Surplus over fixed and other charges	$19,893,472 81	$27,698,593 22

ASSETS AND LIABILITIES.

The details of the assets and liabilities of the Southern Pacific Company are shown in Table 8. The value of the granted lands belonging to the Central Pacific Railway Company, to the Oregon and California Railroad Company, and to the Southern Pacific Railroad Company, which remained unsold at the close of the year, is not included in the assets of said companies, but the proceeds and all transactions in respect of said lands are shown.

The stocks and bonds owned by the Southern Pacific Company stand charged with $316,565,379.67, an increase during the year of $19,291,573.35. The details of these stocks and bonds (pledged or free) are shown in Tables Nos. 9 and 10.

From Tables Nos. 9 and 10 it will be seen that the Company owns free:

Stocks (par value)	$92,901,889 90
Bonds, (face value)	38,662,300 00
in addition to these stocks and bonds the Company also has free Southern Pacific Company Two Five Years Four Per Cent. Gold Bonds, not included in any statement of outstanding bonds, to the amount of	22,747,000 00

In addition to the aforementioned free stocks and bonds, the companies have assets also in excess of liabilities amounting to $65,179,908.06, as shown in the following statement, in which the assets and liabilities of the Southern Pacific Company and the Proprietary Companies have been combined and all offsetting accounts excluded.

Current and Deferred Assets.	Total, June 30, 1908.	Increase or *Decrease.*
Cash and cash accounts	$22,911,534 01	$1,288,818 27
Material, fuel and other supplies	15,224,923 18	1,452,352 76
Advances for the construction and acquisition of new lines, including electric lines	61,146,399 18	21,268,403 08
Terminal real estate and other property	15,860,787 15	128,175 11
Rolling stock and floating equipment	26,325,398 63	3,995,451 43
Advances for closing Colorado River Crevasse	3,518,152 65	365,232 43
Total Current and Deferred Assets	$144,987,194 80	$28,498,433 08
Current and Deferred Liabilities.		
Cash accounts	$10,769,812 78	*$4,783,428 55*
Interest and dividends	15,356,105 72	1,742,016 68
Loans and bills payable	52,622,648 26	27,932,873 26
Deferred liabilities	1,058,719 98	*88,085 01*
Total Current and Deferred Liabilities	$79,807,286 74	$24,803,376 38
Assets in excess of liabilities	$65,179,908 06	$3,695,056 70
Contingent assets	$4,520,704 94	$182,397 32

STOCKS AND BONDS OF SOUTHERN PACIFIC COMPANY AND OF PROPRIETARY COMPANIES, OUTSTANDING AT THE CLOSE OF THE YEAR.

	Common Stock.	Preferred Stock.	Bonds and other fixed interest bearing obligations.
Stocks and bonds of Southern Pacific Company	$197,849,258 64	$74,866,463 00	$39,457,500 00
Deduction: Deposited under S. P. Co. 2-5 years 4 per cent. mortgage			$1,000,000 00
Free in treasury	$82,153 34	$106,598 00	649,000 00
Held by Sinking Fund for redemption of bonds			1,786,000 00
Total deduction	$82,153 34	$106,598 00	$3,435,000 00
Amount outstanding in the hands of the Public this year	$197,767,105 30	$74,759,865 00	$36,022,500 00
Amount outstanding in the hands of the Public last year	197,777,105 30	55,637,055 25	36,022,500 00
Stocks and bonds of Proprietary Companies	$309,816,272 00	$25,600,000 00	$344,498,121 10
Deduction: Deposited against issue of Southern Pacific Company common stock and bonds	$275,904,333 00	$25,580,000 00	$10,850,000 00
Owned by Southern Pacific Company free	33,497,065 50	11,000 00	21,428,000 00
Owned by Proprietary Companies	349,500 00		88,000 00
Held by Sinking Funds for redemption of bonds			11,803,000 00
Total deduction	$309,750,898 50	$25,591,000 00	$44,169,000 00
Amount outstanding in the hands of the Public this year	$65,373 50	$9,000 00	$300,329,121 10
Amount outstanding in the hands of the Public last year	65,273 50	9,000 00	304,742,551 89
Total stocks and bonds of Southern Pacific Company and of Proprietary Companies outstanding in the hands of the Public	$197,832,478 80	$74,768,865 00	$336,351,621 10
Total last year	197,842,378 80	55,646,055 25	340,765,051 89
Increase		$19,122,809 75	
Decrease	$9,900 00		$4,413,430 79

		Total, June 30, 1908.	Increase or *Decrease*.
Contingent liabilities, viz.:			
Insurance, replacement & depreciation funds provided for by deductions from revenues and by charges to operating expenses	$4,960,196 30		
Reserve funds for replacement and depreciation of floating equipment and rolling stock	7,749,574 19		
Principal of deferred payments on land contracts	483,416 08		
Unadjusted claims and accounts	3,000,711 42		
		16,193,897 99	*2,379,586 17*

Under the classification of Operating Revenues and Operating Expenses promulgated by the Interstate Commerce Commission in effect since July 1, 1907, the reserve funds established in former years for maintenance and renewals are not available for the payment of extraordinary repairs and renewals growing out of damages by floods and other exceptional causes. Therefore, the sum to the credit of this reserve fund, amounting to $4,178,641.97, was written off and credited to Profit and Loss.

The Southern Pacific Company advances to the Proprietary Companies the funds required by them for the construction of extensions, for additions, betterments, and equipment, and for terminal properties; also for the construction of new lines and for the acquisition of properties important in the development of the business of the respective companies or in the economical operation of their properties. During the progress of the work the sums thus furnished are carried by the Southern Pacific Company until it is deemed well to dispose of the securities received in payment for such construction, equipment, or other property. Such advances and expenditures amounted, on June 30, 1908, to $103,332,584.96. Of this sum, $61,146,399.18 was for the construction and acquisition of new lines (including electric lines); $15,860,787.15 for terminal real estate and other property, and $26,325,398.63 for rolling stock and floating equipment.

The Company is building railways in the Republic of Mexico under concessions and subventions which make it important that the work should be prosecuted without interruption. The sums required in temporarily financing the Company's expenditures for this and other important work under way were in part secured from the Union Pacific Railroad Company. The sums thus obtained amounted, on June 30, 1908, to $45,376,389.27, of which $20,200,010.00 has since been repaid.

The opening for business, on December 8, 1907, of the Bay Shore Railway afforded a much-needed relief at San Francisco in the handling of trains and traffic. The old line, via Ocean View, built in 1863, traverses what is now a thickly settled part of San Francisco. It is a single track line of heavy grades and curvatures, and its facilities are wholly inadequate for the present traffic of the Company. The new line, of low grades, built on land adjacent to San Francisco Bay, is 11.04 miles in length. Although it is at present only double tracked the entire distance, yet the right of way, the grading, and the bridging are arranged for a four-track main line. The tunnels, five in number, aggregating 9,948 ft. in length (1.884 miles), are double tracked, are masonry lined, with brick arch and concrete side walls and invert. The portals are of concrete, brick faced and trimmed with sandstone. A duplicate of tunnel No. 2 (1,086.4 ft. in length) is now building to the west of the present tunnel to afford four main tracks. The differences between the new and old lines are as follows:

	New line.	Old line.	Saving by new line.
Length (miles)	11.04	13.69	2.65
Maximum grade per mile (feet)	15.84	158.00	142.16
Highest point of grade above San Francisco City base (feet)	20.3	292.0	271.7
Curvature (degrees)	203.46	795.72	592.26

At Visitacion and adjacent thereto, the Company has reclaimed about 195 acres of land. In addition to the filling by dredging, 2,023,323 cubic yards of material (principally rock excavated in this vicinity) was used. At Visitacion there is in course of erection an engine house of 40 stalls, a concrete transfer pit, 494 x 70 feet, a machine shop, 446 x 130 feet, a planing mill and car repair shop 335 x 185 feet, a freight car repair shop, 440 x 115 feet, a storehouse, 103 x 52 feet, a power house, 87 x 50 feet, and other buildings and appurtenances. All these buildings will be of the most substantial character and equipped with machinery and appliances of the best designs for doing work economically. Classification yards and sidings have been built or are in progress of construction, aggregating about 58 miles in length when completed. Two and one-half miles of trestle were built for the purpose of carrying trains to dump filling material for the line across the arm of San Francisco Bay.

In order to secure the desired right of way and terminals, it became necessary to purchase real estate considerably in excess of that actually needed, but only so much thereof as was needed has been charged to the cost of the line, and the remainder is carried under Real Estate. Including the charge for real estate, the sum of $8,676,586.81 was expended to June 30, 1908, for the construction of this line, for terminals, and for shops at Visitacion.

Under the concession of August 14, 1905, referred to in the Annual Report for that year, for the construction of certain lines in the Republic of Mexico, 400.61 kilometers (248.93 miles), were completed by June 30, 1908, of which 354.24 Kilometers (220.12 miles) were in operation. There remain to be built by November, 1912, about 772 kilometers (480 miles) of additional railway. Under this concession the Company receives a subsidy of 12,500 pesos per kilometer (20,116 pesos per mile), payable in Five Per Cent. National Redeemable Debt Bonds of the Republic of Mexico "up to the amount of five million pesos; and these being exhausted the rest of the subvention will be paid in cash, which the Company will receive in ten annual payments without cause of profit, the first payment to be made six months after the respective line which causes the subvention has been constructed and approved by the Secretary of Communications and Public Works." Since the close of the year, the Company has received on this account bonds to the amount of 3,000,000 pesos.

The concession of the Cananea, Yaqui River, and Pacific Railroad Company authorizes the construction (without subvention however), of about 1,257 kilometers (781 miles) of railway. There were completed to June 30, 1908, 455.72 kilometers (283.18 miles), of which 378.98 kilometers (235.49 miles) were in operation, and about 801 kilometers (498 miles) remain to be built by May, 1914.

These concessions aggregate about 2,430 kilometers (1,510 miles) of railway, of which 856.33 kilometers (532.11 miles) were completed by June 30, 1908, leaving about 1,574 kilometers (978 miles) to be built.

CAPITAL EXPENDITURES.

The expenditures by the Proprietary Companies for the construction of new lines, for equipment, and for additions and betterments to completed lines charged to capital account, were as follows:

Expenditures for new lines, viz.:			
Central Pacific Railway:			
Change of line, Palisade, Nev.			$111,994 90
Galveston, Harrisburg and San Antonio Railway:			
Extension from Stockdale to Cuero		$2,216 66	
Additional cost of Galveston, Houston and Northern Railroad purchase in 1905		100,000.00	
			102,216 66
Houston and Texas Central Railroad:			
Extension from Mexia to Nelleva			133,455 59
Louisiana Western Railroad:			
Extension from Eunice to Mamou			2,341 17
Morgan's Louisiana & Texas Railroad & Steamship Co.:			
Extension from Lafayette to Port Allen		$473,030.17	
Extension from Arnaudville to Port Barre		14,748 87	
Extension from Bayou Sale to South Bend		48,474 55	
			536,253 59
Nevada and California Railroad:			
Liabilities assumed in purchase of the Fallon Railway			23,712 13
Oregon and California Railroad:			
Extension from Henderson to Springfield			4,439 16
Southern Pacific Railroad:			
Change in line, Salton Desert			160,886 68
Texas and New Orleans Railroad:			
Extension to Port Arthur		$48,985 44	
Surveys		3,523 72	
			52,509 16
Expenditures for Additions and Betterments viz.:			
Ballast	$125,367 63		
Bridges, trestles and culverts	536,142 78		
Changes in line	232,943 09		
Changes in gauge	78,783 37		
Fencing right of way	7,767 67		
Highway crossing signals	2,313 65		
Interlocking and block signals	722,697 07		
Main tracks	360,247 25		
Over and under grade crossings	101,988 38		
Revision of grades	4,511 36		
Real estate	1,119 85		
Right of way and grounds	239,989 50		
Sidings and passing tracks	1,353,192 84		
Telegraph and telephone lines	134,002 98		
Tunnels	210,688 83		
Widening embankments	159,999 10		
Docks and wharves	265,030 52		
Engine houses, shops and appurtenances	296,878 20		
Fuel and water stations and appurtenances	293,423 56		
Station buildings	258,116 76		
Terminal buildings and yards	296,712 09		
Other buildings and appurtenances	353,740 34		
Two locomotives, 14 passenger cars, 1 pay car, 642 freight cars, 1 fire tug, and 1 launch	894,715 78		
Floating equipment in course of construction	108,922 32		
Additional cost of equipment added during preceding fiscal year	1,609 78		
Additions and improvements to existing equipment	32,374.51		
Total	$7,073,279.21		
Less credits	516,016.43		
			$6,557,262 78
Less expenditures paid from income of Southern Pacific Company, viz.:			
Southern Pacific Coast Railway	$224,332 24		
New Mexico & Arizona Railroad	56,544.31		
Sonora Railway	2,075 51		
			282,952 06
			$6,274,310 72
			$7,402,119 76
Deductions:			
Proceeds from sale of real estate			$29,701.30
Proceeds from sale of rock and other property			8,841 73
Miscellaneous collections			19,007.63
Material recovered from track abandoned			26,065 43
Cost of surveys written off and other adjustments			5,621 25
			$89,237 34
Net expenditures for capital account of Proprietary Cos			$7,312,882.42

CHANGES IN EQUIPMENT DURING THE YEAR.

	Condemned, destroyed, sold or transferred & credited to Replacement Accounts.	Added and charged to			
		Replacement Accounts.	Capital Account.	Free Assets So. Pacific Co.	Total.
Locomotives	29	27	—	117	144
Baggage cars	6	7		*5	2
Baggage and mail cars	3	6		-	6
Baggage and passenger cars	4	4		-	4
Baggage, mail and passenger cars	1	-		-	
Business cars	3	3	—	—	3
Composite	8		—	—	—
Dining cars	3		—	-	—
Instruction	—	—	2	—	2
Observation cars	—	1	—	1	2
Passenger cars	23	29	10	65	104
Postal cars	2		-	2	2
Narrow-gauge passenger-train cars	25	4	—	—	4
Box cars	1,335	370	480	904	1,754
Caboose cars	8	70	—	**20*	50
Flat cars	977	662	162	36	860
Fruit cars	18	—	—	-	—
Furniture cars	5	—	—	†*4*	†*4*
Gondola cars	136	1	—	†*2*	†*1*
Gondola cars (Hopper bottom)	188	1	—	—	1
Refrigerator cars	2	1	—	†*2*	†*1*
Stock cars	76	—	—	†*7*	†*7*
Tank cars	5	184	—	25	209
Narrow-gauge freight-train cars	60	20	—	—	20
Work equipment	183	535	—	8	543
Amount credited or charged	$2,222,470 73	$1,850,216 13	$824,634 33	$3,345,545 31	$6,020,395 77

*Sold by Southern Pacific Company to Proprietary Companies. †Credit.

The locomotives added during the year average 98.48 tons total weight of engine without tender, and 84.39 tons upon drivers. The freight cars added during the year averaged 50 tons capacity.

There remained to the credit of the funds for replacement of rolling stock at the close of the year, $1,011,324.63.

The locomotives and cars owned, and their capacity at the close of the year were as follows:

	This year.	Last year.	Increase, or *Dec.*	Pr cent.
Locomotives, standard gauge	1,858	1,738	120	6.90
Locomotives, narrow gauge	16	21	*5*	23.81
Total	1,874	1,759	115	6.54
(*Standard Gauge.*)				
Weight:				
Total, excluding tender, tons	132,147	129,128	12,019	10.01
Ave. total, excluding tenders, tons	71.12	69.12	2.00	2.89
Total, on drivers, tons	108,588	98,371	10,217	10.39
Ave. total, on drivers, tons	58.44	56.60	1.84	3.25
Passenger-train cars, stand. gauge.	1,722	1,650	72	4.36
Passenger-train cars, narrow gauge	36	57	*21*	36.84
Total	1,758	1,707	51	2.99
Freight-train cars, standard gauge	43,411	43,300	111	0.26
Freight-train cars, narrow gauge	417	457	*40*	8.75
Total	43,828	43,757	71	0.16
Total capacity, stand. gauge cars, tons	1,532,194	1,475,704	56,490	3.83
Av. capacity, stand. gauge cars, tons	35.90	34.63	1.27	3.67
Work equipment, standard gauge	4,850	4,468	382	8.55
Work equipment, narrow gauge	27	49	*27*	44.90
Total	4,877	4,517	360	7.97

NOTE.—Decreases shown in *italics.*

TRANSPORTATION OPERATIONS.

For the purpose of comparison, the revenues and expenses of this year are restated in the following tables under the classification in effect last year, deducting, however, from the expenses of last year, such expenses as were then included in operating expenses but which are this year charged to income account, also adjusting last year's expenses to the primary accounts of this year's classification as far as practicable.

Thus restated the results of the year's transportation operations compared with those of the preceding year are as follows:

	This year.	Last year.	Inc., or *Dec.*, Per ct.
Av. miles of rail lines operated	9,505.61	9,400.59	1.12
REVENUES.			
Passenger, inc. extra baggage	$35,647,534 18	$33,551,888 82	6.25
Mail and express	4,931,373 25	4,907,899 76	.48
Freight	71,124,459 79	75,710,299 19	*6.06*
Switching, rentals, etc.	1,842,199 30	1,460,088 45	26.17
Total rail lines	$113,545,566 52	$115,630,176 22	*1.80*
Outside operations—revenues	9,731,354 25	10,564,183 91	*7.88*
Total revenues	$123,276,920 77	$126,194,360 13	*2.31*
OPERATING EXPENSES.			
Maint. of way and structures	$16,936,161 78	$16,011,358 02	5.78
Maint. of equipment	14,927,084 90	14,884,062 69	.20
Conducting transportation	40,484,550 06	36,895,635 80	9.73
General expenses	3,657,697 31	3,344,204 86	9.37
Total rail lines	$76,005,494 05	$71,135,261 37	6,85
Outside operation—expenses	8,657,557 84	9,130,070 74	*5.17*
Total expenses	$84,663,051 89	$80,265,332 11	5.48
Gross revenue over total exp.	$38,613,868 88	$45,929,028 02	15.93
PASSENGER TRAFFIC			
Revenue passengers carried	41,393,734	41,860,915	*1.12*
Rev. passengers carried 1 mile.	1,640,036,373	1,587,837,350	3,29
Rev. pass. trains pr mile road*	$4,175 84	$3,992 77	4.59
Do., do., per *rev. train* mile.*†	$1 94	$1 85	4.87
Av. rev. per pass. per mile	2.174 cts.	2.113 cts.	2.89
Average distance carried	39.62 miles.	37.93 miles.	4.46
FREIGHT TRAFFIC. (Way-Bill Tonnage.)			
Tons rev. & Co. freight carried	28,998,913	29,871,901	*2.92*
Do., carried one mile	7,845,002,515	7,995,891,714	*1.89*
Ton-mls per ml of rd—all frt*	824,251	849,424	*2.96*
Rev. frt. per mile of road*	$7,333 27	$7,893 68	*7.10*
Do., per *revenue train* mile*‡	$3 59	$3 53	1.70
Av. receipts per ton per mile —revenue freight	1.097 cts.	1.098 cts.	.....
Av. distance carried—all fr'ght	270.53 miles.	267.67 miles.	1.07

*Based on traffic over rail lines only, length of ferries used between rail stations, excluded in distance over which traffic was moved.

†Revenue passenger train and *all* mixed train miles, but excluding mileage of locomotives helping.

‡Revenue freight train and *all* mixed train miles, but excluding mileage of locomotives helping.

NOTE.—Decrease in *italics.*

(*a*) Based on traffic over rail lines only, length of ferries used be-

The following statement shows the increase in the Company's revenues and service during the first half year and the shrinkage caused by the general falling off in business during the second half year.

	Gross Revenues.	Tons of Revenue Freight Carried.	Tons of Revenue freight 1 mile.	Locomotive Miles in Revenue Freight Service including Mixed.	Number of Passengers Carried.	Number of Passengers 1 mile.	Locomotive Miles in Revenue Passenger Service including mixed.
Six months ended Dec. 31, 1907.	$69,104,356 25	13,313,526	3,721,260,980	13,447,424	21,449,664	879,486,214	11,785,955
Six months ended Dec. 31, 1906.	62,129,313 81	12,473,299	3,406,822,517	11,746,008	21,565,576	789,461,618	11,263,344
Increase	$6,975,042 44	840,227	314,438,463	1,701,416	......	90,024,596	522,611
Decrease	....	....	....	....	115,912	....	....
Per cent.	11.23	6.74	9.23	14.48	0.54	11.40	4.64
Six months ended June 30, 1908.	$54,172,564 52	9,526,878	2,764,959,708	9,467,201	19,944,070	760,550,159	10,737,221
Six months ended June 30, 1907.	64,065,046 32	12,098,193	3,488,417,132	12,845,036	20,295,339	798,375,732	11,312,952
Decrease	$9,892,481 80	2,571,315	723,457,424	3,377,835	351,269	37,825,573	575,731
Per cent.	15.44	21.25	20.74	26.30	1.73	4.74	5.09

tween rail stations excluded in distance over which traffic was moved. (*b*) Revenue passenger train and *all* mixed train miles, but excluding mileage of locomotives helping. (*c*) Revenue freight train and *all* mixed train miles, but excluding mileage of locomotives helping.

The rail lines were operated for 66.94 per cent. of their gross receipts against 61.52 per cent. in 1907. The average for both rail and water lines, including outside operations, was 68.68 per cent. against 63.60 per cent. in 1907. Expenses for "maintenance" were 28.06 per cent. and for "operation" 38.88 per cent. of the gross revenues of the rail lines.

The increase of $4,397,719.78 in operating expenses resulted entirely from the increase in expenses during the six months ended December 31, 1907. In the six months ended June 30, 1908, there was a decrease in operating expenses of $6,225,435.32. The increase in the first half year resulted from the expenses incident to the greater amount of traffic moved, which, in the preceding year, had already reached proportions where it exceeded the limit of handling it economically, from the greater cost of material and supplies—principally fuel, lumber and ties—from the higher wages schedules, and from the expenses incident to restoring to its former standard the roadway damaged by the disastrous floods and heavy snow storms in the spring of 1907.

In the following statements the expenses have been combined under accounts which present them concisely and comparatively with last year.

Maintenance of Way and Structures.

	This Year.	Last Year.	Increase or *Decrease.*
Repairs of roadway and track	$7,235,472.06	$7,420,172.15	*$184,700.09*
Bridges, trestles and culverts	1,501,370.96	1,705,332.26	*203,961.30*
Ties	3,144,080.49	1,615,358.99	1,528,721.50
Rails, frogs, switches and fastenings	1,525,299.72	1,482,215.77	43,083.95
Buildings, grounds and appurtenances	2,543,703.14	2,784,472.44	*240,769.30*
Snow and sand fences and snow sheds	276,992.13	150,919.89	126,072.24
Superintendence	670,191.26	611,064.14	59,127.12
Stationery and printing	26,533.27	23,729.95	2,803.32
Colorado River Crevasse	12,518.75	218,092.43	*295,573.68*
Total	$16,936,161.78	$16,011,358.02	$924,803.76

NOTE.—Decrease in *italics.*

The increase in expenditures for ties resulted from an increase in the average cost of ties from 58 cents to 70 cents per tie (an increase of 20.69 per cent.), and from the greater number of ties put into the track.

The following rails, ties, tie-plates, and continuous rail joints were used in making renewals, and the entire cost thereof charged to operating expenses:

	This year.	Last year.	Increase or *Decrease.*
Miles of new steel rails	303.80	355.20	*51.40*
Per cent. of renewals of all rail in track, including sidings	2.37	2.85	*.48*
Number of burnettized ties	1,234,890	1,196,344	38,546
Number of other ties	2,713,718	1,587,559	1,126,159
Total number of ties	3,948,608	2,783,903	1,164,705
Equal to miles of continuous track	1,410.22	1,005.02	405.20
Per cent of renewals of all ties in track including sidings	11.01	8.06	2.95
Number of tie plates	3,053,358	2,369,693	683,665
Equal to miles of continuous track	545.24	427.74	117.50
Number of continuous rail joints	276,100	137,291	138,809
Equal to miles of continuous track	392.19	195.02	197.17

NOTE.—Decrease in *Italics.*

The weight of rails per yard in main line and branches at the close of the year was as follows:

	This Year.	Last Year.	Increase or *Decrease.*
Shop machnry. and tools	566,215 47	638,193 53	*71,978 06*
Superintendence	460,411 96	413,507 66	46,904 30
Other expenses	702,471 72	656,262 60	46,209 12
Total	$14,927,084 90	$14,884,062 69	$43,022 21

NOTE. Decrease in *italics.*

The companies have not made any charge for "Depreciation" of equipment as contemplated by the Interstate Commerce Commission's new accounting regulations, but, as in the past, have charged to operating expenses (less salvage) the original cost (estimated, if not known) or purchase price of all equipment condemned, destroyed, sold, or vacated from any cause during the year. The amount thus charged is shown under the charge to "Renewals" in Table No. 24 and amounted to $1,270,011.76.

The average cost of repairs and renewals per locomotive and per car per annum, and the average number of serviceable locomotives and cars owned during the year were:

	Average Cost Per Annum. This Yr.	Average Cost Per Annum. Last Yr.	Average Serviceable Number. This Yr.	Average Serviceable Number. Last Yr.
Locomotives, for repairs	$3,089 70	$3,443 66		
for renewals	44 54	119 30		
Total	$3,134 24	$3,562 96	1,818	1,692
Passenger train cars, for reps.	$893 80	$789 94		
for rnwls.	71 77	82 31		
Total	$965 57	$872 25	1,742	1,700
Freight train cars, for repairs	$92 06	$87 17		
for rnwls.	23 39	26 10		
Total	$115 45	$113 27	44,312	43,562

CONDUCTING TRANSPORTATION.

	This Year.	Last Year.	Increase or *Decrease.*
Locomotives, fuel for	$9,314,822 93	$7,375,948 05	$1,938,874 88
Locomotive service other than fuel	7,462,556 94	7,458,589 29	3,967 65
Train service	5,995,044 07	5,849,433 11	145,610 96
Station and terminal service	11,036,423 89	11,015,354 27	21,069 62
Operating floating equipment	584,353 45	561,043 41	23,310 04
Injuries, loss, damage, and other casualties	3,429,167 58	2,002,801 52	1,426,366 06
Superintendence	1,328,979 45	1,159,951 93	169,027 52
Mileage payments	445,686 76	617,736 00	*172,049 24*
Advertising & printing	887,514 99	854,778 22	32,736 77
Total	$40,484,550 06	$36,895,635 80	$3,588,914 26

NOTE.—Decrease in *italics.*

The increase in these expenses has been principally in fuel for locomotives resulting from an increase in the cost per ton of coal and fuel oil from $2.13 to $2.70, or about 27 per cent. The increase in injuries, loss, damage, and other casualties resulted principally from the accumulation of freight claims growing out of the difficulty of verifying claims filed following the San Francisco fire and the payment of claims growing out of the congested traffic conditions in the Spring of 1907.

The work done by the transportation department of the rail lines is shown in the following table:

	Increase or *Decrease.*	Per Cent.
Gross operating revenues	*$2,084,609 70*	1.80
Expenses conducting transportation	$3,588,914 26	9.73
Revenue passengers carried one mile	52,199,023	3.29
Mileage of passenger cars	588,320	.44
Locomotive mileage with passenger trains, including helping	*53,120*	.24

Miles of main and second track operated, excluding mileage operated under trackage rights.	Total.	141-lb.	96-lb.	90-lb.	80-lb.	76-lb.	75-lb.	70-lb.	61.5-lb. 60-lb.	56-lb.	54-lb.	52-lb.	50-lb.	Less than 50-lb.
Main and second track	5,562.78	0.95	20.62	144.12	2,868.78	171.40	2,084.46	——	195.75	0.95	——	——	75.75	——
Branches	4,190.59	—	.37	——	102.48	58.79	238.80	10.72	1,627.08	276.18	253.11	88.72	1,333.57	200.77
Total	9,753.37	0.95	20.99	144.12	2,971.26	230.19	2,323.26	10.72	1,822.83	277.13	253.11	88.72	1,409.32	200.77
Per cent. of total miles of track	100.00	0.01	0.21	1.48	30.46	2.36	23.82	.11	18.69	2.84	2.59	.91	14.45	2.07
Per cent., last year	100.00	—	.22	1.24	31.44	3.33	19.81	.11	19.73	4.26	2.41	.93	14.45	2.07

Expenditures for "Maintenance of Way and Structures" averaged $1,745.96 per mile of main and second track against $1,674.08 for the preceding year.

At the wood preserving plants of the lines east of El Paso, 340,143 lineal feet of piling and 1,724,832 feet B. M. lumber were creosoted, and 640,811 cross ties were burnettized; on the Pacific System lines, 615,781 lineal feet of piling, and 1,585,184 feet B. M. lumber were creosoted, and 1,219,671 cross ties were burnettized.

MAINTENANCE OF EQUIPMENT.

	This Year.	Last Year.	Increase or *Decrease.*
Locomotives	$5,666,704 92	$5,989,492 50	*$322,787 58*
Passenger train cars	1,703,852 63	1,503,692 81	200,159 82
Freight train cars	5,115,757 10	4,934,229 67	181,527 43
Working equipment	365,050 61	345,356 82	19,693 79
Floating equipment	346,620 49	403,327 10	*56,706 61*

Tons of revenue freight carried one mile	*409,018,961*	5.93
Tons of revenue and company freight carried one mile	*150,889,199*	1.89
Mileage of freight cars	*17,664,960*	3.16
Locomotive mileage with freight and mixed trains, including helping	*1,676,419*	6.82
Total locomotive mileage in service for which the attendant expenses are charged to "Conducting Transportation"	*2,946,063*	5.33

NOTE. Decrease in *italics.*

The cost of fuel per locomotive mile in revenue service and in non-revenue-service, for which the expenses are charged to "Conducting Transportation," was 17.813 cents per mile run against 13.353 cents in the preceding year, and for the entire expenses for "Conducting transportation" 77.420 cents against 66.794 cents in the preceding year.

Average Number of Tons of Freight and Loaded Cars, Per Train (Excluding Caboose), and the Tons Per Loaded Car for the Year

Revenue and Company Freight (Way-Bill Tonnage).	*Tons per Train: Tons.	(+) Increase (—) Decrease: Tons.	Per Cent.	Loaded Cars per Train: Cars.	(+) Increase, (—) Decrease: Cars.	Per cent.	Per Cent. of Loaded Car Mileage to Total Car Mileage.		Tons per Loaded Car: Tons.	(+) Increase (—) Decrease: Tons.	Per cent.
Lines east of El Paso	332.75	—13.10	3.79	15.73	—1.15	6.81	64.69	— 5.21	21.15	0.66	3.23
Lines west of El Paso	448.12	+ 46.68	11.63	20.79	+ .11	.53	69.06	— 4.46	21.56	+ 2.14	11.02
Average all lines	403.89	+ 24.09	6.34	18.83	0.37	1.93	69.90	— 4.97	21.43	+ 1.65	8.34

*Ton miles per revenue freight train and all mixed train miles.

GENERAL EXPENSES.

	This Year.	Last Year.	Increase or *Decrease*.
Salaries and expenses of general officers	$433,410 39	$413,220 25	$20,190 14
Salaries and expenses of clerks and attendants	1,838,387 71	1,652,313 55	186,074 16
Law expenses	376,567 96	324,528 08	52,039 88
General office expenses	236,898 96	227,728 55	9,170 41
Stationery and printing	181,359 63	164,896 60	16,463 03
Insurance	354,851 94	370,826 45	*$15,974 51*
Other expenses	236,220 72	190,691 38	45,529 34
Total	$3,657,697 31	$3,344,204 86	$313,492 45

Note. Decrease in *italics*.

GENERAL.

The two remaining notes of the Central Pacific Railroad Company to the United States of America of $2,940,635.78 each, due respectively August 1, 1908, and February 1, 1909, were paid off in July, 1908, releasing Central Pacific Railway Company First Refunding Four Per Cent. Bonds to the amount of $5,882,000, which then became a free asset in the treasury of the Company. These were the last two notes out of 20 notes given in February, 1899, by the Central Pacific Railroad Company to the United States of America in final settlement of the indebtedness of $58,812,715.48, growing out of the issue of bonds by the United States Government in aid of the construction of the Central Pacific and the Western Pacific bond aided railroads.

The discharge of this debt marks an epoch in the history of the Central Pacific Railroad. By an Act of Congress in 1862, the "Central Pacific Railroad" Company was authorized to build a railroad from Sacramento to a junction with the Union Pacific Railroad, and was given fourteen years to complete the road. This junction was effected in May, 1869, and in the fall of that year the entire rail line from Ogden to San Francisco Bay was in operation. The gross earnings in the year 1870 (the year following the opening of the entire line) amounted to $7,438,970 on the 894 miles operated; and in the year 1899, in which the final settlement with the United States Government and readjustment of the Company's bonded and other indebtedness was effected, the gross earnings amounted to $16,401,026 on the 1,359 miles operated. Since the readjustment of this debt, February 1, 1899, there has been expended to June 30, 1908, in straightening the line, in reducing grades and curvature, and in other reconstruction, in the construction of the Ogden Lucin Cut-Off, referred to in the Annual Report for 1903, and for other betterments and additions by which the service and facilities to the public were increased, the sum of $34,270,680. The gross receipts for the year ended June 30, 1908, for the 1,495 miles of railway operated amounted to $33,456,141.32.

The delivery of the remaining 3,000 refrigerator cars for the "Pacific Fruit Express Company," referred to in the annual report, was completed during the year, and said company now has 6,600 cars in service. The paid-up capital stock of the company is $10,800,000, paid for by the Southern Pacific Company and the Union Pacific Railroad Company, one-half each.

In addition to the completed lines of railway opened for traffic as reported under "Properties and Mileage," and the railways in the Republic of Mexico, heretofore referred to, construction is progressing on the lines of the following companies or of companies organized in their interest, viz.:

Morgan's Louisiana & Texas R. R. & S. S. Co.—On the extension from Lafayette to Port Allen (opposite Baton Rouge) about 29 miles of track and about 12 miles of grading are completed. On the extension from Bayou Sale to South Bend, a distance of about 11 miles, about 7 miles are completed and the grading is completed for the remainder of the line.

Nevada & California Ry. Co.—On the extension from Keeler to Mojave, a distance of about 146 miles, about 36 miles are completed and work on the remaining 110 miles is progressing.

Southern Pacific R. R. Co.—The grading on an extension from San Ramon to Pleasanton, about 10 miles in length, was completed.

Central California Ry. Co.—On this line from Niles to Redwood City, a distance of about 16 miles, about 7 miles of track and about 7 miles of grading are completed, and the grading on the remaining 2 miles is nearing completion.

Sacramento Southern R. R. Co.—On this line from Sacramento to Antioch, a distance of about 54 miles, about 2 miles of track and about 10 miles of grading are completed, and work is progressing on the remainder of the line.

Under the pension system, put into effect by the companies on January 1, 1903, there were carried on the pension rolls 390 employees. The payments to them for the year amounted to $130,315.61.

The accompanying report of the Comptroller shows fully and in detail the financial and other transactions of the Southern Pacific Company and of the Proprietary Companies.

By order of the Board of Directors,

E. H. HARRIMAN,
President.

No. 8. Southern Pacific Company.

Assets.	June 30, 1908.	June 30, 1907.
Capital Assets.		
Stocks and bonds as shown in detail in Tables 9 and 10	$316,565,379.67	$297,273,806.32
Steamships (No. 21)	3,660,259.29	3,660,259.29
Sinking fund (No. 17)	144.00	744.00
	$320,225,782.96	$300,934,809.61
Current Assets.		
Cash	$5,763,465.53	$6,774,616.70
Bills receivable	1,710,489.68	675,820.09
Agents and Conductors	1,825,932.11	2,766,682.23
Dividends and interest accrued to June 30	830,449.71	549,950.03
Individuals and companies	3,232,614.73	2,038,189.19
U. S. Government transportation	2,013,811.14	1,808,377.43
Material, fuel and other supplies	10,541,985.09	9,160,125.08
	$25,918,747.99	$23,773,760.75
Deferred Assets.		
Advances for construction of new lines	$44,310,194.11	$25,996,739.43
Advances for acquisition of new lines and property	11,309,290.94	6,225,550.85
Advances for acquisition of electric lines	5,526,914.13	7,655,705.82
Rolling stock	18,424,446.67	14,849,702.64
Steamships and other floating equipment	7,900,951.96	7,480,244.56
Real estate and other property	15,081,566.27	14,936,236.89
Wood preserving plants	249,109.75	221,294.54
Individuals and companies	2,390,628.10	705,796.21
Advances for closing Colorado River Crevasse	3,518,152.65	3,152,920.22
	$108,711,254.58	$81,224,191.16
Proprietary Companies.		
Central Pacific Ry. Co.	—	$1,201,852.66
Direct Navigation Co.	$27,813.12	40,578.73
Galveston, Harrisburg & San Antonio Ry. Co.	10,870,265.53	9,560,706.41
Houston and Shreveport R. R. Co.	—	964.72
Houston and Texas Central R. R. Co	686,213.64	897,406.27
Louisiana Western R. R. Co.	40,745.29	—
Morgan's Louisiana & Texas R. R. & S. S. Co.	298,049.96	—
Oregon & California R. R. Co.	7,741,965.77	8,037,638.34
Southern Pacific Terminal Co	111,458.50	—
	$19,776,511.81	$19,739,147.13
Contingent Assets.		
San Antonio and Aransas Pass Ry. Co.	*$3,981,007.97	$4,053,553.37
Unadjusted accounts, Proprietary Companies	114,490.75	—
	$4,095,498.72	$4,053,553.37
Total assets	$478,727,796.06	$429,725,462.02

* Includes $3,898,000, face value, San Antonio and Aransas Pass Ry. Co. Income Four Per Cent Bonds, on which interest is payable on January 1, of each year, only if earned, out of net earnings and income.

Liabilities.

Capital Liabilities.		June 30, 1908.	June 30, 1907.
Common stock		$197,849,258.64	$197,849,258.64
Preferred stock		74,863,300.00	39,500,700.00
Preferred stock subscription receipts outstanding		3,163.00	140.00
Subscriptions to preferred stock		—	16,141,915.25
First mortgage six per cent steamship bonds, due January 1, 1911		1,786,000.00	1,858,000.00
Four per cent. gold bonds (Central Pacific stock collateral), due August 1, 1949		30,418,500.00	30,218,500.00
Twenty-five years four per cent. gold bonds, due June 1, 1910, viz.:			
Authenticated by Trustee	$30,000,000		
Less in treasury	22,747,000	7,253,000.00	7,253,000.00
		$312,173,221.64	$292,890,513.89
Current Liabilities.			
Coupons matured—unpaid		$125,332.47	$124,207.47
Coupons due July 1		2,888,492.50	2,890,912.50

	June 30, 1908.	June 30, 1907.
Interest accrued on bonds and loans to June 30, but not due	2,234,251.63	2,279,746.98
Dividends due—unpaid	59,764.96	62,946.45
Dividends due July 1, 15, and October 1	8,555,803.97	6,825,794.11
Bonds satisfied of mortgage but not presented	1,000.00	1,000.00
Traffic balances	958,393.76	1,868,115.47
Loans and bills payable	52,472,648.26	24,409,775.00
Vouchers and pay rolls	6,899,476.64	9,867,984.19
	$74,195,164.19	$48,330,482.17
Deferred Liabilities.		
Pacific Mail Steamship Co.	$60,675.22	$502,492.47
Taxes accrued but not due	209,020.63	226,000.00
Wells, Fargo & Co.'s express contract	208,000.00	240,000.00
	$477,695.85	$968,492.47
Proprietary Companies.		
Central Pacific Ry. Co.	$4,238,359.59	—
Houston, East and West Texas Ry. Co.	13,807.99	$517,410.20
Houston and Shreveport R. R. Co.	23,240.27	—
Louisiana Western R. R. Co.	—	2,489,834.05
Morgan's Louisiana & Texas R. R. & S. S. Co.	—	3,899,542.27
Nevada and California Ry. Co.	55,947.02	1,071,530.94
Southern Pacific R. R. Co.	26,597,509.41	40,260,028.81
Southern Pacific Terminal Co.	—	41,021.12
Texas and New Orleans R. R. Co.	621,240.56	630,915.85
	$31,550,104.84	$48,910,283.24
Contingent Liabilities.		
Marine insurance fund	$3,195,687.63	$3,205,677.59
Steamship insurance fund	1,607,697.54	1,607,697.54
Reserve fund for maintenance, renewals, etc.	—	4,178,641.97
Floating equipment replacement fund	3,955,462.65	3,352,134.79
Rolling stock replacement fund	208,462.71	162,041.71
Reserve for depreciation of rolling stock	2,502,164.52	1,923,952.91
Insurance fund	32,630.45	20,234.44
Unadjusted claims and accounts	1,915,918.16	1,711,143.49
Unadjusted accounts, Proprietary Companies	—	97,499.28
Individuals and companies	4,059.28	58,558.79
Principal of deferred payments on land contracts	141,061.62	101,521.80
	$13,563,144.56	$16,419,104.31
Total liabilities	$431,959,331.08	$407,518,876.08
Balance to credit of profit and loss	46,768,464.98	22,206,585.94
Total liabilities	$478,727,796.06	$429,725,462.02

No. 9.—SOUTHERN PACIFIC COMPANY—STOCKS OWNED—JUNE 30, 1908.

	Total Outstanding June 30, 1908.	Total Owned by Southern Pacific Company.
PROPRIETARY COMPANIES.*		
Carson & Colorado Ry. Co.†	—	—
Central Pacific Ry. Co.—Common	$67,275,500.00	$67,275,500.00
Central Pacific Ry. Co.—Preferred	13,600,000.00	13,600,000.00
Direct Navigation Co.	50,700.00	200.00
Galveston, Harrisburg & San Antonio Ry. Co.	27,084,372.00	27,056,600.00
Houston, East & West Texas Ry. Co.	1,920,000.00	1,918,200.00
Houston & Shreveport R. R. Co.	400,000.00	397,600.00
Houston & Texas Central R. R. Co.	10,000,000.00	9,998,300.00
Louisiana Western R. R. Co.	3,360,000.00	3,360,000.00
Morgan's Louisiana & Texas R. R. & S. S. Co.	15,000,000.00	15,000,000.00
Nevada & California R. R. Co.	4,425,700.00	4,425,700.00
Oregon & California R. R. Co.—Common	7,000,000.00	6,970,198.50
Oregon & California R. R. Co.—Preferred	12,000,000.00	11,991,000.00
South Pacific Coast Ry. Co.	6,000,000.00	6,000,000.00
Southern Pacific R. R. Co.	160,000,000.00	160,000,000.00
Southern Pacific Terminal Co.	2,000,000.00	1,999,600.00
Texas & New Orleans R. R. Co.	5,000,000.00	4,999,500.00
Total Proprietary Companies	$335,116,272.00	$334,992,398.50
OTHER COMPANIES.		
Beaver Hill Coal Co.	$500,000.00	$500,000.00
Cananea, Yaqui River & Pacific R. R. Co.	‡2,500,000.00	‡2,500,000.00
Central California Ry. Co.	30,000.00	30,000.00
Coast Line Ry. Co.	100,000.00	100,000.00
Coos Bay, Roseburg & Eastern R. R. & Navigation Co.	2,000,000.00	2,000,000.00
Gila Valley, Globe & Northern Ry. Co.	2,000,000.00	2,000,000.00
Goose Lake & Southern Ry. Co.	406,000.00	406,000.00
Independence & Monmouth R. R. Co.	25,000.00	12,750.00
Inter-California Ry. Co.	216,000.00	216,000.00
Lincoln Northern Ry. Co.	11,200.00	11,200.00
Los Angeles Ry. Co.	5,000,000.00	2,250,000.00
Maricopa & Phoenix R. R. Co. (Organized January 10, 1908)	1,000,500.00	1,000,500.00
Merced Cañon Ry. Co.	100,000.00	50,000.00
Mexican International R. R. Co.	—	4,172,100.00
Northwestern Pacific R. R. Co.	35,000,000.00	17,500,000.00
Oroville & Nelson R. R. Co.	13,000.00	13,000.00
Pacific Electric Ry. Co.	20,000,000.00	10,000,000.00
Pacific Fruit Express Co.	10,800,000.00	5,400,000.00
Pacific Mail Steamship Co.	20,000,000.00	10,010,000.00
Rubicon Water & Power Co.	500,500.00	500,500.00
Sacramento Southern R. R. Co.	100,000.00	100,000.00
San Bernardino & Redlands R. R. Co.	200,000.00	200,000.00
San Francisco & Napa Ry. Co.	55,000.00	55,000.00
Southern Pacific Co.—Common	197,849,258.64	82,153.34
Southern Pacific Co.—Preferred	74,866,463.00	106,598.00
Sunset R. R. Co.	500,000.00	250,000.00
Wells, Fargo & Co.'s Express	8,000,000.00	1,530,000.00
Stocks of Oil Companies	—	18,337,336.40
Stocks of Land and Town Sites Cos.	—	106,666.66
Stocks of Miscellaneous Companies	—	898,620.00
Total Other Companies	—	$80,338,424.40
Total	—	$415,330,822.90
Asia Steamship Co.	£100	£100
Persia Steamship Co.	£100	£100

* Companies whose revenues and expenses, transportation and traffic statistics are embraced in the accompanying statements for "Proprietary Companies." †Stock amounting to $4,380,000 held in 1907 was exchanged for a like amount of capital stock of the Nevada & California Railway Co. ‡Mexican currency.

No. 10.—SOUTHERN PACIFIC COMPANY—BONDS OWNED—JUNE 30, 1908.

PROPRIETARY COMPANIES.*	Total Outstanding June 30, 1908.	Total owned by Southern Pacific Company
Carson & Colorado Ry. Co. first mortgage 4 per cent	$2,000,000.00	$2,000,000.00
Central Pacific Ry. Co. first refunding mortgage 4 per cent	93,919,000.00	12,203,000.00
Central Pacific Ry Co. 3½ per cent. mortgage	16,611,000.00	2,000.00
Central Pacific Ry. Co. Through Short Line, first mortgage 4 per cent.	9,199,000.00	899,000.00
Galveston, Harrisburg & San Antonio Ry. Co. second mortgage, Eastern Division 6 per cent	1,000,000.00	374,000.00
Galveston, Harrisburg & San Antonio Ry. Co. equipment 6 per cent	1,558,000.00	1,558,000.00
Galveston, Harrisburg & San Antonio Ry. Co. second mortgage, M. & P. Extension 6 per cent	6,354,000.00	1,110,000.00
Galveston, Houston & Northern Ry. Co. first mortgage 5 per cent	800,000.00	800,000.00
Gulf, Western Texas & Pacific Ry. Co. first mortgage 5 per cent	2,224,000.00	2,224,000.00
Houston & Shreveport R. R. Co. first mortgage 6 per cent	150,000.00	150,000.00
Houston & Texas Central R. R. Co. Lampasas Extension, first mortgage 5 per cent	450,000.00	450,425.00
New York, Texas & Mexican Ry. Co. first mortgage, Matagorda Division, 6 per cent	842,000.00	548,000.00
Oregon & California R. R. Co. first mortgage 5 per cent	17,745,000.00	32,000.00
Southern Pacific R. R. Co. first consolidated mortgage 5 per cent. of 1893	4,127,500.00	243,000.00
Southern Pacific R. R. Co. first mortgage 6 per cent. of 1875	5,111,000.00	15,000.00
Southern Pacific R. R. Co. first refunding mortgage 4 per cent	88,489,000.00	7,332,000.00
Texas & New Orleans R. R. Co. first mortgage, Main Line, 6 per cent	862,000.00	561,000.00
Texas & New Orleans R. R. Co. first mortgage, Dallas Division, 4 per cent.	3.997,000.00	1,190,000.00
Texas & New Orleans R. R. Co. equipment 6 per cent	612,000.00	612,000.00
Total Proprietary Companies	$256,050,500.00	$32,278,000.00
OTHER COMPANIES.		
Associated Oil Co. first mortgage 5 per cent.	$2,833,000.00	$750,000.00
Calexico School District 6 per cent	—	3,000.00
Coos Bay, Roseburg & Eastern R. R. Nav. Co. first mortgage 6 per cent	625,000.00	625,000.00
Los Angeles Interurban Ry. Co. first mortgage 5 per cent	—	4,510,000.00
Los Angeles Pacific Co. first mortgage 5 per cent	—	765,000.00
Mexican Consolidated Public Debt 3 per cent	—	†252,300.00
Northwestern Pacific R. R. Co. first refunding mortgage 4½ per cent.	5,694,000.00	5,694,000.00
Northern Pacific Terminal Co. first mortgage 6 per cent	—	5,000.00
Pacific Electric Ry. Co. first mortgage 5 per cent	—	770,000.00
Riverside & Arlington R. R. Co. first mortgage 4 per cent	—	140,000.00
San Jose-Los Gatos Interurban Ry. Co. first mortgage 5 per cent	—	50,000.00
Silsbee School District 6 per cent	—	3,000.00
Southern Pacific Co. (C. P. Stock Collateral) 4 per cent	30,418,500.00	1.649,000.00
Sunset R. R. Co. first mortgage 4 per cent.	316,000.00	158,000.00
Bonds of other companies	—	3,002,000.00
Total Other Companies	—	$18,376,300.00
Total Bonds	—	$50,654,300.00
Total Stocks (Table No. 9)	—	415,330,822.90
Total Stocks and Bonds	—	$465,985,122.90

*Companies whose revenues and expenses, transportation and traffic statistics are embraced in the accompanying statements for "Proprietary Companies."
†Mexican Currency.

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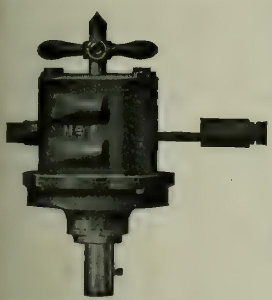

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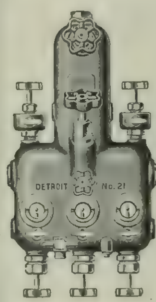

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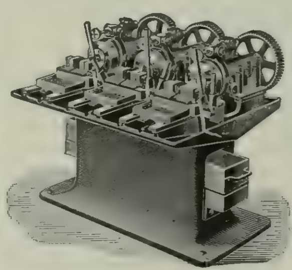

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CONTENTS

The advent of severe winter weather throughout the whole northern portion of the United States, and reports of difficulties in railway operation on most lines in this territory, suggest the enormous increase in the cost of operation, due not only to increased coal consumption, but the larger loss attending slow operation and decreased volume of traffic hauled. At such times train operation becomes a matter of getting passenger trains through to destination on any schedule, and freight traffic is limited to a few short trains which run at very slow speeds. In clear, cold weather, when there is no snow obstruction, some return can be made to normal operation, but the train resistance is increased and average speed materially reduced, due partly to wind resistance and to increased journal friction caused by the change in viscosity of lubricating oil. As coal consumption by the locomotive is nearly proportional to train resistance, the fuel expense in winter months in freight service is nearly 50 per cent. greater than in summer months. The resistance in accelerating trains to schedule speed is so much greater in winter that the time occupied is much longer, all of which contributes to the larger winter fuel bill. It is under conditions similar to these where expenses are proportionally large, that there is more opportunity for improvement, and if the extra fuel consumption resulting from frequent stops in winter were fully appreciated by the engineers and trainmen, there would be many changes made in present methods of operation. The increased resistance, caused by journal friction in cold weather when the lubricant is more viscous, is well understood, but as far as we know the subject has not been made one of special investigation in dynamometer work. The extensive measurements conducted by the Engineering Department of the University of Illinois with its remodeled dynamometer car, which is described elsewhere in this issue, will afford good opportunity for a study of train resistance as affected by temperature, and it is the purpose of those in charge to make a thorough investigation of this important subject.

The industrial history of the last hundred years has been plentifully sprinkled with instances of valuable inventions, making great savings or improvements, and hailed by everybody with enthusiasm, which, almost before people could get acquainted with them were superseded and thrown aside because of the advent of some other invention which was still better. This common experience is brought to mind by the letter, printed in another column, of W. L. Park, general superintendent of the Union Pacific. Mr. Park tells a most interesting story of how he has improved his discipline so that the trainmen regularly obey even the flagging rules, the most troublesome rules in the whole code; and then, almost in the same breath, he goes on to inform us that he has got beyond the need of flagging. His automatic block signals give such satisfactory service that he has actually told his flagmen to take advantage of the protection afforded by them. No one east of the Missouri has ever dared to say this out loud. True, Mr. Park does not declare himself quite so unqualifiedly as we have put it in this paraphrase, but our statement gives substantially the correct impression, we are quite sure. And this experiment of the Harriman lines (which was first brought to public notice by Mr. Slater at the Washington meeting of the Signal Association two years ago) should prove valuable to superintendents all over the country. Not the least interesting statement is that declaring that good discipline is a tangible asset, when a road is dealing with passengers. Another point is that good discipline in the matter of flagging brings improved behavior in other matters. This was to be expected, as has been predicted repeatedly in these columns.

But while the officers of the Union Pacific are to be commended for their progressive ideas and for what they have accomplished, it must be observed that they have not cured the incurable defects of the flagging rule. They still retain the loosest screw in the whole mechanism. The brakeman is to flag when the "circumstances" require it. He is to use fusees "if conditions warrant"; if recalled before he has gone far he is to put down torpedoes, "if necessary," and he is told to go farther than the distance named in the rule, "if conditions require it," though he is not told how much farther What good is done by putting down torpedoes at, say, 10 rods from the standing train? All these conditional precepts go to show that the U. P., like all other roads, recognizes that the flagging rule must be elastic, and everybody knows that with an elastic rule the matter always remains unsettled. We have in every day practice the alternative of omitting the flagging at times when any intelligible *rule* would forbid its omission, or else of incurring unnecessary and intolerable delays to trains. In other words, the present instructions cannot be called rules; they are too indefinite. With such indefiniteness the situation would be unsatisfactory even if

all our brakemen were as good as the best ones; but they are not all first class. The really and permanently important thing in the Union Pacific practice, therefore, is the high degree of perfection that has been attained in the operation of the automatic block signals. With the space interval maintained in the greatest practicable efficiency we shall by and by abolish flagging, as has been done in Great Britain. And this satisfactory degree of efficiency is not so far in the dim future as it formerly seemed to be. The Union Pacific is doing good work toward hastening the day of consistency and simplicity; and one or two other roads are beginning to help in the good work.

In granting permission to the Erie to issue $30,000,000 30-year 5 per cent. collateral trust bonds, the New York Public Service Commission, Second District, has stipulated precisely what use shall be made of the proceeds of the bonds. Notes issued in March, 1908, to meet desperately pressing needs. and notes now being issued to provide for the refunding of interest coupons on the company's general lien and convertible 4 per cent. bonds, are to be retired by exchanging $10,500,000 new bonds at par for the notes at par. Bonds to the amount of $11,380,000 may be issued to be exchanged for coupons of the convertible 4s falling due before August 1, 1909, and the remaining $8,120,000 bonds may be issued and sold at not less than 87½. The Commission makes its approval to dispose of any of the bonds conditional on the actual expenditure on improvements and additions by the company of an amount equal to the face value of the coupons refunded. The road, in asking permission to refund its coupons, argues that at present its net receipts just about pay fixed charges, but that if it may use these receipts for making improvements and additions, instead of paying the money out as interest, it will later be able not only to earn its fixed charges and interest on the money now borrowed, but some profit as well. The Commission, in effect, takes the company at its word. It says: "Go ahead, but see that the money that would have been paid out in interest is actually spent on the property." The success of the company's plan now depends on two closely related conditions. In the first place, 90 per cent. of the bondholders must be willing to exchange their current interest coupons, as they come due, for new bonds at par, and J. P. Morgan & Co. must be willing to, in effect, accept new bonds at par for the cash that they have been paying out to meet the interest falling due on certain issues of bonds during the past 10 months. The second condition is that the Erie shall earn sufficient to enable it to spend the required amount on additions and improvements. The willingness of the bondholders and of J. P. Morgan & Co. to meet the first condition is directly dependent on their belief in the ability of the Erie to fulfill the second condition. As a step in the regulation of railways, this exact definition of the uses to which the proceeds of a bond sale must be put carries this case to the boundaries of government control.

FREIGHT-TRAIN MILEAGE AND FREIGHT REVENUES.

The accompanying drawing shows the relation between freight-train mileage and freight earnings, on a large trunk line for almost eight years. A similar drawing showing passenger-train mileage and passenger earnings on the same road for the same period was published in our issue of November 13, page 1328. The figures on the left hand margin of the drawing refer both to the number of freight-train miles and to the number of dollars of earnings from freight traffic.

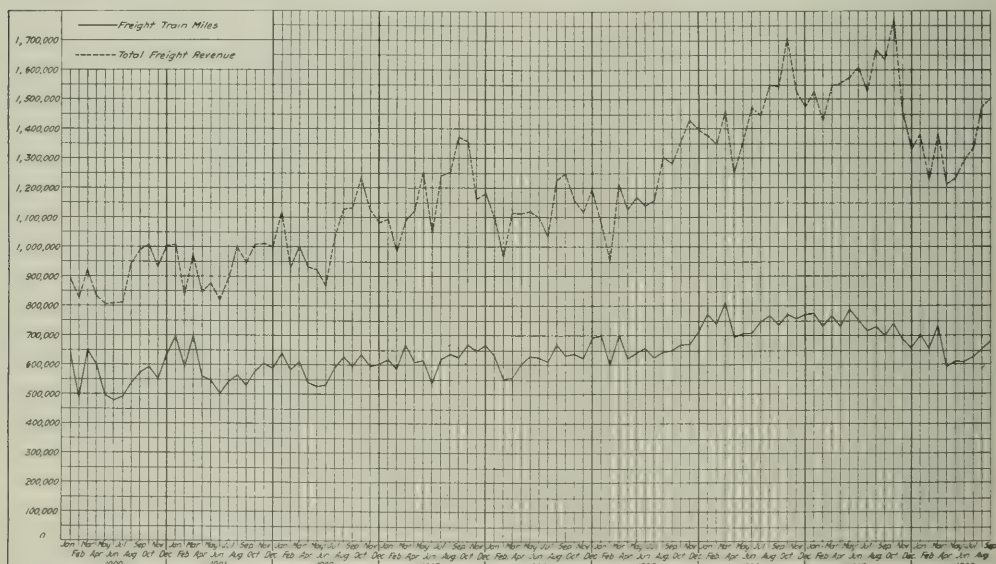

Diagram to Illustrate Comparison Between Freight Train Miles and Freight Train Revenue; Years by Months, 1900-1908.

On comparison of the drawing in our issue of November 13 with the one presented here, a very striking contrast will be noted. In the former drawing the train-mileage and earnings lines frequently crossed and recrossed. In summer the passenger earnings line rose much faster and in winter declined much faster than the passenger-train mileage line. Occasionally earnings increased while train-mileage decreased. Sometimes earnings decreased while train-mileage increased. But in the drawing presented herewith the freight-train mileage line is always below the earnings line and always goes up and down with it. If, when passenger business falls off in winter, railways also reduce the number of passenger trains, there arises an outcry against them from the public and from

railway commissions. On the contrary, when freight business falls off in April, May and June, train service may be and is reduced correspondingly, and reaches its maximum when traffic is lighest, which usually is in June. When traffic picks up in September and October freight-train service is increased, and reaches its maximum when there is the most freight moving, which may be at any time from September to January.

The result is an essential difference between the results from freight and passenger business. While the cost of handling a ton of freight one mile varies with the volume of business, it does not vary anywhere near as much as the cost of hauling a passenger one mile varies with the volume of business. Plainly, it costs about as much to haul a passenger train with a very few people in it as to haul it well-loaded. In proportion, therefore, as the number of passengers per train increases the cost per passenger declines, and in proportion as the number of passengers per train decreases the cost per passenger increases. We know of one case where one of the fastest through passenger trains in this country hauled but three passengers from its point of origin to its point of destination. We know of another case where another fast through train hauled but a half-dozen passengers. Obviously, the cost of hauling each of these passengers per mile was very great, and exceeded by many times the revenue derived from them. Such a thing could not happen in the freight business, because most freight trains, unlike all passenger trains, are not run on fixed schedules, but are run only when there is business for them to handle. When a road has 500 cars of freight to haul from Chicago to New York it hauls them in ten trains. When it has only 300 cars of freight to haul it hauls them in six trains. Within limits, therefore, it can throughout the year adjust its freight-train mileage and the resulting expenses to the traffic offered and the probable earnings from it.

When there was so much complaint two years ago about shortage of cars we heard shippers say that freight ought to be handled as passengers were—that if freight trains were run regularly and on fixed schedules there would be enough facilities to hanule the business and shippers and consignees would not be subjected to frequent losses because of delays to goods in transit. Study of the facts shows that if all freight was handled on regular, scheduled trains, the freight business would become as unprofitable as the passenger business is in the West unless there was a very heavy increase in freight rates. On the road to whose business the drawings we have printed relate the average rate per ton per mile in 1900 was 5.58 mills and in 1908 was 5.73 mills. Meantime, the estimated average cost per freight-train mile rose from $1.24 to $1.67. But for an increase, meantime, in the average tons per train mile from 291 to 387, by the use of more powerful locomotives, longer trains, larger cars and better loading of cars, the profits of the road from freight business would have been wiped out; the revenue per ton mile in 1908, if no more tons had been hauled per train mile than in 1900, would have been considerably less than the expenses per train mile. The advance in the average number of tons per train mile, however, increased average earnings per train mile from $1.50 in 1900 to $2.07 in 1908. There could have been no such increase in tons per train mile if regular, scheduled freight service had been required.

The conclusions to be drawn from these studies of passenger and freight-train mileage and earnings are obvious. A regular, fast, scheduled service, maintained throughout the year, such as the passenger service given by American railways, is bound to be very expensive, because it is adjusted, not to the average amount of business available throughout the year, but to the maximum amount of business available at any part of the year. In proportion as a service approaches the irregularity of the extra, large tonnage, freight trains that are put on as business increases and taken off as it decreases, it approximates to the minimum possible cost of operation. If the public prefers the cheapest practicable service, either passenger or freight, to a regular, frequent service, it can get it by letting the roads adjust train mileage at all times to the traffic available. But if the public prefers a regular, frequent service, either passenger or freight, in the long run it will have to pay for it in higher rates. Railways, like other commercial concerns, must cut the coat according to the cloth; and in the long run either the public will have to pay for the kind of service it gets, or the railways will have to give it the kind of service, passenger or freight, for which it pays.

THE UNIT IN RAILWAY OPERATION.

We need in railway operation to-day a wider knowledge of the essential nature of units. The accountant and statistician have latterly been hard pressed by a querulous public and a fastidious investor for definite measures of situations that shall take the place of indefinitely formed impressions. The Statistical Committee of the American Railway Association has specifically stated its problem as a problem of devising units.

The railways run to make money. Between the outgo of the investor's money for plant and expenses, and the intake of revenue, is a vast complex of causes and effects. These may have all degrees of significance to the final result sought, and they may range through almost every form of activity and of relation to individuals and to the social order in its various groupings. There is grave danger where the result is so far removed from the cause, that is, where the return desired is so far removed from the outlay which was designed to produce it, that the mind should be lost in the maze, and that there should result a vast aggregate of purposeless expenditure of time and resources. To preserve this chain of sequences and trace throughout the efficient cause to its adequate result where so many causes are contributing to a result, and so many results other than the one sought flow from a particular cause, it is absolutely necessary to have units. These units gather the effects at each stage of sequence to serve in turn as the causes to the next stage of sequence.

A unit is that thing which throughout its entirety responds in the same way to the same causes and produces in the same way the same effects. The idea is again expressed in the word entity. In the more common use of the word, a unit is some definite part of an entity which bears all its characteristics—or, in other words, it is the entity in miniature, and serves as a basis for measuring the significance of the entity.

But while the notion of what a unit is may be clear, in practice we can only most rudely approximate it. What we do adopt as a unit, is, in statistics, but one of the several coincident results. So long as the proportionate relation between it and the other coincident results is not disturbed, it serves as an index for all of them; but when some new factor is introduced this relation may be so disarranged that the particular result which we have used for an index of the whole body of results ceases to be reliable. Over and over again are mistakes made by ignoring this principle. Operating officers have been educated to the use of certain more or less accidental units. The increasing pressure is for "results." Reputations are made and blasted in terms of these units or "results," while real causes and effects are lost sight of. We do not go far back in railway practice to find the fetich of the operating ratio, and, somewhat more recently, of the big train load. Only when all the unrecorded causes and effects continue to have the same proportionate relation to the cause and effect which we use as the index to the whole, is our index significant. A big trainload that is accomplished at the cost of expensive locomotive maintenance, demoralized train movement, increased loss and damage expense, less ton-mile net efficiency of equipment, extraordinary costs for revision of bridges and structures and maintenance of track, disturbed morals of the trainmen—is not a gain, but distinctly a loss. Year after year these losses can go on without any

registry being made, except in the underlying conditions. They are only offset by the enormous productivity of the railway in other directions which makes up for the colossal blunders of its managers.

A first principle which the statistican recognizes is that a large part of his results are what he calls deferred results, and he throws the expense offsetting them into the class called maintenance. In this way he is able to apportion such causes against their effects for a series of years. A railway is in business for not a day, a week, or even a year, and more and more does it turn its attention to tracing the effects of these causes whose productivity is deferred or distributed over many years. Only in the light of such knowledge are intelligent policies devised; in other words the problem is to discover those larger entities or units within which cause and effect must be brought together to arrive at an intelligent notion of the net result. The official income account of a month or a quarter of a year is at best but a very partial index to the situation. Underneath is the play of the corroding or enhancing factors which at last in some way will come to the surface and be registered in the income account when it shall be too late.

If it is necessary that the statistician recognize these principles in his compilations it is far more essential that the manager recognize them in forming his organization. The problem of organization on a railway is a problem, at the last, of classification. The contending schools of divisional and departmental organization are in finality dealing with a statistical problem. We believe that a closer analysis of the real things that are happening along with the "results" that are produced is needed. Among these real things to be taken into view, and which so far have too often been ignored by railway men, are those far reaching causes and effects that are working out in the personal temperament and efficiency of the men. Railroading to-day, even within the lines of the operating forces themselves, and quite apart from the public questions raised, is a science of sociology, not less, but even more than it is a science of mechanical, and civil and electrical engineering. Lines of organization are frequently drawn across the grain of human nature in absolute disregard of the normal, healthful social forces that can be drafted into the service of the road and made to register their effects in the income account.

Incidental to the doing of anything the manager should remember that there is a by-product which is the maintenance and betterment of the intelligence and interest and moral qualities of the man who does the work. This is not upon any sentimental grounds, but from the strict requirements of the situation—to make more money. Mr. Rockefeller has said that his great company has built up its wealth from its by-products. Mismanaged railways have lost great aggregates of wealth by ignoring the by-products to be worked out in the constantly enhanced efficiency of their working force. Few realize the potentialities in an aggregate of 25,000, 50,000 or 100,000 men set into natural unit groups within and through which should be the free and selectivity play of all the latent forces in an orderly completion making for the enhancement of the net income of the road. In this eager race for "results," railroading is reduced to a mere arithmetic of superficial and frequently transient or local phases of the great underplay of the profoundly philosophical causes and effects. When to this is added the taint of personal favoritism or the obnoxious features of class consciousness, the situation has become hopeless indeed. There is a need in railroading for that large comprehension that unites the present with the future, the immediate cause with the remote effect through all the slow intricacies of educational, social and moral agencies. The great railway edifice at last rests upon the man. No complexity of machinery nor ostentation of aggregates can displace the requirement of self-respecting, eager, individual efficiency.

Letters to the Editor.

TIGHTENING THE GRASP OF GOVERNMENT.

New Haven, Conn., January 11, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Most persons had supposed that when Mr. Bryan with his platform demanding rate making by the Government, physical valuation of the railways and federal control of railway capitalization, was so overwhelmingly defeated last November we should enjoy a period of comparative rest from agitation for further experimental legislation against the railways. It will be recalled that the proposed plank demanding a physical valuation of railway property by the federal government which came before the Republican national convention was defeated in the committee on resolutions. Nevertheless now and then I read in some daily paper an interview or public utterance, usually inspired from Washington, telling of a proposed measure to be passed by Congress for federal control of railway capitalization.

If such a measure is to be considered by our Congress it seems only fair to ask, since we still profess to be a government by the people, whether there is a really popular demand for it. Are our people generally, or any large and interested class among them, demanding this legislation? If they are they seem to be singularly quiet about it. Does the shipper ask for it? I have endeavored to follow this question in its various aspects as closely as possible, and yet I fail to learn from any source of any large or representative shipper or class of shippers demanding this sort of legislation. In fact, the intelligent shipper seems to know that railway rates in this country bear no relation to the capitalization of the railways; that although he may suffer at times from discriminating or unreasonable rates these irregularities cannot be charged to overcapitalization. The remedy must be sought elsewhere.

Does the merchant want it? I fail to hear of any association of merchants expressing itself as favoring this proposition. On the contrary, the New York Merchants' Association—

". . . respectfully urges all members of Congress . . . and of railway commissions to encourage the return of railway business to normal conditions by ceasing and discountenancing ill-considered or unjustified censure of existing methods of railway management, and by limiting proposed new legislation on these matters to such measures as have been so carefully investigated and studied as to determine clearly not only the necessity for their enactment, but also their proper form and scope for the accomplishment of intended reforms."

Does the investor want it? Perhaps in this whole discussion there is nothing more significant than the silence of the investor. Of all persons in the community there is none whose interests would be more directly and seriously injured than the investor's from overcapitalization. The thoughtful investor knows that governments are proverbially prodigal and extravagant in their expenditures of public and other funds. Will it be less extravagant in its supervision of the expenditure of railway funds and of the output of railway securities when the government has no responsibility in the securing or raising of such funds? This present scheme of administrative supervision divorces the relations between the stockholder and his directors. It diminishes the self-reliance and watchfulness of the former and destroys the sense of moral responsibility of the latter. The stockholder is the natural foe of overcapitalization, but he is the last to ask that his prerogatives as owner should be taken away from him.

Do we hear of any lawyers advocating or approving of this new step in the system of our government? No. He who is learned in the law knows that the proposed legislation is a somewhat violent stretch of the United States Constitution and of the sphere of action of the federal government. Nor has any student of railway economics favored this idea.

Who does want it? I will enumerate to the best of my information: Professor Henry C. Adams, statistician to the

Interstate Commerce Commission; the members of that commission, a few of the more radical members of Congress and some politicians and loquacious agitators. That is the extent of the list at present. In a really popular form of government "what are they among so many," while hundreds of thousands, nay, millions of merchants, shippers, business men and investors either express themselves as opposed to the scheme of legislation or are ominously silent so far as any request is heard. Those who support it are all in public life or have their own political fortunes and aspirations to guard.

Whether the American railways are overcapitalized or not, the proposed remedy for the alleged evil is of a radical and experimental nature and open to many economic, constitutional and practical objections. Furthermore, it is submitted that the burden of proof lies upon the proponents to show that this legislation is necessary and expedient and that there are actual and existing evils which the new scheme will in its natural consequences remedy and correct.

It would seem only proper that those who so flippantly assert that our railways are overcapitalized first define overcapitalization and then prove their assertion. It would be very interesting if the Interstate Commerce Commission would explain to us, if this sort of government interference is necessary, why the American railways, after three-quarters of a century under the present system of corporate management and freedom from governmental control, are the most lightly capitalized of any railways in the world, save those of Denmark, Norway, Sweden and South Australia, while the American shipper enjoys the lowest freight rates of any shipper in the world.

ARTHUR C. GRAVES.

Contributed Papers.

MANUAL BLOCK SIGNALING WITH THE "A B C" SYSTEM ON NORTHERN PACIFIC.

The essential features of the block signaling rules put into use by Superintendent Beamer on 63 miles of the Northern Pacific single track about a year ago, and on over 500 miles in October last, are well known to readers of the *Railroad Age Gazette*.† The train despatcher controls all trains without a time-table, and the block signalmen in the stations, using a separate wire, distinct from the despatcher's train wire, go through the regular operations of the telegraph block system, so as to confirm the safety of the despatcher's movements independently of his actions. Permissive movements are strictly forbidden, except in rare emergencies.* The freight train capacity of the road has been increased on some divisions about 20 per cent., and in some of the comparisons even a higher percentage is shown. And while the average speed of freight trains has been thus improved there has at the same time been a saving in wages to the company per train mile; and by spending less time on the road each trip the men can make more trips per month. That there has been an increase in safety, as compared with the ordinary time-table and despatcher system, goes without saying, almost. On this last point evidence is scarcely necessary, for the superior simplicity of the space interval system is apparent from a mere statement of the two methods.

In view of the reported success of Mr. Beamer's innovation we have inquired of him somewhat particularly concerning the experience which he has thus far gained, with a view to giving an account, more detailed than has heretofore been published, of the reasons for and against adopting the "A B C" rules on railways generally. (By a "free" interpretation we may assume that "A B C" means Alfred Beamer, creator.)

The first and most significant fact to be taken into account is that Mr. Beamer at the outset, desiring to secure safety first and celerity second, determined to run his trains regularly by absolute blocking only. Having done this he was prepared to adopt regulations which for simplicity much resemble the train staff system; and the train staff system (or the tablet, based on the same fundamental principles) is generally agreed to be the safest method yet devised for spacing trains on single-track. The superintendent who is always ready to relax well known and desirable safety measures for the sake of saving a little time for a train, may as well at once give up the idea of completely repeating the success obtained on the Northern Pacific. One who expects to do much permissive blocking must expect not only to have a lesser degree of safety, but to sacrifice much of the simplicity which is an important element of strength in any scheme for regulating train movements.

Before entering upon a comparison between the Beamer plan and the better known methods of train control, we will notice a few details of the Northern Pacific practice.

DETAILS OF OPERATION, SPOKANE AND TROUT CREEK.

The record shown herewith, Fig. 1, is that of an eastbound freight train of December 1st, 1908, running from Spokane to Trout Creek, 133 miles. The number at the top, D F 187 is the regular designation of this manifest train each day, and the same number is retained from the Pacific Coast starting point through to St. Paul, Minn. The notations in the eight lines at the heading are self-explanatory. Littlemore was the engineer of engine 472, a helper running from T. C. (Tuscor) to J. (Trout Creek). Engine 2418 is the regular engine of the train.

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†See *Railroad Age Gazette*, November 6, 1908, page 1286; September 4, 875. See also *Railway Age* for 1907, as follows: February 22, page 237; April 12, page 595; May 3, page 698; May 17, page 765; November 15, page 672; also March, 1908, page 303.

*Following are the principal features of the order issued when the system was introduced on the division east of Spokane.

Effective at 12.01 a.m., October 10, all time-card trains [both passenger and freight] shown on Time-table No. 29, are annulled. All the running rights that a train has at any time are conferred upon it through the medium of a block card, issued by the train despatcher.

A block is the section of main line extending from the signal at one telegraph office to the signal at the next telegraph office in advance.

Train and enginemen are prohibited from accepting or running on a card purporting to authorize them to pass an open telegraph office.

No train will, except under flag protection, be allowed to leave a terminal or pass a telegraph office, no matter what may be the position of the signal semaphore, without both the conductor and engineer first securing a block card authorizing the train to use the block in advance.

Immediately following the departure of a train from a telegraph office the operator will report its departure to the despatcher and to the operator at the next telegraph office in advance of the train.

Immediately upon receipt of this report the operator at the office in advance will assure himself whether the block in advance from his office is clear, and if so, he will at once ask the despatcher, in the form provided, for the block in advance for the approaching train. If his record shows the block in advance is occupied by another train, he will hold his signal against the approaching train until advised that the block in advance is clear.

Having secured the block card from the despatcher he will at once secure from the operator at the next office in advance a pledge of the block for the train for which the despatcher has authorized the block card. After this has been accomplished he will place his signal in the clear position and deliver a copy of the card to the engineer and another to the conductor as the train passes his office

Trains approaching telegraph offices and finding signal at clear will understand from this that the block ahead is clear and will pass the telegraph office without reducing speed, catching the block cards as they pass. If, however, from any cause the cards should not be secured the train will be brought to an immediate stop and will not proceed until the cards are secured.

Conductors and engineers will immediately examine the block card following its receipt by them and make sure that it is correctly made out. They will follow implicitly all instructions given them thereon. If directed to take siding at a station they will do so *disregarding a signal to come down the main line*. The rights conferred on the train by a block card cannot be *extended* by a signal, but may be *restricted* by one.

When taking siding to meet an opposing train or to be passed by a following train, trains will head in at the first switch at all points where lap sidings are provided.

All exceptions, and the name of the telegraph office in advance, must be repeated to the despatcher by the receiving operator. [A card bearing no exceptions is not repeated.]

When necessary to change instructions on cards that have already been put out by the despatcher, he will invariably do so by annulling the card containing the instructions which it is desired to change . . . Despatchers will, when making a change in meeting or passing points invariably use the term, "Instead of."

All trains will be designated by the number of the engine pulling them.

In the event of a wire failure occurring between two telegraph offices trains will simply flag across. When trouble of that kind occurs despatchers on the side of the break opposite from the despatcher in whose territory the break occurs will be advised of the fact by the operator closest to the break, . . . and will move trains over the detached territory until repairs to the wire have been made.—For other details of this circular see *Railroad Age Gazette*, November 6, 1908, page 1286.

The space for No. (number) at the top of the card is used in filing the records at the close of the day.

(The "train sheet," which is before the despatcher at any given time consists of as many of these long, narrow strips as there are trains on the road at that time. Each strip is kept between brass grooves or slides, and as soon as a train has completed its trip the strip is taken out.)

The heading of the card being thus filled in, the remainder of the record is made from the bottom upward; the cards for this division being always printed so that westbound trains are to be read downward and eastbound trains upward.

"Time Ordered" is the time at which the train crew was ordered to be on hand. In this case the train left promptly at the expected hour. Despatcher Darling had charge of this movement from the starting point to Hauser; Despatcher Wyckoff from Hauser to Noxon, and Despatcher Smith from Noxon to the end of the division.

The train started with 41 cars, weighing 1591 tons. The first block card was No. A-188, delivered to the train at Spokane. The number of this card is entered against the next block station, Yardley, at the time the card is issued, and, of course, *before* the arriving time at Yardley has been entered. By this practice the despatcher always has a clear indication of the cards which have been issued and have not been fulfilled.

Card A-196 was issued at Trent for the movement to Hauser, with an "exception" informing this train that it was to take the siding at Otis (not a block station) and there meet westbound engine No. 1617.

Card A-202 was issued at Hauser for the movement to Rathdrum. The stop of 18 minutes at Rathdrum is noted at the bottom, as having been required to take water ("RD. wtr.").

The first note at the bottom, "Otis No. 53 (1617)" shows the train which was met at Otis, No. 53 being the designation of its character as a fast freight.

The next note indicates that there was a loss of ten minutes between Trent and Otis, because of low steam.

Returning now to the time record, we find that at Ramsey order No. A-214 was given for the movement from Ramsey to Athol, with an exception to "Take siding and meet engine 292 at Athol." The note at the bottom of the record, "AX No. 15 and set out," means that the train met at Athol was passenger No. 15, and that there was also at that station a delay to set out one or more cars.

Card A-236, issued at Athol for the movement thence to Granite, had the exception "Take siding and let engine 161 pass at Granite."

The 34 minutes' delay at Granite needs no explanation, as this train had to clear the block section in the rear before the passenger train (engine 161) running in the same direction, entered it, and then had to wait at Granite until the passenger had cleared the block section in advance.

Card A-249, issued at Granite for the movement from Granite to Cocolalla, contained the exception "Look out for engines 1371 and 1365, working on main line."

Card No. 280, issued at Kootenai for the movement to Hope, contained the exception "Take siding at Hope." This was not to meet any particular train, but to allow the crew a period of time, the length of which was not known, to eat and to coal and water the engine.

This card was issued at Kootenai to run to Hope, because the office at Oden was not open at that time, 8:05 p.m.; but by the time the train reached Oden the operator had come on duty and reported the train. Oden is open at night but not in the day time.

The notation 39-0-1590 means that from Hope the train consisted of 39 loaded cars, and no empty cars; weight, 1,590 tons.

The despatcher not being informed as to how long a time would be used at Hope, the next order would not be issued until the operator at that station, being informed by the conductor at the proper time, called for a card for the movement from Hope to Clarks Fork. It may be assumed that in this case he asked for the card at, say, 9:35. The departing time in every case indicates the actual departure of the train from the station, and not the time when the conductor gave the signal to start.

The notation at the bottom of the sheet, "H. eat and fill," means not that the trainmen were to eat and be filled, but that they were to eat their luncheon at Hope, and fill out the train with cars (some having been left at Athol).

The notation "H R No. 3 (233) and no steam," means that at Heron passenger train No. 3 was met, and that there was a delay also, because of low steam pressure. Passenger trains continue to be called by their numbers which have been in use for years, although these numbers have nothing to do with the running rights. They are of use mainly for the passenger department and for advertising.

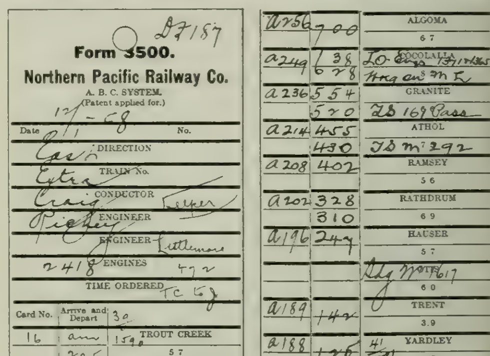


Fig. 1—Sample of a Despatcher's Train Sheet.

Actual length of sheet, 18 ins. Sheet cut in two and engraving reduced about one-third in height and width.

The order issued at Noxon is No. 1, being the first number issued after midnight. This order bore the exception, "Hold main track and meet engine 472 at Tuscor." There was also another exception on this card consisting of instructions to run at a certain restricted speed over two places between Noxon and Tuscor, these notations being the substance of bulletins No. 20 and No. 26. This is the meaning of the notation on the record "B-20-26."

The last notation at the top of the card, "39-0-1590," shows

the make-up of the train when it arrived at Trout Creek.

The last notation at the bottom of the card means that the delay at Noxon (Nx) was for taking water, and that the helping engine was taken on at Tuscor.

One day's trains.—The chart, Fig. 2, shows graphically the movement of all the trains over this district for December 2, 1908; four eastbound and four westbound passenger trains through; one passenger train each way between Spokane and Hauser Junction, and 20 through freight trains, 10 eastbound and 10 westbound. From Spokane to Yardley, 4½ miles, and spatching rules, but permissive blocking was freely used; while at the later date there was no permissive signaling. As will be seen by the summary at the bottom, the average running time was reduced 9⅔ per cent., though the number of trains run was 20 per cent. greater. Besides this increase in trains, the operation of the division was complicated in 1908 by the presence of four work trains each day, traversing a territory of 20 miles between Heron and Trout Creek, making usually four trips a day, or 16 trips for the four trains. The number of through passenger trains is four each way daily,

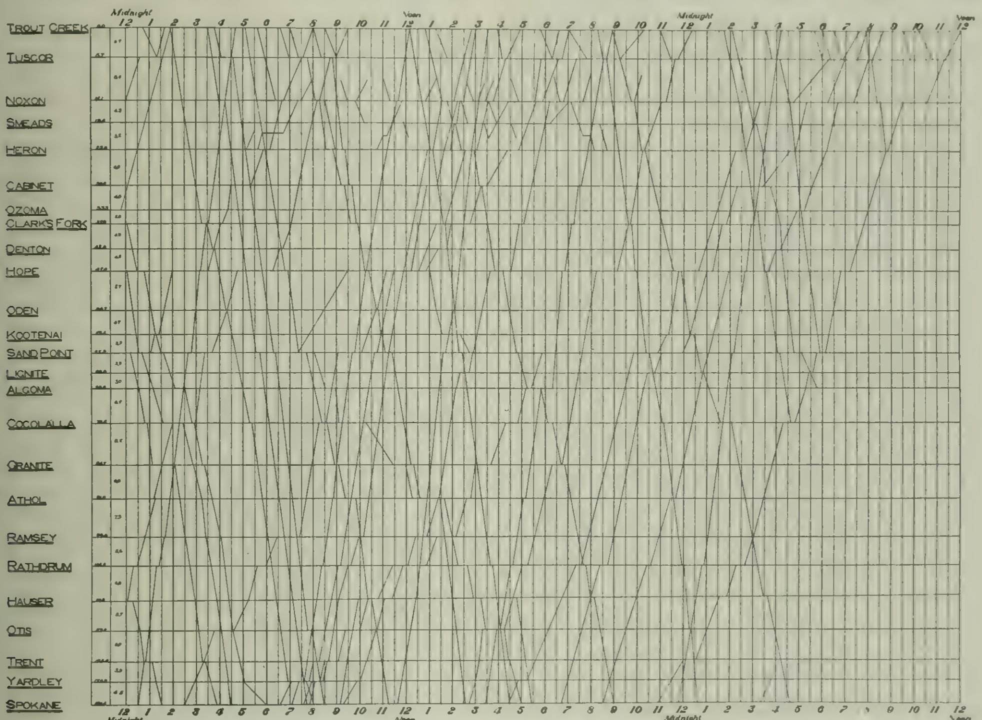


Fig. 2—Movements of Trains Between Spokane and Trout Creek, December 2, 1908.—Northern Pacific.

The passenger trains, eastbound, are those leaving Spokane at 12:30 a. m., 7:09 a. m., 11:37 a. m., 3:28 p. m., 11:52 p. m.; westbound, leaving Trout Creek at 3:30 a. m., 3:50 a. m., 12:10 p. m., 8:17 p. m.

for a short distance between Rathdrum and Ramsey there are two main tracks, which accounts for the meetings of trains between stations. The short runs between Heron and Smeads and between Noxon and Tuscor represent gravel trains. The meeting of trains at 10.45 a.m. between Cocolalla and Granite was at a "blind" spur track. When trains meet at a place like this, the block cards given to the conductor and engineman confer right to the meeting point, and there the conductors secure new cards by telephone. All of the "blind" sidings are equipped with telephones.

The meet at Kootenai at 1:15 a.m. was arranged the same as for a blind siding, Kootenai being closed at night.

The station track diagrams, Fig. 3, are samples of diagrams, one for each station, with which the despatcher's desk is equipped. The engravings are one-third the actual size.

In the table below, the tonnage and time of freight trains over this line for the first 15 days in November, 1908, are given, together with the average time of all of the freight trains of each day; and alongside of these figures are shown those for the corresponding days of 1907. The weather conditions were the same in 1908 as in 1907. At the earlier date the manual block system was in use, with standard code de-

and, in addition to these, there is one passenger train each way daily between Spokane and Hauser.

Comparison of A B C and Standard Code Operation between Spokane and Trout Creek. Through Freight Trains Only.

Date.	1907 No. of trains.	Tons.	Time, Total, hrs. m.	Ave h. m.	1908 No. of trains.	Tons.	Time, Total, hrs. m	Ave. h. m.
Nov. 1..	12	14,690	133 11	11 06	17	19,746	152 13	8 58
" 2..	17	19,635	181 47	10 40	20	22,275	181 09	9 03
" 3..	10	13,699	110 03	11 00	20	21,544	196 40	9 50
" 4..	13	14,498	123 56	9 32	21	22,415	194 09	9 05
" 5..	12	13,672	111 37	9 18	22	24,493	229 54	10 27
" 6..	10	11,802	113 50	11 23	15	18,544	153 49	10 15
" 7..	18	22,851	206 28	11 28	17	19,362	164.10	9.39
" 8..	13	14,673	145 12	11 10	13	17,394	120 52	9 18
" 9..	16	17,981	193 20	12 05	22	27,786	235 58	10 43
" 10..	15	18,957	158 23	10 35	20	24,194	204 06	10 15
" 11..	17	17,525	177 30	10 12	20	20,461	186 10	9 19
" 12..	20	21,711	255 12	12 15	15	17,593	145 22	9 41
" 13..	14	14,182	161 27	11 32	14	18,166	143 20	10 14
" 14..	20	24,652	194 14	9 42	17	22,638	181 00	10 38
" 15..	18	20,243	181 00	10 00	17	18,921	165 55	9 45
	225	260,741	2447 10		270	315,532	2654 44	

Average running time, 1907, 10 hrs. 52 min.
Average running time, 1908, 9 hrs. 49 min.
Saving per train over 1907, 1 hr. 3 min.
Increased efficiency over 1907, 9.66 per cent.
Total trains run, 1907, 225; 1908, 270; increase over 1907, 20 per ct.

A similar statement for the 11 days, October 21-31, being the first 11 days of the operation of the new system, shows

that the time of the trains was reduced 15.5 per cent., while the number of trains run was increased 23.7 per cent. The saving averaged two hours and four minutes to each train. In this October record the tonnage was slightly less than in the previous October, but the whole of the falling off was in the westbound movement.

NOTES.

As with any absolute block system with long block sections, an important element of success is the efficiency of yard operation. A yardmaster whose habits are such that he sends trains out just as the cars happen to be ready, or sends them in bunches, can do much to defeat the smooth working of the block system. On the division of the Northern Pacific here under consideration, through freight trains are started out about once in two hours, making the ordinary capacity of the line 12 freight trains in 24 hours (there are four passenger trains each way). The yardmasters make their calculations to send out trains according to these regular intervals and they do not find it difficult to do so. With a line of this character —with passing tracks about six miles apart and with freight trains making an average speed of 20 miles an hour between stations—this number of freight trains, 12 a day, is, in Mr. Beamer's opinion, the reasonable capacity of the line.

The station operators or signalmen are held to the habit of strict attention to duty by a rule forbidding the despatcher to offer a block card; that is, he must not authorize a train to proceed from B to C until B, having heard from A of the approach of the train calls for the authorization. The man at B must therefore be always on hand to get his advice from A and ask for the authorization in due season so as not to delay any train.

On the other hand, the signalman must not arrange a movement and *then* ask the despatcher to confirm it; for occasionally the despatcher, with his more complete knowledge, finds it necessary to require the station signalmen to hold the train. and cards are never issued long before they are needed.

Specimen block cards are shown in Fig. 4. The space on the cards indicated by the word "exceptions" is used to write in any instructions which may be necessary, as, for example, in card A 214.

These instructions may consist of a direction to meet an

and refuse to run on the authority of the card. Enginemen careless in this respect can be tested by decoy cards. If a card said meet engine 48 at the next station, and the engine found there should prove to be No. 49, the conductor and engineman holding the card would go to the station office for an explanation.

Block cards are given to both the conductor and the engineman because it is a duty of the conductor to identify opposing trains at meeting points. On the Northern Pacific the con-

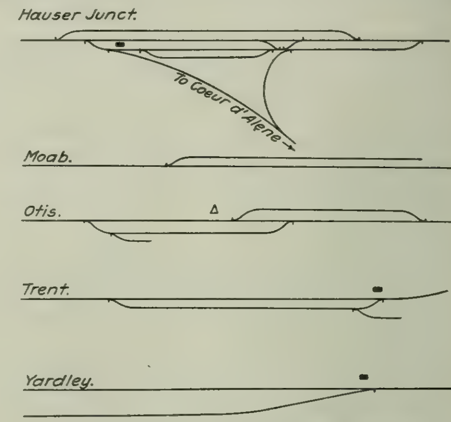
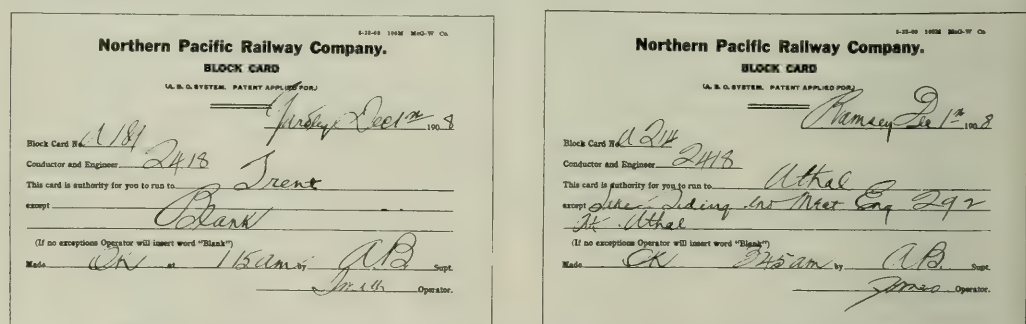


Fig. 3—Despatchers' Station Track Diagrams.

ductors of passenger trains are required to signal to the engineman on approaching a station where another train is to be met.

On passenger trains the rear brakeman catches the block cards from the station men and immediately carries them to the conductor.

Enginemen and conductors (or brakemen) catch cards by hand, light rattan hoops being used by the station man to make it easy for the card to be grasped; but experiments are being made with a simple device, to be attached to engines



Northern Pacific Railway Company.

BLOCK CARD

(A. B. C. SYSTEM. PATENT APPLIED FOR.)

Yardley Dec 1st 1908

Block Card No. A 181

Conductor and Engineer 2418

This card is authority for you to run to Trent

except Blank

(If no exceptions Operator will insert word "Blank")

Made OK at 1 15 am by A B Supt.

Operator.

Northern Pacific Railway Company.

BLOCK CARD

(A. B. C. SYSTEM. PATENT APPLIED FOR.)

Ramsey Dec 1st 1908

Block Card No. A 214

Conductor and Engineer 2418

This card is authority for you to run to Athol

except Lake Siding to Meet Eng 292 at Athol

(If no exceptions Operator will insert word "Blank")

Made OK 3 45 am by A B Supt.

Operator.

Fig. 4—Samples of Block Cards Used With A B C Despatching Rules, Northern Pacific.

Actual size of cards 5¼ in. x 7⅞ in.

opposing train at an intermediate siding which is not a block station; or to be passed there by another train moving in the same direction, or to pass another train headed in the same direction. Where a train has a card to a blind siding, the conductor on arriving goes to the telephone booth and secures a new card for the run to the next station. In giving these meeting and passing instructions, the despatcher is not required to use precisely the same wording to both trains, the repetition of the operations by the signalman being deemed a sufficient safeguard against the chance that an error by a despatcher will go uncorrected. If a card were delivered to engine 2,858 written 2,838 the engineman would see the error

and cars, by which cards can be taken up at any speed without the intervention of the trainman in the operation.

An inspection of the 18 block cards which were given to the conductor of a certain freight train on December 13 shows that for legibility 16 of them would be classed as practically perfect. They would be so classed even by one unacquainted with the road; while the other two are reasonably legible and are, no doubt, entirely satisfactory to men acquainted with the local conditions. Cards are called in and inspected at the superintendent's office often enough to enable the officers to keep informed as to the quality of the signalmen's work.

The operators were carefully instructed before the new

method was put in use, but it is the uniform testimony of the men who did the instructing and of the operators themselves that the new system is so much simpler than the old that the instruction consists mainly in telling what old practices are to be discontinued. Under the new system the work of the operators is so greatly simplified that it is immeasurably easier for an inspector to detect carelessness. Everything that an operator does in connection with the movement of a train is shown on a single slip. In case of any slight irregularity the despatcher is able at once to put his finger on the man responsible.

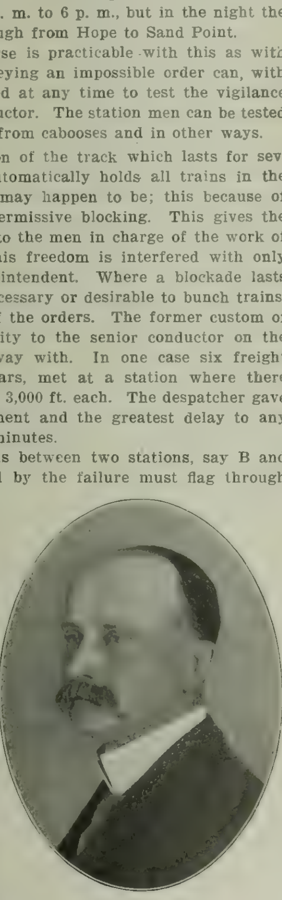
Of the 55 telegraphers in this district 15 have been in service over two years; six have served two years; seven have served one year; seven six months, and 20 less than six months. All of these men had had experience as telegraphers on other railways before coming to the Northern Pacific.

Provision is made for closing offices temporarily and making two block sections into one. For example, the office at Oden is regularly open from 7 a. m. to 6 p. m., but in the night the block section extends through from Hope to Sand Point.

Surprise testing of course is practicable with this as with any system. A card conveying an impossible order can, with proper precautions, be used at any time to test the vigilance of an engineman or a conductor. The station men can be tested by removing the markers from cabooses and in other ways.

In case of an obstruction of the track which lasts for several hours, the system automatically holds all trains in the block section where they may happen to be; this because of the rigid prohibition of permissive blocking. This gives the greatest possible freedom to the men in charge of the work of clearing the track, and this freedom is interfered with only on the order of the superintendent. Where a blockade lasts long enough to make it necessary or desirable to bunch trains, the despatcher gives all of the orders. The former custom of giving supervisory authority to the senior conductor on the ground has been done away with. In one case six freight trains, aggregating 194 cars, met at a station where there were two passing tracks of 3,000 ft. each. The despatcher gave the order for each movement and the greatest delay to any of the six trains was 20 minutes.

When the telegraph fails between two stations, say B and C, the first train detained by the failure must flag through the block, from B to C or from C to B, as the case may be; but having secured protection at both ends of the block the conductor of that train can then act as a pilot for any or all trains.



Alfred Beamer.

Alfred Beamer, Superintendent of the Idaho division of the Northern Pacific, and the originator of the "A B C" rules, was born at Hillsdale, Mich., in 1856, and began his railway service as a telegraph operator on the Detroit & Milwaukee in 1872. He served as operator, agent and despatcher on that and the Lake Shore, and began his service on the Northern Pacific in 1884 as operator. After a few months, he was made Chief Clerk of the mechanical department at Sprague, Wash., where he remained four years. In June, 1888, he was appointed a Chief Clerk in the operating department; and in February, 1903, he was made Superintendent.

(To be continued.)

FREIGHT CLAIM DELAYS REDUCED.

From the Frisco Man

Under a new plan just adopted on the St. Louis & San Francisco the freight claim agent will discontinue addressing superintendents, agents and others direct, with regard to the investigation of loss and damage freight claims, and will send all such claims to the superintendent of transportation for investigation, a bureau for the handling of claims having been provided in that department. Ten traveling agents have been employed, one on each operating division, to whom claims are to be sent for investigation. Some claims will be addressed to agents direct, but comparatively few. The superintendent will not be asked to secure the information. "Over and short" reports will be made, even though goods over may be plainly marked. This report will be sent to the superintendent of transportation with a copy to the traveling agent assigned to the division. He will make an immediate investigation from the "short" report and "over" report, and in case of a "short" report the same as if a claim had been filed. The property will be found or it will be ascertained that it cannot be and the case handled for discipline. It is hoped to have investigation of claims for freight that is lost completed before the average commercial institution presents its claim, thereby enabling the company to make a prompt adjustment.

The office of the superintendent of transportation will have nothing to do with the adjustment of the claims, this being handled by the freight claim agent, as a result of its investigation, and after a recommendation as to the liability of the railway.

The traveling agents will have duties other than the mere investigation of "over" and "short" reports and claims. It will be their duty to see that all agents handle freight properly, keep the proper records regarding the handling of freight, see that the district terminals keep a proper seal record and a proper record for perishable freight, amount of ice in bunkers, the condition of the vent and plugs, and, at certain points which will be specified later, the condition of the freight.

Claims will not be sent to superintendents except where a case is proved against one of their employees, and it then becomes a question of discipline and should be handled by the superintendent personally. It is believed that the number of cases will be decreased to such an extent that it will be no burden to them, but through the handling of these cases personally they will have a knowledge of the freight claim conditions on their division and have an opportunity to remove the cause.

E. D. Levy, superintendent of transportation, says:

For a number of years there has been an incessant demand made by shippers individually, and through their various commercial organizations, for a more prompt payment of claims for loss and damage of freight.

The management of the Frisco railway realizing that there was considerable justice in the complaint of the public with respect to delay in adjusting freight claims, has undertaken to correct it, and the new plan was authorized with this end in view.

In the past practically no investigation was made until the claimant presented his claim. Under the new plan, considering a "short" report and a "damage" report as a claim, and investigating it as such, the investigation being made by an experienced man on the ground, instead of writing numerous letters, it is hoped to have the investigation of the larger portion of our claims for loss and damage completed before the claim is received.

Of course this does not refer to concealed losses, but we can make the investigation of a claim for a concealed loss in less time than under the present practice.

The traveling agents have been impressed with the fact that, while it is important to investigate a claim sent to them

for investigation, and develop all its facts, and to do so quickly, it is secondary to finding the cause of the claim and removing it, in order that we may not have a second one.

Once every month all of the traveling agents will meet in the office of the superintendent of transportation, together with the office force handling the claims, and overs, shorts and damages and all matters will be thoroughly discussed, in order that all may have the benefit of the experience of every individual.

MILITARY HABITS IN TRAIN OPERATION.

BY W. L. PARK,

General Superintendent, Union Pacific Railroad.

The involuntary, as well as the loyal performance of duty, history teaches us, was the aim of the military leaders who have won the great battles of the world. Napoleon was able to drive his adversaries in great numbers and much confusion before him for the reason that his orders were promptly carried out. Grant, at the opening of the civil war, knew the value of discipline when he refused railway transportation and started from Springfield on foot with the Twenty-first Illinois, concluding the march at the front with the best drilled regiment from that state. Lee's strength was in his calm and dignified insistence upon close and faithful observance of his orders. The Japanese in their war with Russia conquered by their superior discipline alone. Without good discipline the skilled strategists would be helpless and the brightest military brain count for naught.

In railway as well as military discipline the first essential must of necessity be a thorough knowledge, by the officials in charge, of what is required. The primary rules governing the operation of trains are comprehensive and plain, and do not contain the intricacies of military tactics; they can therefore the more easily be applied, but such application must be consistent and impartial, and above all, there must be no hesitancy or vacillation at the caprice of some one individual.

The rank and file are constant; they may be looked upon as cast all in about the same mold; and whether the force is formed into an efficient or an indifferent force, depends entirely upon the individual who shapes and carries out the policy of discipline. This individuality of the commanding officer must permeate and dominate the entire organization.

Railroading is more nearly akin to warfare than any other humane profession. The number of casualties to persons on our railways for the year ending June 30, 1907, was 122,855, of which 11,839 represented the number of persons killed and 111,016 the number injured. Of this number the passengers killed were 610, and those injured 13,041. The personal injuries, fatal and non-fatal, assume much the same aspect to the general officers in charge of a railway as to the general officers in command of an army. The responsibility of the railway officer, however, is greater, for he has not the excuse of war. Therefore, if "Eternal vigilance is the price of safety" in battle, it is certainly a maxim that should have first consideration from railway men. It does not, however, and the small things that are so essential to military discipline are usually neglected by railway officials. The patience of the drill sergeant in obtaining an erect bearing, uniform step and prompt obedience to orders all tend to involuntary action in time of emergency, without which "Bull Runs" would appear more frequently in history. But railway officials almost universally neglect these things, depending upon the so-called "esprit de corps" and the native intelligence of the men. But in time of need they frequently find this lacking; or it is weakened by superior allegiance to organizations, or by indifference.

One of the first, but not least important of the steps to good discipline is the proper protection of trains by flagmen. A railway has no right to take in charge passengers unfamiliar with the ordinary means of self protection, and not fully and adequately protect them from the danger of collision. Such protection costs nothing, facilitates the movement of trains and adds much to the general discipline. It can only be obtained, however, by exacting military discipline, which compels involuntary performance of duty at all times and under all circumstances.

There should be no impatience on the part of officials with trivial delays to trains, perhaps originated to discredit this part of the service. Many weeks of patient drilling have been nullified by some official indicating his disapproval of exactness in flagging, with no better reason than personal discomfort at an unusual delay. The men are quick to observe and imitate, and of course are ready to shirk a duty which to them seems unnecessary and unreasonable. A little encouragement to depart from a strict enforcement of this important duty will spread fast, while a reprimand for neglect will travel very slowly indeed.

The flagman cannot render the service with uniformity and zeal unless he understands exactly what is required of him and knows that he is meeting such requirements. Under proper guidance and constant surveillance he will soon take a pride in his work, and render the full measure of efficiency required, not only for safety, but for the reputation of the road by whom he is employed. Here again comes in the "personal equation," not of the flagman, but of the official in charge. If the flagman is spasmodically excused from performing his duty, or the overlooking of a slight departure from the full performance of this duty is indulged in, the discipline is not on a safe foundation; it does not command the respect of the men and the superintendent will not obtain the high degree of efficiency requisite to meet the test of all the circumstances that may arise. Without stability discipline is practically worthless.

Fidelity to duty has seemingly of late years been on the wane among railway men. Many reasons are given; such as, first allegiance to organizations with dependence upon them to obtain mitigation of penalties; the attitude of the public towards railway managements; scarcity of experienced men and fewer apprenticeship opportunities. All of these are perhaps factors, but all can, in a great measure, be counteracted by insistence upon strict observance of the rules.

The "Efficiency Tests" in vogue on the Union Pacific System and the Southern Pacific Company's lines have done much to bring about a more satisfactory condition of discipline. There must, however, be the basis of training in order to obtain the results desired.

Strict observance of flagging rules performed by a bright, neatly uniformed young man, displaying his flag or red light at the same distance from the rear of the observation end of a sleeper, rain or shine, always taking the same attentive position, waiting the same length of time before proceeding farther back, and returning promptly when recalled by the whistle of the locomotive, inspires confidence on the part of the passengers; it adds to their comfort and at the same time contributes to the reputation of the railway.

Constant attention to this duty, and the favorable comments elicited from observing passengers instills pride and loyalty. Passengers ordinarily do not understand the operation of trains; they are quick, however, to appreciate and commend good flagging. Observing efficiency in this respect during the entire day, they are apt to rest well in the assurance that it will be continued throughout the night. Confidence inspired in this way is an asset worth far more than the mere physical exemption from accidents. It brings its rewards in increased patronage and in peace of mind to operating officials. This last alone is worth much more than the cost of establishing and maintaining a right system of flagging.

If railway officials would give this one thing the attention it deserves, they would be surprised to learn to what extent good flagging helps the discipline otherwise. Many of the

duties of the conductor and engineer are dependent upon and made more uniform by faithfulness and regularity in flagging. One of the first essentials to perfection in this respect is the divorcing of the flagman from the engineer and conductor, an innovation frequently resented by both, particularly the latter. The flagman acting independently compels, however, prompt work about the locomotive and baggage car; else he is gone back in the allotted time and must be recalled, a performance relished neither by the engineer nor the conductor.

Where flagging can be dispensed with under conditions of absolute safety, there should be no hesitation in doing so. The fact that innovations of this kind meet much opposition from operating officials indicates a lack of progressiveness in details of operation. The Union Pacific and the Southern Pacific have recently adopted the following rule:

"When a train stops or is delayed under circumstances in which it may be overtaken by another train the flagman must go back immediately with stop signals a sufficient distance to insure full protection. One-fourth of a mile from the rear of the train he will place one torpedo on the rail; continuing back one-half mile from the rear of his train, he will place two torpedoes on the rail, two rail lengths apart. He may then return to the single torpedo where he must remain until relieved by another flagman or is recalled by the whistle of his engine. When recalled, if he does not see or hear an approaching train, the single torpedo will be removed (and not before); if conditions warrant, a red fusee will be displayed to protect his train while returning.

"During foggy or stormy weather, in the vicinity of obscure curves, or descending grades, or if other conditions require it, the flagman will increase the distance.

"Should a train be seen or heard approaching before flagman has reached the required distance, he must, at once, place one torpedo on the rail, and, if by night or during foggy or stormy weather, display a red fusee, continuing in the direction of the approaching train.

"If the flagman is recalled before reaching the required distance he will, if necessary, place two torpedoes on the rail two rail lengths apart by day, and by night display a red fusee in addition, to protect his train while returning.

"When a train is flagged, the engineman must obtain a thorough explanation of the cause, stopping if necessary.

"The front of a train must be protected in the same manner when necessary.

"Conductors are responsible for the full protection of their trains in both directions and under all conditions.

"In block signal districts where the automatic home block signal governing the track in use can be plainly seen at the rear of the train to be at 'stop,' its location being not less than one-half mile from the train to be protected, it will be unnecessary for the flagman to go back. The indication of the signal at the time train passes must not govern the modification of the flagging."

This last paragraph has received careful attention. Before adopting it there was necessary a very thorough drilling of enginemen as to observance of automatic block signals. The drilling has brought this feature of discipline to a very satisfactory stage, fully justifying the adoption of the modified rule. Its merits are that the flagmen are relieved from perfunctorily performing duties that are entirely unnecessary. The responsibility is placed with the engineer of the approaching train and he is so trained that it becomes second nature to move his locomotive under the guidance of the block signals. He involuntarily controls its movements, as directed, and so long as he does so a collision is impossible. Throwing this responsibility where it rightfully belongs sharpens the attention of the engineer. Divided responsibility in this respect, as all railway men are aware, has been the cause of many a deplorable accident, followed by accusations between the men as to each other's shortcomings. Differences are seldom cleared away by later investigations and the question of veracity remains unsolved.

The animate safeguard—the man—has heretofore been deemed more effective than the inanimate object in stopping an oncoming train. Of course in changing from one to the other the step should be carefully taken. The men, however, after thorough drilling and testing on observance of block signals, soon become accustomed to the change; and, once the change is made, we have eliminated the performance of duties that are manifestly obsolete and not in keeping with modern railroading. By dispensing with the human factor as far as possible, and developing a more acute sense of duty and personal responsibility among the employees, American railways may be brought to that high plane of efficiency which all enterprising officers should aspire to and maintain. In this one thing American railways seem to be inferior to the European, and without any good reason. The morale on American railways ought to be better than that in other countries, as we have here a higher average of intelligence and more favorable surroundings, and the young have greater opportunities for advancement. Undoubtedly we lack in efficiency of supervision and education of employees. This, however, is now in a fair way to be corrected, and with the advent of automatic block signaling and interlocking a new era of efficiency is dawning. In the meantime the most essential duty of both officials and employees is to obtain efficient flagging.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XIV.

A table herewith gives for each stage the net estimated cost of the rolling stock and electrical equipment thereof, after allowing credit for the steam locomotives and rolling stock displaced, these credits being based on the figures agreed while in Melbourne.

*Cost of New Rolling Stock, Alterations to Existing Stock, and Electrical Equipment.**

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Alterations to existing rolling stock†	£13,175	£69,917	£146,802	£210,726
Additional rolling stock.‡	20,724	20,724	20,724	201,930
Complete electrical equipment	39,028	157,278	293,381	445,038
Total	£72,927	£247,919	£460,907	£857,694
Less credits: For locomotives & roll'g st'k released	6,608	28,903	38,615	107,442
Total	£66,319	£219,016	£422,292	£750,252
Spare material	1,355	2,641	3,752	4,629
Total	£67,674	£221,657	£426,044	£754,881

*Including freight, tariff, engineering and contingencies.
†See tables on cost of lengthening and altering suburban steam stock.
‡These figures include the amount to be credited to the country service for the transfer of its cross-compartment stock to the suburban service.

Under the climatic conditions existing in Melbourne it is not necessary to provide sheds for the housing and routine inspection of the whole of the stock. I recommend, however, that inspection pits to accommodate all the motor coaches necessary for Stage I, and three-quarters of the motor coaches necessary for Stage III, be constructed under the Flinders street sidings. I also recommend that an inspection pit to accommodate one motor coach be provided at certain outlying stations.

In addition to this routine inspection, it is necessary to provide for the thorough examination and overhaul of the electrical equipment after each motor coach and trailer coach has run a certain number of miles. For this purpose I recommend the erection of a small car shed on the site available

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

at Flinders street in preference to running the stock into the Newport shops, which would involve an unnecessary increase in the waste mileage. For heavy repairs, painting, etc., the stock would be taken to Newport as at present.

Capital Cost of Inspection Pits and Proposed Flinders Street Car Shed.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Car shed	£8,795	£8,795	£17,591	£24,251
Inspection pits	5,597	14,743	27,588	33,090
Total	£14,392	£23,538	£45,179	£57,341

The Flinders street car shed will be provided with electrically-operated cranes for lifting the coach bodies, and the necessary stores and tools for dealing with minor repairs and renewal of the electrical equipment.

Annual Cost of Maintaining Rolling Stock and Electrical Equipments.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Cleaning of cars	£481	£2,638	£5,084	£7,888
Inspection and cleaning of equipm't.	1,053	5,769	11,122	17,256
Sundries—oil and stores	451	2,473	4,766	7,395
Repairs.*	2,707	14,834	28,598	44,372
Total	£4,692	£25,714	£49,570	£76,911

*At Flinders Street car shed and at Newport.

My estimate of the cost of the inspection pits and car sheds proposed is given in an accompanying table.

The cost of maintaining the electrical equipment is almost directly proportional to the mileage run. A table gives my estimate of the annual cost of cleaning and repairs to rolling stock. This estimate is based on my experience with similar equipments.

In order to obtain the motormen's and guards' wages for working the services proposed, rosters have been prepared on the basis of the set-workings referred to, and from these the number of men required to work the service has been estimated. The totals of the wages sheets corresponding to the estimates which have been made for each stage, are given in a table herewith.

Annual Cost of Train-Operating Staff.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Motormen's wages and stores	£2,693	£10,052	£19,027	£29,079
Guards' wages and stores	2,229	7,728	15,158	23,479
Total	£4,922	£17,780	£34,185	£52,558

I have considered the location of the block sections and, taking into account the extra facilities afforded by a multiple-unit system of electric train operation for handling the additional trains which it is proposed to run, I do not anticipate that for Stage I of the proposed conversion any difficulties need be feared with the sections as now set out. From the detailed particulars of the running speed over each section of the lines covered by Stage I, your signaling department will be able to decide definitely by how much the proposed service can be increased without necessitating a rearrangement of the existing block sections.

The accompanying table compares the time taken by the present steam trains in running over each block section with that which would be taken by the electric trains. The fact that the electric trains occupy the block sections for a shorter time allows of a closer headway, *i.e.*, a more frequent service, and so increases the capacity of the lines.

I have also investigated the effect on the location and number of the block sections in the central area if Stages II and III of the scheme were put into operation, and the above remarks as to Stage I apply to the future stages with the exception of the traffic between Flinders Street and North Melbourne Junction Signal Box. In Stage I the Essendon trains only are concerned, and there is no difficulty. In Stage II the introduction of the Williamstown service results in a two minutes' headway at intervals for two trains, and in Stage III the superimposing of the Coburg and Sunshine trains on the previous services introduces a two minutes' headway at intervals for three trains. While I do not think that the principle of maintaining a regular service over the entire day, independently of the extra trains put on to cope with the rush traffic, should be interfered with, it is possible that your traffic department may be able to lay out the time table to somewhat better advantage and thus improve these conditions; but, if not, additional and automatically operated block sections should be introduced on this section to avoid possible short signal checks to one train affecting the trains following.

TIME OF TRAINS IN BLOCK SECTIONS (STAGE I).

Down.	Steam. M.	Steam. S.	Elec. M.	Elec. S.
Pt. Melbourne Br.				
Flinders St. to Ferrars St.	4	0	2	16
Ferrars St. to Graham St.	5	0	4	54
Graham St. to Port Melbourne	1	30	0	50
	10	30	8	0
St. Kilda Branch				
Flinders St. to Albert Park	7	0	4	37
Albert Park to St. Kilda	5	30	5	23
	12	30	10	0
Sandringham Br.				
Flinders St. to Box E	2	0	1	46
Box E to Richmond.	1	30	1	12
Richmond to South Yarra	4	0	2	36
So. Yarra to Prahran	3	0	2	24
Prahran to Windsor }			1	36
Windsor to Balaclava }	6	30	3	26
Balaclava to Elsternwick	3	0	2	26
Elsternwick to No. Brighton	6	30	5	25
No. Brighton to Middle Brighton	3	0	2	12
Middle Brighton to Brighton Beach	2	30	1	37
Brighton Beach to Sandringham	7	30	5	50
	39	30	30	30
Essendon Br.				
Flinders St. to BoxA }	2	30	0	42
Box A to Viaduct }			1	35
Viaduct to No.1 Box	2	0	1	58
No. 1 Box to Franklin St.	1	0	0	41
Franklin St. to No. Melbourne Jctn.	3	0	2	7
N. Melbourne Junctn to Kensington	2	0	1	39
Kensington to Newmarket	3	0	2	56
Newmarket to Ascot Vale	3	30	2	10
Ascot Vale to Moonee Ponds	3	0	2	15
Moonee Ponds to Essendon	3	0	2	42
	23	0	18	45

Up.	Steam. M.	Steam. S.	Elec. M.	Elec. S.
Pt. Melbourne Br.				
Port Melbourne to Graham St.	2	0	0	56
Graham St to Ferrars St.	5	0	4	51
Ferrars St. to Flinders St.	3	0	2	8
	10	0	7	55
St. Kilda Branch.				
St. Kilda to Albert Park	7	0	5	2
Albert Park to Flinders St.	5	0	4	58
	12	0	10	0
Sandringham Br.				
Sandringham to Brighton Beach	8	0	6	4
Brighton Beach to Mid. Brighton	2	30	1	44
Mid. Brighton to No. Brighton	3	0	2	11
No. Brighton to Elsternwick	6	30	5	33
Elsternwick to Balaclava	3	0	2	8
Balaclava to Windsor	4	0	3	35
Windsor to Prahran }			1	32
Prahran to South Yarra }	5	30	2	23
South Yarra to Richmond	3	30	3	9
Richmond to Box E.	1	30	1	6
Box E to Flinders St.	2	0	1	35
	39	30	31	0
Essendon Br.				
Essendon Box to Moonee Ponds	3	30	2	34
Moonee Ponds to Ascot Vale	2	0	1	53
Ascot Vale to Newmarket	3	0	1	33
Newmarket to Kensington	2	30	2	50
Kensington to No. Melbourne Junctn.	2	0	1	32
No. Melbourne Jnctn to Franklin St.	2	30	2	16
Franklin St. to No.1 Box	1	0	0	44
No. 1 Box to Viaduct	3	0	2	19
Viaduct to Box A. }	2	30	1	40
BoxA to Flinders St }			0	39
	22	0	18	0

(*To be continued.*)

PAN-AMERICAN RAILWAY.

The German consul at Tapachula, which is very near the extreme southwest corner of Mexico, reports that the rails on the Pan-American Railway were laid to that point, within a few hundred yards of the Guatemala border, July 1 last, and construction trains were then running. The Mexican Pan-American begins on the Tehuantepec Railway at San Geronimo, 20 miles from the Pacific coast, and extends along the foot of the coast range, never very far from the sea, west by south to the Guatemala boundary, a distance of about 260 miles. Shipments to points on this line may be made either from Vera Cruz or Puerto Mexico (formerly Coatzacoalcos), the gulf terminus of the Tehuantepec Railway.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.

BY W. F. M. GOSS,
Dean of the College of Engineering, University of Illinois.

II.

II. DIFFICULTIES IN OPERATING UNDER HIGH-PRESSURES.

6. *The work with the experimental locomotive* has shown that those difficulties which in locomotive operation are usually ascribed to bad water increase rapidly as the pressure is increased. The water supply of the Purdue laboratory contains a considerable amount of magnesia and carbonate of lime. When used in boilers carrying low pressure there is no great difficulty in washing out practically all sediment. The boiler of the first experimental locomotive, Schenectady No. 1, which carried but 140 lbs. and was run at a pressure of 130 lbs., after serving in the work of the laboratory for a period of six years, left the testing plant with a boiler which was practically clean. Throughout its period of service this boiler rarely required the attention of a boiler-maker to keep it tight. Water from the same source was ordinarily used in the boiler of Schenectady No. 2, which carried a pressure of 200 lbs. or more. It was early found that this boiler operating under the higher pressure frequently required the attention of a boiler-maker. After having been operated for no more than 30,000 miles, cracks developed in the side-sheets, making it impossible to keep the boiler tight, and new side-sheets were applied. In operating under pressures as high as 240 lbs. the temperature of the water delivered by the injector was so high that scale was deposited in the check-valve, in the delivery-pipe, and in the delivery-tube of the injector. Under this pressure, with the water normal to the laboratory, the injectors often failed after they had been in action for a period of two hours. The interruptions of tests through failure of the injector, and through the starting of leaks at stay-bolts, as the tests proceeded, became so annoying that, as a last resort, a new source of water supply was found in the return tank of the university heating plant. This gave practically distilled water, and its use greatly assisted in running the tests at 240 lbs. pressure.

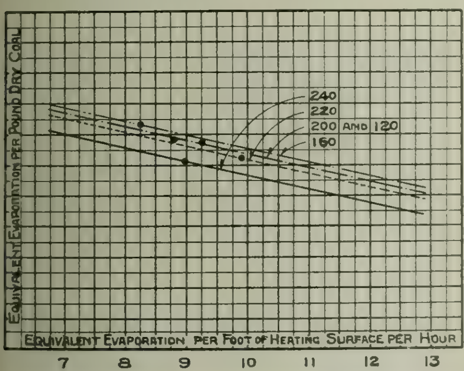


Fig. 8—Evaporation Per Pound of Coal Under Different Conditions of Pressure.

Probably some of the difficulties experienced in operating under very high steam pressures were due to the experimental character of the plant, and would not appear after practice had become committed to the use of such pressures by a gradual process of approach, but the results are clear in their indication that the problem of boiler maintenance, especially in bad water districts, will become more complicated as pressures are further increased. Since, taking the country over, there are few localities where locomotives can be furnished with pure water, the conclusion stated should be accepted as rather far-reaching in its effect.

The tests developed no serious difficulties in the lubrication of valves and pistons under pressures as high as 240 lbs., though this could not be done with the grade of oil previously employed.

With increase of pressure, any incidental leakage, either of the boiler or from cylinders, becomes more serious in its effect upon performance. In advancing the work of the laboratory, every effort was made to prevent loss from such causes, and tests were frequently thrown out and repeated because of the development of leaks of steam around piston and valve rods, or of water from the boiler. Notwithstanding the care taken, it was impossible under the higher pressures to prevent all leakage, and the best that can be said for the data under these conditions is that they represent results which are as free as practicable from irregularities arising from the causes referred to; that is, as far as leakage may affect performance, the results of the laboratory tests may safely be accepted as a record of maximum performance.

In concluding this brief review of the difficulties encountered in the operation of locomotives under very high steam pressures, the reader is reminded that an increase of pressure is an embellishment to which each detail in the design of the whole machine must give a proper response. A locomotive which is to operate under such pressure will need to be more carefully designed and more perfectly maintained than a similar locomotive designed for lower pressure; and much of that which is crude and imperfect, but nevertheless serviceable in the operation of locomotives using a lower pressure, must give way to a more perfect practice in the presence of the higher pressure.

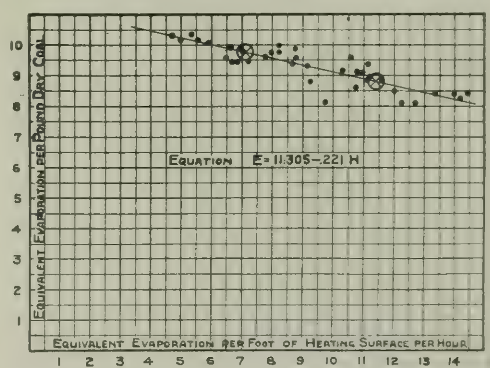


Fig. 9—Evaporation Per Pound of Coal Under All Conditions of Pressure.

III. BOILER PERFORMANCE.

7. *The Performance of the Boiler.*—The pounds of water evaporated per pound of coal plotted in terms of rate of evaporation are shown for each of the several pressures in Fig. 8. The equations representing the performance of the boiler and furnace as established by these lines are:

$E = 11.040 - .221\ H$, when pressure is 240
$E = 11.310 - .221\ H$, when pressure is 220
$E = 11.373 - .221\ H$, when pressure is 200
$E = 11.469 - .221\ H$, when pressure is 160
$E = 11.357 - .221\ H$, when pressure is 120

where E is the number of pounds of water evaporated from and at 212 deg. per pound of coal, and H is the number of pounds of water evaporated from and at 212 deg. per sq. ft. of heating surface per hour. The area of heating surface employed is based upon the interior surface of the firebox and the exterior surface of the tubes. In determining the posi-

tion of the lines represented by these equations certain conventions were adopted. These, and the reasons underlying them, may be described as follows:

The only difference in the running conditions applying to the tests of each series is that of pressure, and as the terms employed in plotting the several diagrams are the same, it is evident that the differences in performance are only such as may result from the difference in pressure. Since the quantities are in terms of equivalent evaporation, the differences cannot be great. Accepting this view, it was first sought to determine the slope of the lines for the several groups. This was done by plotting upon a single sheet all the points, eight in number, available for the series at 240 lbs., together with eight points selected as fairly representative from each of the other series, making 40 points in all. The result is shown in Fig. 9. Points thus plotted were divided into two groups, one representing the lower rates of combustion, and the other representing the higher rates, the points being so chosen that each group contained four points from each of the several series. The ordinates and abscissæ for points of each group were then determined, and the several values thus obtained averaged. The final results were then plotted, giving the points shown by the circles inclosing a cross (Fig. 9).

The equation from the line drawn through these points is

$$E = 11.305 - 0.221\ H$$

The line thus found (Fig. 9) may fairly be assumed to represent the slope of the mean line of any number of points which for purposes of comparison may be selected from the larger group.

In determining, therefore, the location of the mean lines (Fig. 8), the abscissæ and ordinates of all points were averaged and the results plotted. Through the derived point a line is drawn having the slope already found; that is, the mean line of Fig. 9.

8. *Effect of Changes in Steam Pressure upon the Evaporative Efficiency of the Boiler.*—The generation of steam at a pressure of 120 lbs. involves a temperature of the water which is 50 deg. less than that which must be dealt with in generating steam at a pressure of 240 lbs., and in general it has been assumed that any increase in boiler pressure necessarily results in some loss of evaporative efficiency. It has been known that for the small ranges of pressure common in stationary practice this difference is not great, but the facts have not been established with reference to locomotive performance or for ranges as great as those covered by the experiments under consideration in any service.

The performance of the boiler experimented upon under a range of pressure varying from 240 to 120 lbs. may be seen by comparing the mean curves already developed (Fig. 8). This diagram shows that the lowest efficiency is obtained with the highest pressure and that with one exception the lines representing performance under different pressures fall in order, inversely with the pressure. The exception is to be found in the line representing performance at 120 lbs. pressure. This line falls low, a condition which may be explained by the fact that the spark and cinder losses for these tests are known to have been excessive. The mean line located from 40 points, representing all pressures (Fig. 9), will represent any of the lines of Fig. 8 with an error not greater than 0.2 lbs.

The results clearly define four general facts, which may be stated as follows:

(a). The evaporative efficiency of a locomotive boiler is but slightly affected by changes in pressure.

(b). Changes in steam pressure between the limits of 120 lbs. and 240 lbs. will produce an effect upon the efficiency of the boiler which will be less than 0.5 lbs. of water per pound of coal.

(c). The equation $E = 11.305 - 0.221\ H$ represents the evaporative efficiency of the boiler of locomotive Schenectady No. 2 when fired with Youghiogheny coal for all pressures between the limits of 120 lbs. and 240 lbs. with an average error for any pressure which does not exceed 2.1 per cent.

9. *Smokebox Temperatures.*—The results of the tests show that in all cases the temperature of the smokebox gases increases as the rate of evaporation increases. Plotted diagrams showing the exact relationship indicate a marked similarity for all pressures; all have the same slope and if superimposed they would fall very closely together.

Thus, they show that when the rate of evaporation is 9 lbs. per foot of heating surface per hour, the smokebox temperature for all pressures is between the limits of 700 deg. F. and 730 deg. F. There are but four results for a pressure of 240 lbs., in comparison with eight or more for other pressures. If the results from the tests at 240 lbs. pressure be omitted it will be found that those remaining, which represent a range of pressure from 220 to 120 lbs., are nearly identical. This is best shown by the equations of the curves in question, which are given in Table 1.

Boiler-pressure pounds	Equations
220	$T = 496.3 + 25.66\ H$
200	$T = 491.0 + 25.66\ H$
160	$T = 487.7 + 25.66\ H$
120	$T = 478.9 + 25.66\ H$
Average	$T = 488.5 + 25.66\ H$

Table 1—Smokebox Temperatures Under Different Pressures.

The average of the several equations represents the average of any of the several groups of results obtained under different pressures, with an error which in no case exceeds 10 deg. F., or 2 per cent.

Again, the equations show that the effect of increasing the pressure from 120 to 220 lbs. is to increase the smokebox temperature 17 deg.; that is, an increase of pressure of nearly 100 per cent. results in an increase of smokebox temperature of approximately 3.5 per cent.

In the preceding statements is to be found an explanation of the constancy in the evaporative efficiency of the boiler under different steam pressures. The fact seems to be that the water in the boiler is about as effective in absorbing the heat of the gases when its temperature is 400 deg. (240 lbs. pressure) as when its temperature is but 350 deg. (120 lbs. pressure).

The data sustain the following conclusions:

(a). The smokebox temperature falls between the limits of 590 deg. F. and 850 deg. F., the lower limit agreeing with a rate of evaporation of 4 lbs. per ft. of heating surface per hour and the latter with a rate of evaporation of 14 lbs. per ft. of heating surface per hour.

(b). The smokebox temperature is so slightly affected by changes in steam pressure as to make negligible the influence of such changes in pressure for all ordinary ranges.

(c). The equation $T = 488.5 + 25.66\ H$, where T is the temperature of the smokebox expressed in degrees F, and H is pounds of water evaporated from and at 212 deg. per ft. of heating surface per hour, possesses a high degree of accuracy.

10. *Draft.*—The term "draft," as herein employed, represents a reduction of pressure as compared with that of the atmosphere expressed in inches of water. The draft was observed at three different points between the ash-pan and the stack. These were the smokebox in front of the diaphragm, the smokebox back of the diaphragm, and the firebox. At each of these points connection was made with a U-tube containing water. The results for each different steam pressure vary but little so that those representing the draft as affected by rate of evaporation for any one pressure, for example, 160 (Fig. 10), are fairly representative of the entire exhibit.

Referring to Fig. 10, the solid points represent the draft in the smokebox in front of the diaphragm; the crosses, the draft behind the diaphragm, and the circles, the draft in the firebox. Expressing the results in other terms, it appears that vertical distances between the highest curve and the intermediate represent the resistance of the diaphragm; vertical distances between the intermediate and the lowest curve, the resistance of the tubes, and vertical distances between the lowest curve and the axis, the resistance of the ash-pan, the grate and the fire upon it. Values under this curve are a close approach to the effective draft. In general, draft values vary greatly with the conditions at the grate. A thin, clean fire results in comparatively low draft values throughout the system, while a thick fire, or one which is choked by clinkers, leads to the reverse results. It is for this reason that individual points representing draft sometimes vary widely from the mean of all results.

When the rate of evaporation is 10 lbs. per ft. of heating surface per hour, the draft in front of the diaphragm is approximately 4 in. for all pressures.

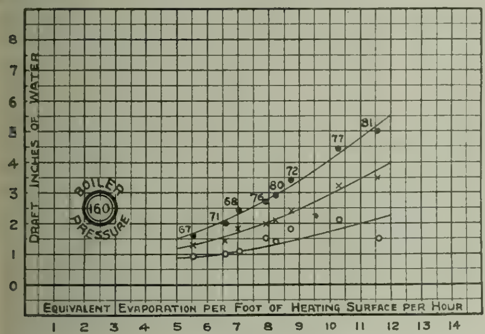


Fig. 10—Draft.

11. *Composition of Smokebox Gases.*—As previous experiments had shown irregularities in the evaporative efficiency of boilers of locomotives, it was early decided to proceed with care in determining the composition of the smokebox gases. It seemed probable that if the composition of these were known for each test, variations in the evaporative efficiency of the boiler might be explained. To this end, therefore, each step in the process was carefully considered, and the work of sampling and analyzing the gases was assigned to a chemist of experience who had no other duties to perform.

The gases were drawn from the smokebox over mercury, a period of from a half hour to an hour and a half being employed in securing the sample. The sampling-tube was of copper and of small diameter. Its length was sufficient to extend to the center of the smokebox, and gas was admitted to it by small perforations at the extreme end only. This tube could be drawn in and out through a stuffing-box to permit the sample to be taken either from the center of the smokebox or from any location between that point and the shell. In securing the sample it was the practice to move the tube systematically at regular intervals of time. By these means it was assumed that abnormal results due to fluctuations in the condition of the fire would be entirely avoided.

The results, notwithstanding all precautions, have not proved entirely satisfactory; that is, where the evaporative performance is abnormal, they do not permit the assignment of a definite cause. The defects are doubtless due to faulty sampling, though it is not clear in what manner the sampling may be improved in connection with locomotive work. They do, however, entirely justify certain general conclusions. They show that the amount of excess air admitted to the furnace is never great, and in most cases it is very small—far below the limits which are thought desirable in stationary practice. They show, also, that the excess air diminishes as the rate of combustion increases. It is apparent, therefore, that the loss in efficiency arising from excess air is under normal conditions smaller than in most other classes of service. Moreover, while the supply of air appears limited, it is significant that the losses from imperfect combustion, as shown by the presence of CO, are also small, the actual amount varying irregularly between limits which are very narrow.

12. *The quality of steam* was uniformly high under all conditions for pressure, the average for all tests being 99 0%. The quality declined slightly with increase of pressure, but in no case did the moisture exceed 1.35 per cent.

(To be continued.)

TELEPHONE CALLING APPARATUS.

The Cummings & Wray calling apparatus for use on train despatchers' telephone lines is now in service on the two busiest divisions of the Chicago, Milwaukee & St. Paul; on two divisions of the Delaware, Lackawanna & Western, and on one or more divisions of the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe, the Great Northern, the Michigan Central, the Chicago & North Western, the Louisville & Nashville and the Chicago, Rock Island & Pacific. The apparatus is made both by the Western Electric Company, Chicago, and the Kellogg Switch & Supply Company, Chicago.

The essential element in this calling system consists of synchronous clocks, one at the despatcher's office and one at each station. The first operation performed by the despatcher when he wishes to call a station is to close a circuit which starts all the clock movements in the system, all having been held at zero by a detent which is released by a relay. The second hand of each clock sweeps over a series of contacts, closing each successively; and each of the 28 or more contacts is assigned to one of 28 stations. For example, if station No. 10 is the one to be called, the despatcher presses a key which causes a current to be sent to the line when the second hand of his clock passes over its tenth contact. At station No. 10 the clock contact for the local apparatus at that station is closed, at the same moment, by the local clock, and the calling relay at that station being thus switched into the main line, closes its points, energizing a local circuit which rings a bell. This relay, being a "stick" relay, holds the bell circuit closed until the operator heeds the bell and opens the bell circuit. At all other stations the clocks are arranged to leave the local circuits open during the passage of the second hand over the tenth point, and therefore no other station is called. Where it is desired to call two or more offices at the same time, the despatcher at the outset (after starting the clocks) closes keys corresponding to the different points on the clock dial, and he could in that way call the whole 28 offices successively. The 28th would be called in about 28 seconds after the clocks were started. The offices most frequently called are arranged to have their local connections closed in the first part of the journey of the clock pointer over its dial, and those which are called less frequently are arranged in the latter part of the dial, where more time is required. The 28 keys are arranged in a row across the front of the despatcher's box containing the clockwork and other apparatus. On train despatching wires the stations usually do no calling, the despatcher keeping the receiver constantly at his ear; but whenever he does not, a bell is switched in, and local stations can call by using a hand generator.

The designers of this apparatus have tested it thoroughly under all conditions, and have brought it to a very satisfactory state of efficiency. The synchronizing mechanism is a standard lever escapement clock movement. Instruments are made to call more than 28 stations where desired. By using the line circuit during only a fraction of a second for each call, disturbances by lightning or other foreign currents or discharges have been reduced to a minimum.

DYNAMOMETER CAR OF THE UNIVERSITY OF ILLINOIS AND THE ILLINOIS CENTRAL RAILROAD.

BY F. W. MARQUIS.

The dynamometer car here described belongs jointly to the Railway Engineering Department of the University of Illinois and the Illinois Central Railroad. It is designed for general experimental work on steam roads, and is especially adapted for the determination of train resistance and for use in making locomotive road tests. It was originally built and equipped in 1900, and was operated as then equipped until 1907, during which period it was used in locomotive tonnage rating tests over practically the entire Illinois Central system. It was also used on the New York Central in tests which were made in connection with the electrification of its New York terminal, as well as on the New Jersey Central and the Baltimore & Ohio. A description of the car as originally equipped appeared in the *Railroad Gazette* of June 30, 1900. The co-operation of the railway and the university in the construction and operation of this car was made possible by the interest of William Renshaw, formerly Superintendent of Machinery of the Illinois Central. The plan has proved entirely satisfactory to all concerned, the university having had unusual facilities for carrying on its instructional and research work, while the railway, on the other hand, has had available at all times a skilled corps of test car operators who have made such tests and reports as have been described by its officials. The car has been operated at all times by representatives of the university, and all tests have been participated in by students of the Department of Railway Engineering.

In 1907 this car was dismantled and rebuilt, the old recording apparatus being discarded and replaced by new equipment, which is here described. An outside view of the car is shown in Fig. 1, inside views in Figs. 2 and 3, and a floor plan in Fig. 4. It was originally built particularly heavy, in order to withstand the usage it receives in freight service, and when rebuilt the center sills were reinforced by continuous steel channels and steel platforms were added. It is 45 ft. 4 in. long, and 40 ft. over the end sills, 8 ft. 4⅜ in. wide inside, 9 ft. 1⅝ in. outside, with an extreme width of 10½ ft. over the observation windows. The height from the rail to the roof

Fig. 1—Dynamometer Car; University of Illinois and Illinois Central Railroad.

is 12 ft., and from the rail to the top of the cupola 14 ft. 10 in. About 15 ft. in the rear end is occupied by the berths, lockers, closets and toilet room, leaving 25 ft. working space, in which the recording apparatus, work benches, etc., are placed. The car is lighted by electricity, being supplied with an axle light equipment made by the Bliss Electric Car Lighting Co.

Views of the new recording apparatus are shown in Figs.

Fig. 2—Interior of Dynamometer Car.

5 and 6. It provides means for obtaining a continuous graphical record of the following data: Curve of drawbar pull, speed curve, record of work performed by locomotive at tender drawbar, curve of power developed by locomotive at tender drawbar, curve of acceleration, record of time, record of position of mile posts, stations, etc.; record of throttle opening, record of reverse lever position, record of locomotive boiler pressure, record of air-bake applications, record of wind direction, record of wind velocity.

Fig. 3—Dynamometer Car, Interior View.

Besides the above, any data which prove of interest in special tests, such as time of taking indicator cards, etc., may be recorded upon the chart by means of additional pens provided for such purposes. All of the above data are recorded in the form of curves or lines, with offsets, on a continuous strip of paper 36 in. wide, which travels across the top of the recording table. This paper can be driven either at a constant speed by means of a motor, current for which is supplied by the storage battery which forms a part of the axle light equipment; or at a speed proportional to the speed of the car. In the first case the records are obtained on a time base, in the second on a distance base. In the latter case the paper is driven from the axle of an auxiliary two-wheeled truck, which can be seen in Fig. 1. This truck is so constructed that its wheels can be lifted from the rails from within the car. They are never run except during a test. A sectional view showing the transmission gear from this truck is shown in Fig. 8. It may be seen from this figure that a vertical shaft, extending up into the car, is driven from the truck axle by means of two pairs of bevel gears, which are carried in a cast iron gear case and run in oil. This vertical shaft is provided with two universal joints and a slip joint, which permit relative motion between the truck wheels and car body. At its upper end it carries a bevel gear, which meshes with two other bevel gears carried on a horizontal shaft, which may be seen near the bottom in Fig. 5. These two bevels are so attached by means of a ratchet device to the horizontal shaft, that it is driven in the same direction for both directions of car travel. This horizontal shaft so drives the paper (through a clutch and a

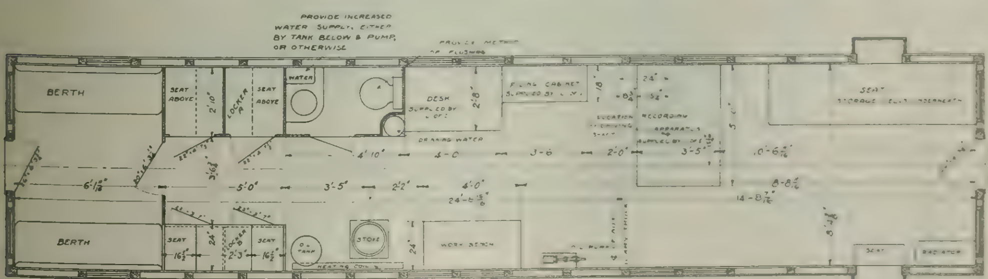


Fig. 4—Plan of Dynamometer Car.

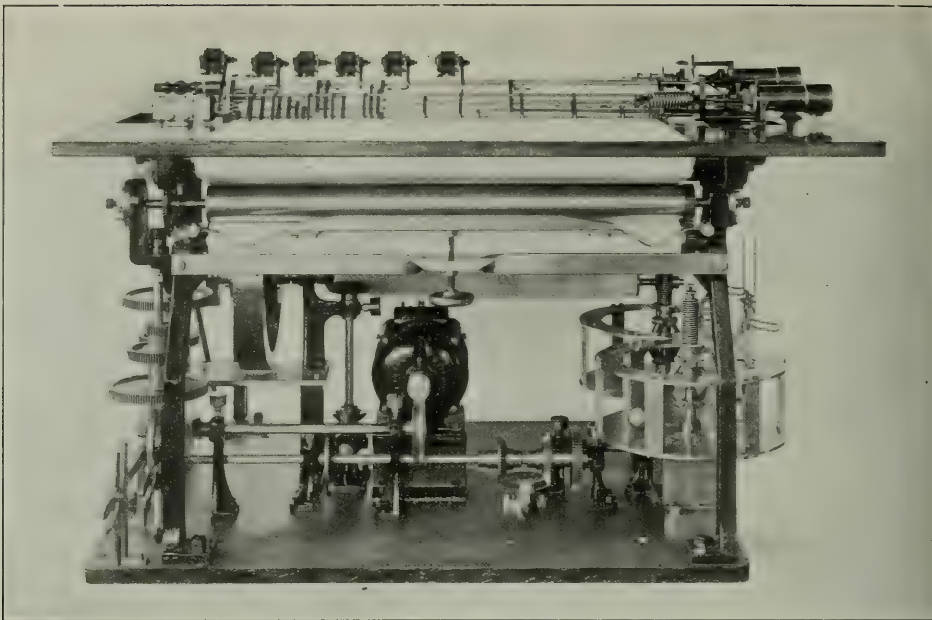


Fig. 5—Recording Apparatus, Front View.

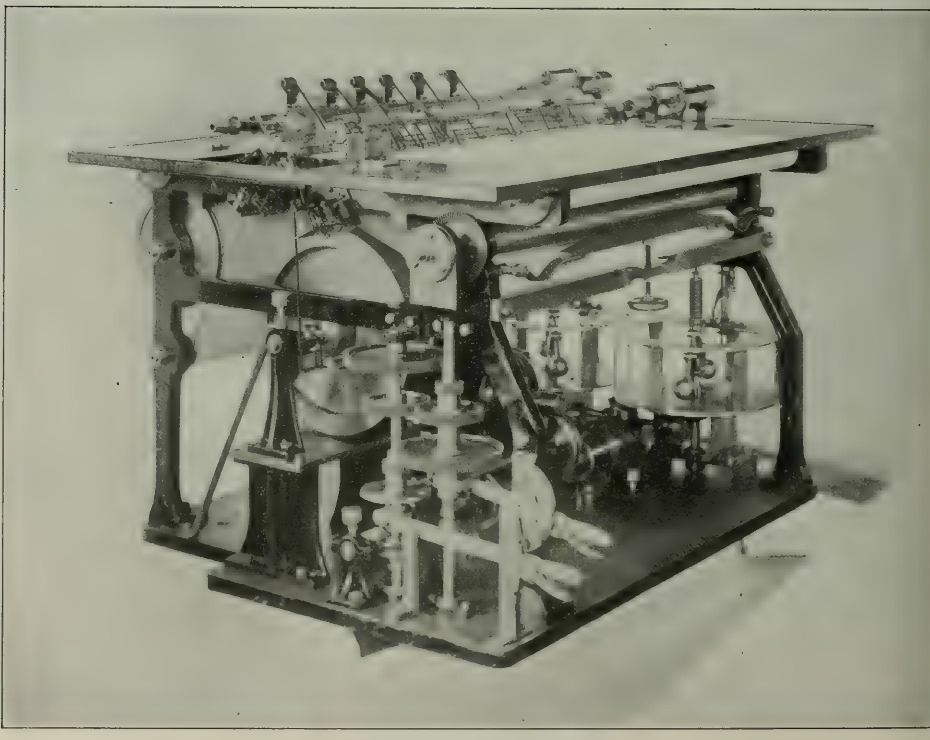


Fig. 6—Recording Apparatus, Side View.

set of change speed gears) that the paper travel is in the same direction at all times. The lower lever shown at the left in Fig. 6 operates the clutch, by means of which the paper may be driven either from the motor, or from the center truck axle, or it may be thrown out of connection with both of these. The upper lever controls the change speed gears, by means of which the paper may be driven at a constant speed of 3¾, 15 or 60 in. per minute, or $\frac{1}{16}$, ¼ or 1 in. per 100 ft. of car travel.

The recording apparatus as a whole is entirely self-contained, and is mounted on a heavy cast iron base plate. As mounted in the car it is enclosed in a glass case to protect the instruments from dust and grit. All of the active recording pens are arranged to move in a straight line at right angles to the direction of paper travel. Motion is communicated to the pens from the various parts of the apparatus by hollow aluminum rods, lightness being thus secured to diminish disturbance due to inertia and friction. The datum or zero pens are arranged in a straight line 1½ inches ahead of the line in which the active pens move.

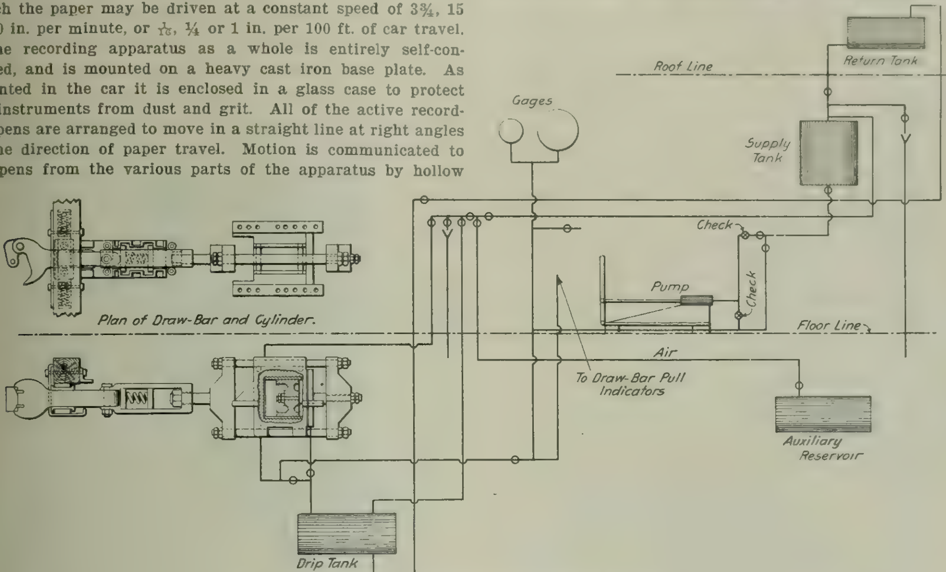


Fig. 9—Hydraulic Apparatus for Measuring Draw-bar Pull.

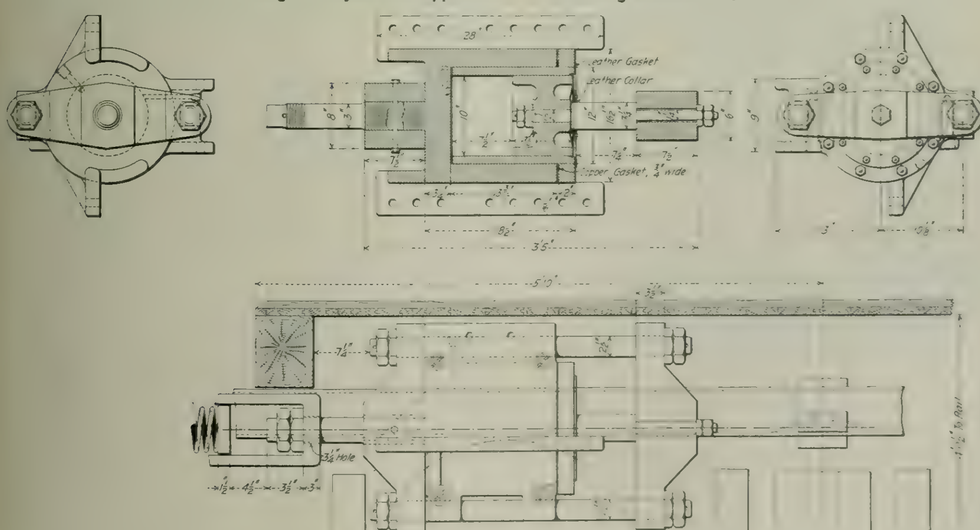


Fig. 7—Cylinder and Yoke of Draw-bar Apparatus.

DRAW-BAR PULL.

There are two methods of measuring and recording draw-bar pull used on dynamometer cars. In the first and more common method the pull is received upon heavy calibrated springs, the deflection of which is transmitted by levers and links to the recording pen. The accuracy of the results in this system depends, first, upon the calibration of heavy springs, which is in itself a tedious and difficult operation; and second, upon the absolute rigidity of the framework which carries the power transmission system. This framework necessarily extends from the springs below the car to the recording pen within and, under the stresses to which a dynamometer car is subjected, rigidity in this framework and fixity of relation between fulcrum points of levers is hard to get.

In the second method the draw-bar pull is received on the piston of a cylinder placed below the floor and filled usually with oil. The oil pressure resulting from the pull is transmitted by piping to a small indicator cylinder on the record-

ing table. The pull is ultimately measured by the spring of the indicator; but this spring is much more easily calibrated than the larger springs of the other system, and, moreover, the accuracy of the results by the second method is in no way affected by relative motion between the large cylinder below the car body and the recording table.

For the reasons above indicated the University of Illinois car was fitted with a hydraulic transmission dynamometer when originally built in 1900, and the system has been retained in the new equipment, although it differs materially in details from the original design. The new design is shown in the diagram in Fig. 9.

A heavy cast iron cylinder with an inside diameter of 10 in. is fastened to the underframing of the car near the front end, in line with the drawbar. The pull upon the draw-bar is taken against oil contained in this cylinder. The pressure upon the oil, caused by the draw-bar pull is transmitted to the recording indicator which forms a part of the recording apparatus. Fig. 9 shows a sectional view of the cylinder, and also the system of oil piping. Since the working pressure in the oil is rather high (a little over 1,000 lbs. per square inch for a draw-bar pull of 80,000 lbs.) it is necessary to take every precaution against leakage. Both the piston and the cylinder bore are ground, since any form of piston packing is inadmissible on acount of its friction.

In order to avoid the difficulties attending the use of a stuffing-box around the piston rod, the particular form of cylinder construction shown was adopted. The cylinder casting is built solid in front, the piston rod extending toward the

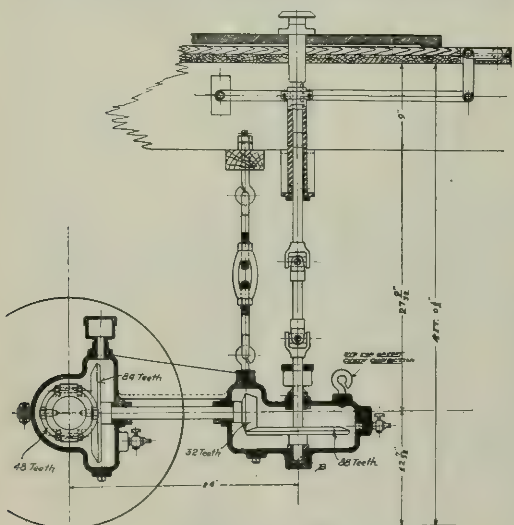


Fig. 8—Transmission Gear from Car Axle.

back from the piston. The pull on the draw-bar is delivered to the piston as a thrust from behind by means of the yoke connection shown in Fig. 9. With this construction the leakage has proved to be small and easily taken care of. The only result of leakage is that the piston is allowed to travel slowly forward in the cylinder. By means of an electric "telltale" device, an alarm bell is automatically rung before the piston reaches the end of its travel. Fresh oil is then forced into the cylinder by means of a pump provided for that purpose. This may be done during the progress of a test and without invalidating the draw-bar pull record. Even in heavy freight work, when the draw-bar pull is great and the speed slow, it is seldom necessary to thus replace oil in the cylinder oftener than every 25 or 30 miles. The oil which leaks by the piston drains into the drip tank shown in Fig. 9, and from there is forced back through the return tank and into the supply tank by air pressure.

In order to lessen friction due to side pulls on curves, the draw-bar is connected to the draw-bar yoke by means of a pin about which it can swivel. Besides this, both the draw-bar and yoke are guided between rollers. This construction is also shown in Fig. 9.

The draw-bar pull recording indicators, which are provided in duplicate, for reasons to be stated later, may be seen on

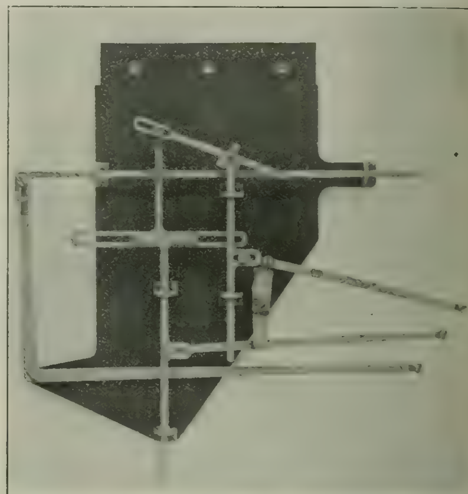


Fig. 10—Horse-Power Recorder.

top of the table at the right in Figs. 5 and 6. They are built by the Crosby Steam Gage & Valve Company, and are similar in design to the outside spring Crosby steam engine indicator, but much larger. One special feature in their design is that three different pistons, having areas of ½, 1 and 1½ sq. in., respectively, may be used in them, a different bushing with a bore to fit the piston being used in each case. By changing these pistons and using different springs, it is possible to make use of the total 6 in. of available pen travel in all classes of work, from the lightest passenger trains to the heaviest freight trains.

SPEED RECORD.

Two types of speed recorder are used, one for high and the other for low speeds. The high-speed recorders, which are provided in duplicate, are of the centrifugal type, and are used for speeds above 15 miles per hour. In their construction knife edges were used where possible, in order to reduce friction to a minimum. They were also designed so that they are not affected by the jolts and vibrations of the car. It was desired to have the movement of the speed pen proportional to the changes in speed, or, in other words, to have equal changes in speed represented by the same pen movement throughout the total range. In order to accomplish this it was found necessary to use a cam with a properly shaped profile. For low speeds a Boyer speed recorder (geared up so that it runs much faster than usual) is used. Its upper limit is about 25 miles per hour.

RECORD OF WORK DONE BY THE LOCOMOTIVE.

When the paper is driven at a rate which is proportional to the car travel, the area under the curve drawn by the draw-bar pull pen is a measure of the work done by the locomotive at the tender draw-bar, assuming that the measuring draw-

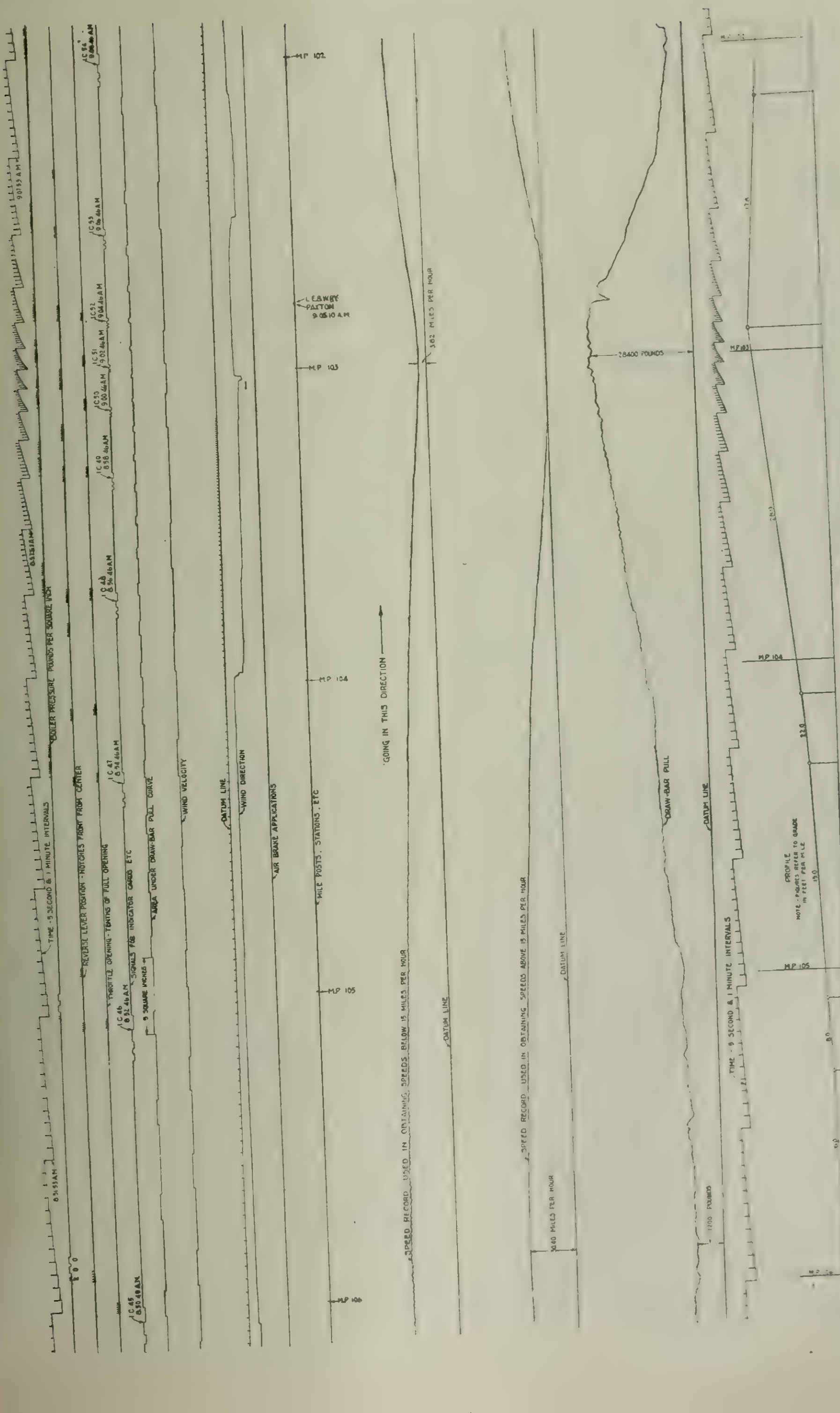


Fig. 11—Sample Dynamometer Record.

bar of the test car is attached to the tender draw-bar. This area is measured and recorded by a specially designed planimeter, which rests on the chart and is attached directly to the draw-bar pull pen rod. Its record is made by a pen controlled by an electro-magnet, the circuit through this electro-magnet being closed by the planimeter at the completion of each 5 sq. in. of area under the draw-bar pull curve.

TIME RECORD.

The time record is made by a pen which is moved by a cam controlled by an electro-magnet. The circuit through this electro-magnet is closed every 5 seconds by a special clock. The cam is so constructed that the pen is drawn about $\frac{1}{16}$ of an inch to one side every 5 seconds for one minute, when it is returned the total distance it has traveled during the minute, and starts over again. It thus draws a line, which shows both 5 second and 1 minute intervals. For convenience in working up the chart two time records are provided, one at each edge of the chart.

OTHER RECORDS.

The wind direction and velocity records are made by a wind vane and anemometer, which may be seen above the car roof in Fig. 1. They give the direction and velocity of the wind relative to the car. Since the speed and direction of motion of the car are known, the absolute direction and velocity of the wind may be obtained. It is probable that the air disturbances set up around the sides and roof of the car render untrustworthy the records from these two instruments. Sufficient experience has not thus far been obtained to warrant conclusions concerning the accuracy of their records.

The record of air-brake applications is made by a standard steam engine indicator, to which pressure from the brake cylinder is piped. It thus gives a record showing the number of applications, their duration and intensity. The mile-post pen, which is controlled by an electro-magnet, draws a continuous line, and at mile posts, stations, etc., is drawn slightly aside by the magnet which is operated by an observer in the observation window. Records of the locomotive boiler pressure, throttle opening, reverse lever position, etc., are also made by pens which are controlled by electro-magnets. Wires are run to the locomotive cab, and observers there make the contacts which operate the magnets. Special codes are used in making these records. Besides the above, attempts were also made to record curves of acceleration and draw-bar horsepower, but neither of these recorders, due largely to imperfections in design, has proved entirely successful up to this time. The horse-power recorder is shown in Fig. 10. The arm projecting at the lower right-hand corner, as shown in the figure, is connected to the extra draw-bar pull recorder mentioned above, and the arm just above it, to the extra speed recorder. When these two lower arms are moved by these recorders proportionally to the draw-bar pull and speed, the third arm is so constrained by the connecting links that its movement is proportional to the product of the movement of the other two; that is, to the horse-power. This recorder has been operated since the car was put in service, but the friction within the mechanism has proved to be great enough to seriously affect the results.

The accelerometer consists essentially of a flywheel weighing about 60 lbs., driven through springs by an arm on a shaft whose speed of rotation is proportional to the car speed. Acceleration causes relative motion between the flywheel and shaft, and this motion is transmitted to a recording pen by means of cams. Difficulties arising from this cam system have thus far prevented the successful operation of this device. Changes will soon be made in the design of the accelerometer, which, it is hoped, will make it possible to obtain more reliable curves of acceleration than have thus far been secured.

Fig. 11 shows a sample section of an actual record made by the recording apparatus. A profile of the road, drawn subsequent to the making of the chart, is added at the bottom, since it is of assistance in interpreting some of the other records. No discussion of the charts seems necessary, since the significance of the various lines is indicated upon the record itself. The chart as reproduced is exactly as drawn during the progress of the test, except that some of the lettering has been added to explain the meaning of the record and the profile has been added as stated above. The mile-post numbers, indicator card numbers, time, etc., are, of course, stamped upon the chart during the progress of the test.

The changes in the car body and the design of the draw-bar arrangements were carried out by W. O. Moody, Mechanical Engineer of the Illinois Central, and by the courtesy of J. G. Neuffer, Superintendent of Machinery, all construction except that of the recording apparatus was done at the Burnside shops of the railway. The recording apparatus, the dynamometer cylinder, auxiliary truck, transmission gearing and general arrangements were designed by the writer, working under the direction of Prof. Edward C. Schmidt, of the Railway Enginering Department of the University of Illinois. The recording apparatus was also built under the direction of the university.

Since being again put in service in April, 1908, this car has been engaged principally in a series of train resistance experiments which are planned eventually to determine the influence of axle load, kind of cars, variations in car equipment, track curvature and temperature upon the resistance of both freight and passenger trains. Thus far the work has included principally tests to determine the influence of axle load upon freight train resistance and some studies of the effects of temperature. The results of the investigations are not yet ready for publication.

THE RAILWAYS AND THE PEOPLE.*

BY FRANK TRUMBULL,
President of the Colorado & Southern Railway Company.

The historian of the legislation of this period will marvel at the serious attempts by anti-trust laws to maintain the competitive idea alongside compulsory uniformity in rates, restraint of trade by labor organizations, and laws "with teeth in them" which have well-nigh destroyed the competitive motive. Is it not high time that we recognize, at least in the transportation world, the fallacy of the economic principle we have been exalting; that we try to co-operate more and compete less? If monopoly has slain its thousands, unbridled competition has slain its tens of thousands.

The population of the United States has thus far doubled every thirty years. During the lifetime of some of us it will be 125 million, and some of us will live to see it 150 million. Transportation necessities double faster than the population, and already we have seen the railways sadly overtaxed. How are all these people to be adequately served? Government ownership has been suggested and promptly discarded. Up to date there is only one answer—that is by private capital. In the absence of government ownership, we might perhaps describe the private capital which it is necessary to interest as an "employee," and we ought not to be surprised if that employee, like others, should want to have something to say about the compensation which it shall receive, and the general conditions under which it shall perform its work. If at the present time you would like to put your money into this great semi-public service, what are the terms of employment? In the first place, you do it with the knowledge beforehand that neither the state nor the federal government will furnish you any financial aid; nor will they lend you their credit; nor will they guarantee you anything. They will not even protect you against competition, as France has long since been wise enough to do; and this, in spite of the fact that unrestricted competition is not compatible with regulation. It is true you get one thing from the state; that is the right of eminent do-

* From an address to the Board of Trade of Fort Worth, Texas.

main. The state and the federal government have the right to take private property for public use, but they have been prudent enough not to put public money into the railway business. Hence they have said to railway corporations: "We will transfer to you for construction purposes the right to take private property for public use." And this is for the public benefit. If, for example, you should want to build a hundred miles of railway into an undeveloped territory, and ten communities in that territory should want the road, it would be intolerable that one community or one individual could prevent their being served. Apart from this element of public benefit, the practical working of the right of eminent domain, so far as the corporation is concerned, usually is the purchase of the right-of-way by the railway at a fair price, or in the case of disagreement, at a price fixed by the owners' neighbors. In the case of new construction, it usually happens that committees of individuals who are desirous of having the additional service, can, for some occult reason, purchase from the owners on more favorable terms than the railway corporation itself can do. The fact is, that in conveying to railways the right of eminent domain, the people are simply giving something to themselves. Under present conditions if you conclude to engage in the railway business, the "muniments, titles and franchises" which the orators say you get from the state, consist of this somewhat dubious right of eminent domain and

THE RIGHT TO BE REGULATED.

Should there be no regulation whatever? By no means! The right of the government to regulate corporations engaged in public service has been too long upheld and admitted to now be turned over. But the questions, "How far should the regulation go" and "What is a reasonable return upon your capital if invested in railways," must be answered by investors as well as by law-makers, for it takes two to make a bargain. In Great Britain the right to regulate the railways has long since been accepted as reasonable, but there they do a great deal to *protect* railways as well as to regulate them; and their rates are higher and their wages much lower than on American railways. There is this further difference between Great Britain and the United States; there they have only one Parliament, while in the United States we have forty-seven—forty-six states, plus Congress. It might be said, as regulation is conceded, that capital has been married to regulation. Probably most of us will agree that marriage is a good thing; but is polygamy? If there are no custom-house barriers to commerce between the states, why should there be barriers in the matter of transportation? Bear in mind that the bulk of the business of transportation is interstate or foreign commerce, and that of the wages distributed in your state thereby the bulk is earned in moving that commerce. If the federal government is to prescribe the rates at which it is to be carried, why should the states have power to interfere with the expenditure of the revenues and in other respects?

REGULATION OF RATES.

I have referred previously to rebates and rate wars. It is a fine thing for all of us that these evils are behind us. Discriminations against individuals or corporations, are no longer tolerated. There is, however, *apparently* another kind of discrimination, viz.: between communities. Freight is hauled right through Dallas, Texas, to Fort Worth, to Wichita Falls or Stamford and delivered at the latter places for the same prices that would be charged if delivered at Dallas; and similarly, freight is hauled through Pueblo and Denver, Colorado, to Fort Collins and other places similarly situated at just the same prices which would be charged if the haul terminated at Pueblo. Note I say that this is an *apparent* discrimination. Assume for argument's sake, that this is an evil, how can it be remedied? Government ownership does not solve the problem. In the case of the postoffice, for example, if I mail a letter to-night to New York and you mail one to Dallas, you pay two cents and I pay two cents. You are helping to pay for carrying my letter to New York. Why should you? It might be cured in one way, viz.: by making all rates per mile. This was tried in Australia and the result is that there are no interior cities in that great commonwealth. The fact is, it is impossible in any of these matters to be mathematically consistent. The best that can be done by any human being or government is to render substantial justice. Which would you rather have—substantial justice and your interior cities, or mathematical consistency and cities on the seacoast only? If the latter, what would become of the wheat fields of the Dakotas as compared with districts nearer the ocean, or with the cotton of North Texas or Oklahoma as compared with the cotton of South Texas? Fort Worth and Denver, and hundreds of other interior cities would be ruined and nobody ever witnessed such a business convulsion as would come to pass.

OVERCAPITALIZATION.

It is said the railways are over-capitalized and the people are taxed to pay dividends on watered stock. This is a feature of transportation which seems to have about the same fascination for many minds that a small galvanic battery has for children, and when they tackle the subject and try to formulate a precise remedy that will retain the energy of private capital, they go through about the same amount of wriggling that the children do in trying to let go of the battery. The same with the question of physical valuation of railways; it is one of those theories which please the imagination, but no one can say what the government could do with it after it had it, any more than what the government could do with a physical valuation of farms and farm improvements. The question of location, proximity to large centers of population, and a dozen other questions would, in either case, still have to be considered. And suppose the physical valuation of a railway and its capitalization were made to exactly agree. How long would the agreement continue?? Not thirty days! In fact, the divergence would commence forthwith, and fluctuations, up or down, would continue indefinitely. There is as little relation between capitalization or valuation and rate-making, as there is between the capitalization or valuation of a department store and the price of suspenders. The capitalization of railways in Great Britain is about $300,000 per mile, while in the United States the average is only $60,000. Those sections of the United States which have the highest railway capitalization have the lowest rates. The Chicago & Alton, concerning whose capitalization so much has been said, is now receiving a lower average rate per ton mile than four years ago, and it must make the same rates as the Illinois Central, the Wabash, or any competitor with a lower capitalization per mile. The Santa Fe must make the same rates between Fort Worth and Galveston as the Houston & Texas Central, and vice versa, regardless of the capitalization of either. In one respect railways may sometimes be said to be over-capitalized; that is, when there is no return, or a very meager return, on the capitalization. I have had the satisfaction of being connected with the curing of at least one such instance of over-capitalization by building additional mileage, for which, of course, additional capital was necessary. In other words, the over-capitalization was cured by the issue of more capital.

The national banks of the United States pay 13 per cent. dividends on their capital, and besides, properly add each year large sums to their surplus. Cotton mills pay as high as 66 per cent. dividends. I might multiply instances by citing the successes of many of you in this audience of which we are all proud. Let me quote only the following from a very interesting series of articles in the Dallas *News* last June and July:

"When finally the cattlemen were compelled to surrender to the farmers the country southward they moved into Childress and Hall counties, confident that there they could stay indefinitely unmolested by the clamor of men wanting to uproot the grass. Nine years ago Mr. S bought one hundred thousand acres of land for a ranch. It was for that purpose and not for speculation that the land was bought, but two years ago the land came into such demand for agricultural pursuits that he found it profitable to sell out and move into Hall county. Now he is leaving Hall county. That is the way the cattle-

man is being made to 'move on.' For the Childress county land Mr. S. paid a price averaging $1.50 an acre; he sold it at a price averaging $7.50 an acre. The increment, in other words, has been about 50 per cent. a year, so that if progress has crowded the cattleman out, it has nevertheless paid him handsome damages."

Contrast this now with the railway situation. The last printed report of the Texas Railroad Commission states the total capital stock of Texas railways at 131 million dollars. During the year, dividends paid by railways amounted to $287,789.60, which was equivalent to about one-fifth of 1 per cent. on the whole capital stock just quoted. Most roads in Texas have never paid a cent of dividends. How then, if rates are reasonable and service good, can anyone, except the owners of the stock, possibly have been injured? If you are considering putting your money into the railway business, how are you to be attracted to this field of endeavor? Will you be satisfied with a statutory interest return on your investment, or would you like to "grow up with the country?" Perhaps the acquisitive faculty is lodged somewhere in your system. I doubt not it was planted in the human breast for some wise purpose. If it had not been, I suppose the Indians would have this country yet, particularly that part of it west of the Mississippi river. Now is it any more disgraceful to increase your fortune in building railways than in selling lands, or in any other occupation? The "predatory politician," will doubtless refer to you as "predatory wealth," but don't mind that; you will have the satisfaction of knowing that you are making it possible for thousands of employees of railways and allied industries to help themselves and making it possible for other thousands to live more comfortably than they could otherwise do. In other words, you will be a producer, while the "predatory politician" produces nothing; and perhaps you will find some consolation in remembering that in the parable, the condemnation was not upon the man with ten talents, but upon the man with one only.

CHINESE RAILWAY POLICY.

There are now about 4,000 miles of railway in operation in China, nearly as much as in all Japan. About as much more is under construction or survey, some 2,000 miles being actually under construction. The Board of Railways recently established by the government is a strong one and much is hoped for it. The government plans to take over as fast as possible all the railways in the empire. It is believed that this will be of great advantage both to the Chinese and to foreign makers of equipment and supplies. It will not tend to diminish railway extension under a progressive administration, and a great deal will be saved through the economy of standardizing equipment. Existing railways, which have been built under concessions to citizens of various foreign countries, use a number of different standards of rolling stock and other material. If this equipment is ultimately standardized, it will mean a good deal to American interests, as it is conceded that American locomotives, cars, bridges and rails are best suited to Chinese conditions. That this is understood by the Chinese is largely due to the teachings of Japanese engineers who have been trained in America. There is nothing at present to show that Japan will be able soon to build equipment for China. On the contrary, the Japanese, for some years to come, will have to buy equipment abroad to satisfy their own needs.

NEW LOCOMOTIVE EQUIPMENT; EAST INDIAN RAILWAY.

We illustrate herewith two new types of heavy passenger locomotives recently supplied to the East Indian Railway by the Vulcan Foundry, Limited, Newton-le-Willows, Lancashire, England. Both are intended for fast passenger service on the 5 ft. 6 in. gage main lines and, in many important respects, the dimensions are the same in both cases. The Atlantic type is the first engine of its kind to be employed on the East Indian Railway. It has outside cylinders driving the second pair of coupled wheels, and balanced Richardson slide valves worked by Stephenson link-motion inside the frames. The boiler barrel is made of steel plates 9/16 in. thick. It has a diameter at the front end 4 ft. 6¾ in., and a length of 13 ft. 7½ in., containing 201 tubes of 2 in. diameter and 14 ft. long between tube plates. The firebox is of the Belpaire type, 6 ft 10 in. long inside at top, and 4 ft. 1⅛ in. wide, the depth at front being 6 ft. 4¼ in. and at back 5 ft. 4¼ in. The driving and coupled wheels have journals 8 in. by 9 in., the journals of the bogie wheels being 6½ in. by 8 in., and those of the trailing carrying wheels 7 in. by 12 in. Inside frames are used throughout, even the usual double framing for the trailing wheels being absent.

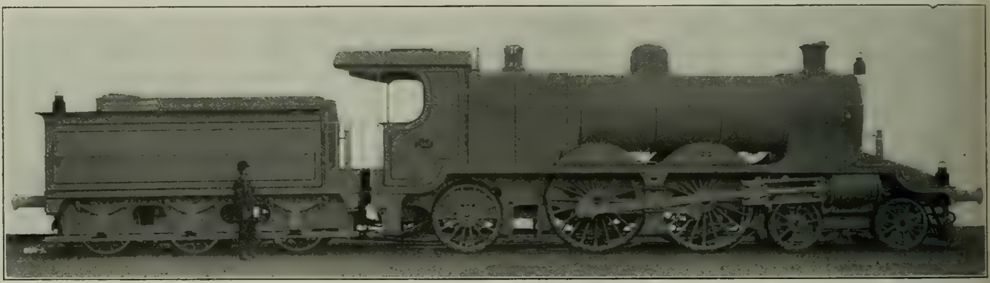


Fig. 1—New Atlantic Locomotive for the East Indian Railway.

The cab is of very commodious design, well covering the footplate, but no cab is provided at the front of the tender as is generally done on Indian locomotives. Taken as a whole, the engine presents an appearance more nearly in accordance with English standards than is the case with the majority of locomotives sent out to India.

A six-wheel tender is fitted, having a coal capacity of 5 tons, and holding 3,150 gallons of water. The leading dimensions are as follows:

Cylinders, diameter	19 in.
Piston stroke	26 "
Coupled wheels, diameter	78½ "
Bogie wheels, diameter	43 "
Trailing wheels, diameter	52 "
Wheel base, rigid	15 ft.
Wheel base, total engine	27 ft. 6 in.
Boiler heating surface, tubes	1,473 sq. ft.
" " " firebox	142 "
" " " total	1,615 "
Grate area	29.5 "
Working steam pressure, per sq. in.	180 lbs.

Weights in working order:
On bogie .... 35,280 lbs.
On coupled wheels ....69,440 "
On trailing wheels .... 31,360 "
Of engine ....136,080 "
Of engine and tender ....220,080 "
Tractive effort .... 18,293 "

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 3.79$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 51.02^*$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 7.43$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 913.93$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 54.74$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 18.26^*$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 43.00$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 84.16$$

Displacement of 2 cylinders, cu. ft. = 8.53

$$\frac{\text{Total heating surface}}{\text{Displacement, 2 cylinders}} = 189.33$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 3.45$$

*Per cent.

The 4-6-0 type is also shown. As previously stated, many of the dimensions are the same in the case of this design as in that described above; the same proportions being retained for the cylinders, whilst the boiler is interchangeable. The coupled wheels are, however, smaller, although the rigid and the total wheelbase remain the same. The coupled wheels are 6 ft. 1½ in. diameter, as compared with the 6 ft. 6½ in. of the Atlantic locomotive, and, with an identical load per coupled axle in each case, the 4-6-0 type has 46½ tons of adhesion to the 31 tons of the 4-4-2 type.

Both classes of engine are fitted with Holden & Brooke's No. 8 m/m injectors, Dewrance's double bulls-eye pattern sight-feed lubricators, steam sanding apparatus and the automatic-vacuum brake.

These locomotives are among the largest and most powerful yet supplied to the East Indian Railway, and they rank among the most advanced standards for Indian railways. They have been built to a very careful specification and of rigidly selected materials. The total weight of the 4-6-0 type is 100 tons, with tender of exactly the same pattern as that fitted to the Atlantics.

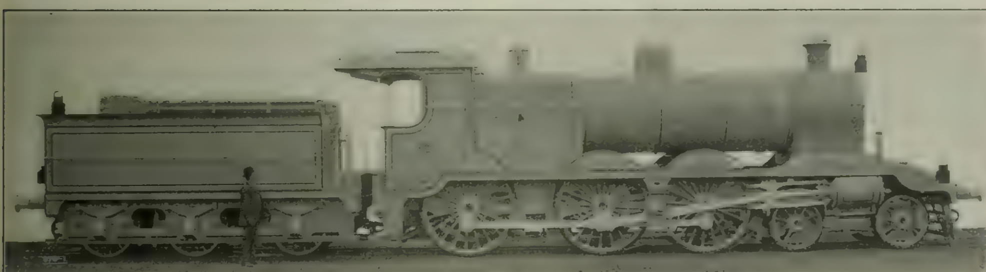


Fig. 2—New Ten-Wheel Locomotive for the East Indian Railway.

GOVERNMENT ACCIDENT BULLETIN NO. 29.

The Interstate Commerce Commission has issued accident bulletin No. 29 showing railway accidents in the United States during the three months ending September 30, 1908. The number of persons killed in train accidents was 191, and of injured, 3,046. Accidents of other kinds bring the total number of casualties up to 17,279 (734 killed and 16,545 injured). These reports deal only with (a) passengers and (b) employees on duty.

Table No. 1.—*Casualties to Persons July, August and September*, 1908

	Passengers		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd	Inj'd.
Collisions	43	1,025	58	546	101	1,571
Derailments	10	822	65	336	75	1,158
Miscellaneous train accidents.*	..	46	15	272	15	318
Total train accidents	53	1,893	138	1,154	191	3,046
Coupling or uncoupling	..	...	39	573	39	573
Other work abt. trains or switches	..	...	19	3,524	19	3,524
In contact with bridges, etc.	1	23	17	344	18	367
Falling from cars or engines or while getting on or off	37	833	127	2,548	164	3,381
Other causes	19	930	284	4,724	303	5,654
Total other than trn accidents	57	1,786	486	11,713	543	13,499
Total all classes	110	3,656	624	12,867	734	16,545

Note.—"Passengers" includes passengers traveling on freight trains and also postal clerks, and express messengers, employees on Pullman cars, newsboys, live-stock tenders, and men in charge of freight.
*Including locomotive boiler explosions.

The very marked diminution in the number of casualties of all kinds, which continued through the last three quarterly bulletins, and which was due to the falling off in railway traffic and other well-known collateral causes, seems now to be checked. The last bulletin (No. 28) was for the April-June quarter, which always is lighter in traffic and in accidents than the other quarters of the year; and the present bulletin would therefore show casualty lists heavier than that one under ordinary circumstances; but the difference between that quarter and this is made larger, without doubt, by reason of the fact that between July 1 and October 1 the business of the country began to recover from the depression which began in October, 1907.

The totals of the present record are far smaller than in the corresponding quarter of a year ago (Bulletin 25), but in comparing Bulletin 29 with Bulletin 28 the main lesson which is to be derived from all accident statistics—the need of preventing accidents in the future—again confronts us. The number of employees killed increased 17 per cent.; employees killed in train accidents, 39 per cent.; and passengers killed from causes other than train accidents, 30 per cent.; but the increase in the number of passengers killed in train accidents was no less than 307 per cent. Nothing could more clearly enforce the lesson of the necessity of heeding the record of the causes of collisions as set forth in Table 2A, for four-fifths of the passengers killed in train accidents were the victims of collisions. Of the eight most serious collisions (Nos. 1, 2, 5, 6, 7, 8, 9, and 11), five occurred on lines where the block system

was not in use; one, No. 8, on a line where it was ostensibly in use, but was abandoned temporarily to save the time of passenger trains; and one, No. 1, on a line where it appears to have been used "permissively" for freight trains carrying passengers (drovers); leaving only one of the eight, No. 5, which appears to have been in no wise due to lack of the space-interval rules.

TABLE NO. 1A.—*Comparison of Principal Items.*

	Bulletins No. 29.	Bulletins No. 28.	Bulletins No. 25.
1. Passengers killed in train accidents.....	53	13	110
2. Passengers killed, all causes	110	57	195
3. Employees killed in train accidents.....	138	99	236
4. Employees killed in coupling...........	39	30	87
5. Employees killed, all causes	624	534	1,144
6. Total passengers and employees killed...	734	591	1,339

TABLE NO. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	213	$233,733	15	500
" butting	129	203,376	55	683
" train separating	123	53,067	2	42
" miscellaneous	705	282,148	29	346
Total	1,170	$772,324	101	1,571
Derailments due to:				
Defects of roadway, etc........	253	$165,851	11	183
Defects of equipment	621	534,213	15	205
Negligence train & sign'l men,etc	79	52,149	5	130
Unforeseen obstruct'n track, etc.	73	86,289	16	127
Malicious obstruct'n track, etc.	17	13,139	5	25
Miscellaneous causes	354	326,443	23	488
Total	1,397	$1,178,084	75	1,158
Total collisions and derailments	2,567	$1,950,408	176	2,729

Following is the usual list of Class A train accidents—all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

TABLE NO. 2A.—*Causes of Twenty-three Prominent Train Accidents (Class A).*

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

Collisions.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	R.	F. & F.	3	1	$1,860	19	Excessive speed and negligent flagging; occurred 3:40 a.m.; 3 passengers in caboose killed.
2	..	......	4	40	3,000	29	Confusion of orders. (See note in text.)
3	M.	F. & F.	0	4	5,283	24	Train approached station 3 a.m. at uncontrollable speed. Air-brakes not properly applied; 1 angle cock closed; cause of this not discovered.
4	M.	F.	0	0	5,300	22	Train separated and rear part ran into forward part; cause of parting not discovered. Only 14 cars out of 37 cars had air-brakes working. Whole crew held at fault for failure to test brakes.
5	M.	P. & P.	7	20	5,760	5	Engineman disregarded signals at crossing. (See note in text.)
6	B.	P. & F.	3	37	6,000	28	Agent failed to deliver order; trusted an inexperienced assistant, who made only 3 copies of order when he should have made 5.
7	B.	P. & F.	20	14	11,000	52	Westbound freight encroached on time of regular eastbound passenger. Freight reached entrance to siding at meeting point at 8:01 or 8:02, one or two minutes behind passenger's time, instead of five minutes before that time, as required by rule. Men in charge of freight admitted before coroner that regulation speed from last station, as shown on time table, was not sufficient to enable them to reach the meeting point at 8 o'clock. Passenger engineman's view of road was obscured by snowstorm.
8	B.	P. & F.	5	49	12,000	2	Mistake in writing telegraphic order. (See note in text.)
9	B.	P. & F.	4	2	13,300	53	Operator accepted order after train had passed. (See note in text.)
10	R.	F. & F.	0	0	16,000	20	Excessive speed.
11	B.	P. & P.	8	59	22,297	1	Operator accepted order after train had passed. (See note in text.)
Total......			54	226	$101,800		

Derailments.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	D.	P.	2	2	$3,000	41	Malicious obstruction. A person was arrested and held for trial on a charge of murder.
2	D.	P.	2	0	3,200	37	Malleable-iron brake-lever jaw on tender broke, allowing rod to fall and throw wheel off track.
3	D.	P.	4	9	3,300	13	Washout, due to flood from broken reservoir.
4	D.	P.	1	16	4,900	9	Track spread; cause of spreading not determined. Rails 100 lbs. per yd., oak ties, broken stone ballast, all in first-class condition. Train consisted of 2 electric locomotives, weighing 95 tons each, and 9 cars. Line straight. Train was running at regular speed.
5	D.	F.	2	0	10,000	61	Breakage of flange of wheel of tender.
6	D.	F.	0	0	11,000	31	Broken wheel. Wheel was put under a drop test and found to be of poor material.
7	D.	P.	2	60	12,000	62a	Undiscovered; believed to have been fast running.
8	D.	P.	2	4	12,700	38	Worn rail on curve; curve, 5 degs.; superelevation, 4½ in.; speed, 40 miles an hour.
9	D.	F.	0	0	13,400	34	Broken truck.
10	D.	F.	0	0	14,100	18	Undiscovered; believed that a truck was broken when air brakes were suddenly applied on a deck-girder bridge 88 ft. long.
11	D.	P.	0	38	16,393	58	Maliciously misplaced switch; speed, 50 miles an hour.
12	D.	P.	2	37	20,000	35	Burning bridge; cause of fire not discovered. No person blamed.
Total......			17	166	$123,993		
Grand total.			71	392	$225,793		

Collision No. 2, killing two passengers, was due to a confusion of orders by the conductor and motorman of an electric car (train No. 9). The case may be explained by supposing the movement of train No. 9 as eastward from A to B, C, D, E, F, and so on. Order No. 3 was issued directing train No. 9 to proceed to E. Later, order No. 5 was issued directing No. 9 to report at D; but the first order was received last and the conductor and motorman acted on it, and thus the collision occurred between D and E. Order No. 5 was received by the conductor and motorman of No. 9 at A, direct by telephone from the despatcher. Proceeding to B, they received order No. 3 from the conductor of a westbound train, to whom the despatcher had sent it at C six minutes before he sent order No. 5. The conductor and engineman of No. 9 are held negligent in not observing the sequence of numbers on the orders and in not noticing the recorded times, which showed that the order received last had been sent first. The despatcher, in sending order No. 5, did not put into it the words "instead of," and in telephoning it to the conductor and motorman of No. 9 he said nothing to them about having issued an earlier order which was to be disregarded.

Collision No. 5 occurred at a crossing where two lines, both belonging to the same railway company, cross each other diagonally. Passenger train No. 7, approaching the crossing on line B at excessive speed, was thrown off the track at the derailing switch and ran upon the ground across line A, stopping with the smoking car athwart the main track of A, in which position it was wrecked by the engine of train No. 4 on line A. Seven passengers were killed and 19 passengers and one trainman were injured. The engineman of train No. 7, who is a man of experience, appears to have been oblivious to the signals. The derailing switch was 281 ft. from the crossing and his engine ran to a point 170 ft. beyond the crossing. The signal was 50 ft. in the rear of the derailing switch and was in plain view for 885 ft. farther in the rear.

It is estimated that the speed of the train when derailed was at least 50 miles an hour, though the schedule speed of the train over that part of the line is only 22 miles an hour, the rate being limited by a city ordinance. The engineman of No. 7 "claimed" that the signal was clear when he first came within view of it, but the superintendent regards the evidence as conclusive that it was in the stop position and had been so for some time before this train came within sight of it.

Collision No. 8, causing five deaths, was due to an error in a train order. It was between an eastbound passenger train and a westbound freight. The engines and cars of both trains were badly damaged. The order as issued directed the passenger train to wait at B until "five fifteen 515 a.m." This authorized the freight to run to B if it had time to reach that point in time to properly clear the passenger train. The order as delivered to the freight read "five fifty-five 555 a.m." instead of five fifteen 515 a.m.," and the freight therefore encroached on the time of the passenger, having apparent authority to do so, to the extent of 40 minutes, and in consequence met the passenger east of B. The operator at L, who took the order for the freight, destroyed the first order she made and in place of it wrote a second copy. In making this second copy the error occurred. This operator had been in the service of the company at L four days. She had had instruction in a telegraph school twelve months and had been examined by the chief train despatcher after being under the tutelage of a station operator eleven days. It is assumed that the first order written out at L was correctly worded, as the operator had repeated it to the despatcher. Where a telegraphic order is rewritten it is the duty of the operator, under the rules, to again repeat it by telegraph to the despatcher, but this was not done. The telegraph block system is in use on the line where this collision occurred, but the block stations are far apart, and to avoid delay to the trains the block system was supplanted by a time order, as above explained. With the block system thus modified or suspended the westbound freight train, under the rules, would be required to be sidetracked at some station before the passenger train was due, and the passenger train in this case being behind time the order was issued so as to permit the freight train to go farther west before turning out.

In collision No. 9 there was negligence by both despatcher and operator. It occurred about 1.30 a.m. The operator accepted an order for the passenger train after it had passed his station. By reason of having been asleep, or otherwise negligent, he did not know whether the passenger train had passed or not, and assumed that it had; assumed that the despatcher would not offer the order to him if the train had already passed. The order was sent on Form 19, contrary to the rule, and it was acknowledged in a form applicable only to Form 31; and the despatcher did not require the operator to display his signal before taking the order; for these irregularities both men are blamed. The despatcher had ground for suspicion that the operator had not been vigilantly attending to duty and is blamed for not taking extra precautions on that account. The despatcher had had seven years' experience as such. The operator, 23 years old, had served on this road less than two months, but is said to have had several years' experience elsewhere.

Collision No. 11, causing fatal injury to five passengers, was due to the acceptance by a station operator of a train order for a train which had passed his office. Train No. 3, westbound, and No. 12, eastbound, held orders to meet at K. When No. 12 arrived at K, No. 3 being then at L, the next station east and 7 miles distant, the train despatcher undertook to change the meeting point from K to L. This order was accepted by the operator at L before he had made certain that No. 3, which had passed his train-order signal, had been held—a violation of the rule. The train despatcher then gave the order to No. 12 at K, which immediately proceeded to act upon it, and before the operator at L could reach No. 3, which was at the west end of the siding, it left there for K under the order originally given, and the trains met at a point where, by reason of the curvature, neither train could be seen from the other until they were quite close together. The operator at L is held at fault in accepting the order after the train had passed his train-order signal, and the despatcher is held at fault for giving the order to No. 12 without knowing definitely that No. 3 had been held. The services of these men had been satisfactory up to the time of this collision.

DIFFICULTIES WITH TRACK CIRCUITS IN GREAT BRITAIN.*

Numerous difficulties which are not encountered in American practice beset English railway officers in the use of track circuits, as follows:

1. The very light weight of a considerable portion of the English goods wagons. Most of these cars have a capacity of from 7 to 10 tons, though the number of wagons of 20-tons capacity is being increased.

2. The brakes on English goods wagons are seldom applied except while the vehicle is standing on a siding or being shunted in a yard, the ordinary service braking of the train being accomplished by the use of the engine brakes and the brake in the guards' van on the rear of the train. In the common type of English goods wagon the brake is applied through a long lever, the trainman generally standing upon the lever in order to apply the brake. As a rule, brakes are used on one side of the car or wagon only. This infrequent braking of goods-wagon wheels permits the formation of a sort of glaze upon the tires which is so low in conductivity that the pressure of the wheels upon the rails is hardly sufficient to reliably shunt the track-battery current of a track circuit away from its relay.

3. The use of Mansell wheels. These wheels have wooden centers, and in order to form a shunt upon the track circuit the wheel tires must be specially bonded to the axles.

4. The use of cast-iron wheels with steel tires, making poor electrical contact between the tire and the wheel center.

When the North Eastern Railway installed its automatic block system it was found that the contact between the wheel and the tire was often insufficient to secure a proper shunt, and the railway company found it necessary to bond the tires of all goods-wagon wheels to the wheel centers to secure proper electrical contact.

5. The inward canting of rails to correspond with the coning of the wheel treads.

Almost all British rail is supported in cast-iron chairs which are given such a slope as to cant the head of the rail inward at an angle to correspond with the coning of the wheel treads, which is generally one in twenty, though some roads use one in ten. This, of course, causes a larger bearing area between wheel and rail with proportionately less concentration of load, thus diminishing the probability of good electrical contact.

6. Whether from the chemical composition of English rail or from some other properties of it or from atmospheric or other conditions the rail heads in use appear to acquire a sort of film or glaze, which is a poor conductor. While the cause of this condition it not definitely known, its existence is vouched for by British signal officers of repute.

On the underground electric railways in London, including the Baker Street & Waterloo, the Great Northern, Piccadilly & Brompton, the Hampstead Tube, and the District Railway, there are over 500 automatic block signals in use, mechanical-trip automatic train stops being used in these installations. All of these roads use direct-current propulsion and the track circuit used for signaling is of the polarized, direct-current type, a factor in the use of such track circuits in connection with a direct-current propulsion system being the use of the

*From the report of Ames and Adams, Interstate Commerce Commission.

fourth rail in the track for the propulsion-return circuit, the two running rails not being used for this purpose and the third rail being used for the propulsion feeder. This arrangement is installed on account of the British Board of Trade regulation which requires that when the running rails of an electric railway are used for propulsion return the drop must be restricted to ten volts, the requirement being made in order to prevent electrolysis of water pipes and other metal conduits or structures laid underground. The electric railways in London find it cheaper to install a separate insulated return rail than to restrict the drop in the return circuit in compliance with the Board of Trade regulation.

On the Liverpool and Southport electric line of the Lancashire & Yorkshire a number of semiautomatic high semaphore signals are used, operated by solenoids, using the 600-volt current from the third rail. While they are in daily service and working reasonably well, the railway officers do not consider them a particularly desirable form of electric signal. These signals are controlled by track instruments called treadle bars, which are mounted inside the running rails in such a position as to be depressed by the wheel flanges, this movement being used for the operation of circuit controllers.

The treadle bar and other forms of track instruments are used to a considerable extent in Great Britain and on the continent in connection with controlled manual block systems and for the control of indicators and annunciators at interlocking plants, and in fact for a great many purposes where in America a track circuit would be used. There is, of course, scarcely any comparison between what can be accomplished by treadle bars as compared with track circuits, either from the standpoint of reliability or economy, under American conditions, and while, for the reasons previously stated, the use of the track circuit has met with but little favor in Great Britain, its use is increasing, and it is believed by those familiar with British signaling conditions that this increase will be considerable in the next few years.

AUTOMATIC SIGNALS FOR A JUNCTION.

The overlap principle, as used in automatic track circuit block signaling on single track, under which, when two trains are moving toward one another, each sets successive signals ahead to stop the opposing train (so that there shall always be at least two non-synchronous stop indications to protect every train), has been applied near San Antonio, Texas, to protect against each other two trains approaching a junction on converging tracks where there is no attendant. This is on the line of the Galveston, Harrisburg & San Antonio (Southern Pacific), and the scheme includes another junction attended by a switchman, with about two miles of single-track main line between them; and trains are run over this two-mile section wholly by the signals. There are no time-table rights and no written meeting orders. The problem to be dealt with was similar to that of a straight single-track line, except that the trains to be protected from running into each other were not always running in opposite directions on the same track, with an indefinite possible meeting point, but might be converging toward a definite point, the junction.

The situation of these junctions and the locations of the signals are shown in the drawing, which has been sent to us by General Manager Van Vleck. A part of the line governed by track circuits a and b, shown by dotted line, consists of a curve of 1½ degrees, but the rest of the main line is straight. Signals 2077 and 2078 are governed by the following track circuits; A to B; B to C; C to E, and C to F. Signal 2053 is governed by track circuits A to B; B to C; C to D, and C to F. Signal 1365 is governed by track circuits A to B; B to C; C to E, and C to G.

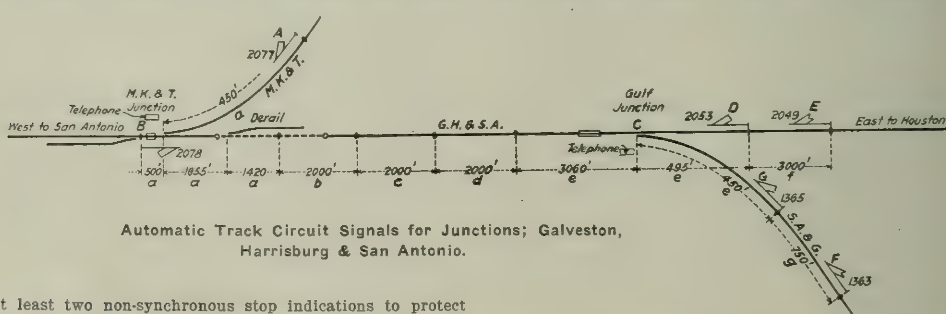
The way in which one train heads off another may be seen by assuming a train from the Missouri, Kansas & Texas moving toward San Antonio. On passing signal 2077 and shunting the track circuit, it sets in the stop position signals 2078, 2053, and 1365; also sets horizontal the distant signals 2049 and 1363. If a train from Houston, or from the San Antonio & Gulf, has already passed the distant signal (2049 or 1363), it will be stopped by the home signal (2053 or 1365) and must wait until the signal clears. If the signal does not clear in 20 minutes the train must flag through the block to B.

If a westbound train should pass E or F before the M. K. & T. train reached A, signal 2077 would, of course, be set in the stop position.

A train from San Antonio to Houston passing signal 2078 would set signals 2077, 2053, 2049, 1365 and 1363 against opposing trains, and such opposing trains would be stopped by 2077, 2053 or 1365. If a westbound train were to pass 2049 or 1363 before the eastbound passed 2378, it would of course set signal 2078 against the eastbound. Trains from the M. K. & T. approaching B, and from the S. A. & G. approaching C, have to be stopped before fouling the main track in order to give the front brakeman time to go ahead and set the switch.

The average number of trains each way daily over the main line between San Antonio and Gulf junction is 20; the number to and from the M. K. & T. is 8, and the number to and from the S. A. & G. is 4.

There are telephone offices at both junctions, and the despatcher keeps conductors and enginemen informed, so that when superior trains are delayed, so much as to cause delay to an inferior train, the situation will be understood and the trains moved accordingly. In the event of opposing trains meeting while flagging through the block, the westbound, according to the rule, has the preference.



Automatic Track Circuit Signals for Junctions; Galveston, Harrisburg & San Antonio.

Trains from the east or north are required to approach M. K. & T. junction under control, and call for a signal from the switch tender. G. H. & S. A. trains must stop clear to the junction switch, unless the switch tender gives a hand signal to proceed. M. K. & T. trains work under a similar rule. Trains from the west must approach M. K. & T. junction under control, and stop clear of the switches, unless given a proceed signal by the switch tender. M. K. & T. junction is at the entrance of the main yard at San Antonio.

General News Section.

A bill has been introduced into the legislature at Albany, N. Y., requiring railways to publish their time tables continuously "in all the newspapers."

The Missouri Pacific and the Chicago, Burlington & Quincy have arrived at a settlement of their differences regarding the crossing by the former road of the latter's tracks at St. Joseph, Mo., and the Missouri Pacific will now be able to reach its new terminal and freight house at St. Joseph, from which it has been shut out owing to its controversy with the Burlington.

George I. Roberts, 25 years old, a Wells-Fargo express messenger, has received a Carnegie medal for jumping out of his car into the San Joaquin river at Antioch, Cal., to save the life of a girl 13 years old, who was knocked off a trestle by his train—train No. 5 of the Atchison, Topeka & Santa Fe. The engineman had slackened speed, seeing two girls in danger on the trestle, but he was unable to stop until he passed them, and only one of the two succeeded in clinging to the timbers of the trestle.

Reports from the legislature of South Dakota, which is now in session, indicate that those who thought the session of 1907 exhausted the supply of brick bats suitable to throw at railways were very much mistaken in their estimate. The number of bills affecting railways which were introduced up to January 24 was 30, and the variety would do credit to a state with ten times as many aggrieved citizens as South Dakota. Mr. Simonson has introduced a bill to prohibit drinking on trains, any offender to be arrested and turned over to the police at the next station. The percentage of alcohol is not specified. Mr. Morris proposes to require electric headlights on all locomotives, and Mr. Newall has offered a full-crew law. Mr. Peterson, whose forte seems to be simplicity, would reduce all railway telegraph, express and telephone rates 25 per cent. at one stroke of the pen. Mr. Elson, evidently looking upon Mr. Simonson's prohibition of whiskey as too mild a measure, proposes to make it a misdemeanor to drink, gamble or use profane language on any passenger train. Mr. Heval would require track scales at all stations and another bill requires scales in the stock yards on which to weigh the animals.

Bergen Tunnel of the Lackawanna.

The Delaware, Lackawanna & Western opened to traffic this week its new tunnel through Jersey City Heights, N. J., thereby relieving the congestion of passenger traffic that had outgrown the old tunnel. The new tunnel is about seven-eighths of a mile long and has been blasted through solid trap rock, the easterly portal being about three-quarters of a mile west of the Hoboken passenger terminal.

Work was begun on it in March, 1906, the Grace Construction Co., New York, being the contractor. A year later the contract was annulled by mutual consent and the railway company purchased the entire equipment and assumed the work itself; the first thing done was to change the method of operating the drills from electric to compressed air power, for which change a power house was erected at the west end.

The tunnel is of the most modern construction. There are two openings, each 85 x 100 ft., extending 80 ft. to the surface and walled with 18 in. of concrete. There are two ventilators as well, which, with the larger openings, keep it practically clear of smoke and gas. The entire bore is lined with a foot thickness of concrete, and drain pipes have been supplied at regular distances along the side walls embedded in the concrete to allow the water from the rock to flow away without damaging the masonry. The pipes carrying wires have been embedded beneath each track and there are bolts in the ceiling above to provide for the future when electricity may become the motive power for train operation.

In carrying the two tracks to the east portal of the tunnel, it was necessary to fill in 25 ft. south of the original tracks and a distance of 300 ft. west to the West Shore Railroad, over which and Hoboken avenue two steel bridges have been built. At the west end, a heavy trestle bridge has been built to carry the tracks over those of the Erie Railroad. The old signal houses at either end of the old tunnel have been abandoned. The electro-pneumatic interlocking at the east is controlled from a concrete tower west of Grove street, Jersey City, and the interlocking at the other end is handled from a temporary wooden tower.

All eastbound traffic goes over the two tracks of the new tunnel, while the old tunnel carries the westbound traffic. The Lackawanna's local, or commutation travel, has increased 30 per cent. in nine years, covering a distance of about 40 miles, and 30,000 people are carried daily in each direction in and out of Hoboken.

Joint Interchange and Inspection at Peoria, Ill.

A committee of mechanical and transportation officers of the railways at Peoria, Ill., has prepared a report favoring the establishment of a joint interchange and inspection bureau at that city. The committee found that in January, 1909, the number of cars interchanged at Peoria averaged 974 per day and that inspecting and reporting them cost during the month $6,216. The committee believes that a manager of the proposed joint interchange and inspection bureau and joint assistant managers, clerks, inspectors, etc., could be employed at $3,840 per month. There would be also offices, lights, telephones, etc., to be paid for, costing about $100 per month, and the first expense of equipment of the necessary offices, which is estimated at $600. On this basis it will be seen that there would be a net saving per month of about $2,000. The committee believes also that better records would be kept and the movement of cars would be more satisfactory. The members of the committee were A. L. Rossetter, R. R. Harris, T. J. Haynes, T. N. Kucher, E. R. Bissell, E. Raymond, D. C. Frederick, B. C. Cooper and E. R. Taylor.

Reports from California, Oregon and other parts of the West and Northwest indicate that the railways have suffered severely from storms during the past few weeks. The Southern Pacific lines have had more trouble in maintaining service over some of their lines in California than in any past time in years. There were several days of heavy snow. This was followed in California by heavy downpours of rain, which melted the snow; and the floods that resulted did much damage to roadway both by washing it out and by causing slides of earth and rock. Some important bridges were much damaged. Trains in the Northwest have been operated under great difficulties. Slow orders on account of bad track have caused passenger trains to be run much behind schedule and freight trains have been run with much irregularity.

For Passengers to Paste in Their Hats.

The traveler seated on the observation platform at the rear of a modern passenger train finds fascinating occupation in watching the silent monitors of the track. From his comfortable seat he notes as he passes that the signal covering the track on which his train is running is set at the stop position and remains there till long after it has gone out of sight, no matter how long the tangent. He knows that before his train has left the zone protected by that signal it has entered another and that the semaphore arm, responding to the impulse of the locomotive, has risen to the horizontal position, thus extending its absolute authority over that block of track. If the road happens to be double-track he may occasionally see the signal set on the opposite track, warning of the approach of another train, and he will also have the opportunity of watching the signal return to the clear position after the train has passed to another block. If it be a piece of single track he will notice that the signals on the right-hand side of the track remain at the danger position after his train has passed, while those on

the left-hand side drop back to clear. This shows him that the track is blocked for trains proceeding in the same direction as his, but is cleared the other way. The protection in this case is afforded by the fact that as soon as the train leaves the block that clears the track for a train going in the opposite direction it sets the signal ahead, so that it is protected by the block at either end. This arrangement not only guards against rear-end, but also head-on, collisions. At night the lights are as interesting to watch as the semaphore arms by day and the signals never fail to attract attention.—*Union Pacific officer, in Omaha Bee.*

Washington Letter.

WASHINGTON, Feb. 17.—Three bills affecting railways were passed by the House this week, and two of them are understood to have more than a good chance to become law. The three are known as the Safety Appliance Bill, the Bill to Enlarge the Interstate Commerce Commission, and the Bill for the Destruction of Useless Railway Documents.

The Safety Appliance measure was passed under pressure on Monday despite the protests of members who asked that it go over until the House could have opportunity to examine it. But although the hearings of the committee on the bill had not yet been printed and no member outside of those belonging on the Committee on Interstate and Foreign Commerce had had an opportunity to read them, and in spite of the objections of leaders of organizations of railway employees, the bill was railroaded through the House under charge that those who voted against it would be responsible for the maiming of railway employees. The bill provides that from July 1, 1910, the compulsory uniform safety appliance law shall include not only couplers and power brakes but also sill steps and hand brakes, running boards and hand holds or grab irons on the roofs. The Interstate Commerce Commission shall designate the number, dimensions, location and manner of application of the appliances, and thereafter said number, location, dimensions and manner of application shall remain as the standards of equipment to be used on all cars subject to the provisions of the Federal law, unless changed by an order of the Commission. The bill is not expected to pass the Senate, but its promoters in the House will have made it serve their purpose by passing the responsibility for its defeat to the Senate.

The bill to enlarge the Interstate Commerce Commission from seven members to nine does not appear to have had any particular opposition. All who spoke seemed to believe that the Commission is undertaking too much work, and that this bill will enable it to dispose of its work faster. Of course if Mr. Taft's ideas prevail, a year or two hence, a commission of nine may not be needed, but the claim is that the present emergency is so great that Congress should wait no longer before giving the Commission assistance to carry on its work. The gossips say that a chief purpose of the bill is to provide a place for Representative Hepburn when his term as Congressman expires. It is understood that the Commission itself does not want the measure passed. In the upper chamber Senator La Follette, who is the leading rate regulator in Congress, believes it would be unwise to pass it. He agrees with the Commission that the effect of the measure will be to impede progress by rendering the Commission unwieldy. Conservatives in the Senate are no more friendly to the bill than is Mr. La Follette. With the congestion of business now existing, Senators believe that nothing can be done at the current session, but that the bill will probably be run through the lower chamber again at the special session and will then be used as the basis for a railway debate in the Senate.

The bill for the destruction of useless railway papers is coupled with a provision for the punishment of any person who wilfully falsifies railway accounts, and it is regarded as a meritorious bill. Many railways have been annoyed and put to expense through the operation of the present law, which virtually forbids the destruction of any records of whatever nature. In many instances roads have been compelled to rent warehouse space for the storage of obsolete papers. This bill, which passed without amendment, re-enacts the provision for the punishment of any person who shall wilfully make any false entry in any record or memoranda, or who shall wilfully destroy, mutilate, alter, etc., and adds the proviso that "the commission may in its discretion issue orders specifying such operating, accounting or financial papers, records, books, blanks, tickets, stubs or documents of carriers which may, after a reasonable time, be destroyed, and prescribing the length of time such books, papers or documents shall be preserved."

Vagrants on the Pennsylvania.

Reports just compiled by the Pennsylvania Railroad show that during the year 1908 657 trespassers were killed and 791 injured on the lines of the Pennsylvania system east and west of Pittsburgh. In 1907 822 trespassers were killed. These figures emphasize the recommendation in the recent annual reports of the state railroad commissions of Pennsylvania and Indiana that laws should be enacted providing substantial punishment for all persons who trespass on the rights of way of railways.

President McCrea, of the Pennsylvania, writing to O. F. Lewis, of the Charity Organization Society of New York, says that his company has been unable to develop co-operation by the towns and cities along its lines in prosecuting and convicting trespassers and vagrants. The number of arrests has increased to such an extent that many city and town authorities are unable at times to take care of the trespassers sentenced to their penal institutions for confinement. It is the same old story of shirking and neglect. Mr. McCrea says: "County authorities will assert that a vagrant be permitted to move from one county to another before being arrested, and the county in which the arrest is made charged with the maintenance of the prisoner. County authorities and their constituents object to the expense entailed in the maintenance of these people. When vagrants are arrested and incarcerated in county jails it is seldom that any record is taken of them, and when they are released and again incarcerated in the jail of another county the latter county has no record showing former incarcerations. With co-operation the records of vagrants would be accessible to all county authorities, and confirmed tramps could be singled out and given adequate punishment."

During the year 1908 2,989 persons were arrested for trespassing, 442 for vagrancy and 10,457 for illegal train-riding on the lines of the Pennsylvania system.

Railway Appliances Exhibition at Chicago, March 15-20.

An exhibition of all sorts of appliances used in the construction, maintenance or operation of railways will be held on a large scale at the Coliseum, Chicago, throughout the week of March 15-20. The appliances exhibited will be full size, and many of them will be in operation.

For a number of years the Road and Track Supply Association has had a small exhibit of models and drawings of these appliances in the parlors of the Auditorium during the annual meeting of the American Railway Engineering and Maintenance of Way Association, but as railway officers naturally would prefer to see the devices themselves, it was decided to give an exhibit that would afford them this opportunity and would comport with the size and importance of the association.

The Coliseum, chosen for the purpose, has on the main floor 45,317 sq. ft., of which 32,517 sq. ft. will be devoted to exhibits and 12,800 sq. ft. to aisles. In addition to this there will be the Annex to the Coliseum, which contains 9,582 sq. ft., 6,138 sq. ft. being devoted to exhibits and 3,444 to aisles.

This will be the largest and most complete exhibit of materials for the engineering department that has ever been held in this country. Large numbers of railway officers will no doubt attend, as it will be an unusual opportunity to see improvements in which they are interested.

The manufacturers' appreciation of this opportunity is evidenced by the large spaces that some of them have taken. Two firms have secured upwards of 1,500 sq. ft. each and several 1,000 sq. ft. each.

There are only a few spaces now left. These can be secured by writing to John N. Reynolds, Secretary-Treasurer of the Road and Track Supply Association, 160 Harrison street, Chicago.

Western Railway Club.

The monthly meeting of the Western Railway Club was held at the Auditorium Hotel, Chicago, on February 16. The paper of the meeting was by R. B. Dole, Assistant Chemist of the Water Resources branch of the United States Geological Survey, and was entitled "The Quality of Surface Waters in the Northern Central Cities." The paper dealt with analyses that have been made of the waters in the section through which the railways entering Chicago run. It was illustrated by stereopticon views.

American Society of Civil Engineers.

At the meeting held on February 17 a paper by R. P. Bolton, M. Am. Soc. C. E., entitled "The Operation of Passenger Elevators," was presented for discussion.

Canadian Society of Civil Engineers.

At a sectional meeting held on February 18, a paper entitled "Modern Fireproof Construction: Facts and Figures," by W. N. Moorhouse, was read, and illustrated with lantern slides.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.: May 11-14, 1909: Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11: St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month: New York.

American Railway Association.—W. F. Allen, 24 Park Pl., New York, May 19, 1909: New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.: Oct. 19, 1909: Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909: Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.: 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.: irregular, usually weekly: Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York: 2d Friday in January, March, May, Sept. and Nov.: Buffalo

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.: June 16, 1909: Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty St., N. Y.; Apr. 27-30, 1909; Louisville, Ky

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago: June 21-23, 1909: Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5: Chicago

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.: 2d Friday in month, except July and August: Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909: Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.: 2d Tues. in mnth, ex. June, July, Aug and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York: 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.: 1st Tues. after 2d Mon., ex. June, July, Aug.: St. Paul and Minn

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa: 4th Friday in month, except June July and August: Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Lohis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo. 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov: Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.: September, 1909: Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago: 3d Tuesday each month, except June, July and August: Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago

Traffic News.

The Oklahoma Corporation Commission will hold a hearing February 15 on a proposed order revising the rules governing the consignment of freight, car service, etc.

The Transcontinental Passenger Association at its next meeting, which will be held in Seattle, Wash., in June, will consider the question of a general increase in baggage-car rates to Pacific coast points.

A bureau has been created in the office of E. D. Levy, Superintendent of Transportation of the St. Louis & San Francisco, to have charge of the handling of all freight carried in ventilated cars or requiring any artificial temperature.

The Georgia Railroad Commission has refused to permit the Central of Georgia to increase its passenger fares from 2¼ cents a mile to 2½ cents; and has denied the application of the road for leave to take off certain trains on the Macon and Washington branches.

Beginning April 1, a stop-over of ten days will be allowed at Cincinnati to passengers holding through tickets. A similar rule has been adopted for Buffalo on westbound business and is under consideration with respect to eastbound business. Exchange street, Buffalo, which formerly swarmed with ticket brokers now has only two.

The executive committee of the Western Passenger Association has recommended to the Association that a ten-day stop-over privilege be granted on all first-class round-trip tickets reading through Chicago. The roads interested have recently voted to grant this privilege at St. Louis, Pittsburgh, Cleveland, Buffalo and Kansas City.

The executive committee of the Western Passenger Association has adopted a recommendation that passengers buying tickets from western points to eastern ports no longer be allowed to check their baggage through to steamship docks. The reason given is that the steamship companies refuse to advance the charges on baggage delivered to them; and as the transfer companies at the ports often find it impossible to find the owners of baggage, they frequently are unable to collect the transfer charge.

The Chicago Coal Dealers' Association, the Pennsylvania Retail Coal Dealers' Association, and the Michigan, Indiana and Wisconsin Retail Coal Dealers' Associations have all adopted resolutions asking the railways to accept payment for the transportation of freight upon the basis of the weight of the coal as ascertained at destination. At present mine weights govern, and the retail dealers claim that they are constantly subject to loss because the coal weighs less at destination than the mine weights show.

Passenger train No. 4 of the Denver & Rio Grande was held up at 3.15 a.m. of February 13, at Military Junction, between Fort Logan and Denver, by two bandits, who suddenly appeared from the tender and compelled the engineer and fireman to stop the train. The bandits compelled the fireman to call out to the mail clerks to open the door and one of the robbers forced the fireman to help him put three sacks of registered mail into one large mail sack. This he threw out of the car. The robbers then marched their prisoners ahead of the train and made good their escape.

The Great Southwestern Express Company, with a capital stock of $300,000, has been organized in New York to do business in Texas. J. A. Russ, formerly with the Pacific Express Company, will, it is stated, be Manager of the new company. The new company proposes to establish offices throughout Texas and to seek to compel the railways, under a state law which has long been dormant, to carry the company's business, even though contracts exist with other express companies. The law in question was passed in 1887, and requires every railway in the state to furnish reasonable and equal facilities at reasonable and equal rates to all corporations and persons engaged in the express business.

The meeting held in New York this week to consider rates on coal and coke from the Virginias, Ohio and western Pennsylvania to lake ports reached no result. The participants were the representatives of the Western Pennsylvania and

Eastern Ohio Railway Traffic Association, the Ohio Coal Traffic Association and the chief traffic officers of the West Virginia coal carrying roads. There is some friction because, it is claimed, West Virginia operators pay 40 per cent. less for mining coal than do those of Ohio and western Pennsylvania, and at the same time enjoy the advantage of a much lower railway rate to competitive points. It is said that West Virginia operators have been making serious inroads in the trade territory of the Ohio and western Pennsylvania operators.

The freight traffic committee of the Chicago Association of Commerce and H. C. Barlow, Traffic Director of the Association, are co-operating with the railways in a campaign to reduce loss and damage to freight. The Association is distributing several thousand copies of a pamphlet entitled "Why Freight Is Lost or Damaged," which was written by A. C. Kenly, Superintendent of Freight of the Atlantic Coast Line, and was originally published under the auspices of the General Managers' Association of the Southeast. It both tells how to mark and pack freight and how not to mark and pack it, and is copiously illustrated with photographs of actual packages which were well or ill packed and which show the results of the kind of packing that they received. The Association of Commerce proposes to persist in its campaign to educate shippers on this subject, with the expectation that losses of shippers through loss and damage will be reduced and the amount of contention and friction between them and the railways due to this cause will grow less.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 41 giving a summary of car surpluses and shortages by groups from December 24, 1907, to February 3, 1909, says: "The report for this period shows a decrease in the surplus of 10,093 cars, leaving a total of 301,571. The largest decrease was in box cars, the total number of this class restored to service being 16,572. Unfavorable conditions in the coal trade seem to have continued, resulting in an increase of 6,031 coal and gondola cars. There was practically no change in the number of bad order cars."

The accompanying table gives the car surpluses and shortages for the period covered by the report, and the chart shows surpluses and shortages in 1907, 1908 and 1909.

INTERSTATE COMMERCE COMMISSION.

When carriers have of their own volition made a reduction in rates, it is not the practice of the Commission to award reparation as a matter of course on all shipments made previous to the reduction. Such a policy would operate as the strongest possible deterrent to the voluntary decrease of rates.

The unreasonableness of a through rate on an interstate shipment via a given route cannot be determined, in the absence of other evidence, by a mere comparison therewith of a lower aggregate of rates consisting of a local intrastate rate plus an independent interstate rate based on a junction through which the carriers have no joint route and no basis of division.

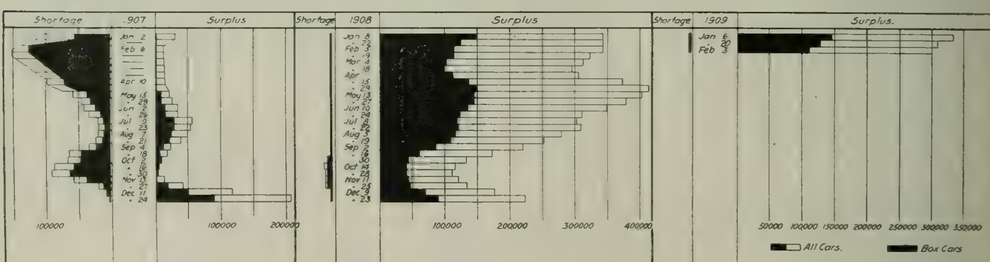
In complaints for recovery of damages caused by unreasonable or unduly discriminatory rates, the cause of action accrues when the payment is made; in any other complaints for recovery of damages for alleged violations of the act to regulate commerce of which this Commission has jurisdiction, the cause of action accrues when the carrier does the unlawful act or fails to do what the law requires.

Responsibility for Misrouting.

Washington Broom & Woodenware Co. v. Chicago, Rock Island & Pacific. Opinion by Commissioner Harlan.

In this case the defendants alone were responsible for the misrouting of the shipment in question through a junction carrying a higher rate than was available through another junction, and must therefore bear the entire burden of the mistake; and the connecting carriers participating in the movement, being without fault, cannot be required to join in the payment of the damages to which the complainant is entitled.

The privileges embodied in a separate storage and reconsignment tariff issued by one carrier cannot be availed of, or applied to movements, under a joint tariff to which that carrier and two others are named as parties, unless the latter tariff by express reference to the former so provides.



Car Surpluses and Shortages in 1907, 1908, 1909.

CAR SURPLUSES AND SHORTAGES, FROM DECEMBER 24, 1907, TO FEBRUARY 3, 1909, INCLUSIVE.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,104	26,723	116,180	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	[illegible]	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	[illegible]
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	[illegible]
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1908.
(See also issues of February 5 and 12.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with 1907.
Alabama Great Southern	309	$199,961	$88,323	$319,865	$49,229	$57,451	$7,629	$106,592	$7,747	$228,648	$91,217	$916*	$11,489	$78,812	$48,253
Atlanta, Birmingham & Atlantic	642	147,786	44,555	203,984	22,857	37,916	11,501	80,417	9,614	162,305	41,679	.....	7,500	34,179	3,302
Baltimore & Ohio	3,992	4,629,499	991,413	6,012,241	640,298	885,751	125,372	2,242,120	124,044	4,017,585	1,994,656	41,455*	173,635	1,779,566	890,319
Charleston & Western Carolina	340	98,126	27,444	132,185	25,303	13,128	2,799	44,933	3,337	89,500	42,685	.....	4,100	38,585	§9,850
Chicago & Erie	270	271,937	62,666	367,376	23,724	71,309	12,985	181,251	8,591	297,860	69,516	110	11,083	58,543	75,472
Chicago, Rock Island & Gulf	493	238,760	63,598	315,120	57,914	21,540	6,101	108,108	9,419	203,082	112,038	259*	858†	112,637	§3,067
Cincinnati, Hamilton & Dayton	1,036	457,968	126,222	717,985	71,710	127,439	20,952	346,441	27,215	593,757	124,228	14,468*	25,000	84,760	131,022
Cincinnati, New Orleans & Texas Pac.	337	479,585	130,093	644,946	49,905	119,651	17,471	207,429	17,685	412,141	232,805	1,132*	19,642	212,031	123,760
Cleveland, Cincinnati, Chic. & St. L.	1,982	1,475,721	559,589	2,253,287	247,301	605,189	64,712	918,189	51,446	1,886,837	366,450	5,356*	100,227	260,867	262,221
Denver & Rio Grande	2,552	1,322,912	317,387	1,717,789	124,503	338,158	36,528	647,722	53,862	1,200,773	517,016	382*	65,000	451,634	§130,502
Duluth, Missabe & Northern	246	54,486	31,661	89,920	47,867	67,353	1,392	53,125	23,752	193,489	103,569*	6,933*	5,146	115,648‡	80,602
Evansville & Terre Haute	310	111,810	48,797	177,616	26,222	24,271	3,923	59,580	6,526	120,522	57,094	301*	9,035	47,758	10,437
Georgia R. R.	307	162,899	68,980	246,488	49,002	30,694	8,287	98,165	10,119	196,267	50,222	.....	2,490	47,732	27,536
Georgia Southern & Florida	395	106,734	57,592	185,889	22,354	33,004	4,698	64,882	8,360	133,298	52,591	1,585	9,837	44,339	9,071
International & Great Northern	1,160	583,106	163,756	794,426	133,976	112,677	17,127	299,610	20,493	583,883	210,543	.....	23,000	187,543	107,153
Iowa Central	558	207,464	43,357	262,635	16,678	50,433	9,790	122,345	8,631	207,877	54,758	.....	7,345	47,413	§39,691
Lake Erie & Western	724	289,107	57,813	366,723	47,653	67,994	8,660	150,704	10,424	285,435	81,288	.....	17,380	63,908	105,948
Lake Shore & Michigan Southern	1,508	2,320,903	776,589	3,531,307	300,566	479,464	114,787	1,205,094	63,309	2,163,220	1,368,087	4,861*	223,646	1,139,580	533,275
Louisiana Ry. & Navigation Co.	343	86,933	13,837	106,090	22,654	7,903	3,279	41,377	5,577	80,790	25,300	.....	3,750	21,550	25,220
Michigan Central	1,746	1,412,911	494,176	2,099,350	195,578	329,750	80,271	829,626	37,057	1,472,282	627,068	14,867*	94,694	517,507	29,740
Minneapolis & St. Louis	1,027	260,386	82,612	368,927	21,416	57,754	10,639	139,864	11,737	241,410	127,517	54*	15,342	112,121	20,998
Mobile, Jackson & Kansas City	403	117,529	32,746	159,016	21,534	16,706	1,623	44,716	9,897	94,476	64,540	.....	6,135	58,405	26,106
Morgan's La. & Tex. R. R. & S. S. Co.	351	429,225	101,113	564,211	82,862	41,365	5,691	171,718	13,239	314,875	249,336	9,342	22,614	236,064	§17,750
New York Central & Hudson River	3,588	4,421,887	1,986,836	7,208,746	724,002	1,442,945	202,730	2,892,677	143,097	5,405,451	1,803,295	41,410	586,529	1,258,176	171,552
Northwestern Pacific	373	83,779	103,214	205,513	41,504	37,818	2,496	89,541	9,696	181,055	24,458	.....	8,955	15,503	35,715
Oregon R. R. & Navigation	1,264	722,959	261,317	1,043,759	87,058	75,989	23,015	295,206	32,929	514,197	529,562	4,838*	50,953	473,771	§212,918
Peoria & Eastern	352	173,384	57,748	250,395	30,539	42,340	4,642	97,925	4,792	180,238	70,157	.....	11,888	58,269	14,301
Rutland	468	113,942	71,710	212,099	41,611	32,034	5,659	89,789	7,095	176,188	35,911	.....	8,649	27,262	22,122
St. Louis Southwestern	773	496,525	131,597	654,513	108,094	97,639	25,856	145,455	21,170	398,214	256,299	637*	15,025	240,637	83,235
St. Louis Southwestern of Texas	697	239,281	92,035	354,480	97,363	66,689	8,146	139,988	16,631	328,817	25,663	173*	4,050	21,440	55,912
Santa Fe, Prescott & Phoenix	257	83,695	24,955	115,710	16,506	11,155	2,423	28,594	5,429	64,107	51,603	.....	.....	51,603	7,599
Seaboard Air Line	2,611	997,952	333,561	1,464,500	175,480	193,576	49,174	512,025	47,657	977,912	486,588	1,383*	50,500	434,705	272,617
Southern Pacific—Pacific System	5,586	1,169,849	2,175,994	6,817,301	679,467	945,816	133,896	1,854,876	241,615	3,855,670	2,961,631	12,103*	245,503	2,704,025	399,748
Texas Central	268	80,967	44,555	132,862	18,322	14,418	1,014	38,825	4,780	77,359	55,503	.....	1,969	53,534	337
Toledo & Ohio Central	441	222,634	41,683	275,560	44,587	48,113	4,599	123,274	5,856	226,429	49,131	3,291*	14,247	31,593	§9,546
Wabash	2,515	1,127,362	524,335	2,139,273	212,583	340,110	64,083	870,607	60,746	1,548,129	591,144	2,388*	63,255	525,501	111,983
SIX MONTH OF FISCAL YEAR.															
Alabama Great Southern	309	$1,134,160	$508,556	$1,814,649	$242,636	$356,688	$44,897	$599,973	$50,979	$1,295,173	$519,476	$4,473*	$68,817	$446,186	$141,070
Atlanta, Birmingham & Atlantic	642	708,664	245,229	1,010,556	118,432	174,049	51,777	365,913	38,545	748,716	261,840	.....	39,000	222,840	43,417
Baltimore & Ohio	3,992	28,001,513	6,856,557	36,964,881	4,372,136	5,295,010	786,141	12,450,386	720,393	23,624,066	13,340,815	256,034*	1,019,485	12,065,296	246,048
Charleston & Western Carolina	340	505,487	143,049	693,770	138,998	88,129	14,670	257,061	19,622	518,480	175,290	.....	24,600	150,690	22,454
Chicago & Erie	270	1,580,570	407,747	2,160,004	223,878	494,020	68,594	999,263	45,689	1,831,444	328,560	1,600	68,080	262,080	112,968
Chicago, Rock Island & Gulf	493	1,055,060	377,543	1,508,595	367,925	124,472	36,662	567,509	51,770	1,148,338	360,257	1,206*	16,033	343,018	§37,363
Cincinnati, Hamilton & Dayton	1,036	2,909,876	913,393	4,249,864	491,622	787,619	131,683	1,743,667	125,921	3,280,512	969,352	.....	150,393	818,959	213,059
Cincinnati, New Orleans & Texas Pac.	337	2,955,674	732,066	3,888,104	432,497	783,628	98,421	1,180,557	103,929	2,599,032	1,289,072	9,957*	117,852	1,161,263	300,962
Cleveland, Cincinnati, Chic. & St. L.	1,982	8,439,523	3,723,154	13,441,907	1,544,298	2,315,162	420,589	5,199,270	260,596	9,739,915	3,701,992	13,999*	411,348	3,276,645	105,131
Denver & Rio Grande	2,552	7,718,761	2,745,601	10,958,756	1,246,355	1,712,547	235,191	3,617,416	313,053	7,124,562	3,834,194	37,875	389,750	3,482,319	§569,907
Duluth, Missabe & Northern	246	6,456,614	180,585	6,667,536	475,899	512,413	7,249	797,168	76,869	1,869,598	4,797,938	39,931	270,550	4,567,319	§519,535
Evansville & Terre Haute	310	707,382	310,717	1,129,569	167,030	145,018	21,776	338,086	37,817	709,727	419,842	1,726†	54,210	363,906	7,746
Georgia R. R.	307	999,668	392,232	1,479,249	311,135	204,259	49,497	599,417	44,025	1,208,333	270,916	.....	10,615	260,301	§25,363
Georgia Southern & Florida	395	539,537	307,219	960,437	78,588	171,651	29,791	350,970	52,019	683,020	277,417	8,758	49,994	236,181	83,192
International & Great Northern	1,160	3,172,461	912,473	4,352,753	666,584	939,394	92,123	1,639,761	122,433	3,160,295	1,192,458	.....	138,000	1,054,458	801,371
Iowa Central	558	1,179,712	282,641	1,535,094	143,645	267,952	53,265	659,578	51,563	1,176,003	359,091	.....	44,377	314,714	§212,193
Lake Erie & Western	724	1,717,470	443,201	2,279,497	328,510	409,476	65,993	864,308	60,948	1,729,235	550,262	.....	102,761	447,501	§51,446
Lake Shore & Michigan Southern	1,508	13,547,231	5,092,282	21,240,351	2,684,773	2,922,176	508,901	6,525,339	341,103	12,982,292	8,258,059	11,699*	773,647	7,472,713	§19,096
Louisiana Ry. & Navigation Co.	343	406,992	65,763	511,870	141,149	66,562	18,264	224,386	30,343	480,704	31,166	.....	19,500	11,666	61,544
Michigan Central	1,746	8,331,742	3,428,675	12,891,230	1,620,627	1,710,890	366,520	4,823,710	209,352	8,731,099	4,160,131	19,856*	565,694	3,574,581	§721,718
Minneapolis & St. Louis	1,027	1,518,978	611,004	2,277,988	208,276	274,866	59,450	779,608	72,484	1,394,684	883,304	95*	92,304	790,905	61,497
Mobile, Jackson & Kansas City	403	571,445	160,006	780,869	118,639	91,162	9,513	247,191	51,944	518,449	262,420	.....	20,603	241,817	99,577
Morgan's La. & Tex. R. R. & S. S. Co.	351	1,831,562	510,860	2,492,254	423,824	256,755	47,987	899,347	73,305	1,701,218	791,036	7,861	97,115	701,782	247,692
New York Central & Hudson River	3,588	25,877,067	14,712,380	45,196,653	5,658,700	7,618,374	1,089,888	16,092,210	945,887	31,405,059	13,791,594	139,171	2,357,676	11,573,089	18,809
Northwestern Pacific	373	682,358	897,809	1,702,709	351,596	219,691	13,765	568,512	55,665	1,209,229	493,480	.....	54,830	438,650	§33,761
Oregon R. R. & Navigation	1,264	4,898,973	1,841,715	7,125,074	730,788	448,362	124,300	1,802,759	172,674	3,278,883	3,846,191	5,070*	261,761	3,579,360	§145,497
Peoria & Eastern	352	978,108	366,745	1,466,464	189,504	214,354	30,485	551,296	26,913	1,012,552	453,912	.....	53,812	400,100	§16,392
Rutland	468	791,883	575,329	1,525,861	222,353	190,992	37,104	565,910	35,389	1,051,748	474,113	.....	56,663	417,450	77,446
St. Louis Southwestern	773	2,732,933	622,013	3,498,951	445,114	562,201	126,726	844,116	118,879	2,097,036	1,401,915	3,362*	90,150	1,308,403	§41,046
St. Louis Southwestern of Texas	697	1,400,538	498,511	2,031,864	489,492	395,686	50,025	835,282	92,181	1,862,666	169,198	1,314*	49,884	118,000	§6,549
Santa Fe, Prescott & Phoenix	257	470,111	158,755	670,012	112,472	57,070	13,920	157,971	28,184	369,617	300,395	.....	.....	300,395	§58,963
Seaboard Air Line	2,611	5,391,403	1,663,866	7,785,678	1,157,572	1,137,988	274,689	2,754,923	287,012	5,612,184	2,173,494	9,037*	303,000	1,861,457	319,778
Southern Pacific—Pacific System	5,586	25,951,503	13,513,252	42,173,961	5,034,260	5,127,922	671,343	11,036,065	1,191,764	23,061,354	19,112,607	40,594*	1,378,666	17,693,347	2,380,684
Texas Central	268	392,856	226,504	656,978	77,886	82,984	5,973	224,528	25,104	416,475	240,503	.....	11,954	228,549	4,768
Toledo & Ohio Central	441	2,052,671	313,073	2,473,167	337,377	365,905	33,604	754,224	33,099	1,524,209	948,958	21,252	83,997	886,213	112,723
Wabash	2,515	8,768,786	3,525,950	13,359,183	1,476,961	1,935,649	397,622	4,981,882	382,751	9,174,865	4,184,318	6,236*	407,785	3,770,297	§363,311

*Deficit. †Credit. ‡Loss. §Decrease.

COURT NEWS.

The Adams Express Company, having obtained an injunction in the Federal court restraining the Indiana Railway Commission from fixing certain rates for express companies, two trials were held. The court ruled against the Commission and the orders were withdrawn.

The hearings in the government's suit against the coal carrying roads have been indefinitely postponed because of a disagreement between the counsel for the government and counsel for the Philadelphia & Reading, over the authority of Examiner Guilbert to pass on the evidence.

The hearings held by order of the court to secure testimony in the suit of the government against the Union and Southern Pacific (held last month in New York and later in Pittsburgh) were continued last week at Cincinnati. Many witnesses were called to testify that the two roads maintained their soliciting agencies jointly, indicating an absence of competition.

The United States Circuit Court of Appeals at Chicago on February 11 reversed a decision in the United States District Court, Judge Bethea, in which the Atchison, Topeka & Santa Fe was convicted and fined for alleged violation of the federal safety appliance law. The chief reason for reversing the lower court was that the Circuit Court of Appeals believed that Judge Bethea erred in directing peremptorily a verdict against the railway.

Judge Edward R. Meek, of the Federal court, on February 8 issued an injunction perpetually restraining the Railroad Commission and the Attorney-General of Texas from enforcing against the Pullman Company an order issued by the Railroad Commission on February 1, 1907, requiring a reduction of 20 per cent. in sleeping car rates in the state. The railways over whose lines the Pullman Company operates are also restrained from obeying any order by the Commission in reference to sleeping car rates.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

John W. Newlean has been appointed General Auditor of the Chicago Great Western, succeeding C. O. Kalman, resigned.

R. C. Wight, Secretary to the Receivers of the Chicago Great Western, has resigned, and that position has been abolished.

The office of W. E. Crane, Vice-President of the Fort Smith & Western, has been moved from Fort Smith, Ark., to St. Louis.

Robert McCulloch, Vice-President and General Manager of the United Railways of St. Louis, has been elected President, succeeding John I. Beggs, resigned.

George B. Harris, President of the Chicago, Burlington & Quincy, has been elected also President of the Colorado & Southern, succeeding Frank Trumbull, resigned.

Daniel Willard, Second Vice-President of the Chicago, Burlington & Quincy, has been elected also President of the Colorado Midland, succeeding Frank Trumbull, resigned.

F. W. Estabrook has been elected President of the St. Paul & Des Moines, succeeding G. A. W. Dodge, resigned. F. C. MacMillan, General Manager, has been elected Vice-President.

Adrian Iselin, Jr., Vice-President of the Buffalo, Rochester & Pittsburgh, has been elected President, succeeding Arthur G. Yates, deceased. W. T. Noonan, General Manager, has been elected also Vice-President.

John D. Shields, Auditor of Freight and Ticket Accounts, of the Chicago, Burlington & Quincy, at Omaha, Neb., has been appointed Auditor of Freight Accounts, with office at Chicago, succeeding C. D. Bird, transferred to other duties. J. W. Newell succeeds Mr. Shields.

John R. Sharpe has been elected to the new office of Second Vice-President of the Georgia, Florida & Alabama, with office at Bainbridge, Ga. J. L. Nisbet, Assistant Secretary and Assistant Treasurer, has been elected Secretary and Treasurer, with office at Savannah, Ga., succeeding J. F. Dusenbury, resigned.

Donald Rose, whose appointment as Assistant to the President of the Illinois Central has been previously announced, was born in Scotland and came to Canada when a boy. He spent two years in the Traffic Department of the Grand Trunk, at Montreal, and later served in the Traffic departments of the Chicago, Rock Island & Pacific and the Atchison, Topeka & Santa Fe. In 1892 he entered the General Freight offices of the Illinois Central and when the Western extension was completed to Omaha he was made Commercial Agent, at Salt Lake City, Utah. In 1902 he was appointed Assistant to the Second Vice-President. In 1904 he was appointed General European Agent, with office at London, England, where he was in charge of the traffic interests of the Illinois Central. He remained in that position until his recent appointment on February 1 as Assistant to the President, with office at Chicago.


Donald Rose.

Operating Officers.

J. B. Chandler has been appointed Car Service Agent of the Minneapolis & St. Louis and the Iowa Central, with office at Minneapolis, Minn.

G. S. Stoner, who was appointed Trainmaster of the Missouri, Kansas & Texas of Texas in August, 1906, and was later temporarily assigned to the position of General Agent, at Denison, Tex., during congestion of traffic in the yard, and whose return to the position of Trainmaster was deferred on account of changes in superintendents, resumed his position as Trainmaster, at Denison, on February 1. This corrects an item in our issue of February 5.

P. J. O'Neil, Superintendent in charge of operation and construction of the Lead Belt Railway, the property of the Federal Lead Co., has been appointed also Assistant Superintendent of the Illinois Central at Flat River, Mo. He began railway work in 1884 as a laborer and was later made foreman, and while so employed learned telegraphy. Three years later he went to the employ of the Chicago & Eastern Illinois, where he worked on construction and later as brakeman, operator and agent. Four years later he was made despatcher of the Great Northern, at Havre, Mont., and in 1897 became General Agent and General Yardmaster of the St. Louis, Iron Mountain & Southern at St. Louis. He was for some time President of the Carondelet Business Men's Association of St. Louis, and in 1907 resigned to become Superintendent of the Lead Belt Railway, with office at Flat River, which position he retains.

Traffic Officers.

C. M. Calvin has been appointed Division Agent of the Chicago, Rock Island & Pacific at Trenton, Mo.

F. J. Thomure has been appointed Traffic Manager of the Mississippi River & Bonne Terre, with office at Bonne Terre, Mo.

John H. Schultz, Traveling Agent of the Chicago & North Western, at Pittsburgh, Pa., has been appointed Traveling Passenger Agent at Buffalo, N. Y.

J. K. McNab, Traveling Freight Agent of the Canadian Pacific, at Portland, Ore., has been transferred to Vancouver, B. C. George L. Morrison succeeds Mr. McNab.

E. L. Whitney, Commercial Agent of the Louisiana Railway & Navigation Co., at Dallas, Tex., has been appointed General Agent for the state of Texas, with office at Dallas.

John C. Wood, Commercial Agent of the Chicago, Indiana & Southern, at Chicago, has been appointed Commercial Agent of the Chicago, Milwaukee & Puget Sound, at Chicago. John T. MacTaggart succeeds Mr. Wood.

H. G. Powell, Traveling Freight Agent of the Illinois Central and Indianapolis Southern, at Indianapolis, Ind., has been appointed Commercial Agent at Dubuque, Iowa, succeeding W. S. Benson, deceased. R. A. Barr succeeds Mr. Powell.

J. N. Steele, Traveling Freight Agent of the Trinity & Brazos Valley, at Houston, Tex., has been appointed Soliciting Freight Agent at Houston. H. J. Neff has been appointed Traveling Freight Agent at Houston.

J. R. Hurley has been appointed General Agent, Passenger department, of the New York Central lines west of Buffalo, at Milwaukee, Wis. J. S. Willebrands has been appointed Traveling Passenger Agent for the state of Wisconsin, with office at Milwaukee.

W. B. Ryan, Vice-President and General Manager of the Tehuantepec National, has been appointed General Traffic Manager of the National Railways of Mexico. H. Lawton, Freight Traffic Manager of the Mexican Central, and C. W. Fish, General Freight Agent of the National Lines of Mexico, have been appointed General Freight Agents of the National Railways of Mexico.

J. G. Love, Division Freight and Passenger Agent of the Chicago, Milwaukee & St. Paul, at Sioux City, Iowa, has been appointed Division Freight and Passenger Agent in charge of the Des Moines division, with office at Des Moines, Iowa, succeeding S. H. Vaughan, assigned to other duties. C. N. Curtis succeeds Mr. Love and will have charge of the Sioux City and Dakota division and that portion of the Iowa and Dakota division south of Marion Junction to Running Water, S. Dak.

Engineering and Rolling Stock Officers.

Robert Belton, Roadmaster of the Atchison, Topeka & Santa Fe, at Florence, Kan., has resigned.

W. H. Edgecombe has been appointed Bonus Supervisor of the Western Grand division of the Atchison, Topeka & Santa Fe, with office at La Junta, Colo.

F. C. Pickard, Master Mechanic of the Mississippi Central, has been appointed Master Mechanic of the Cincinnati, Hamilton & Dayton, at Moorefield, Ind., succeeding C. B. Cadman, resigned.

D. W. Hickey has been appointed Foreman of Construction Equipment of the Chicago, Burlington & Quincy, at Galesburg, Ill., succeeding O. W. Duffy, resigned to accept service with another road.

George L. Moore, whose resignation as Chief Engineer of the Rutland has been previously announced, has been appointed Engineer of Maintenance of Way of the Lehigh Valley, succeeding R. G. Kenly, resigned.

Purchasing Officers.

W. Josselyn, Storekeeper of the Chicago, Burlington & Quincy, at Plattsmouth, Neb., has been appointed Storekeeper at Sheridan, Wyo., succeeding B. G. McKeen, resigned to engage in other work. H. M. Regnier, Storekeeper at Hannibal, Mo., succeeds Mr. Josselyn. J. F. Rothschild, Storekeeper at St. Joseph, Mo., succeeds Mr. Regnier, and J. L. Feemster succeeds Mr. Rothschild.

OBITUARY.

Richard C. Moore died at his home in Richmond, Staten Island, N. Y., on February 12, after an illness of about 10 days. He was at one time Purchasing Agent for the New York Central Lines.

John C. Williams, President of the Forest City Iron & Steel Co., and formerly Chief Engineer of the Cleveland & Mahoning, now the Mahoning division of the Erie, died February 8 at his home in Cleveland.

Samuel H. Chaittenden, formerly a civil engineer, died at Washington, D. C., on February 15. He was in charge of survey work on the Union Pacific in 1866, and for many years was in the employ of the government.

Arthur G. Yates, the announcement of whose death appeared in our issue of last week, had been President of the Buffalo, Rochester & Pittsburgh since 1890. Under his administration the road has increased its mileage from 304 miles to 568 miles, and its gross earnings, which were $2,542,158, or at the rate of $8,362 per mile in the first year of the administration of Mr. Yates, were $8,408,145 or at the rate of $14,803 per mile last year. Mr. Yates was born at East Waverly, N. Y., in 1843. In 1865 he entered the employ of the Anthracite Coal Association, which represented the Delaware, Lackawanna & Western, the Delaware & Hudson and the Pennsylvania Coal Co., in Rochester, N. Y. Two years later he went in business for himself, and in 1876 organized the firm of Bell, Lewis & Yates in Buffalo, N. Y. Later he organized the Lehigh & Franklin Coal Co., which handled both anthracite and bituminous coal at Chicago and other lake ports. The Bell, Lewis & Yates firm was later incorporated as the Bell, Lewis & Yates C. M. Co., Mr. Yates retiring from its management in 1890, when he became President of the Buffalo, Rochester & Pittsburgh, but in May, 1896, control of the company was again placed in Mr. Yates' hands. Mr. Yates brought to his work an untiring industry and a rare good judgment. His mind was constructive and comprehensive. He was prompt in decision and a man of unusual force.


A. G. Yates.

Railroad Construction.

New Incorporations, Surveys, Etc.

BEAVER VALLEY & NORTHWESTERN.—An officer writes that this company was organized to build a line from Oklahoma City, Okla., northwest to Lajunta, Colo., about 500 miles. Surveys made and line located from Gage, Okla., where connection is to be made with the Atchison, Topeka & Santa Fe, west via Beaver City to Hooker, where connection is to be made with the Chicago, Rock Island & Pacific, about 105 miles. Right of way secured for 80 per cent. of the way, and contract for construction let to T. E. Luttgerding, of Wichita, Kan. Work is to be begun in May. J. W. Webb, President, Beaver City, and C. H. Holmes, Secretary, Gage, Okla. (Nov. 13, p. 1373.)

CALIFORNIA NORTHEASTERN.—See Southern Pacific.

CAROLINA, CLINCHFIELD & OHIO.—This company's plans call for a line from Elkhorn City, Va., south through Tennessee and North Carolina to Spartanburg, S. C., 285½ miles. The line is in operation from St. Paul, Va., where connection is made with the Norfolk & Western, south to Speer's Ferry, about 38 miles, where connection is made with the Virginia & Southwestern; also from Johnson City, Tenn., where connection is made with the Southern Railway, south to Marion, N. C., 98 miles. An officer writes that it is expected the line from Dante, Va., south to Bostic, N. C., 211 miles, where connection is to be made with the Seaboard Air Line, will be opened for through traffic not later than February 20. (Oct. 16, p. 1175.)

CHICAGO, MILWAUKEE & PUGET SOUND.—St. Paul Pass tunnel, the Chicago, Milwaukee & Puget Sound Ry.'s tunnel through the Bitter Root mountains, had the headings connected February 9. The alinement was within 0.03 of a foot and the levels within 0.01, and therefore practically exact. The excavation during January amounted to approximately 750 ft. of the entire section. A description of the methods used in digging this tunnel was given in the *Railroad Age*

Gazette, October 9, 1908. K. C. Weedin was Engineer and Winston Bros. Co. the contractor.

CHICAGO, ROCK ISLAND & PACIFIC.—An officer writes regarding the line from Wildorado, Tex., west to Tucumcari, N. Mex., 92 miles, that it was partially graded in 1904. It is expected to finish the line and put it in operation by December, 1909. This will give a direct line from Memphis via Tucumcari to El Paso and California. All the Rock Island tributary lines will use this short cut instead of going, as at present, from Amarillo, north to Dalhart, thence south to El Paso. (Jan. 29, p. 235.)

CHIHUAHUA & PACIFIC.—See Kansas City, Mexico & Orient.

COLORADO & MEXICO.—An officer writes that this company, which was incorporated this year to build a line from Douglas, Ariz., via Sulphur Springs valley to Courtland, 40 miles, began grading on January 10. The entire line is under contract to Powers & O'Connor, contractors, El Paso, Tex. J. L. Campbell, Chief Engineer, Bisbee, Arizona.

DELAWARE, LACKAWANNA & WESTERN.—The double-track tunnel through Bergen Hill, N. J., was opened for traffic last week. The new tunnel parallels the old one, and the two are 51½ ft. apart. Together they will make a four-track line through to Hoboken, N. J. The new tunnel is less than a mile in length. Fuller details are given in another column. (March 13, p. 391.)

DES MOINES & SIOUX CITY (ELECTRIC).—Contracts for the construction of this line have been let to the American Engineering Co., contractors, Indianapolis, Ind. Options have been secured on most of the right of way along the three different routes in view. The building of this road depends largely upon the success of the American National Corporation Co., of Indianapolis, which company has in hand the financing of the line. (Sept. 11, p. 932.)

GALESVILLE & ETRIC.—See Western Transportation Co.

GULF, COLORADO & SANTA FE.—An officer writes that it is expected to have work on the Texas & Gulf, building from Center, Tex., to Zuber, 21.3 miles, finished by June. Work was suspended in February, 1908, and resumed in October. John Scott & Sons, St. Louis, Mo., are the contractors. (Feb. 12, p. 330.)

HUDSON & MANHATTAN.—Plans have been filed by this company with the New York Public Service Commission, First district, to extend the subway from its proposed terminus at Thirty-third street and Sixth avenue, Borough of Manhattan, New York, to the Grand Central Station in Forty-second street. The plans call for a two-track subway from Thirty-third street, up Sixth avenue, thence under Bryant park near Fortieth street, entering Forty-second street west of Fifth avenue, and through Forty-second street to the Grand Central Station. The new subway is to run beneath the present Interborough subway along Forty-second street.

IOWA & SOUTHWESTERN.—Organized in Iowa, with $300,000 capital, and office at Clarinda, Iowa. The company proposes to build a line from Clarinda southwest via College Springs to Blanchard, in Page county, about 18 miles. Preliminary surveys and estimates of the cost of construction have been made. W. F. Farquhar, President, College Springs, and J. N. Miller, Vice-President, Clarinda.

JONESBOROUGH, LAKE CITY & EASTERN.—Incorporated in Texas to build a railway from Uvalde, Texas, to Laredo, 125 miles. The proposed line will connect with the Southern Pacific at Uvalde and the International & Great Northern at Laredo.

KANSAS CITY, MEXICO & ORIENT.—An officer writes the following as a synopsis of progress up to February 1. This synopsis follows the proposed line from Kansas City to Topolobampo, Mex.

The Kansas City Outer Belt Electric, which will furnish an entrance into and terminal facilities at Kansas City, Mo., is practically graded and concrete culvert work completed. The necessary steel bridges, with the exception of that crossing the Missouri river, are on hand. This line will be double-tracked with 90-lb. rails. It is probable that the construction work will be resumed during the present year. No grading has been done on the line from the western terminus at Kansas City, Kan., to Emporia, a distance of 108 miles.

From Emporia to Eldorado, 61 miles, the grading is about completed, and two miles of track are laid north from Eldorado. The steel bridge material is now on the ground and ready for erection.

No construction work has been done on the section from Eldorado to Wichita, Kan., 32 miles.

From Wichita to Sweetwater, Tex., 433 miles, the line is completed and in operation.

From Sweetwater to San Angelo, 78 miles, grading is completed and 11 miles of track laid north from San Angelo. Rails and ties are now on the ground at San Angelo with which to continue track laying north from that point for a distance of 10 miles. The steel for the bridge over the Concho river at San Angelo is also on hand.

From San Angelo to the Rio Grande river, 304 miles, no construction work has been done.

From the Rio Grande river to Chihuahua, Mex., 170 miles, the line is completed and in operation for a distance of 90 miles east from Chihuahua and grading is completed for 12 miles further east.

From Chihuahua to Minaca, 122 miles, the K. C., M. & O. operates over the Chihuahua & Pacific.

From Minaca west to Sanchez, on the western slope of the Sierra Madres, 76 miles, the line is completed and in operation and grading is completed for nine miles beyond Sanchez.

From Las Hornillos to Topolobampo, 74 miles, the line is completed and in operation. Twenty-one miles of grading is finished beyond Las Hornillos, leaving a gap of 166 miles of grading and 196 miles of track yet to be completed on the western slope of the mountains.

KANSAS CITY OUTER BELT (ELECTRIC).—See Kansas City, Mexico & Orient.

KANSAS CITY SOUTHERN.—An officer writes that grading between Howe, Okla., and Heavner, has been completed, and that track laying and bridging on this cut-off has been postponed. (March 13, p. 391.)

LAKE SUPERIOR & ISHPEMING.—An officer writes, regarding the change of line through Negaunee, Mich., that the work is about completed, including the grade reduction, and that the line will probably be open for traffic early in the present summer. The steel bridges, including two viaducts, 285 ft. and 305 ft. long respectively, were erected by the Toledo-Massillon Bridge Co.

LOUISIANA & PINE BLUFF.—An officer writes that work on the extension from Dollar Junction, Ark., to New London, 15 miles, and from New London to Wilmington, 15 miles, has been abandoned for the present. (March 13, p. 392.)

MANILA RAILWAY.—An officer writes that this company started grading about two years ago on the Island of Luzon, P. I., building lines aggregating 428 miles for a syndicate formed by Speyer & Co., during the past year. Up to December 7 the company opened 125 miles of railway for traffic. About 40 miles additional are partly completed. No contracts are to be let for any of the work. J. G. Metcalfe, Vice-President, and A. W. Clark, Secretary and Treasurer, New York.

MARSHALL & EAST TEXAS.—An officer writes that this company has spent about $100,000 rehabilitating the old line between Marshall, Tex., and Winnsboro. New ties have been laid, new bridges built, and a small amount of new track laid. No work has yet been done reducing the grade and taking out bad curves, but it is expected some of this work will be carried out in 1909. Negotiations are pending with residents of Marshall for rights of way, etc., for its proposed extension south. It is expected that satisfactory arrangements will be made soon and the line extended about 20 miles. Maximum grades on this extension will be five-tenths of one per cent., and maximum curvature about 4 degrees. (Jan. 1, p. 36.)

MEXICAN SOUTHERN.—An officer writes that this company is building an extension from Oaxaca, Mex., in the state of Oaxaca, south via Zimatlan and San Pablo Huixtepec to Taviche, 34 miles. The line has been built from Oaxaca to San Pablo, and grading contract let for the remaining 16 miles from that place to Taviche.

MISSOURI, OKLAHOMA & GULF.—Press reports from Muskogee, Okla., say that negotiations were finished recently to extend this road from Calvin, Okla., south to Denison, Tex., 92 miles. (July 3, p. 457.)

Missouri Pacific.—An officer writes that contracts amounting to $250,000 have been let to the L. J. Smith Construction Co., Kansas City, Mo. The work includes ballasting on the Valley, Natchez and Memphis divisions, and bridge filling work on the Memphis division.

Montana Roads.—A company is being organized by M. S. Darling, of Conrad, Mont., and associates, to build a line from Conrad, where connection is to be made with the Great Northern, to Valier, 27 miles. Grading is to be started this coming spring or summer. The line will traverse an irrigation district of 160,000 acres, to be opened for settlement soon.

Montana, Wyoming & Southern.—According to press reports, contracts are to be let soon for building this proposed line from Sheridan, Wyo., northeast to Miles City, Mont., about 150 miles. R. H. Walsh, President of the First National Bank of Sheridan, is President. (Oct. 23, p. 1227.)

New York, New Haven & Hartford.—Final authority has been given by the New York Public Service Commission, Second District, for the building of the New York, Westchester & Boston. In January last the commission granted a certificate of public necessity and convenience, with the stipulation that a rehearing should be held. This rehearing was held on February 10, when all oppositions to the project were withdrawn and the company is now free to proceed with the work. (Jan. 15, p. 139.)

New York, Pittsburgh & Chicago Air Line.—An officer writes that during the past year engineers have been at work revising the line of this company. The projected route is from Pittsburgh, Pa., east via Indiana, Cherry Tree, Irvona, Sandy Ridge, Loneville, Tusseyville, New Berlin, Sunbury, Mahanoy City and Tamaqua to Allentown, 298 miles. It is expected that construction work will be started during 1909. The line from Pittsburgh to the Susquehanna river, 188 miles, as shown by the surveys, will have a maximum grade east of 15 ft. to the mile, with no pusher grades, and 20 ft. westbound with nine miles of 60-ft. grade up eastern slope of Allegheny mountains at Sandy Ridge. Maximum curvature Pittsburgh to the summit of the Allegheny mountains 2 deg. Maximum curvature entire line 3 deg. Joseph Ramsey, Jr., Orange, N. J., is interested.

New York, Westchester & Boston.—See New York, New Haven & Hartford.

North & South Carolina.—An officer writes that this company has leased from the Seaboard Air Line a branch running from Hamlet, N. C., to Gibson, 11 miles. This line has been extended from Gibson via McColl, S. C., to Clio, 15 miles, and is now in operation, completing the road. W. R. Bonsal & Co., of Hamlet, N. C., were the contractors. W. R. Bonsal is President and Treasurer of the railway.

Ohio Railway (Electric).—An officer writes that this company has completed the line from Bellefontaine, Ohio, to Lima, 33 miles; also the line from Lima to Toledo, 73 miles. (March 27, p. 393.)

Pittsburgh, Binghamton & Eastern.—This company, organized to build a line from Binghamton, N. Y., southwest to Clearfield, Pa., 232.5 miles, was placed in the hands of a Receiver late in 1908. We are told that a reorganization of the company may be effected at an early date, and work on the line resumed. About six miles of track have been laid between Powell, Pa., and Canton, and about 20 miles of grading is finished. Some four bridges have already been put up. Contract was let previous to placing the road in the hands of Receivers to Wm. J. Oliver & Co., of Knoxville, Tenn. Rivenac & Co., who have a sub-contract for some of the work, are on the ground at Canton with their men and outfit, but are doing no work as yet. Louis T. McFadden, John P. Reynold, Jr., and Fred C. Leonard, Canton, Pa., are the Receivers. (Sept. 18, p. 981.)

Port O'Connor, Rio Grande & Northern.—Press reports indicate that a general contract for building and equipping this proposed line to J. H. Collins, contractor, Chicago. (Feb. 5, p. 282.)

Rochester, Syracuse & Eastern.—See Syracuse, Lake Shore & Northern.

Rogue River & Oregon Southern (Electric).—An officer writes that this company, incorporated in Oregon to build from Grants Pass, Ore., on the Oregon Railroad & Navigation Co., southwest through the Rogue river valley, a rich timber section, to Waldo, about 50 miles, has obtained franchises from the city of Grants Pass, and the county of Josephine, to build its proposed electric line over the public highways and streets. Water power on the Illinois river has been located, and it is expected to begin construction work this spring. O. S. Blanchard, of Grants Pass, is interested. (Sept 11, p. 934.)

Salem, Falls City & Western.—An officer writes that work on this line, building from Dallas, Ore., east to Salem, 14 miles, has been suspended during the winter and is to be resumed about April 1. It is expected to have the entire line finished by October. Rails have been bought, some of which are already on the ground. L. Gerlinger, President, Portland, Ore. (Aug. 7, p. 693.)

Southern Pacific.—An officer of the California Northeastern writes that this line, which connects with the Southern Pacific main line at Weed, Cal., is now in operation northeast to Holland, Ore., 74 miles. Construction is under way from Holland north to Klamath Falls, 14 miles. (Dec. 18, p. 1610.)

Sparta Railway & Power Company.—See Western Transportation Co.

Syracuse, Lake Shore & Northern (Electric).—An officer writes that this company started operating January 1 its extension from Baldwinsville, N. Y., north to Fulton, 15 miles, and will probably build a further extension from Fulton northwest to Oswego, about 20 miles, during 1909.

Contracts are to be let in March for building an extension of the Rochester, Syracuse & Eastern from Port Byron, N. Y., east to Syracuse, about 35 miles. Surveys have been made and franchises and rights of way secured. (Sept. 25, p. 1028.)

Terre Haute & Southern Indiana.—Incorporated in Indiana, with $50,000 capital, to build a line from Terre Haute, Ind., west through Illinois to the Missouri state line, about 200 miles, with a branch southerly through Vigo and Sullivan counties, Ind., to coal fields. The directors include H. C. Pugh, R. G. Wasson, Robert Herkimer, S. C. McKeen, H. B. Bement, H. P. Taussig and Charles Minshall.

Texas & Gulf.—See Gulf, Colorado & Santa Fe.

Texas Roads.—John B. Carrington, Secretary of the Business Men's Club, San Antonio, Tex., writes, regarding building of a railway from San Antonio, south to Brownsville, about 300 miles, that J. F. Edwards, of St. Louis, representing capitalists of that place, failed to meet the conditions in regard to building this line and that negotiations with him have ceased. The city of San Antonio still has $100,000, of which it is prepared to give $75,000 as a cash bonus and the remainder to be used in obtaining rights of way to the Bexar county line and securing terminals within the city. Several groups of capitalists are figuring on this proposition, but no definite contract has as yet been submitted and the Business Men's Club of San Antonio is free to entertain propositions from any capitalists or railway builders wishing to build this line. The city of San Antonio does not intend to build this road itself, nor does it wish to employ any engineers to make preliminary surveys, nor does it wish to finance the road itself. The city and the people of the country through which the line will pass are willing to give as a bonus, either in lands or money, approximately $1,000,000 and to make contracts with responsible railway builders, who in turn will be required to give evidence of substantial financial backing and to furnish satisfactory bond. The city of San Antonio, through the Business Men's Club, will be glad to open negotiations with any bona fide capitalists or railway builders. (Nov. 13, p. 1375.)

Virginia & Southwestern.—An officer writes that this company, which is building the Holston River extension, a 40-mile line which will connect the V. & S.W. at Moccasin Gap, Va., with the Southern at Persia, Tenn., is now receiving bids for the construction of this line. This work was begun about three years ago and about 75 per cent. of the grading and masonry work was completed. In this resumption it is proposed to have the line finished and ready for operation in October. (Feb. 12, p. 331.)

Western Transportation Company.—This company, of which J. N. Braun is President and General Manager; A. B.

Karns, Secretary, and C. Oehler, Chief Engineer, with office at St. Paul, Minn., has surveys made and rights of way secured on 30 miles, for a line to be built from Portage, Wis., north via Briggsville, Oxford, Friendship and Arkdale to Grand Rapids, about 70 miles.

Negotiations have been finished for taking over the Sparta Railway & Power Co., organized to build a line from Sparta, Wis., northwest via Angelo, Trout Falls and Cataract to Melrose, 28 miles. Contracts let to local parties to build the entire line. Contracts are to be let soon for a number of bridges, one to have a total length of 800 ft., including the approaches. Shops and car barns are to be put up at Sparta. Steam power is to be used for freight service, and gasolene motor and gasolene-electric cars will be used for passenger service.

The Galesville & Etric, which has also projected a line in Wisconsin, will be built in 1909 by the W. T. Co., as well as a 60-mile interurban electric line in Montana.

Williamsport & North Branch.—An officer writes that although surveys have been made for an extension from Bernice, Pa., to coal mines, about four miles, it is probable that arrangements will be made to use the tracks of the Lehigh Valley as heretofore, instead of building the extension.

Railroad Financial News.

Baltimore & Ohio.—See Cincinnati, Hamilton & Dayton.

Boston & Maine.—See New York, New Haven & Hartford.

Carolina, Clinchfield & Ohio.—The company has sold $2,600,000 5 per cent. equipment notes, series A, dated December 1, 1908, due in semi-annual instalments of $130,000 each, beginning June 1, 1909, and ending December 1, 1918.

Chesapeake & Ohio.—Edwin Hawley, Frank A. Vanderlip, John W. Castles, Frank Trumbull, H. E. Huntington and F. W. Scott have been elected directors. The retiring directors are Samuel Rea, Walter G. Oakman, Thomas P. Fowler, J. P. Green, Temple Bowdoin and Martin Erdmann. This is a further step in the transfer of the control of the Chesapeake & Ohio from Pennsylvania and Vanderbilt interests to Edwin Hawley and associates.

Chicago, Burlington & Quincy.—The First National Bank, J. P. Morgan & Co., and the National City Bank, New York, are offering $15,000,000 Chicago, Burlington & Quincy general mortgage 4 per cent. bonds of 1908-1958 at 99½. This is part of an authorized issue of $300,000,000, of which there was previously outstanding $16,000,000. It is understood that the Burlington sold these bonds to reimburse itself for the recent purchase of Colorado & Southern stock.

Chicago Railways.—N. W. Harris & Co. and the National City Bank, New York, have bought $6,000,000 first mortgage 5 per cent. bonds of 1907-1927 issued to pay for extensions and improvements. The bonds are being offered to the public at 101.

Cincinnati, Hamilton & Dayton.—The Federal court has appointed a special master to report on the receipts and expenditures of the receiver. The present receiver, Governor Harmon, says that he will retire as receiver on May 1.

It is understood that the Baltimore & Ohio is to take some part in the reorganization of the C., H. & D.

Colorado & Northwestern.—This road is to be sold at foreclosure at Boulder, Colo., on March 29. An upset bid of $250,000 is fixed. The road runs from Boulder, Colo., to Sunset, where it branches, one line going to Ward and one to Eldora. It has, including spurs, about 50 miles of track. It has been operated by W. B. Hayes as Receiver for about two years.

Colorado & Southern.—George F. Baker, J. W. Blythe, W. P. Clough, George B. Harris, James J. Hill, James N. Hill, Darius Miller, E. P. Nichols and Daniel Willard have been elected directors, and W. F. Crandall, H. E. Huntington, William Shillaber, T. P. Shonts, Henry Walters, Levi C. Weir, B. F. Yoakum, James Campbell and Henry H. Wehrhane have retired from the board. George B. Harris, President, of the Chicago, Burlington & Quincy, has been elected also President of the Colorado & Southern and chairman of the board, succeeding G. M. Dodge. Harry Bronner, Edwin Hawley, G. M. Dodge and Frank Trumbull have been re-elected directors.

Colorado Midland.—George B. Harris, President of the Chicago, Burlington & Quincy; Daniel Willard, Second Vice-President, and W. T. Clough, Vice-President of the Great Northern, have been elected directors of the Colorado Midland, succeeding Frank Trumbull, G. M. Dodge and A. C. Rearick. This marks a further step in the transfer of the control of the Colorado & Southern and allied lines from the Edwin Hawley interests to the Burlington interests.

Erie.—The New York Public Service Commission, Second district, has given permission to this company to issue $30,000,000 bonds. (See an article in another column.)

Fall Brook Railway.—See Geneva, Corning & Southern.

Geneva, Corning & Southern.—Stockholders of the Fall Brook Railway, the Syracuse, Geneva & Corning and the Pine Creek Railway will vote on March 16 on the plan to ratify the action of the directors in consolidating these companies into a new company to be known as the Geneva, Corning & Southern, which will own about 230 miles of railway. The three companies which are to consolidate are leased to the New York Central & Hudson River.

Interoceanic of Mexico.—See National Railways of Mexico.

Louisville & Eastern.—See Louisville Traction Co.

Louisville Railway.—See Louisville Traction Co.

Louisville Traction Co.—This holding company, owning nearly all of the stock of the Louisville Railway, has acquired control of the Louisville & Eastern, now in the hands of receivers. The Louisville Railway operates 145 miles of electric railways in Louisville, Ky. The Louisville & Eastern operates 27 miles of road running from Louisville to Beards and La Grange over a private right of way.

Metropolitan Street Railway (New York).—Two-thirds of the $12,500,000 outstanding general mortgage and collateral trust 5 per cent. bonds have been deposited, under the plan of the bondholders' protective committee, A. J. Hemphill, chairman, with the Guaranty Trust Co., New York, and the time for depositing bonds has been extended to January 23.

Mexican Central.—See National Railways of Mexico.

Mexican International.—See National Railways of Mexico.

Minneapolis & St. Louis.—Speyer & Co., New York, recently bought $2,015,000 first and refunding mortgage 4 per cent. bonds of 1899-1949. The proceeds of the sale is to be used by the railway company for retiring $455,000 Minneapolis & Merriam Junction 7 per cent. bonds which matured January 1, 1907, and $1,015,000 Iowa extension 7 per cent. bonds which will mature June 1, 1909.

National Railroad of Mexico.—See National Railways of Mexico.

National Railways of Mexico.—Stockholders of the Mexican Central voted on February 11 to authorize the sale of the property of the Mexican Central to the National Railways of Mexico. The sale of the property of the National Railroad of Mexico was confirmed in October, 1908. The property of the Mexican International and the Interoceanic of Mexico has not been transferred to the National Railways of Mexico. The Mexican Central and the National Railroad Companies having sold all their assets, are subject to dissolution when desired.

Nevada, California & Oregon.—See Sierra Valleys.

New York, New Haven & Hartford.—In answer to certain questions asked by the House of Representatives of Massachusetts, the New York, New Haven & Hartford says that the sale of its holding of the Boston & Maine shares to John L. Billard was in good faith, and was an actual transfer of all rights and voting privileges pertaining to the stock to interests believed to be friendly to the New Haven company. In connection with the question about street

railway holdings, the New Haven company says that as to its railway, the company is subject to the laws of Massachusetts, but that as to its acts as a consolidated corporation it is subject to the charter of the Connecticut corporation.

Pine Creek Railway.—See Geneva, Corning & Southern.

Sierra Valleys.—The property of this company was sold under foreclosure on January 30 for $75,000 to the Nevada, California & Oregon. Most of the stock and all the bonds of the Sierra Valleys are owned by the N. C. & O. The Sierra Valleys runs from Plumas Junction, Cal., west to Mohawk, 37 miles, and the Nevada, California & Oregon runs from Reno, Nev., north through Plumas Junction to Alturas, Cal., 184 miles.

Syracuse, Geneva & Southern.—See Geneva, Corning & Southern.

Twenty-eighth & Twenty-ninth Street Crosstown (New York).—J. B. Mayer, temporary receiver, has been appointed permanent receiver in the foreclosure suit brought by the Central Trust Co., New York.

United Railroads of St. Louis (Electric).—An initial dividend of 3½ per cent. has been declared out of the earnings for the six months ended January 1, 1909, on the $5,000,000 7 per cent. cumulative first preferred stock. The stock is all owned by the United Railways Investment Co.

Wichita Falls Railway.—The Texas legislature has been asked to authorize the Wichita Falls Railway to take over and operate the Wichita Falls & Northwestern and the Wichita Falls & Southern. The roads are owned by the same interests. The Wichita Falls runs from Henrietta to Wichita Falls, 20 miles, and is operated under lease by the Missouri, Kansas & Texas. The Wichita Falls & Northwestern runs from Wichita Falls to Frederick, Okla., 50 miles, and is being extended to Paul's Valley, another 50 miles. The Wichita Falls & Southern is being built south from Wichita Falls. More than 55 miles of this line are completed and in operation.

Wisconsin Central.—Newman Erb, President; F. N. Prince, Mark T. Cox and J. S. Bache have been appointed a committee to take up with the Minneapolis, St. Paul & Sault Ste. Marie the subject of completing a lease of the Wisconsin Central by the Soo.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The St. Joe & Grand Island expects soon to be in the market for 10 locomotives.

The Temiskaming & Northern Ontario is in the market for two switching locomotives.

The Georgetown & Western has ordered one locomotive from the Baldwin Locomotive Works.

CAR BUILDING.

The Missouri, Kansas & Texas is asking prices on 30 passenger coaches.

The Wabash-Pittsburgh Terminal is said to be asking prices on 200 fifty-ton steel hopper cars. This item is not confirmed.

The J. D. McArthur Co., Winnipeg, Man., has ordered 50 thirty-ton flat cars from the Crossen Car Manufacturing Co.

The Abilene & Southern, Abilene, Tex., has ordered two combination passenger and baggage cars from A. V. Kaiser & Co.

The Findlay-Marion Railway & Light Co., G. W. Meeker, Columbus, Ohio, will soon be in the market for 12 interurban cars.

The Intercolonial has ordered two 60-ft. baggage cars from the Preston Car & Coach Co. and three baggage cars from the Crossen Car Manufacturing Co.

IRON AND STEEL.

The Great Northern has ordered 285 tons of structural steel for a grain elevator at Superior, Wis.

The Wheeling & Lake Erie has ordered 3,500 tons of rails from the Carnegie Steel Co. for delivery before April 1.

The Chicago & North Western has ordered 375 tons of structural steel from the Illinois Steel Co. for a new bridge at Chicago.

The Chicago Great Western, reported in the *Railroad Age Gazette* of February 5 as being in the market for 5,000 tons of rails, has placed this order with the Illinois Steel Co.

The Crane Co., Chicago, reported in the *Railroad Age Gazette* of January 22 as being in the market for 2,500 tons of structural steel for a warehouse at Chicago, has placed this order with Vierling, McDowell & Co., Chicago. The general contractors for the erection of the building are Lanquist & Illsley, Chicago, as reported on February 5.

RAILROAD STRUCTURES.

Chicago, Ill.—Frost & Granger, architects, Chicago, are preparing plans for two passenger stations to be built at Evanston, Ill.; a new station at Calvary, Ill., and a new station at Irving Park boulevard and Ravenswood Park, Chicago, for the Chicago & North Western. The stations at Evanston and Calvary will cost $30,000 each and the station within the city limits $10,000. They will be one story, of pressed brick and stone, and will be finished with oak, tile and mosaic work.

The inbound freight house of the Wabash, corner of Twelfth and Clark streets, was destroyed by fire on February 10. Two lives were lost. The estimated loss is $500,000.

The Chicago, Rock Island & Pacific will erect a two-story office building at Seventy-first street and Stewart avenue for the Auditing and Car Service Departments.

Cisco, Tex.—The Texas & Pacific and the Texas Central have prepared plans for a joint passenger station at Cisco. This building will be erected soon. Cost, $8,000.

East Youngstown, Ohio.—The Youngstown & Ohio is said to have bought land in Youngstown as a site for a passenger station, freight house and yards.

Greenville, Tex.—The creosoting plant of the Missouri, Kansas & Texas was burned on February 8 at a loss of about $150,000. It has not been decided whether or not the plant will be rebuilt.

Jacksonville, Ill.—The Chicago & Alton has given the contract for building the new passenger station to John W. Evans & Sons Co., of Bloomington, Ill. (Feb. 5, p. 284.)

Kennewick, Wash.—The North Coast has given the contract for the construction of a steel and masonry bridge over the Columbia river to the Puget Sound Bridge & Dredging Co., Seattle, Wash. It will cost about $1,000,000.

Taylor, Tex.—The International & Great Northern will commence work soon upon the rebuilding of the roundhouse and shops destroyed last fall. The new structures will cost $50,000. (Sept. 25, p. 1022.)

Toledo, Ohio.—The Ohio Electric Railway is at present building large freight and passenger terminals which will be completed about March 15.

SIGNALING.

On February 14th the Rock Island changed the night color indications of the signals and switches on the Chicago Terminal Division (Chicago to Blue Island). [illegible] were red for stop, green for caution and white for clear, and green was also used for the adverse indication of a siding switch. The new colors are: red, stop; yellow, caution; green, clear, and yellow is also used for the adverse indication of a siding switch.

New Automatics on Rock Island.

The Rock Island has just completed the installation of automatic block signals on the Kansas Division, single track, between Topeka and Herington, 80.2 miles. There are 125 signals. Of these two are normal danger, two-position; two are normal danger, three-position and two are normal caution, three-position; these are all in McFarland yard, the special arrangement being made to meet local conditions. The remainder are normal clear, three-position, with the exception of two which are two-position and one semi-automatic distant signal for the Topeka interlocking plant. Switch indicators are provided at all switches remote from signals; that is to say, at such a distance that trainmen could not obtain authority to open a switch by observing a signal. There are two indicators at each switch in the majority of cases, one indicator showing the approach of a westward train and the other showing the approach of an eastward train.

All signals give indications in the lower, right hand quadrant and have one arm. Blades are painted yellow, with a black transverse stripe. Signals are style "B," electric motor, made by the Union Switch & Signal Co. Power is supplied by "BSCO" primary batteries, sixteen cells to each signal. All line circuits are polarized. Control circuits are taken through normally closed contacts in switch boxes operated by all facing-point switches in the block of the signal concerned. Switch boxes also shunt the track circuit at every switch when the switch is opened. Track relays are of four ohm resistance; line relays, 500 ohms.

All the apparatus was put in by the railway company's forces.

Forty-Fifth Street Interlocking, Chicago.

The Union Switch & Signal Co. put in service on February 9, 1909, a forty-seven-lever, electric interlocking machine at Forty-fifth street, Chicago, on the Rock Island-Lake Shore Terminal. There are forty-three working levers controlling four high signal arms, thirty-two dwarf signal arms and thirty-four switches. There are two double-arm, high signals mounted on signal bridges, the upper arms being three-position slotted and the lower arms two-position, not slotted. Two of the dwarf signals are double-armed; the upper arm governs straight movements on the main track against traffic.

All signals give indications in the upper, right-hand quadrant, but the dwarf signals clear to 45 degrees only. The distant signals for this plant are Hall enclosed discs, which are part of the automatic block-signal system which already existed on the terminal district. All signals are lighted by electric lights of 2 c.p.

The storage battery is charged from the railway company's 220-volt, direct-current line through a variable resistance.

Electric detector locking is provided on all main line routes, in addition to mechanical detector bars. It is accomplished by breaking the control circuits of the switches through contacts of 500-ohm relays controlled by block indicators. There are two block indicators for each of the two main line tracks and one annunciator for each direction with traffic. The block indicators are of the semaphore type and the annunciators of the disappearing disc type. Each annunciator is provided with a single-stroke bell.

Route-locking is provided for the two main line movements with traffic. This is accomplished by breaking the circuit of a stick relay by means of a contact on the distant signal when the latter clears. The stick relay cannot be restored until the train has passed the home signal, when the detector locking takes effect. This stick relay opens the control circuits leading to the switches in the route. Indication locking is thus also provided for the distant signals, as the stick relay cannot pick up unless the distant signals assume the caution position. Slow hand electric screw releases are provided to release the electric locking in emergencies.

The cabin is three stories high, built of reinforced concrete, with brick trimmings and slate roof. The lower story contains the heating apparatus and switchboard. The battery room is on the second floor, as is also the lavatory and a room for the relays. The third story, where the machine is placed, overhangs on the track side by 4 ft. 1 in. The dimensions of the cabin at the base are 8 ft. 5 in. by 20 ft. The interlocking apparatus was installed by the Union Switch & Signal Co., the electric locking and other adjuncts, together with the cabin, being installed by the Rock Island, which will operate the plant.

High-Speed Tool Steel.

Professor J. O. Arnold, of Sheffield University, announced January 28 in a lecture before the Royal Institution, London, that "in less than a year the efficiency of high-speed steel would be more than quadrupled, and this new steel would be a British steel." Professor Arnold has high standing as a metallurgist, and he consults for the Sheffield steel makers, Jonas & Colver. A cable message, February 16, indicates that the new metal is already in process of manufacture by this firm.

The Strength of "Bled" Pine.

The Government Forestry Department makes the following summary of the results of 1,325 tests of the weight and strength of pine from which the resin has been bled and not bled. The results are astonishingly similar.

Longleaf pine.	No. of tests.	Specific weight of test pcs., Per cent.	Strength, per sq. in. — Bending, lbs.	Strength, per sq. in. — Compres'n, lbs.
Unbled trees	400	0.74	12,358	7,166
Bled and recently abandoned..	390	.79	12,961	7,813
Bled and abandoned 5 years..	535	.76	12,586	7,575

Supply Trade News.

The Wm. J. Oliver Manufacturing Co., Knoxville, Tenn., recently finished and put into operation a new erecting shop.

A. V. Kaiser & Co., Philadelphia, Pa., have sold one 78-in. Sellers driving wheel lathe and one Niles 200-ton hydraulic driving wheel press to the Georgia & Florida Ry.

A. F. Conklin has been made Special Representative of the Quaker City Rubber Co., Philadelphia, Pa. Mr. Conklin's headquarters will be at 253 Broadway, New York.

The Walker & Douglas Railway Appliance Co., Hammond, Ind., has been incorporated by William L. Walker, Andrew E. Douglas and E. G. Sproat. Capital stock, $10,000.

K. M. Zorn has been appointed Consulting Engineer and Salesman of the Youngstown Car Manufacturing Co., Youngstown, Ohio, with office at 120 Noble road, East Cleveland, Ohio.

The Corrugated Bar Company (formerly Expanded Metal & Corrugated Bar Co.), St. Louis, Mo., is erecting a building at Youngstown, Ohio, to be used as a warehouse and fabricating shop.

G. C. Goebel has been appointed Representative of the Detroit Graphite Co., Detroit, Mich., with office at Indianapolis, Ind. He will have charge of the Kentucky and Southern Indiana territory.

Harry Vissering, for the last 10 years General Sales Agent of the United States Metallic Packing Co., Philadelphia, Pa., and Superintendent of the American Locomotive Sander Co., Philadelphia, has resigned both positions.

The National Paint Works, New York, has opened a branch office at 1520 Chestnut street, Philadelphia, Pa., in charge of Herbert F. Wallace, and a branch office in the Monadnock building, San Francisco, Cal., in charge of Van E. Britton.

George P. Jones, President of the Jones Car Door Co., Chicago, died on February 10 at his residence in Chicago from paralysis. He was born in 1840, at London, Ohio, and came to Chicago in 1877. He was a member of the Union League Club.

Edwards' all-steel trap doors are to be used on the new coaches being built for the Carolina, Clinchfield & Ohio by the Harlan & Hollingsworth Corporation, Wilmington, Del. The O. M. Edwards Co., Syracuse, N. Y., is the maker of these doors.

The Davenport Locomotive Works, Davenport, Iowa, is hav-

ing plans prepared by W. L. Stebbings, Monadnock block, Chicago, for an additional shop building. It will be a one-story structure, 130 ft. x 200 ft., with brick superstructure and steel trusses.

F. H. Bostwick has been appointed Manager of the Denver, Colo., office of the Wellman-Seaver-Morgan Co., Cleveland, Ohio. Mr. Bostwick will have his headquarters at 611 Ideal building.

The Lord & Burnham Co., Irvington, N. Y., has opened a branch office of its ventilating department in the Heed building, Philadelphia, Pa. It is to be in charge of Albert H. Bates, who has been representing the company from its factory at Irvington.

The Browning Engineering Co., Cleveland, Ohio, has appointed J. R. Traver representative at Denver, Colo., and R. I. Wiswell representative at Atlanta, Ga. They will deal in locomotive cranes, revolving steam shovels, railway ditchers, railway wrecking cranes, buckets and magnets.

The Riter-Conley Manufacturing Co., Pittsburgh, Pa., has just established in the West two new sales offices. One will be in St. Louis, Mo., Third National Bank building, with H. B. Clarke as Resident Manager, and one in Seattle, Central building, with W. H. Dickinson as Resident Manager.

The sales organizations of the Northern Electrical Manufacturing Co., Madison, Wis., and the Fort Wayne Electric Works, Fort Wayne, Ind., are to be merged, with the executive offices at Fort Wayne. This will result in a concentration of manufacture, the Northern works being confined to direct-current apparatus, and the Fort Wayne works to alternating-current machines.

The Indiana Foundry Co., Ltd., Indiana, Pa., reports that its sand drying stove is now used by many of the railways and large industrial plants throughout the country and that the export trade on it is increasing at a satisfactory rate. The company has added a number of heavy heating stoves to its line, such as are used in railway shops, stations, factories, mills, etc., and has been working to the limit of its capacity on these all season.

A selling company has been organized under the name of J. Rogers Flannery & Co., with headquarters at Pittsburgh, Pa., to take over the sale of the Tate flexible staybolt, owned and manufactured by the Flannery Bolt Co., Pittsburgh, Pa. This selling organization will also exploit the Keystone nut lock, also manufactured by the Flannery Bolt Co. The representatives of the new company will be H. A. Pike, New York; W. M. Wilson, Chicago; Grundy & Leahey, Richmond, Va.; Tom R. Davis, Mechanical Expert, Pittsburgh.

The Heine Safety Boiler Co., St. Louis, Mo., has just finished installing for the New York Central & Hudson River boilers for engine houses as follows: Three 125 h.p. at Minoa; three 150 h.p. at Oswego; three 250 h.p. at East Buffalo; three 300 h.p. at Syracuse; three 300 h.p. at Rensselaer, for the B. & A.; four 300 h.p. at Rensselaer, for main line. The Heine Company has also just completed the installation of two 200 h.p. boilers in the Chicago, Rock Island & Pacific shops at Fairbury, Neb., and is about to install a 200 h.p. boiler in the repair plant of the International Car Co., New Orleans, La.

Dodge & Day, Philadelphia, Pa., have a contract with the Lidgerwood Manufacturing Co., New York, for the inspection of shipments of material from the states and the erection of same at the Gatun locks, Canal Zone. This contract covers the inspection and erection complete of six duplex cableways and one single cableway which will be used to handle materials from barges to stores, from stores to mixers, and from mixers to place at the Gatun locks. Dodge & Day were retained in the capacity of Consulting Engineers in connection with the electrical equipment as well as engineers for the construction and starting of the apparatus for acceptance at Panama.

Jose F. de Navarro, who died on February 3, was at one time one of the proprietors of the Ingersoll Rock Drill Co., a predecessor of the Ingersoll-Rand Co., New York. He also promoted the Metropolitan Railway, the first elevated railway built in New York City. He was born in Spain in 1823 and graduated from the Spanish Naval Academy when he was 15 years old. He then went to Cuba and was an instructor in mathematics and astronomy at Havana. He came to the United States when he was 19 years old and taught languages in Philadelphia. In 1844 he started a mercantile business in Cuba, but soon returned to this country and went into business in New York City. He built the Navarro apartments on Fifty-ninth street south of Central Park, which were the first of the high-class modern apartments. He was a director of the Equitable Life Assurance Society and of the Atlas Portland Cement Co., New York.

C. G. Young, heretofore Construction Manager of J. G. White & Co., New York, will open an office as a consulting engineer at 60 Wall street, New York. Mr. Young graduated from Haverling Academy in 1885. In 1886 and 1887 he completed a shop course in the plants of the Schuyler Electric & Manufacturing Co., Hartford, Conn., doing foundry, machine tool, dynamo and lamp work. In 1888 he was made General Superintendent of the Mount Morris Electric Lighting Co., New York. During his four years with this company he built plants and transmission lines for the lighting system of the entire West Side in New York city. He then went to J. G. White & Co. as Construction Superintendent, being also Construction Superintendent of the White-Crosby Co. In 1900 and 1901 he made special investigations, examinations, reports and negotiations for contracts in various parts of the world. He was then made General Manager of Construction for J. G. White & Co., having general supervision over all construction work. In 1906 he was made Construction Manager under the Third Vice-President, where he remained until the present time. Mr. Young starts from the Pacific coast on February 24 for a trip around the world. He is a member of the American Institute of Electrical Engineers, Associate of the American Society of Civil Engineers, and a member of many other technical clubs and associations.

C. G. Young.

TRADE PUBLICATIONS.

Insulation.—A leaflet in the shape of a unique illustration, printed in three colors, shows a messenger carrying a telegram regarding the use of the hair felt for car insulation made by Baeder, Adamson & Co., Philadelphia, Pa.

Oil Burners and Furnaces.—Tate, Jones & Co., Inc., Pittsburgh, Pa., have just issued a series of facsimile letters, bound in filing form, received from several customers, regarding the use of oil burners and furnaces made by this company.

Locomotive Stay-Bolt Iron.—A catalogue illustrating the various tests to which Carter locomotive stay-bolt iron is subject is just being distributed by Christopher Murphy & Co., Chicago. The Carter iron is made by special process in furnaces designed and patented by R. A. Carter, of the Carter Iron Co., Pittsburgh, Pa.

Union Pacific.—Colorado as a winter resort is described in a 20-page pamphlet, issued by the passenger department. The pamphlet is made attractive by views of scenery along the route and by the eloquent way the salubrity of the Colorado climate has been described. Another publication of the Union Pacific, that very uniquely calls attention to its through service to the Pacific coast, is a story entitled "A Los Angeles Limited Romance," by James French Dorrance.

Travel Tours.—This is the title of a quarterly publication issued by the Gillespie-Kinports Co., 1 Madison avenue, New York City. This concern has conducted many summer tours across the continent for several years past. The first number of the quarterly contains descriptive articles concerning the countries to be visited by tours to Mexico, conducted by Mr. Beard; to the Mediterranean, conducted by Mr. Gillespie, and to the Pacific coast, conducted by Mr. Kinports.

Motors, Battery Charging Outfits, Tungsten Lamps, etc.—The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has just issued a number of standard loose leaf catalogues. Circular No. 1148 covers mercury rectifier battery charging outfits, circular No. 1158 covers electric motor friction brakes, bulletin No. 5533 covers series of incandescent lighting system with Tungsten lamps, and circular No. 1165 is a more artistic presentation of the various uses of Westinghouse a.c. and d.c. electric fans. This catalogue is printed in two colors, contains a large number of half-tone illustrations and is bound in a highly colored cover. Folder No. 4122 describes the electric suction sweeper, made by the Electric Suction Sweeper Co., Canton, Ohio.

Bolt, Nut and Rivet Machinery; Upsetting and Forging Machines and Wire Nail Machinery.—The National Machinery Co., Tiffin, Ohio, has just issued a 200-page catalogue, 8½ in. x 11 in., covering the machinery which it manufactures. The half-tone illustrations and line drawings accompanying the descriptive matter are of sufficient size and excellence to show the details of the machinery to good advantage. The various designs and sizes of the machinery described include the National wedge grip bolt and rivet headers, hammer headers, wedge grip continuous motion rivet headers; heading, upsetting and forging machines, bolt pointing machines; single, double and triple bolt cutters, with attachments; die sharpening machines, forged and pressed nut machines, nut burring and facing machines, nut tappers, washer machines, vertical and alligator shears and wire nail machines. Several tables relating to the bolt business are given in the back of the publication.

Supply Trade Business Conditions.

The following extracts are from letters received within the last two weeks from the concerns named:

National Paint Works, New York.—Business for February promises to be at least double what it was for last February, as we have already reached in actual shipments the amount shipped for the entire month of February, 1908; most of this increased business has come from railways. We are operating to our full maximum capacity and have lately added six new mills to our factory equipment.

Wm. J. Oliver Manufacturing Co., Knoxville, Tenn.—Our plant is now running to a maximum capacity, and the number of employees on our pay-roll would exceed four hundred.

Dodge & Day, Philadelphia, Pa.—We have a number of commissions under way at this time which are in their preliminary stage upon which investigations are being made. In addition to this, we have completed work of this character on a number of good sized propositions which are awaiting the final touches in connection with the financial end. There has been no tendency in the form of a boom in business, but we feel encouraged by a general tendency towards resumption.

Union Malleable Iron Co., East Moline, Ill.—We are very busy at the present time, which is natural, as we depend on the implement manufacturers for a large part of our work.

The Long & Allstatter Co., Hamilton, Ohio.—We are running about one-half our normal capacity, and we have received a reasonable number of orders since the first of the year, which leads us to believe there is a decided improvement in the business outlook.

S. Flory Manufacturing Co., Bangor, Pa.—Within the last two months business in our works has improved very much. We are working full time, having re-employed all the men who had been laid off for a short time during the very great depression since last September. The general outlook for business for this year is very good and have now orders on hand to keep our works going for quite a while.

Jefferson Union Co., Lexington, Mass.—We experienced a notable improvement in business beginning last September which has continued up to the present time, and in October we began running our plant of about 50 employees on full time, having previously been on a four-day basis. While the past two or three weeks' business has been a little quiet, we attribute it to the inventory period, and indications, we believe, are favorable to a steady increase of business from now on. We have taken advantage of the depreciation in business to make extensions to our plant and get ourselves fully equipped.

Indiana Foundry Co., Indiana, Pa.—Business has run along with the past year very satisfactorily to us. In 1908 we gained a little over 20 per cent. in our foundry output over 1907, and have just about completed a 50 per cent. addition to our foundry.

Ajax Manufacturing Co., Cleveland, Ohio.—Inquiries during the past month or two have been very frequent, and look very encouraging. While the number of orders secured during the past few weeks are considerably more than the latter part of December and the first of January, we feel that the number of orders to be placed in the next two or three months will be considerably more still in proportion. The outlook for increased business seems very encouraging to us.

Heine Safety Boiler Co., St. Louis, Mo.—While our shops are not operating up to capacity, we felt sufficiently sure of the future to begin last fall the construction of a new shop, taking advantage of the slack building situation. Trade will unquestionably improve in the near future.

The Charles Parker Co., Meriden, Conn.—Closely following upon the Presidential election, we noticed quite a little spurt in business, but the same has largely fallen off for some little time. We are pleased to note, however, that for the past week there seems to have been quite an increase in the numbr of orders covering our line of vises. It is quite an index to the state of trade when the vise business commences to get back to its normal condition, as it shows that either old factories are fitting up for business in looking over their old tool equipment, or new factories are being opened up. We regret to say that at the present time we do not seem to be receiving a very large amount of business from the railway trade direct, but possibly this may come through some of the jobbing houses who are handling our line. We are now running about 70 per cent. of the number of employees and the number of plants the same as in our normal business. We have recently increased our hours of running per week but have not materially increased the number of employees.

Booth Water Softener.

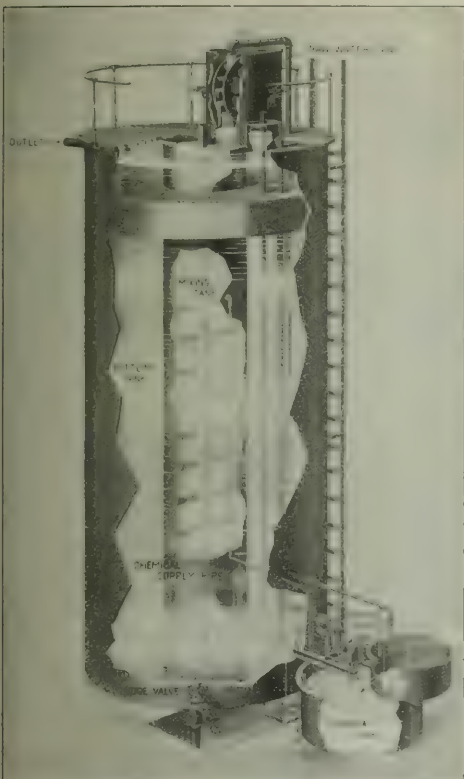
The advantages claimed for the water softeners made by the L. M. Booth Co., New York, include: Compactness and simplicity of construction, convenience of operation, uniform supply of reagents in proper proportions, thorough agitation and efficient sedimentation. The style illustrated herewith is the Type F softener.

The chemicals for treatment, usually quicklime and soda ash, are prepared at ground level. Sufficient lime to last twelve hours is slaked in the lime tank and discharged through a screen into the chemical tank. The pieces of unburned lime, stones, etc., are caught on the screen and disposed of as convenient. The soda ash is thrown directly into the chemical tank, where it is mixed by the action of the agitators with the lime and the proper quantity of water and thus made up to correct strength. Thorough agitation in the chemical tank is necessary to keep the lime suspended in the mixture. In this tank, the paddles work through the entire volume of the chemical tank and have a reciprocating motion. From the chemical tank the chemicals are automatically measured and fed to the water by apparatus which will be described later.

The raw water enters the softener through the inlet pipe, and is discharged on the overshot water wheel located in the raw water tank at the top of the softener. The water wheel furnishes the power required for operating the paddles in the mixing tank, as well as that required to operate the chemical pumps and agitators in the chemical tank. The latter being at ground level, the power is transmitted to them from the water wheel shaft by a link and lever. After passing over the water wheel, the water flows through the raw water weir and chute into the top of the mixing tank, where it meets the chemicals which have been delivered from the measuring device and lifted through the chemical supply pipe. While passing slowly down through the mixing tank, the water and chemicals are thoroughly stirred together by the paddles shown. This insures uniform and complete softening, as every particle of water is brought into intimate contact with the chemicals, and also prevents waste of chem-

icals, as these cannot escape being dissolved and used. The time required for the water to pass through the mixing tank is sufficient for the chemical action; also to thoroughly coagulate the precipitate and prepare it for sedimentation. After leaving the mixing tank at the bottom, the water flows steadily upward in the settling tank, while depositing the precipitate. The water flows through the wood filter to the outlet thoroughly softened, pure and ready for use. The precipitate deposited in the bottom of the settling tank is disposed of each day by opening the sludge valve for a few seconds.

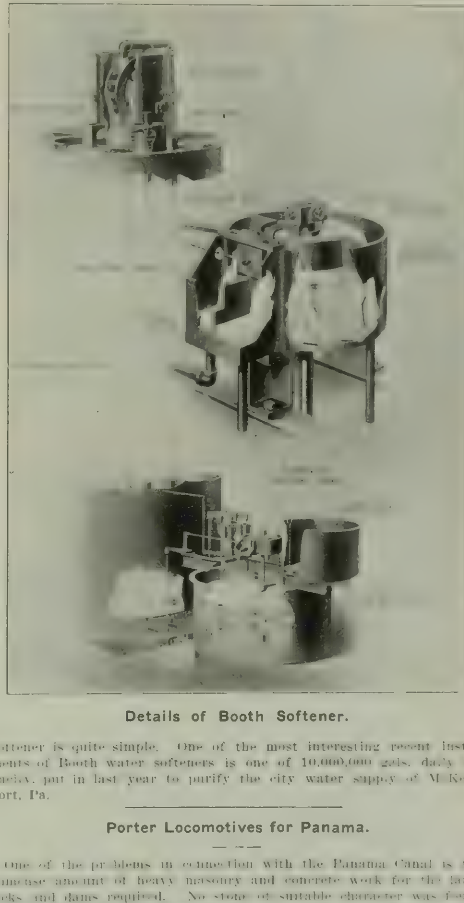
The supply of chemicals is regulated in proportion to the amount of water entering the softener as follows: A uniform stream of chemical solution flows over the chemical regulating weir. A measuring slide, moving along the crest of this weir, divides the flowing solution into two parts, one of which is delivered to the raw water while the other part drops back into the chemical tank. The position of the measuring slide determines the amount of chemicals fed to the water; the measuring slide itself is governed by a float in the float tank, the rise and fall of which is in direct proportion to the amount of water flowing into the softener over the raw water weir. As shown in the illustration the softener is working at half capacity. If a greater amount of raw water enters the softener, the measuring slide will be moved over to the right and cause a proportionately greater amount of chemical solution to be fed to the water. If the inflow of raw water lessens or stops, the measuring slide will proportionately



Booth Water Softener.

move to the left, and partly or entirely cut off the chemical supply. After the chemical solution has become correctly measured off, as described, it flows from the regulating weir to a pump, and is lifted through the chemical supply pipe to meet the raw water in the top of the mixing tank. The flow of chemicals over the regulating weir referred to above is maintained uniform by delivering into the regulating compartment a uniform amount of chemical solution through an orifice in the side of the inner or fixed level compartment. This orifice always being under the same head, the amount of flow through it is unvarying. The fixed level in the inner compartment results because the pump serving it always delivers an excess of chemicals, the excess is allowed to overflow back to the chemical tank. It will thus be seen that the proportioning is all done at the regulating weir, the other parts merely serving to deliver the chemical supply to the weir to be measured, and after it is correctly measured off to allow it to be mixed with the raw water. The chemical solution in the regulating apparatus is kept constantly agitated by paddles mounted on an extension of the shaft that serves the [illegible].

Enough chemicals are usually put into the tank to supply it for 12 to 14 hours. A scale in the chemical tank shows [illegible] to which it should be filled to last for different periods, so the tending of the



Details of Booth Softener.

softener is quite simple. One of the most interesting recent installments of Booth water softeners is one of 10,000,000 gals. daily capacity, put in last year to purify the city water supply of McKeesport, Pa.

Porter Locomotives for Panama.

One of the problems in connection with the Panama Canal is the immense amount of heavy masonry and concrete work for the large locks and dams required. No stone of suitable character was found along the line of the canal, so the Government has opened big quarries at Porto Bello, not far from Colon. This place was originally intended for the Atlantic terminus of the canal by the French. It has a deep and land-locked harbor, on one side of which is a very old Spanish town, which was practically destroyed in the filibustering times and is now in ruins, the few inhabitants living in primitive style in shacks. Across the bay from the old town is the new United States settlement, and the quarries. The wharf facilities are good, and the rock will be handled from the quarries, which are situated well up the side of a hill, by a system of railway tracks, with three or four switchbacks, requiring grades of 3 per cent and curves as sharp as 30 degrees. The rock is taken from the quarries by locomotives and cars, the gage of track being 42 in., and is hauled to a point where it can be dumped down a chute to the crushers. From the crushers it goes down another chute to the loading bins on the dock at deep water, where it is loaded into barges, taken along the coast to Colon, and thence up the canal to the points where the rock is to be used. This railway is to be operated by ten locomotives which the Government bought from the H. K. Porter Co., Pittsburgh, Pa. They are six-wheel connected, saddle-tank locomotives, cylinders 15 in. by 20 in., driving wheels 40 in. in diameter, boiler pressure 170 lbs., weight in running order about 80,000 lbs., and tractive force 16,260 lbs., giving a factor of adhesion of 4.9. These locomotives are well adapted to the service, having very large boilers and fireboxes, and are good steamers, hauling heavy trains up

the grades. The locomotives are equipped with air brakes, M. C. B. automatic couplers, balanced slide valves, metallic packing and cross-heads of two-bar type. The saddle-tank capacity is 1,050 gallons, and fuel capacity 3,000 lbs. coal. The order for these locomotives was placed September 2, 1908, with the promise that deliveries at Colon would begin by November 5, and end November 18, 1908. The locomotives were all delivered ahead of time.

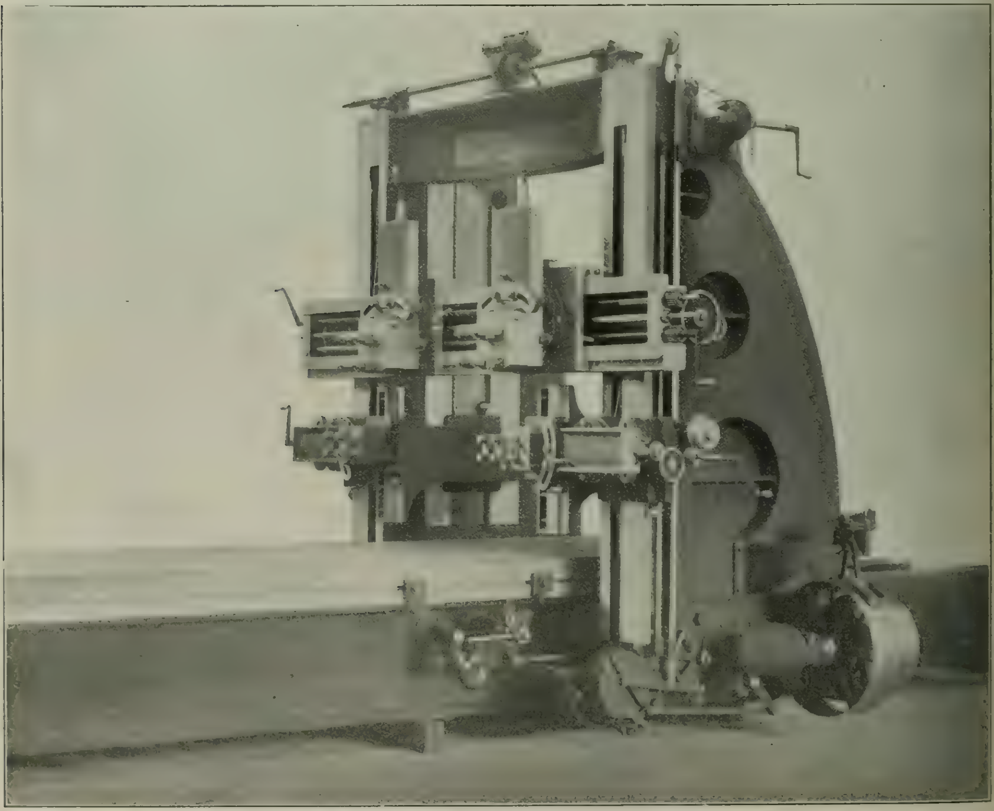
Just before the arrival of the locomotives at Porto Bello there was an unusually heavy tropical storm, with tremendous rainfall, washing away a good deal of the track and doing other damage, and increasing the difficulty of setting up the work. The Porter system of construction greatly facilitated the erection of these locomotives on arrival, and they went together with only a limited number of machinists available, and under various adverse conditions, at the rate of one engine a week.

Porter Locomotives for Panama.

The illustration shows the first three locomotives after they had been set up on arrival at Porto Bello. The quarries are on the far side of the hill in the background, and a hydraulic pipe-line is visible running up the hill for washing off the soil and rubbish from the rock ledges.

Cincinnati Locomotive Cylinder Planer.

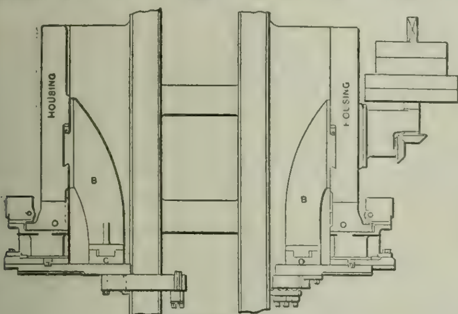
The illustrations herewith show a 72-in. x 72-in. x 18-ft planer built for machining locomotive cylinders and especially those with piston valves. The machine itself is a regular planer arranged for parallel drive, excepting the side heads, which are a radical departure from the usual practice. The housings are machined on the inside with a dovetail toward the front and square on the opposite, into which fits a bracket B, shown in the drawing. This bracket is counterbalanced with chain and weight: a chain was used in place of tiller rope, so that a crank could be applied to the sprocket wheel for raising and lowering the bracket to suit the various cylinders. This bracket is secured to the housing by tightening the taper gib on the straight side, which forces the bracket against the dovetail and draws it against the bearing. The front end of the bracket is made rectangular in section, and is machined and scraped parallel with the housing. On to this is fitted a shoe C, which has a dovetail on the opposite side that fits the cross slide of the side head. After the slide is run onto this shoe, it is adjusted on the bracket by the two taper gibs. After this is done the shoe is a part of the side head to that when the side head is moved up or down it carries with it the shoe, which slides on the bracket B. When it is necessary to reach out, say 24 in., from the housing edge with the tool and the bracket extending out about 18 in., the tool is supported more rigidly than if the piece was placed on the edge of the table very close on the housing, because of the additional support given by the second bearing on the housing. The bracket B was made of a length to clear the projections on all sizes and makes of cylinders and yet have enough bearing so that the shoe C would never extend over the bearing on the bracket.



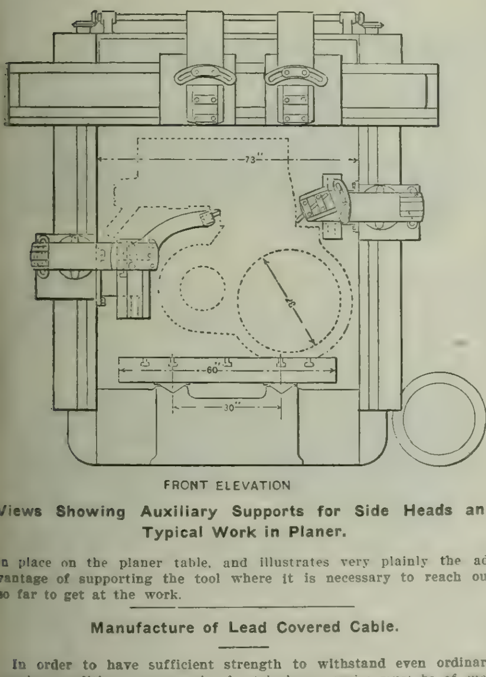
Cincinnati Locomotive Cylinder Planer.

Whenever the machine is to be used for other purposes than cylinders, the slide can be run back in the usual way on the side head, and the bracket raised out of the way. Then the machine has the usual full capacity for ordinary planing.

The drawing shows one of the most difficult cylinders to plane



PLAN VIEW



FRONT ELEVATION

Views Showing Auxiliary Supports for Side Heads and Typical Work in Planer.

in place on the planer table, and illustrates very plainly the advantage of supporting the tool where it is necessary to reach out so far to get at the work.

Manufacture of Lead Covered Cable.

In order to have sufficient strength to withstand even ordinary weather conditions, copper wire for telephone service must be of such size as to make it extremely expensive. Iron wire is not desirable for many localities, such as in the gas laden atmosphere of cities or in the salty air of coast sections, because of its susceptibility to chemical action. Aside from the great expense of maintenance, such poor service is received that some sort of wire protection is imperative. For this protection the dry core type of lead covered cable is commonly used. This cable may be strung on poles in the usual way or it may be laid underground. The former method is chiefly employed in towns and in the smaller cities, but in larger cities the underground method is preferable as poles are unsightly and take up valuable space.

The cable manufacturing plant of the Western Electric Co., Chicago, is at Hawthorne, Ill. This plant has a capacity of turning out 20,000,000 conductor feet or 3,488 conductor miles of telephone cable per day. In this immense output of cable over 24 tons of copper and nearly 73 tons of lead are used. By the purchase of raw materials in great quantities, the lowest prices and the best quality are secured. The dry core type of lead covered cable, having the conductors loosely insulated with paper—has almost entirely superseded the saturated core type, which has its conductors separately insulated and all impregnated with an insulating compound, because of its lower cost and better transmitting qualities. It has also been found that cable having its conductors insulated by a single wrapping of paper gives the most satisfactory results in all kinds of aerial and underground cable.

The raw materials used in the manufacture of Western Electric cable are delivered to the storerooms in carload lots; copper wire in the form of coils, lead in pigs and insulating paper in rolls. The insulating paper is of a special make and is manufactued expressly for the Western Electric Co. Each copper wire is separately insulated by a machine especially designed for the purpose. A roll of insulating paper is fastened to a head which is made to revolve. The copper wire is uncoiled from a stand on the floor. It is led up over a pulley, through the center of the head and around a capstan. The revolving head winds the paper spirally around the wire. The insulated wire continuing on is then wound on a spool placed directly under the machine. Next, the insulated wires are twisted in pairs. The insulating and

Twisting and Insulating Machines.

twisting machines are individually operated by Western Electric motors.

The twisted pairs of conductors are then sent through the stranding machines and formed into cores which are made in sizes from 5 to 600 pairs. This machine is divided into sections called drums. To these sections or drums are fastened the spools upon which the twisted pairs are wound. As the drums revolve these pairs are unwound from the spools and passing through a perforated iron disk attached to the drum and revolving with it, are stranded into the core in layers, each layer running diagonally across the one immediately within it. A sufficient number of spools are used on each drum to form a complete layer of core and as many drums can be used as is desired, depnding upon the number of pairs on the cable which is to be stranded. At each section is a button switch which enables the whole machine to be instantly stopped from almost any point. During

Stranding Machines, in Background, and Cable Being Wound on Reel Ready for Drying, in Foreground.

this process the stranded core is covered with a close spiral wrapping of two ribbons of insulating paper each one overlapping the other. This wrapping is very strong, free from chemicals, and capable of withstanding intense heat.

After the core is formed, a test is given for the continuity of every wire in the cable, also a test for short circuits and grounds. It is then wound automatically on an iron truck and thoroughly dried in an oven, usually from 24 to 48 hours.

The last process is that of encasing the core in its lead sheath, which merely serves to protect the conductors from mechanical injury and moisture. The lead of which this sheath is composed contains a small quantity of tin which serves to give it the greatest resisting qualities with the least possible weight. In the case of submarine cable the conductors are still further protected by a covering over the lead sheath consisting of jute, galvanized iron armor wire, and hemp treated with preservatives and waterproof compounds. By means of

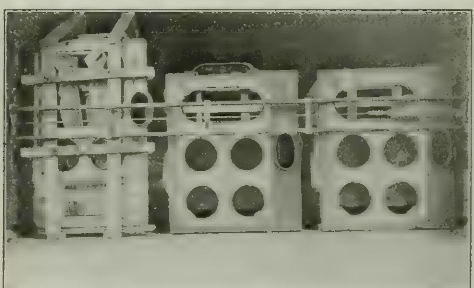
the lead presses and hydraulic pumps the lead, being heated just enough to become plastic, is forced under great pressure into a die-block through the middle of which the core is drawn, thus encasing the core in a seamless sheath of lead. A small portion of the sheath is forced through the die-block before the first end of the core appears, and this is bent in and closed up in order to keep out the air. The last end is sealed in a similar manner. As the lead sheathed cable comes

Lead Presses, at Left, and Hydraulic Pumps for Presses, at Right.

out of the presses it passes over a trough of mirrors, thus enabling the workman to inspect the entire cable and to detect any possible flaws in the sheath. Finally the finished cable is reeled and lagged and is then ready for shipment. After every process in the course of construction the cables are subjected to the most exacting tests.

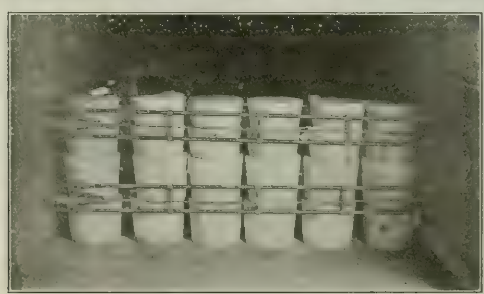
Taylor Package Brace.

The accompanying illustrations show a device for use with less-than-carload lots of eggs, butter, dressed poultry in barrels and other package freight which must be braced in the car to prevent damage from the handling of trains in transit and in switching movements. Such bracing is usually done with 2 in. x 4-in. timbers, but this takes time and is more or less expensive, the timbers usually



Taylor Package Brace Holding Stoves.

being lost after using once, and the nails damage the inside of the car, and also the insulation if it is a refrigerator car. The brace here shown has been tried on the Illinois Central. It is made of gas pipe, cross braced and trussed. The end pieces are malleable iron, with short spurs to hold in the wood of the car side. The



Taylor Package Brace Holding Candy Buckets.

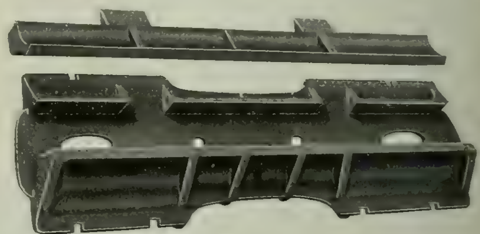
ratchet device is arranged to permit very close adjustment in placing the brace. While heavier than a wooden brace, one man can handle it, and put it in position easily and quickly.

The committee on mechanical devices of the Railroad Refrigerator Service Association recently made an inspection of this brace and reported favorably on it to the association. One test reported by this committee was of a shipment over the Illinois Central to Chicago of 54 tubs of butter starting from Albert Lea, Minn., and picking up cargo en route, the last lot being taken at Janesville, Iowa. When the car was opened at Chicago the butter tubs, which were in one end of the car, four tiers high and held by two of the braces, were intact and in excellent condition. The braces also were in good condition. The length of this trip was 419 miles.

The inventor of the brace is William I. Taylor, a freight conductor on the Illinois Central. Further information concerning it can be obtained from E. F. McPike, Secretary of the Railroad Refrigerator Service Association, No. 1 Park Row, Chicago. Preparations are being made to put the device on the market.

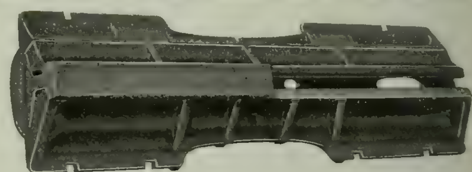
Williams Boltless Rail Joint.

The accompanying illustrations show a two-piece boltless rail joint invented by Willis T. Williams, of Kirkland, Ariz. The joint was first put in trial service on the Pecos River line of the Santa Fe at Roswell, N. Mex., where it remained for 11 months. We understand that when removed at the end of that time it showed neither corrosion nor bright spots indicating wear. Six of these joints have been in ser-



Parts of Williams Joint.

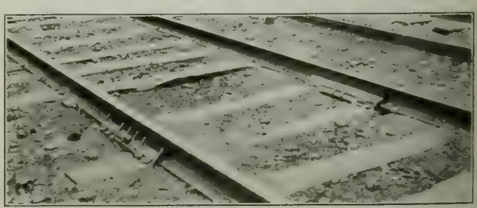
vice for nine months on the Fort Wayne division of the Pennsylvania Lines West, six for six months in the yards of the St. Paul Union Depot Co., and six for four months on the Wisconsin division of the Chicago & North Western. The accompanying view of the joints in track was taken in the North Western yards in Chicago and the line



Assembled Joint.

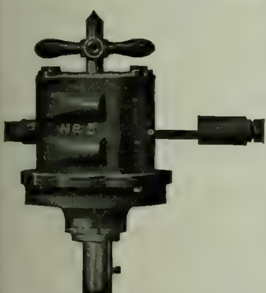
on which they are installed carries the heavy North Shore suburban traffic of the road, as well as the through traffic for this division.

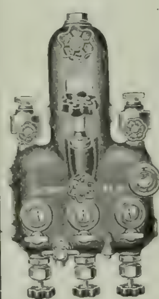
The joints are made of malleable iron and have on the bottom a series of transverse ribs for strength, the outer ones of which come against the tie and prevent longitudinal movement. To prevent rail creeping, there is a round hole through the joint midway of the outer side, in which a 1-in. round bolt is inserted, the rail flanges being cut

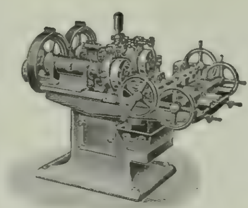


Williams Boltless Rail Joints in North Western Track.

away at the adjacent corners the slight amount necessary to permit the insertion of the bolt. The joints are 26 in. long, and weigh the same as a yard of the rail to which applied; the joint for an 80-lb. rail, for example, weighing 80 lbs. The Williams Boltless Rail Joint Manufacturing Co. has been formed, headquarters, Great Northern Bldg., Chicago.







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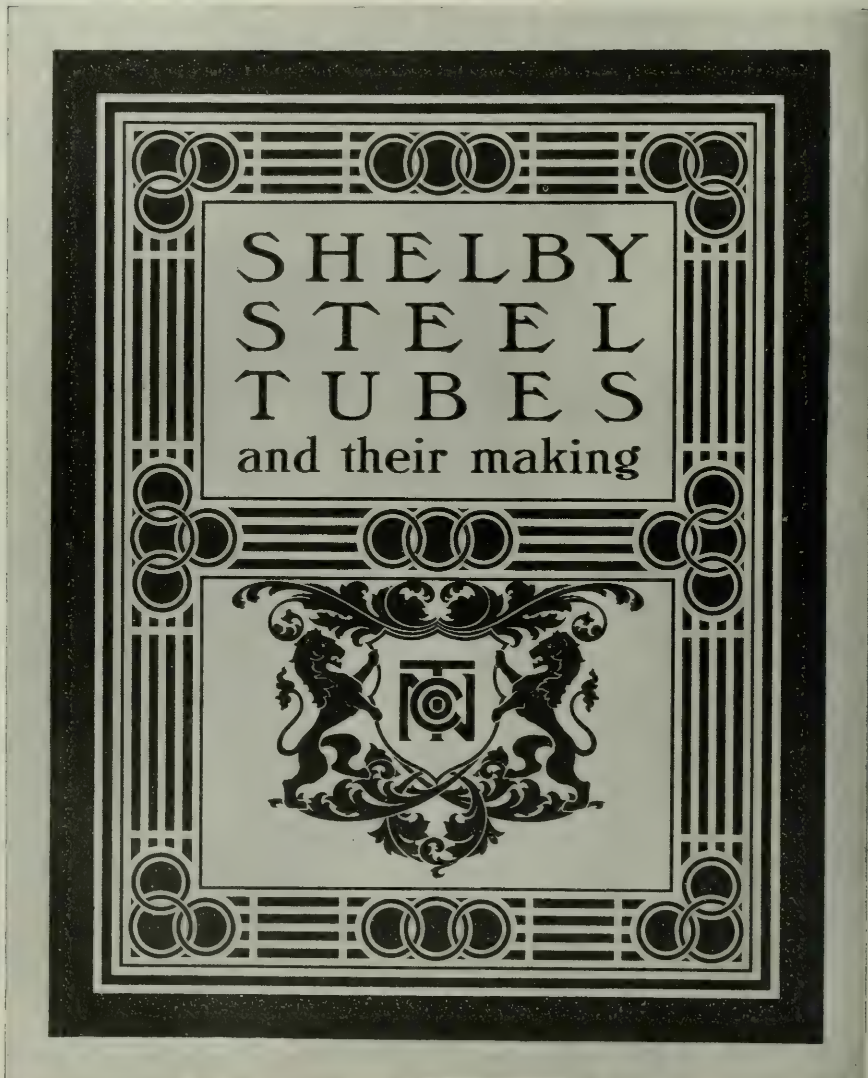

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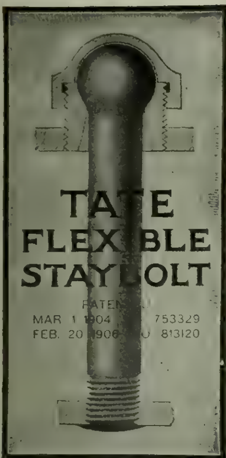
TATE FLEXIBLE STAYBOLTS



allow for and accommodate the forces of Expansion and Contraction along the lines of least resistance.

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32

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CONTENTS

The double side door train experiment in the New York subway during the past week has already proved what seemed obvious when Bion Arnold submitted detailed drawings to the Public Service Commission a year ago. An engraving on another page shows the position of the additional door for outgoing passengers, and its relation to the vestibule door for entrance. Mr. Arnold's plan for using compressed air power is not installed in this trial train, with the result that the hard-worked guards have to do more than double work in moving the doors, and their hostility to the innovation was assured. Indiscreet public statements by the General Manager added to the early difficulties in getting fair play. Nevertheless, the improvement is remarkable. It has been just possible to pass thirty trains an hour through a station. That is the limit. The reduction in time of unloading and loading points the way clearly to an increase in train capacity of one-third. The traffic is growing at such a rate that the added capacity will quickly bring a partly proportionate increase in earnings. With pneumatic door-movers, the guard's work will be less for four doors than it is now with two, so that he can give more attention to the safety of passengers. The present method of holding back incomers by vociferations, "Let 'em off first," sometimes by force from the platform guard and frequently with football tactics by the passengers, is a rowdy performance. It makes women abhor the subway, lessens income, and by so much fails in proper performance of public service.

In their first annual report, the Nebraska Railway Commissioners naively remarked: "Much time was consumed during the first year of the Commission's existence by the formulation of a system of reports, laying out routine office work, and gaining familiarity with the technical details of railway express and telephone business." Probably quite a number of the traffic managers of the railways in this country would be inclined to think that it took them rather more than 12 months to become familiar with the technical details of railroading, or even with the technical details of the branch of railway business that deals with rate making. Of the three Commissioners, one was a physician and the other two lawyers before they started to learn the details of railway business. In company with a good many other State commissions, the Nebraska Commission asks for added power. It also asks for physical valuation of railway property in the state, valuation to go on perpetually. It is acknowledged to be expensive, the expense, of course, being borne by the taxpayer, who presumably would rather spend his money in this wholly unproductive way than to use it to encourage railway building in Nebraska. In a complaint brought before the Interstate Commerce Commission by the State Commission of Nebraska, rates on coal from points in Wyoming were attacked and the Interstate Commerce Commission ordered a reduction. Attempts by State Commissions to have interstate rates to and from points in their own state reduced is a tendency in the regulation of rates by State Commissions that apparently will become more marked as the commissions begin to learn something of the competition between different territories and between different markets. It will give a political motive for a State Commission to try by any means in its power to have rates reduced into its state. In one paragraph of the report the Commission plainly exults in its good work. "Illustrative of the value of the statutory provision [that the railways cannot raise rates without the permission of the Commission] may be cited an attempt by the railways during the summer of 1907 to increase the minimum charge on small freight shipments from 25 to 40 cents. This was prevented by the Commission, although the increased rate was made effective in adjoining states and on interstate traffic."

The substitution in any shop of a piece-work system for an existing time system necessitates establishing a more or less elaborate scale piece-work rate to obtain for the various operations about the shop. These rates necessarily differ according to the local condition of wages and shop appointment, but in any one shop they bear some definite relation to the wage paid under the time system. It is to be borne in mind by the shop management and also impressed upon the mind of the workmen, that a change from the day wage to the piece-work plan is not being instituted in an attempt to increase production without an increase in the wages of the workmen. Co-operation of the man on a machine is vital to the efficient working of the piece-work plan. There is another consideration to be accounted for if a piece-work basis is to continue; that of a possible lowering of a rate when a mechanic attains

skill sufficient to increase his earnings above what is considered a maximum. We have in mind a condition which existed several years ago in a railway shop where the machinists working in the rod gang were able, on a piece-work basis, to make a wage which exceeded the day rate upon which the piece-work rate was based. The result was that the men did not always turn in all the cards for work completed, but only enough of them to get credit for the standard day's work, fearing that the evidence of higher earning power would result in cutting the piece-work rates. In this connection the plan in force at the West Albany shops of the New York Central & Hudson River is interesting. A piece-work rate once fixed will not be altered by the shop management, unless a new method be devised for doing the particular piece of work, notwithstanding the fact that a mechanic may become so skilled as to make a total day wage far in excess of that upon which the piece-work rate was based. An instance in point is that of a rate for finishing, to the pop marks, shoe and wedge wearing faces, which was based on clamping the casting to the planer bed. This rate stood until a chuck was devised which permitted the shop management to make a new rate. A piece-work basis thus guaranteed has at least two good effects: the mechanic puts forth his best efforts, without fear of rate-cutting, for his personal gain, and shop foremen and inspectors are ever on the lookout for more efficient methods.

Governor Deneen is seeking legislation to enlarge the authority of the Illinois Railroad Commission. Among other things he desires the commission to be given control of issues of securities of railways similar to that exercised by the Public Service commissions of New York. It is not surprising that such legislation should be sought in the state where the "Alton deal" was put through. But has it never occurred to Mr. Deneen that it might be well for him to perform his duty as a public officer before he seeks the creation of additional machinery to force the managers of railways to do their duty? The personnel of the Illinois Railroad Commission has been changed since Mr. Deneen became governor. He had a chance two years ago to appoint as commissioners men who had special fitness for their work. He did not take advantage of the opportunity, but appointed a lawyer, a lawyer and newspaper man and a manufacturer, all of whom are politicians. Each is a man of good ability, but none knew much about railway matters. To do work that requires experts Mr. Deneen chose men who were totally inexpert, and who, as they have not attended very closely to business, are probably about as inexpert now as when they were appointed. To regulate the large mileage of railways in Illinois he chose men whose knowledge of transportation matters was gained chiefly in the field of politics. Why, instead, did he not appoint, for example, an experienced railway man, a competent economist or a man experienced in traffic matters from the shipper's standpoint and a lawyer? Having appointed commissioners who know little about the condition and needs of the railways, he proposes that they shall be given power to control the issuance of securities by directors, who may reasonably be assumed to have a pretty full knowledge of those conditions and needs. Mr. Deneen's course indicates that in Illinois, as in a good many other states, a radical policy of regulation of railways is being advocated, not for public, but for political purposes. In New York when a 2-cent fare bill was passed without regard to its merits, Governor Hughes courageously vetoed it because he thought such action was unfair. In Illinois when a 2-cent fare bill was passed Governor Deneen questioned its fairness, and then signed it. Governor Hughes, whatever may be said of his railway policy, at least honestly favored regulation for public purposes, and thwarted those who tried to use it for political purposes. Governor Deneen might profitably imitate Governor Hughes' public spirit and courageous fairness while seeking to get the legislature to imitate the legislation the New York executive has had enacted. Intelligent, fair, faithful officers to administer the laws are surely as important as stringent statutes. If the Governor of Illinois had appointed the former, regardless of political considerations, he would be less open to the suspicion of seeking the latter mainly because of political considerations.

OPEN HEARTH STEEL RAIL MANUFACTURE.

On account of the general interest in the manufacture of open hearth steel rails and the large orders which are being given by the railways for this quality of steel, it is interesting to know about what may now be expected from the steel works in the United States for rolling open hearth rails. A letter from A. I. Findley, editor of *The Iron Age*, gives the following, which will assist in making an approximate estimate:

"There are three mills which roll only open hearth rails, and their capacities are definitely scheduled in the directory of the American Iron and Steel Association as follows: Indiana Steel Company, Gary, Ind., 750,000 tons per year; Tennessee Coal, Iron & Railroad Company, Ensley, Ala., 600,000 tons per year, and Bethlehem Steel Company, South Bethlehem, Pa., 300,000 tons per year.

"At Youngstown, Ohio, is the Ohio plant of the Carnegie Steel Company, including the rail mill with a capacity of 600,000 tons a year. Heretofore only Bessemer rails have been rolled at this plant, but a group of open hearth furnaces has been completed recently, with a rated annual capacity of 420,000 tons. The Pennsylvania Steel Company at Steelton, Pa., has an open hearth plant with a rated capacity of 485,000 tons of ingots per year. The rail mill connected with the same plant, which has heretofore run almost entirely on Bessemer rails, has a capacity of 300,000 tons a year. Much of the open hearth steel at this point goes into products other than rails. At Johnstown, Pa., the Cambria Steel Company has a rail mill which has always rolled Bessemer rails; the open hearth plant of this company is about 1½ miles distant from the rail mill, and its open hearth steel goes largely into plates. The Lackawanna Steel Company has an open hearth plant at South Buffalo, having a capacity much smaller than that of the Bessemer plant, the product of which latter is converted almost entirely into rails. The open hearth steel made at South Buffalo is rolled into plates, structural and bar steel. Similarly at South Chicago, the Illinois Steel Company makes open hearth steel, but it is all intended for the plate mill. The capacity of the Colorado Fuel and Iron Co. is 360,000 tons.

"It would be misleading to say that any of the rail mills named above would produce in any year up to their rated capacity. At Ensley, for example, the open hearth capacity is 450,000 tons of ingots a year, as the original ten open hearth furnaces are not operated and probably never will be, the entire dependence being on the new open hearth plant. Some of the open hearth steel is shipped as billets. At Gary, in view of the billet, structural, universal and merchant mills, it is quite unlikely that there will ever be, in ordinary distribution of business, sufficient steel available to permit of running the rail mill to full capacity. At Bethlehem the structural mill is an important factor, and there is neither pig iron capacity nor open hearth steel capacity sufficient to permit of running the rail and structural mills simultaneously to their full capacity. At Youngstown there are merchant mills to which a portion of the open hearth steel capacity would be devoted. Therefore, 420,000 tons of open hearth rails would not be rolled in any year at that plant. The difficulty of estimating the available open hearth capacity is due to the fact that so many plants are unbalanced, some not having pig iron capacity equal to finishing capacity and others not having steel ingot

capacity adequate to the simultaneous operation of all the finishing plants."

Taking the above figures and conditions of manufacture as explained, an approximate estimate of the steel works in the United States for turning out open hearth rails would be about as follows:

Tennessee Coal, Iron & R. Co.	400,000 tons.
Indiana Steel Co., Gary	600,000 "
Bethlehem Steel Co.	200,000 "
Youngstown (Carnegiè)	300,000 "
Pennsylvania Steel Co.	250,000 "
Colorado Fuel & Iron Co.	250,000 "
Total	2,000,000 tons

The maximum production of steel rails in the United States, both Bessemer and open hearth, was reached in the year 1906, when 3,977,872 gross tons were produced, and the total in 1908 was 1,921,540 tons. It will thus be seen that the present capacity for production of open hearth rails is about equal to the total production in 1908; also that the present open hearth capacity is about 50 per cent. of that of the total requirements for rails in prosperous years.

INTERSTATE COMMISSION ON RATE QUESTIONS.

The parts of the commission's report in which it discusses traffic matters do not sound like the utterances of a body whose main duty is to arbitrate judicially and impartially between railways and shippers. They sound like a statement from a shipper's bureau.

The commission says it "feels that to require the shipper to ascertain for himself at his peril the rate imposes upon him an undue burden"; that the railway "may fairly be required to state in writing, when a written request is made by the shipper, the rate which it has published and maintains in force"; and calls "special attention to this matter as one of immediate and general concern, which discloses the need of an appropriate remedy." In its decision in the case of A. J. Poor *v.* C. B. & Q., *et al*, decided July 8, 1907, the commission said: "To permit shippers to impute negligence to carriers in quoting rates and on that ground to enjoy the rate quoted * * * would open a broad and ample way for the payment of rebates." Since the decision in the Poor case the National Industrial Traffic League and other shippers' organizations have insistently demanded a change in the law that will let shippers "impute negligence to carriers in quoting rates," regardless of the fact that this "would open a broad and ample way to rebating." Has the commission changed the views expressed in the Poor case, or would it rather "open a broad and ample way for the payment of rebates" than oppose the demands of shippers?

The commission renews its petition for legislation to empower it to restrain advances in freight rates, pending inquiry into their reasonableness. It bemoans the hardships shippers suffer because "railways may establish whatever interstate rates they choose" and "no proceeding can be begun before this commission until the schedule establishing the rate has been filed" and lays down the dictum: "No carrier should be required to reduce its rates without a fair hearing, neither, in our opinion, should the public be required to pay advanced rates without opportunity for a fair hearing." The railways are large purchasers of commodities. The commission no doubt thinks it is no hardship for them to have to pay advanced prices for lumber, coal, etc., "without opportunity for a fair hearing."

In fact the Commission assumes in the recently decided case of Shippers & Receivers' Bureau of Newark v. New York, Ontario & Western, that an increase in the cost of labor, and in the price of railway materials and supplies, does not necessarily imply a decrease in the net earnings of a carrier or preclude the possibility even of an increase in its net earnings, due to an increase in the volume of its traffic or to a decrease in the ratio of its operating expenses to its operating revenues; nor is an increase in the cost of labor and materials, accompanied by a decrease in the net revenues of a carrier, necessarily inconsistent with the possibility that its net earnings may still suffice to afford it a fair return on the investment without an increase in its rate schedules.

But if the man who sells the railways lumber or coal has to pay an advance in freight rates before a paternal government has ascertained that the advance is fair it is a great outrage. In other words, when the investor puts his capital into private property devoted to the service of the public he properly loses, the commission thinks, the right that the owner of private property not devoted to the service of the public enjoys to have something to say about what he shall be paid for the use of his property.

This is the opposite of the principle of previous legislation regulating interstate commerce. The original Act to Regulate Commerce, the Elkins Act and the Hepburn Act recognize and confirm the right of the railways to initiate all interstate rates. The rates they fix are *prima facie* reasonable. If their reasonableness be questioned judicially, the presumption of right acting follows the carriers through the proceedings. The legislation the commission asks would, in effect, reverse all this, and put on the carrier the burden of proving that any advance it sought to make in its charges for its services was reasonable.

The Railroad Commission of Wisconsin, in its personnel one of the strongest commissions in the country, has substantially the same power over interstate rates that the Interstate Commerce Commission has over interstate rates. In its annual report for 1908 the Wisconsin Commission also discusses the proposition to require railways to get permission from regulating authorities to advance rates, and says: "The merits of such a plan deserve careful consideration. It is clearly complicated with grave objections. We have serious doubts regarding its feasibility or practicability." There are several reasons for believing the proposed federal legislation would be unconstitutional. Suppose after it were enacted, that a railway sought to advance a rate; that the commission restrained the advance; and that after protracted litigation the courts found that conditions had made the rate sought to be advanced unremunerative. From the time the commission's order restraining the advance went into effect it would have compelled the railway to handle the commodities affected at a loss. The railway would be unable to get reparation from the shippers who for the months or years the proceeding was pending used the confiscatory rate; while as the law now is a shipper who has been charged an excessive rate can get reparation.

While the commission is moved by sympathy for the shipper who may now have temporarly to pay an excessive rate, for which he can later get reparation, it has nothing to say about the irreparable confiscation of the property of the railway that might take place under the legislation it proposes. Perhaps it assumes that its judgment as a traffic manager is so infallible that it never would unjustly suspend an advance. The courts probably would not regard the matter in this light. They would probably hold unconstitutional a law that would empower an administrative body to prohibit changes in rates under conditions that might inflict losses on railways that no judicial review could repair. It would seem that the only way the plan to have the commission restrain advances could be made constitutional would be to require shippers to give bond to pay the proposed higher rates if commission or courts should ultimately hold them reasonable.

The commission's report constitutes a strong argument for separating its administrative and quasi-judicial functions. In his important address before the American Bar Association at Portland, Maine, in August, 1907, Commissioner Prouty said:

"It has been in the past one of the most serious reproaches against that (Interstate Commerce) act that the Commission was made by its terms a prosecuting officer and judge . . . While the orders of the Commission were unimportant and subject to review in the courts, the union of these two functions may have been well enough. . . . The jurisdiction of the Commission has been enormously increased, and its decision with respect to most of the matters that it hears is, in my

opinion, practically final. I feel, therefore, that the time has come when the duties of this body should be separated. . . . I very much doubt whether the same body can properly discharge both these functions. In the end it will either become remiss in its executive duties or will, in the zeal of these, become unfit for the dispassionate performance of its judicial functions."

The condition that Mr. Prouty foresaw seems to have come. The tone of its annual report seems to show that the commission, in the zeal of its executive duties, is growing unfit for the dispassionate performance of its judicial functions. The feeling of the railways that the commission is growing more antagonistic to them is reflected in the statement in its report that prior to July 1, 1908, only one suit had been filed to set aside its orders, while since then 16 such suits have been filed, "and few orders of much consequence have been permitted to go without contest." How can the railways be expected o think that the commission will perform its judicial functions fairly—how can they be expected to acquiesce in its demands for greater powers—when it commits the gross impropriety of arguing in its report against the reasonableness of advances in rates upon which it will later, in its judicial capacity, be called to pass judgment? Probably we can never have a rate tribunal whose wisdom and impartiality will command or deserve the confidence of all interests until we cease to pass laws making the same body both prosecutor and court.

MIXING ANTHRACITE AND BITUMINOUS COALS.

The use of bituminous coal for locomotive fuel by railway companies which are large producers of anthracite coal, and whose lines are flanked by enormous piles of the finer sizes which do not find a ready market, may seem to be an illogical practice, but it is well sustained by economical operating results. The larger sizes of anthracite do not burn rapidly and the spaces between the lumps admit such large quantities of air that the gases are cooled; the rate of evaporation is low and the capacity of the boiler is much less than when soft coal is used. The smaller sizes of anthracite contain a large percentage of ash, as much as 15 to 20 per cent.; the fine coal packs the grate, so that sufficient air is not drawn through for rapid combustion, and again the capacity of the boiler is much reduced. It follows that for fast passenger service, when high steaming capacity is required, it is necessary to use the chestnut or stove sizes of anthracite; but these are the grades most in demand for domestic use and the price is too high for locomotive work. The rate of combustion of the better grades of anthracite is only 50 to 60 lbs. per sq. ft. of grate per hour, and this rate cannot be materially increased, even with a heavy blast and a high vacuum in the smokebox, and it is necessary to use a grate of unusual width in order to get sufficient boiler capacity. This difference in what might be called the physical qualities of anthracite and bituminous coals has naturally suggested the mixture of the two for locomotive fuel, and in point of fact for the smaller sizes of anthracite this is found to be the best method of burning the coal in locomotive boilers. The calorific value of the soft coal being high, a sufficiently hot fire can be maintained, in spite of the loss due to the high percentage of ash in the hard coal, and the more rapid disintegration of soft coal creates spaces in the coal bed for the freer admission of air than would be possible with a closely packed bed of fine anthracite alone. It is, of course, well known that the anthracites are older deposits than the bituminous coals and have been subjected to pressure and the coking process for a longer period, until the volatile matter has been well-nigh eliminated. The best steam coals are found between the two, as in the Welsh or the semi-bituminous coals like those of the Pocahontas seam of West Virginia, which is usually regarded as belonging to the same epoch as those of the Pottsville mines of Pennsylvania, but not so thoroughly coked.

Theoretically, then, it would seem that the most efficient mixture of anthracite and bituminous coal would be one in which the chemical compositon of the whole would approximate that of good Pocahontas or Welsh coal. This is, however, quite difficult to obtain because of the low percentage of ash which these coals contain, so that for practical work the relative proportions of fixed carbon and volatile matter is about the best that can be attained. For example, high-grade Pocahontas coals may analyze as follows:

Volatile matter	17.43 per cent.
Fixed carbon	77.71 "
Ash	4.63 "
Moisture	.23 "
	100.00 per cent.

An average analysis of Lehigh coal would be:

Volatile matter	3.08 per cent.
Fixed carbon	86.38 "
Ash	5.92 "
Moisture	4.62 "
	100.00 per cent.

Of Pittsburgh a fair average would be:

Volatile matter	41.15 per cent.
Fixed carbon	50.88 "
Ash	7.00 "
Moisture	.97 "
	100.00 per cent.

It will be seen at once that no possible combination of two coals containing 5.92 and 7.00 per cent. of ash, respectively, could result in a mixture containing but 4.63 per cent. But it is quite possible to make the relative proportions of volatile matter and fixed carbon approximately the same. In Pocahontas coal this is as 1 to 4.46; in the Pittsburgh as 1 to 1.12, and in the Lehigh as 1 to 28.04. By mixing these coals in equal proportions the resulting mixture would have a ratio of volatile matter to fixed carbon of about 1 to 3.33.

For practical working it would, of course, be impossible to analyze all coals, nor would it be economical to use the high grades of Lehigh and Pittsburgh coals, and, therefore, approximate results only are obtained. In one case for freight service a mixture of one-half No. 2 buckwheat coal and one-half run-of-mine bituminous coal is used, neither, of course, having a very high chemical value, and this is not followed very closely, and no attempt is made to make comparisons with the higher grade coals. Ash must be higher than in the ideal conditions, and even the proportions given have to be varied when the supply of bituminous coal runs short, when two parts of anthracite to one of bituminous is often used.

On other roads no attention whatever is paid to the matter, and any mixture that will work is used, probably with a corresponding lack of economy, while in still another case just enough soft coal is added to keep certain grades of anthracite from clinkering, and this is accomplished by the use of anywhere from 5 to 35 per cent. of soft coal added to the buckwheat. In this case the anthracite is loaded into the tender and the soft coal dumped on top, and the two get well mixed by the fireman simply shoveling in through the pile, a little soft coal coming down with each shovelful. Any available grades of the two kinds of coal are used and a fairly good steam fuel results.

This looks a good deal like haphazard chancework, and it is; and the fact that such crude mixtures do so well indicate that far better results would be obtained if more care were to be taken in the examination of what is used and then a corresponding amount of pains were to be taken to see that they were mixed in proper proportions.

NEW PUBLICATIONS.

The Temperature Entropy Diagram. By Charles W. Berry. New York: John Wiley & Sons. 299 pages; 5 in. by 7 in.; 108 illustrations. Cloth. Price, $2.00.

This book, whose author is a professor of mechanical engineering at the Massachusetts Institute of Technology, is essentially a mathematical treatise and consideration of the entropy diagram from cover to cover. There is little that

can be read as a book is ordinarily read. It must be studied and carefully studied in detail else it will be impossible to follow the processes that are given. The book was prepared for the use of students in thermodynamics, and the author states that an attempt has been made to bring together the data that is ordinarily only to be found scattered through a number of treatises. Although professedly not intended for the advanced student it will be evident at the first glance that it will be useless in the hands of one who has not already made some progress in the study, in fact even in the introduction the language presupposes a considerable knowledge of thermodynamics in order that it may be read understandingly.

The first chapter opens with a discussion of the general subject and this is followed by a consideration of the diagram for perfect gases, saturated steam and superheated vapors, including one for the flow of fluids, and then passes on to the work of hot air, gas and steam engines and air compressors. Naturally it is theoretical in the extreme since otherwise there would be no basis for the premises upon which the mathematical deductions are based. For example, in discussing the point of maximum efficiency of an engine it is shown that that condition cannot be obtained unless all of the heat is received at the upper temperature and rejected at the lower temperature under consideration, a state of affairs that it is quite out of the question to meet in any steam engine practice, although Diesel has attempted to realize it as nearly as possible in his internal combustion engine.

The book under review is a second edition that has been revised and enlarged in which there is a more extended application of the temperature analysis than was attempted in the first edition.

American Railway Transportation. By Emory R. Johnson, Ph.D., Professor of Transportation and Commerce in the University of Pennsylvania. Second revised edition. 434 pages: 5 in. x 7½ in.: with numerous illustrations. Cloth. Price, $1.50. D Appleton Co. 1908.

The second revised edition of Professor Johnson's well known work is accounted for by the rapid progress made by American railways during the past five years, and the extraordinary amount of regulative legislation enacted by the states and the federal government. Professor Johnson has done his work in his accustomed thorough and painstaking manner, and the book at hand presents a perfectly astounding storehouse of material, carefully sub-divided and well indexed, with copious references for further investigation. The compilation of so great a mass of facts, not all easy to obtain, in this careful and scholarly manner, is a work deserving of the highest praise. The objection may be raised that the making of an economic history by the collection and classification of numerous disconnected facts may obscure a clear view of the situation as a whole, just as trees, individually and collectively, are apt to spoil the view of a forest! But in a period where careless economic thought and statement is prevalent, it is refreshing to find an author who admires facts and sets about the acquisition of them in a systematic manner. Professor Johnson does this and more too, in his "Railway Transportation."

A Congressional History of Railways. Vol. 1. Congress and the Railways down to 1850. By Lewis H. Haney, Ph.D., Assistant Professor of Economics, State University of Iowa. Reprinted from the Bulletin of the University of Wisconsin, Economics and Political Science series, vol. 3, pages 167-430.

"In six distinct ways the government tended, or actually came to regulate railways: (1) As sovereign in the District of Columbia; (2) as supreme authority in the territories; (3) as proprietor of public lands; (4) as distributor of the nation's mails; (5) as provided for the public defense; (6) as an investor of aid to railways."

The Congressional History of Railways in the first volume traces this regulation from the earliest proposals to build a railway down to 1850, treating the history both chronologically and by subjects. The legislation both proposed and enacted that affected railways is dealt with, and an attempt has been made to throw light on the present problem of the relation of the government to railways by showing how this problem has been handled in the past and what the results of such and such methods have been.

In this respect the results obtained in the first volume are negative rather than positive. The study of the history of past problems tends to show that the present problem is a different question entirely than any one faced by congress previously. As the author points out in dealing with individual acts of legislation in the first half of the nineteenth century, each act, or proposed act, has to be studied by itself or in connection with other political and economic forces at work in that period rather than in connection with other acts of legislation on the same subject proposed or carried out at a different time and under other circumstances.

The work is admirably arranged for reference. Each chapter has an introduction and a concluding summary. The index is good and the appendices are well selected and valuable, but the book as a whole is not particularly readable. The style is redundant, making the work when read consecutively rather tiresome.

The material was gathered largely from congressional records and other official sources, and full reference is made to these sources in foot notes, which should be of great help to a student of history.

The history of the railway period prior to 1850 might be summed up by saying that regulation of railways, during that time, was proposed rather than enforced, and the principles of land grants in aid of railway building were established, but by 1850 had not been very largely acted on.

Letters to the Editor.

THE UNIT IN RAILWAY OPERATION.

Richmond, Va., February 23, 1909.

To the Editor of the Railroad Age Gazette:

I was glad to see the editorial in your issue of Feb. 12 under the above caption, and hope it will lead to better methods in making comparisons of the results of railway operation than what you call "the fetich of the operating ratio" and the "big trainload."

There is no single unit of service by which to measure the cost of transportation on a railway, but the nearest approximation to one is the *gross ton-mile;* and it seems to me that the importance of keeping an accurate account of the gross tonnage, as well as the train and car mileage, must sooner or later be generally recognized.

It may not be possible to separate the expenses dependent upon train mileage, car mileage and gross ton mileage with exact precision, but a close approximation to exactness is attainable and will give the cost of each of these three separate units of service, upon the combination of which in varied proportions the cost of movement per train mile chiefly depends.

T. M. R. Talcott.
General Manager, Tidewater & Western.

QUALIFICATIONS OF A REAR FLAGMAN.

To the Editor of the Railroad Age Gazette:

S. G.'s article on flagging prompts me to call attention to some defects in our flagging methods, not only on the road in question, but on many others as well. The flagging methods in actual force are in my judgment the weakest link in the operating chain.

I frequently ride at night between New York and the West.

It is not unusual to find the flagman, after the smoking room is vacated by the passengers, say, by midnight or later, comfortably dozing—and who knows but he is asleep? He is in no position, when aroused, to realize the promptness or speed with which he should hasten back in the event a flag is necessary. All passenger trains at least should have a seasoned man, with a good heart and lungs and limbs for flagman, and his duty should be exclusively to protect the rear end. How often does one see this great responsibility resting on an inexperienced youth, or some weakling of a middle-aged man!

A man fit for the place of flagman should be able to run in fair weather on a railroad track, five miles in sixty minutes. No man should be selected for flagman who has not stood a physical examination and performed a proper running feat, and these tests should be made frequently.

While the old rule requiring the flagman to go back a certain number of yards was not always practicable; yet, I think in changing we have gone too far to the indefinite. Whenever a flagman goes back, he should go back a definite minimum distance, and just before returning, when called in, should place a lighted fusee. There has been too much economy in the use of the fusee.

Another thing that has impressed the writer is that in severe weather flagmen are not equipped with proper shoes or clothing to discharge the duty. No man with thin-soled shoes is fitted to make quick time on a railroad track, particularly at night. A standard, double-soled shoe should be determined on as well as the clothing he should wear in stormy and severe weather. D. F. M.

FLAT SPOTS ON CAR WHEELS.

West Lafayette, Ind., February 11, 1909.

To the Editor of the Railroad Age Gazette:

I have read with interest the various letters on Flat Spots on Car Wheels in the *Railroad Age Gazette* and the *American Engineer*, and have noted the criticisms offered to the mathematical analysis given by myself. (*Railway Age*, Feb. 21, 1908; *American Engineer*, May, 1908.)

It should be clearly understood that when this analysis was written the author made no claim for completeness, but, on the contrary, stated that the factors had been omitted. Two points in the analysis have been criticized, namely, (1) The equating of the kinetic energy of the wheel to the energy of a hammer falling through a given height; (2) The concentration of the mass of the car at the center of the wheel. Regarding the first point I would say that I attempted to measure the kinetic energy of the wheel in terms of some known kinetic energy, and the most natural comparison was with the energy required in accepted impact tests. In using this comparison it is not necessary to consider that the length of the flat spot is sufficient to break the rail. The idea was to equate the kinetic energy of the wheel to the maximum allowed for any given rail and then, taking a proper factor of safety, to get a safe length of flat spot. This method is entirely rational. It is the method used to get the safe tensile strength of materials, for example. In such cases the ultimate strength divided by a proper constant is always taken as the safe working strength.

It is true that in the impact test the rail rests upon supports 3 ft. apart, while in the roadbed these supports are considerably closer, say 18 in. This supposition, then, is on the side of safety. Everything considered, the writer is still of the opinion that no good reason has been advanced to show that the analysis is wrong in this particular.

Regarding the concentration of mass, the writer believes that it is more rational to consider only the mass of the rotating parts as concentrated at the center of the wheel. When this is done the "limiting velocity" is changed from 5 miles per hour to something like 80 miles per hour, as shown by Geo. L. Fowler in the *Railroad Age Gazette*, Jan. 8, 1909. Under this assumption the effect of even small flat spots is very serious. The writer believes that with this change in the original assumption the analysis gives results much nearer the truth than those obtained from any analysis pet proposed.

Another analysis, given by H. H. Vaughan in the *American Engineer*, December, 1908, assumes that there is an upward force equal to $\left(\frac{Mv^2}{r}\right)$ opposing the downward force, as soon as the wheel begins to turn about the forward edge of the flat spot. It is also assumed that the mass of all the parts below the springs may be included in M. This latter assumption is obviously wrong, since only rotating parts can have a lifting effect. Considering the assumption made by Mr. Vaughan, the limiting speed is about 15 m.p.h. While this analysis includes a factor neglected by any other, there seems some doubt as to whether or not the force $\left(\frac{Mv^2}{r}\right)$ acts exactly as assumed.

It has been pointed out that many factors of importance in connection with the effect of impact of flat spots have been neglected among these being the following:

(1) The swaying of the car from side to side, increasing at times the effect of the blow considerably.

(2) The elasticity of the track and roadbed, tending to decrease the effect of the blow.

(3) The bending of the rail, causing it to wrap around the wheel, lessening the blow.

(4) The decreased force of the spring as the wheel is forced downward.

It is obviously impossible to include all these factors in any mathematical analysis with any hope of obtaining results that will be of value. Indeed, it seems to the writer almost useless to extend mathematical work much beyond the present limits until some experimental confirmation of results is obtained. The matter now rests with the experimenter.

E. L. HANCOCK,
Assistant Professor of Applied Mechanics, Purdue University.

WANTED: RAILWAY STATESMEN.

Indianapolis, Ind., February 19, 1909.

To the Editor of the Railroad Age Gazette:

In an editorial in your issue of January 29, and in a communication from W. J. Harahan in the same issue, the creation of railway diplomatic corps to improve the relations of the railways with the public is proposed and discussed. May I suggest an amendment? It is that the railways should not only have diplomatic corps, but that those who own or responsibly control them should try to install statesmen in the offices of chairmen, presidents and vice-presidents. I do not mean that they should abduct from the halls of congress or the mansions of the governors of the states the very few real statesmen to be found there, and set them to running the roads, but that they should seek for railway directors and executives men who are not only transportation experts, but who are also big enough and broad enough to operate the roads without having constant butting collisions with the public.

A diplomat and a statesman are two entirely different quantities. We have all heard the old definition of a diplomat as "a man who is sent to lie abroad for his country." The railways have had, and still have, a surfeit of diplomats of that sort. A diplomat is one who can argue or bully an angry nation out of giving his country a beating whether it deserves it or not. A statesman is one who so manages the affairs of his country that there never will be just occasion for any other nation to want to beat it, but who is always prepared to thrash any nation that may unjustly try it. A country must depend mainly on statesmanlike, not mainly on diplomatic,

management of its affairs, to insure it external peace and internal prosperity. If it tries to get along without statesmen to guide its diplomats and furnish them with valid, not merely plausible, arguments, it will soon come to grief though it have the best diplomatic corps to "lie abroad" for it that the world ever saw.

The foregoing statements apply to a railway as well as to a nation. The past history and present plight of the railways of the United States strikingly exemplify their truth. The roads always have had diplomatic corps. But the directors, chairmen, presidents and vice-presidents often have not been statesmen. Because many of them have not been statesmen they have done many things that were unstatesmanlike, dishonest or downright outrageous. They have taken advantage of inside information gained through their trusteeships to manipulate the securities of their own roads to rob their own stockholders. They have adjusted rates discriminatingly to build up industries in which they were privately interested. They have paid dividends that were not earned to give otherwise unsalable stocks a fictitious value, and have thereby both deteriorated the service they rendered the public and defrauded the people that bought the stocks. They have been arrogant and browbeating in dealing with shippers that could not defend themselves, while letting big shippers bully and browbeat them.

Understand, I do not charge these things against all prominent railway men, but against only the minority whose lack of statesmanship, of regard for the rights of other railways and railway men, of common honesty and even of common sense, have brought and are still bringing disrepute on all.

To fend off the attacks from the public that their acts prompted and invited, these unstatesmanlike railway managers sent out a diplomatic corps composed of lawyers without practice and incapable of getting any except as pass-distributors, bribe-givers, lobbyists and politicians; of traffic men without any skill in getting traffic except by intimidating little shippers and buying big ones with rebates; and of claim agents incapable of getting at the merits of claims, but very expert at distinguishing between the man who could be bulldozed into not pressing a just claim, and the man who could not be bulldozed into not pressing an unjust claim. Not an admirable diplomatic corps; not one that was well adapted to keep the roads in good odor with the public. But if we condemn the diplomatic corps, what shall we say of the brand of statesmanship that made necessary that kind of a diplomatic corps, or at least created it?

But, railway officers say, the time of the bribe-giving lobbyist and the rebating traffic manager is past. (It would be too obviously untrue to assert that the time of the claim agent who thinks it is his business *not* to settle claims is past.) Unfortunately, the time of railway men of this class is not past. There are many railway lawyers who formerly lobbied or took a hand in politics for their roads against their wills; these lawyers have welcomed the wave of reform that has made it desirable for them to practice law more and to practise politics less. There are many traffic men who formerly gave rebates much against their wills, and who welcome the change that has made success in the traffic department depend more on ability to get business by lawful and honest means and less on ability to get it by lawless and unscrupulous means. But the effect of early training and years of experience cannot be so soon outgrown by all; and when to training and experience are added a natural aptitude and preference for domineering, subterannean or dishonest methods, a man is not apt to change much after he has reached middle age. Consequently, there are still many men in those departments of the railways that come in contact with the public—a good many of them even at the heads of the departments and giving to them their tone—who are utterly unfit to deal with the public under present conditions. And the worst of it is, they haven't the faintest perception of their unfitness, and never will have until somebody higher up blossoms into a statesman, and reforms or "fires" them. If they are traffic men, they keep on swelling up with pride and arrogance like a poisoned pup when some humble representative of the shipping public comes to beseech them at the throne of grace for a trifling concession. If they are claim agents they keep on trying to convince the humble seeker for redress that he is a thief, and a blackmailer, and that it is doubtful if he ever shipped any goods in his life, but pretty certain that he ought to be in jail. The railways of one section of the country persist in keeping as chairman of a large freight association a man whose egotism and arrogance are as insufferable as his talents are negligible; who was never surprised into giving two civil answers in succession to anybody but some railway officer who could cause him to lose his job, but who painstakingly insults everyone else with whom he comes in contact in the course of business; and who, in consequence, is of course daily making enemies for every one of the roads that employ him. Why do the roads keep him without instilling into his narrow and crabbed soul a few lessons in common decency? Heaven knows! And when men who have been exasperated by the arrogant or insulting words or manner of these "old-fashioned" railway men go out and join in agitation for drastic regulation, railway managers are pained and outraged in their very souls, and wonder when the public will cease demanding unreasonable things and imposing unreasonable burdens and restrictions on the railways!

It was not statesmanlike so to manage railways that expert politicians were needed in their law departments, expert bulldozers and rebaters in the traffic departments and expert non-payers of honest claims and skilled payers of dishonest ones in the claim departments. And it is not statesmanlike to keep such men now without compelling them to change their ways. Before the proposed diplomatic corps can be made of real service both to the railway and to the public, railway management must be so reformed that the diplomatic corps will have less to explain and defend that is neither rationally explicable nor honestly defensible. And before railway management will be thus reformed the responsible managers will have to learn that the roads must be operated out on the prairies and in the mountains of the United States and not in Wall street; that the only sentiment that amounts to anything in the long run in this country is public sentiment, not Wall street sentiment; and that public sentiment has got to be both honestly and painstakingly educated, humbly bowed to and even catered to, if the country is to be rescued from the dire menace of general confiscation of corporate property and state socialism.

The honest, hard-working, courteous, able railway officers are a very big majority of the total number. They feel as acutely as anybody the lack of either statesmanship or diplomacy that has characterized the past public relations of most of the railways. They will be more glad than anybody else to see the properties managed with more statesmanship and diplomacy; for the more statesmanlike and diplomatic the management of railways becomes the more true merit and true ability will count for when promotions are made.

A SMALL SHIPPER.

The damage to the Italian railways caused directly by the earthquake was comparatively small; to the rolling stock, almost nothing. But indirectly serious damage resulted. The passenger cars were used for shelters and the cushions removed to make bedding, so that no less than 600 cars must go to the shops to be refitted. The freight cars stranded on the tracks were broken open and anything available for food or bedding generally confiscated. Locomotives were generally abandoned by their crews where the track was deformed, but especially because disabled by lack of water. There will be large bills to pay for loss and damage of freight.

Contributed Papers.

MANUAL BLOCK SIGNALING WITH THE "A B C" SYSTEM ON NORTHERN PACIFIC.

II.

The American superintendent naturally compares this or any new system with: First, the train despatcher system; second, the telegraph block system; third, the automatic block system; fourth, the controlled manual with visual fixed signals (no staff); fifth, the electric train staff.

1. With the time-table and train despatcher system.—It is not necessary to stop to elaborate this comparison, for the train despatcher system has long since condemned itself. To rehabilitate its character it would be necessary to metamorphose the forces of men on every important railway, so that we should have competent and experienced men of high moral character in every despatcher's and operator's chair; and then to take measures to insure that these almost perfect men would be neither overworked nor underpaid. Even with this impossible thing attained, we still have trainmen's errors, forgetting to see green markers, mistaking headlight numbers, reading registers and schedules incorrectly, and other mistakes which do not occur in block working and against which neither conscientiousness nor good drilling can be a complete safeguard. The simple telegraph block system, with the same amount of intelligent supervision given to it, undoubtedly would be safer than the time interval and despatching system.

2. With the telegraph block system.—The telegraph block system as now generally worked, is a safeguard against butting collisions to some extent; but to so small an extent that every where the time-table and its regulations, in conjunction with written telegraphic orders, repeated over the wires at full length, are continued in full force for all irregular movements. Under these conditions the telegraph block system as a time saver is worth very little; and, indeed, nothing at all, unless, by the use of form 19, the stopping of trains for orders is abolished or reduced. The reasons for thus distrusting the system are the possibility of signalmen (operators) forgetting to record a train; failure to read correctly, or omitting to read at all, a record which has been made; and other reasons less definite, or having to do with less serious dangers. Even on double track everyone distrusts the telegraph block system to the extent of retaining the rear flagging rules in full force; and, of course, the possibility of a butting collision on single track is a greater danger than the possibility of rear collisions on any track. On double track, the engineman always has a chance of mitigating the danger to his train by applying brakes; on single track, as against an opposing train, his resources are reduced immeasurably, because the dangerous obstacle is rapidly moving toward him. On double track it may be moving away from him. No one need have any difficulty in getting something better than the simple telegraph block system.

3. With the automatic block system.—Automatic block signals have not been generally favored for single track lines; but with hundreds of miles in use on the Cincinnati, New Orleans & Texas Pacific, for ten years past, and with thousands of miles on the Southern Pacific and the Union Pacific, and with plans now completed for hundreds of miles more on the St. Louis & San Francisco and the Chicago, Rock Island & Pacific, the use of this safeguard on single track is not to be ignored. But as compared with any system operated by men and using simple telegraphic or telephonic communication or electric bells, the automatic system has to answer, not only for the higher cost of installation of apparatus, but for the possibility of failure of apparatus, causing a false clear indication. There is no doubt that the great majority of roads which have considered the automatic system for single track, and have rejected it, have done so largely because of the great cost of installation. This has been allowed to be the controlling argument, and other arguments have not been explored to their final analysis. The question of the reliability of the apparatus must, however, be fully considered, as, thus far, every road using automatics on single track has retained the despatching rules and other safeguards, which fact clearly evidences that the signals are not relied on for complete protection. The protection from the dangers due to broken rails, which is afforded by automatic track circuit signals, is held by some railway officers to be an important element in their favor; but it does not seem likely that anyone is going to make this element the ruling factor in any decision as between manual and automatic block signaling.

Our present comparison, therefore, is one between a manual system, safeguarded by having every vital operation go through the hands of two or three men, and an automatic system in which there are likely to be some delays due to failure of apparatus, and some danger—which, under the most favorable circumstances must be extremely remote—that opposing trains will collide with one another because of false clear signals. The automatic gives notice of broken rails if the break is bad enough to open the circuit or cause a bad escape, while the non-automatic does not. Theoretically the decision must be in favor of the non-automatic, unless experience shall demonstrate that in the operation of it the men cause collisions by mistakes.

But the decision does not hinge simply on a theory. Thus far we have considered only the question of safety. But the question of convenience comes in. Assuming the automatic system to be safe, telegraph or telephone stations are necessary with it for the purpose of advising trains as to their relative superiority at meeting or passing points. With these scattered along the line at suitable distances apart, a manual block system can be worked at small expense. If, however, the ordinary volume of traffic requires trains to follow one another so closely that there must be meeting tracks between telegraph stations, it may well be that the automatic system will prove economical; because with it the block sections may be made short without greatly increasing the expense over what it would be with long blocks.

As a matter of fact, those roads which have introduced automatics on single track seem to have been actuated by varied motives. If passenger trains are few, so that the only disadvantage of having telegraph stations located far apart consists in short delays to freight trains, the cost of automatics may be partly offset by a saving in telegraphers' wages. On lines like some of those of the Southern Pacific, with local freight and passenger stations few and small, this is an element of weight, undoubtedly. In some cases automatics seem to have been favored because of their adaptability to protecting one or two blocks, at a station, even if money be not available to equip all the way through from station to station. Adopting that plan a line can be equipped gradually. This argument has weight with those who have looked carefully at the collision cost and have found a large percentage of it due to small collisions at and near stations.

On the Cincinnati, New Orleans & Texas Pacific automatics were used at first solely as extra safeguards for short sections through tunnels, usually not near stations. The element of convenience, that is, the regulation of trains as regards their relative superiority, was provided for wholly by the old rules, the same as in the preceding case. The automatics were gradually extended to cover the whole road; and this was largely done while the property was in the hands of a receiver. Whether or not scientific railroading thrives better under a bold manager, having to report only to a Federal court and not to a board of directors who are hungry for dividends is a question that cannot be answered off hand; but such an officer usually has freer judgment than the ordinary manager, and that may have been the case here. It may also have been the case that enginemen were more heedless on

this than on the average road, forcing the receiver to adopt any or all means available to prevent collisions. At all events the signals were put in and are now regarded as a vital feature in the successful operation of the road, which for a good part of its length has a heavy freight traffic. Whatever may be the wisdom or unwisdom of an original investment in automatic block signals, no one ever thinks of doing anything but maintain them in the best condition, once they are installed.

The liability that an engineman will run past a stop signal, disregarding it, is an element of danger with any system. With a manual system the monitorship of the signalmen is a strong safeguard against this, and Mr. Beamer provides a further safeguard in his block card; equivalent, in this respect, to a staff. With automatics there is no safeguard except surprise checking.

4. With controlled manual (using visual fixed signals only). —This system in its complete form has not been much used. Theoretically, for preventing butting collisions alone, it is safer than any other system that depends on enginemen seeing and heeding a fixed semaphore (or fixed disk) and remembering, after passing the signal, what its indication was. The cost of installation of apparatus at each station is considerable, and the system has not been used on single track except with continuous track circuits in addition, further increasing the cost. It would be against all precedent to use this system, except under the strictest absolute block signal rules. If it were used with modifications to make it flexible, it would be less safe. Mr. Beamer would have to admit, however, that those features of flexibility which he employs to avoid difficulties at those stations which are not equipped with interlocked switches and distant signals, and not supplied with properly situated passing sidings are elements the possible dangers of which have to be guarded against.

The controlled manual, as used extensively on the single track lines of the Illinois Central, the Burlington and the Chicago & Eastern Illinois, simply compels the two signalmen to act in unison. No track circuits are provided and therefore there is no mechanical lock to prevent clearing a signal to admit a second train to a block which is occupied. The most obvious criticism of this arrangement is that it is incomplete. With it the regular despatching regulations, with written and repeated orders, are maintained.

5. With the electric train staff.—The train staff system is generally agreed to be the simplest and most certain safeguard in use for providing against butting collisions on single track. It effectually compels the station men to follow a rigid routine and in addition makes use of the enginemen to cooperate with the stationmen in following the routine in such a way as to avoid the chance of error; and the engineman knows that neglect on his own part not only risks a danger, but probably promises one. All this is true of the simple old fashioned staff. The electrical apparatus in the electric train staff system, by which staffs are made always equally available at either end of the block section, adds a complication to the plain staff system, but this complication has justified itself. It provides a simple, sure and easily maintained safeguard against errors by signalmen. The electric train staff is superior to the controlled manual, just mentioned, in that without inconvenience it may be locked up, absolutely, from interference by the signalman, whether he be well disposed and careful or mischievous and ignorant. With the regular controlled manual there must be an emergency release to enable the signalman to forward trains in case of failure of the wire or apparatus, and the signalman must have the key to this release. This involves an element of risk unless the signalman is fully competent, level headed and trustworthy. With the electric train staff the emergency release key is the staff itself, and it is in the hands, not of the signalman, who might misuse a release key when a train was in the block section, but in those of the engineman, who cannot use it as a release except when he is at the station; and who, moreover, is the person most interested in guarding against every danger.

Unless elaborate switch and signal arrangements are made at each station it will be as necessary with the staff as without it to provide preliminary written arrangements (orders or cards), or low speed limits at stations, when trains are to meet or are to perform irregular movements. To introduce this highly efficient electrical apparatus and then to partly nullify its advantages by omitting the switch and signal arrangements which are necessary to its convenient and normal operation would be somewhat inconsistent. Other things being equal, however, the staff system, with its absolute locking and its freedom from dependence on telegraphing and pen-writing, is the acme of simplicity; and, assuming the integrity of the electric interlocking apparatus of the instruments, and also for the present leaving out the question of cost, the staff system may be said to embody the highest attainment, in this field, in the direction of protection against butting collisions.

But of course the question of cost is *not* left out. Many managers would decide in favor of Mr. Beamer's plan at once, as compared with either automatic or controlled manual, because of the cost of installation of apparatus and appliances. (As already intimated, the telegraph block system in its ordinary form and the time interval system are assumed to be out of the race.) The Northern Pacific officers, however, are not short-sighted, and they may be assumed to have considered the whole question with care. Mr. Beamer's system is prima facie safe; has it elements of risk which are of enough consequence to warrant them in deciding, in order to abolish such risk, to incur the cost of installation and the cost of maintenance of electric apparatus; the introduction and training of a new class of mechanical men (maintainers of electrical apparatus), and the delay necessary to make the change to the controlled manual or the automatic? (Mr. Beamer's plan can be introduced anywhere with only a brief preparation.) No accurate comparison can be made, of course; for the most expert insurance actuaries have failed to estimate the probable cost of collisions under any method of train management, let alone a method obviously far better than the old-fashioned ordinary methods. Furthermore, comparisons are impracticable because so much depends on the highly variable "personal equation."

But, assuming that automatics are rejected because of high first cost and the time required to get them; the staff because of cost and of the need of well-arranged side tracks and a full equipment of approach signals; the modified control apparatus (like the Burlington's) because, after making the investment there is still a good deal of the "personal equation" left to be dealt with—assuming all these conclusions on the part of the officers of the Northern Pacific, the ground of their decision in favor of Mr. Beamer's plan is clear.

And how nearly does their system approach to perfect safety? The testimony of the Northern Pacific men who are working it and who are thoroughly familiar with the ordinary methods of train management—the methods formerly in use by themselves—is enthusiastic; both as to simplicity and ease of management and as to elimination of chances of error. As, however, a year and a half will be looked upon by most critics as not affording a large body of experience, it will perhaps be fair to suspend judgment, so far as this testimony is concerned. But the tripartite scheme is not new; it has been in use on the Erie, in Ohio, for 17 years, and is still in use throughout that company's main line in Ohio and Indiana. Superintendents, trainmasters and despatchers who have been on those divisions throughout these years, and of several of whom we have inquired, are unanimous in their testimony that *no collision has occurred* because of any fault in the system. (The Mozier system, described in the *Railroad Gazette*,

October 9, 1891, and also in *The Block System*, pages 51-55.) On the Erie time-tables and time-table rights are still in force, and the use of written and repeated orders is continued as of old. This being so, no precise comparison can be made between Mozier's plan and Beamer's. But as to the value and success of the main feature—the three-man interest in each blocking operation—the newer system has all the advantage of this evidence from the operation of the older one. And it must be regarded as very satisfactory evidence.

As supplementing this evidence from men who can testify to the absence of collisions, on a limited length of railroad, it will be of interest to scan the evidence from a wider field—the whole United States. This is a different kind of evidence, but it is not without its value. We mean the evidence concerning collisions, as given in the Government accident records. From these records we may study the specific mistakes which have caused collisions, and each railway officer who is familiar with train management can make his own estimates as to how completely the new safeguards in the Northern Pacific practice will prevent the recurrence of errors of the kinds cited.

Confining ourselves to telegraphers' and despatchers' errors, we may find in the Government bulletins beginning with the last one issued and continuing back to January 1, 1907, the cases enumerated below.

With telegraphers well instructed and well trained and constantly supervised by a despatcher who is determined to secure perfect service, errors by station operators are rare—so rare that to estimate the probable frequency of any particular error, or of errors generally, is out of the question; but this list will aid the reader in calculating what the tripartite system ought to accomplish. In these bulletins, issued quarterly, there are shown, each issue, the most notable cases of collisions caused by negligence or mistakes of any kind. Picking out those due to misconduct or negligence of operators or despatchers we find:

Bulletin 29, collision 8. Inexperienced operator took a message correctly, but then made a new copy, throwing away the first one, and in the new one made a mistake in writing the time. Collision No. 11; operator received an order for a train which was at his station, but which had passed the office and got away before he could deliver the order. Collision No. 9; train passed while operator was asleep and he, on waking, "took chances" and accepted an order for that train.

Bulletin 28, collision No. 3. Inexperienced operator bungled an order given in irregular form by a trainmaster, the despatcher's wire being out of order. Collision No. 8; operator neglected to deliver an order. He had in hand four orders, but delivered only three.

Bulletin 27, collision No. 3. An operator received an order requiring a train to be at a certain station at 12:15, but he wrote "12:50." In this case, as in the one above mentioned in Bulletin 29, it is believed, though not proved, that the operator, not being satisfied with the copy which he had made, rewrote the whole order, and in rewriting made the mistake. This operator had not had proper sleep preceding the time when he came on duty.

Bulletin 27, collision No. 2. Operator failed to deliver order. Collision No. 12; operator omitted the word "East" from the name of the meeting station. Collision No. 13; operator made mistake in writing name of station in meeting order.

Bulletin 26, collision 26. Operator reported that a train had not passed when it had passed. He looked out of his window and saw the headlight of a locomotive and took it for train No. 6, whereas train No. 6 had passed, having (by order of despatcher) left the station ahead of time. Collision 21; operator neglected to deliver one of four orders. He had telegraphed the conductor's signature to the despatcher before the conductor had signed.

Bulletin 25, collision No. 27, was due to careless reading of an order by a conductor and engineman; but the operator was held partly at fault for having made interlineations in the order. Collision No. 30 was due to an error in sending or receiving the number of a train in an order. Collision No. 28 was due principally to the failure of an operator to deliver a meeting order. He accepted it after the train had gone beyond his control. Collision No. 31 was due to errors in the writing of an order, leading to its non-delivery. The number 611 was erroneously copied as 411. In this case one operator succeeded another in the middle of the process of receiving the order. Collision No. 4 was due to an error in a despatcher's order, two words, including the name of the station, being written twice. Collision No. 9 was due to incorrect copying of an order, 1384 being written 1382. Collision No. 14: despatcher completed a meeting order to an inferior train before properly placing the order for the superior train. Collision No. 15 was due to failure to deliver a meeting order. The operator had put a substitute in his place for 30 minutes and had not properly informed the substitute about the order. Collision No. 22; an operator, in service one month, accepted a meeting order after the train had passed, he having been asleep.

Bulletin 24: collision No. 12, was due to an error by a block signal operator, who reported a freight train as having cleared the block section at his station when it was standing partly in the yard. The signalman claimed to have been informed by the yardmaster that the block was clear. Collision No. 16 was due to wrong information given by an operator to the despatcher. The operator had entered a train on his record, but 10 minutes later, answering an inquiry from the despatcher, said that it had not passed. Collision No. 7 was due to the neglect of an operator to deliver an order. He cleared his signal for another train and forgot to restore it to the stop position. Collision No. 8: operator, 17 years old, accepted an order after the train had left.

Bulletin 23: collision No. 30, killing 32 persons, was due to the failure of an operator to deliver an order. A passenger train which he should have held for the order was on the side track, and the operator claimed to have thrown his signal (while he was taking the order) so as to stop the train; but the signal was not put to the stop position, and the train got away from the station without having the order. Collision No. 9 was due to the error of a despatcher in sending an order to the wrong train; mixing the first, second and third sections in certain clauses of the order. Collision No. 17 occurred under the manual block system, the signalman at fault being a former brakeman, and not a telegrapher. He seems to have misread or to have misunderstood a signal given by bell code, either four or five taps. Collision No. 5 was due to an illegible train order. The order was written "3d 73," but was taken to read "2d 73." Collision No. 13 was due to conflicting train orders. A despatcher, new on the division, forgot an order which had been issued by another despatcher about one hour before.

Having in mind the provisions of the Northern Pacific system, the way in which it would have met the test in the emergencies above enumerated is indicated or suggested in the notes below:

Bulletin.	Collision.	Safeguard in A B C System.
29	8	No writing of time required in orders. All orders very brief and far less varied.
29	11	Enginemen must at every station get an order before starting. Always gets one order; never more than one
29	9	Every train must get an order at every station, asking for it, if not offered.
28	3	No authority to move except on order of despatcher; but if in emergency operators were authorized to act without consulting despatcher, the superior simplicity of the system would be an important element of safety.
28	8	Enginemen must call for orders. Always one order; never more than one.
27	3	Same as 29—8. If an operator sleeps at his post the despatcher's constant intervention exposes the fact.
27	2	Same as 28—8.
27	12	Name of station in order always the same, except in case of an intermediate blind siding.
27	13	Same as 27—12.

Bulletin.	Collision.	Safeguard in A B C System.
26	26	Operator deals with only one train at a time. Number of train or engine usually of minor importance.
26	21	Same as 29—11. No chance for nor temptation to dishonesty in handling signatures.
25	27	As to the operator, orders are far simpler in form. The only danger in reading concerns two features, the number of an engine to be met and the name of the track on which it is to be met; but no order ever specifies more than one meeting station. A mistake in the engine number is not likely to lead the train into danger as it has arrived at the end of the block section before the mistake takes effect, and the clear signal for the next block does not depend on an engine number.
25	30	Only one train being dealt with at a time, its number is not vital.
25	28	Same as 29—11.
25	31	Only one eastbound or one westbound train is dealt with at one time. Orders are so brief that operators would be more likely to finish the writing.
25	4	Error would not occur in writing the simple A B C orders.
25	9	Same as 29—8.
25	14	Operator's duplication of despatcher's work is a safeguard against errors on his part.
25	15	Same as 29—11.
25	22	Same as 29—11. An operator, having delivered an order, at once reports the departure of the train; or if he fails to report, the despatcher who is waiting for the report is likely to call him to account.
24	12	A signalman who accepts somebody's word in a matter like this, would appear to be grossly careless: and a block signal situated so far from the station as to make this error possible is badly located. It is to be hoped that such practice is not tolerated on the Northern Pacific, or on any well-managed road.
24	16	The despatcher's constant knowledge of all trains at all stations greatly aids him in detecting operators' errors.
24	7	Same as 29—11.
24	8	Same as 29—11.
23	30	Same as 29—11.
23	9	Operators check despatcher; despatcher sends forward from each station only one train on each order. Number of train or section relatively unimportant.
23	17	Despatcher's supervision checks operator's errors
23	5	Number of train relatively unimportant.
23	13	Operators check despatcher's acts.

It will be observed that all but two of these errors occurred under the ordinary despatcher system, a system which at the outset was treated as already condemned. The facts, however, constitute a significant body of negative evidence in favor of a simple system like that on the Northern Pacific. Except in the matter of going to sleep on duty and cases of obviously insufficient training, the errors were of a kind which operators of character, intelligence and experience will admit are liable to be committed by a large percentage of operators who ordinarily do satisfactory work. In other words, it is a fair inference that with simpler requirements these same operators would commit errors far more rarely. Their inefficiency is not due in marked degree to moral delinquency or lack of ordinary intelligence. As the manual block system, where introduced on American railways, is entrusted usually to the same men who have worked the wires under the former system, this fact is significant.

Collisions due to misinformation given by operators who have been asleep at their desks must usually be charged to moral weakness—the operator's lack of the courage necessary to tell the truth and admit that he could not give an accurate report of trains. Probably it is no easier on the Northern Pacific than elsewhere to get men who will not come on duty insufficiently rested, or who will not tell lies to the despatcher in a vain effort to evade responsibility; but the A B C system has here two definite advantages; operators must get cards for all trains, by asking for them, before the trains are due; and the despatchers have regular communication with all the operators for all trains, instead of occasionally or irregularly.

Two of the errors were made in the working of the manual block system. The operator who took somebody's word as to the movement of a train near his office must, indeed, have been slipshod in his habits; but the railway manager who arranged his block limits and the location of his block offices so that such an error was possible must also be held guilty of very unintelligent practice. The main protection that the A B C system affords against such faults more than would be afforded by other systems, is in its regular, simple and methodical procedure and in the greater ease with which the despatchers can watch all operations, but the requirement that every engineman shall get a card at every station is an additional safeguard. The error in signaling by bell-taps is not satisfactorily explained. In view of the rarity of that class of errors on British railways, where bell taps are almost universal, it looks as though this case must have resulted from gross ignorance or dulness. But even if ignorant or dull, an operator under the A B C system, to cause such a collision, must commit his error at the same time that the despatcher, independently of him, has committed an error which will cause the same false movement.

One of the most significant lists of collisions that has ever been published is that appearing in the Interstate Commerce Commission's report to Congress February 23, 1907 (*Railroad Gazette*, April 5, 1907). In this list it is shown that of 160 costly collisions occurring in the United States in the two years, July 1, 1904 to July 1, 1906, seven-eighths, or 140, occurred under the old methods, and one-eighth, or 20, under the block system; that of these 20, thirteen occurred under the telegraph block system and were all due to errors or neglect of signalmen, and that seven occurred under the automatic system and were all due to errors of enginemen. As this article is already very long we will not quote that list here; but we may say that of the 13 errors of signalmen three were errors concerning yard movements which occur under all systems or else are curable only by the most complete interlocking of switches and signals, with derails; four would in all probability have been prevented, in the A B C system, by the despatcher; one was due to gross moral delinquency; two to inexperience, indicating highly reprehensible looseness of discipline; one was under permissive blocking, and two would undoubtedly have been prevented if all trains had been required to call for cards at all stations. A partisan of the A B C system would claim, no doubt, that that system would afford a strong safeguard against errors due to gross negligence, to moral delinquency and even to most of the other faults here recounted; and not without reason; but we have deemed it proper to mention these points because it is not reasonable to demand that any system shall cure all the infirmities of the signalman's mind.

As a system, Mr. Beamer's scheme inspires hopes of excellent results. A mere "system" has no fair chance unless the men who work it are intelligently selected and well trained and supervised. But if the Northern Pacific people, imitating many examples of the last 10 years, should neglect these vital elements, and depend on a "system" to make up for deficiencies in personnel, they would still have a hopeful scheme. Such a course would be unfair to the system; but this system certainly has been fortified against unfair tests with marked ingenuity.

Reference was made in the first article to the card catching apparatus for fast trains. This is now in successful use. The card is attached to a piece of rope 2½ ft. long, which is held in position on a post fixed 7 ft. from the nearest rail, one in front of each telegraph office. On this post or crane there are two ropes, each holding a card, one for the engineman, the other for the conductor. They are picked up by a catcher attached to the cab of the engine and to the caboose or rear coach. The catchers for the engines are attached to the cabs permanently, while those for the caboose or coach are furnished the train crews and carried in their train box. These are provided with a shank that fits in the marker holders on the corners of the cars. When not in use the catcher drops down by the side of the car. The catchers are held in position by the train and enginemen while picking up the cards. There is no trouble from failure to pick up the card at any rate of speed.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XV.

There are many arrangements of automatic signaling on the market, but my experience under operating conditions is confined to the Westinghouse and the Hall systems, both of which give good results, the cost of maintaining being low and the irregularities few. In the case of a London railway equipped with the former, a four months' special record was recently taken and gave only one failure for 570,000 signal movements.

The introduction of electrical working renders possible some signal and safety devices which are not readily adaptable for steam locomotive operation. For example, the necessary supply of electrical energy for any power signaling system is placed at the disposal of the railway department at minimum cost. This renders such a system possible commercially in cases where the cost of providing and running special plant for supplying the electrical energy required for power signaling alone would be prohibitive. In spite of this advantage, however, I do not consider that the installation of a power signaling system on your lines would at present show an actual economy if interest and capital expenditure were taken into consideration.† I also see considerable disadvantage in attempting alterations to the signaling system at a time when in any case the railway staff will already be very fully occupied.

As regards automatic safety devices it may, for example, be arranged so that the signals are interlocked with track levers which, in the event of signals being over-run for any reason, will engage with a lever on the train arranged to open a valve on the air-brake pipe line and so apply the brakes throughout the train while simultaneously causing the overload device on the main power switch on the train to open and interrupt the supply of power to the motor circuit, thus bringing the train to rest quite independently of the motorman. Again, in the case of a train over-running a signal, power can be cut off that section of the line at the discretion of the signalman and the train brought to a standstill.

I would, however, recommend that the whole question of signaling and of the provision of special automatic safety devices be left over at any rate until the first section of the lines is being operated electrically so as to profit by the experience of actual working conditions.

The systems of train despatch do not, in my opinion, require any modification for the time being; they are sufficiently good not to have any retarding effect on the improvement in the train service proposed, and can be conveniently considered in detail and dealt with at some later stage when actual experience with the larger number of trains has directed your attention to any real improvement that might be made, and then one or more of the numerous fully developed systems on the market could be adapted for your purpose. This applies to the central area. In the more remote districts, where the traffic is dealt with by single or two-coach trains, it is possible that some economy might be effected by operating under tramway conditions, *i.e.*, by providing no staff at the stations at all and making the train staff responsible for the collection of fares.

The electrification of the railways and the consequent erection of a large and economical power station, capable of generating electrical energy at the lowest possible cost, enables a supply of power to be obtained for any other requirements of the railways at a very low price, and this use of current for other purposes, such as power and lighting, in connection with the railway system should produce not only a saving in cost compared with the present methods of producing power and light, but also, by improving the load on the power station, a beneficial effect on the cost of producing energy for the railways themselves.

It is convenient to consider the lighting of railway stations and offices under two heads:

1. Stations in the central area, such as Spencer Street, Flinders Street, Princes Bridge, Richmond and North Melbourne.
2. All other stations within the radius covered by this report.

The Flinders Street and Spencer Street railway stations already obtain a large supply for lighting from the Spencer Street lighting station, but the lighting has not been extended because the existing plant is, I understand, already fully loaded.

The 500 kw. frequency converters referred to above will, however, provide a considerable margin over the present load and I suggest that the stations throughout the central area should be lit from the 50-cycle circuits. Allowing for losses in conversion, the electricity will be obtained under 1d. per unit and this would certainly show, light for light, a saving over the present working costs. I do not, however, present any estimate as to the actual cost as this is entirely a question of how much light is provided, and no doubt if a change be made you will consider it desirable to do the lighting on a rather more liberal scale than at present. I should recommend that all the stations in the central area be lighted by enclosed arc lamps or else by groups of metallic filament lamps, lamps of this type suitable for station lighting being now obtainable.

For stations outside the central area, I recommend that the lighting should be done from the conductor rail by means of incandescent lamps arranged in series, the number and arrangement of circuits depending on the size of the station. It will be well to allow for at least two circuits on each platform so that the number of lights on a platform, including offices, should either consist of eight, sixteen or some multiple thereof. This would, in my opinion, provide quite a satisfactory service and be an improvement on the existing lighting.

In the more important stations, where, on account of the number of offices and buildings, it might not be convenient to adopt series incandescent lighting, I recommend the provision of a small motor-generator supplied from the conductor rail, suitable for transforming down to 100 volts and running in parallel with a small emergency battery. The operation of this equipment could be safely left in the hands of one of the station officials, the motor-generator being started up when required just like an ordinary motor. The battery would be of sufficient capacity to maintain the lighting service in the event of failure of the supply to the conductor rail from any cause.

Assuming that the lighting of 126 stations in the suburban area covered by the electric traction scheme were carried out, and the lighting of Spencer Street and Flinders Street extended to cover requirements, the maximum demand (at the stations) is estimated at 574 kw. The minimum number of lamps per station allowed in these estimates is sixteen 100-watt lamps (or group lamps) for outdoor lighting and twenty-five 50-watt lamps for the interior of station buildings.

The average cost of wiring, fitting, etc., may be taken as ranging from £2 10s. to £3 per point for platform and outdoor lighting generally, and £1 per lamp for interior work. These prices are inclusive of all material and labor up to and covering the switchboard, and vary with the facilities available for open wiring.* Arc lighting, with enclosed arcs, for piers and yards, may be taken at £17 per lamp, inclusive.

(To be continued.)

*Abstract from the Report to the Victorian Railway Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

†The main gain is in the safety of the system, the working and checking being more precise and the relief of physical strain on the signalmen tending to reduce fatigue and increase the efficiency of the men. The abolition of noise from the cabin is also in favor of better concentration of the operators on the work in their charge.

*It is assumed that the existing standards or pendants, including the lanterns, would, if suitable, be available for wiring and fitting with electric lamps.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.

BY W. F. M. GOSS,
Dean of the College of Engineering, University of Illinois.

III.

IV. ENGINE PERFORMANCE.

13. *Mean Effective Pressure.*—A review of the calculated results shows that the possible range of cut-off under a fully-open throttle is reduced by a definite amount with each increment of pressure. For example, under 120 lbs. pressure, it is possible to operate at 30 miles per hour with the reverse lever in the fourteenth notch from the center, while at 240 lbs., the longest cut-off under similar conditions of speed is represented by the fourth notch of the reverse lever. It is of interest to note, also, that within the range of the experiments each change in the position of the reverse lever results in a change in power which is nearly proportional to the extent of the movement of the reverse lever.

14. *The Indicated Horse-power.*—The range in the values of the indicated horse-power for all pressures falls between the limits of 134 and 610 h.p. It appears from the results that with the coal used during the tests the normal power of the locomotive tested, when run at speed, is between 450 and 500 h.p. The development of more than 500 h.p. was always attended by unusual efforts on the part of the fireman. The power of the engine, under a pressure of 240 lbs., was readily developed with the reverse lever in the second and

Speed-Miles per Hour	120	160	180	200	220	240
50	28.12	26.12	24.43	25.74	24.08	24.97
40	27.51	25.82	23.68	24.43	23.68	23.86
30	27.46	25.28	24.61	24.91	23.59	24.43
20	28.40	26.14	25.44	26.01	25.51	24.09
Average	27.87	25.84	24.54	25.27	24.21	24.34

Boiler Pressure

Fig. 11—Least Steam for Each of the Several Speeds at Different Pressures.

fourth notches, while under 120 lbs. pressure, either a high speed or a much longer cut-off must be employed before this condition is reached. All this, of course, grows out of the fact that in experiments involving a wide range of pressure the cylinder volume remained constant. It is significant that the only two tests giving a horse-power in excess of 600 were run at 180 lbs. and 200 lbs., respectively. It will hereafter be shown that the operation of the engine under these pressures was more efficient than under conditions of pressure which were either lower or higher. Remembering that the results disclose the entire range for which it was practicable to operate the engine under a fully-open throttle, it will be accepted as a noteworthy fact that the higher pressures do not serve to increase the output of power.

15. *Steam per Indicated Horse-power per Hour.*—The high efficiency which is implied by results showing the steam consumption per indicated horse-power per hour, and the narrow range which they represent, taken in connection with the comprehensive character of the running conditions involved, are matters of more than ordinary importance. For example, at a pressure of 240 lbs., the engine experimented upon, when working under a fully-open throttle, gave a horse-power hour in return for the consumption of less than 24 lbs. of steam, and under any condition of speed or cut-off for which it was found possible to operate the engine under a wide-open throttle, the consumption never exceeded 26.3 lbs. At lower pressures, involving the possibility of a wider choice in the conditions of operating, the range is somewhat increased. Thus, at 120 lbs. pressure, the minimum value is 27.5 and the maximum 33.8, a range which, while greater than that just referred to, is nevertheless extremely narrow as compared with the range incident to the operation of other classes of engines.

The most efficient point of cut-off for the lowest pressure is that secured when the reverse lever is in the eighth notch, which is equal to 35 per cent. of the stroke. At 200 lbs. pressure, the most efficient cut-off is that represented by the sixth notch, or 27 per cent. of the stroke, and the data do not disclose that a shorter cut-off than this under a fully-open throttle is profitable for the engine experimented upon, even though the pressures be raised to 240 lbs. In all cases the best results are obtained at a speed either of 20 or 40 miles an hour; for all pressures above 160 lbs., the most efficient speed is 40 miles. The law of the change of efficiency with changes in speed has been discussed and the reasons underlying pointed out elsewhere.*

The least steam consumption for each speed under the several different pressures employed is set forth in Fig. 11. The values of the figure are of interest. They do not, however, constitute a satisfactory base upon which to form comparisons.

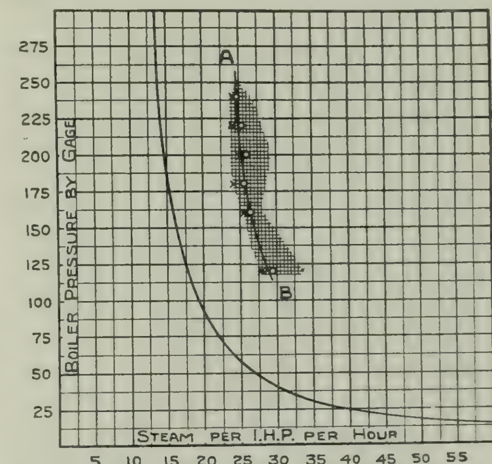


Fig. 12—Steam Consumption under Different Pressures.

16. *Steam Consumption Under Different Pressures.*—The shaded zone upon Fig. 12 represents the range of performance as it appears from all tests run under the several pressures employed. For purposes of comparison, it is desirable to define the effect of pressure on performance by a line, and to this end an attempt has been made to reduce the zone of performance to a representative line. In preparing to draw such a line, the average performance of all tests at each of the different pressures was obtained and plotted, the results being shown by the circles in Fig. 12. Points thus obtained can be regarded as fairly representing the performance of the engine under the several pressures only so far as the tests run for each different pressure may be assumed to fairly represent the range of speed and cut-off under which the engine would ordinarily operate. The best result for each different pressure, as obtained by averaging the best results for each speed at constant pressure, is given upon the diagram in the form of a light cross. These points may be regarded as furnishing a satisfactory basis of comparison in so far as it may be assumed that when the speed has been determined, an engine in service will always operate under conditions of highest efficiency. Again, the left-hand edge

*Locomotive Performance, published by John Wiley & Sons.

of the shaded zone representes a comparison based on maximum performance at whatever speed or cut-off. In addition to the points already described, there is located upon the diagram (Fig. 12) a curve showing the performance of a perfect engine* with which the plotted points derived from the data of tests may be compared. Guided by this curve representing the performance of a perfect engine, a line, *AB*, has been drawn proportional thereto, and so placed as to fairly represent the circular points derived from the experiments. It is proposed to accept this line as representing the steam consumption of the experimental engine under the several pressures employed. It is to be noted that it is not the minimum performance nor the maximum, but it is a close approach to that performance which is suggested by an average of all results derived from all tests which were run. Since its form is based upon a curve of perfect performance, it has a logical basis, and since it does no violence to the experimental data, its use seems justifiable.

17. *Performance Under Different Pressures, a Logical Basis for Comparison.*—The record of boiler performance as set forth in Chapter III., is that actually obtained from the several tests run. It has already been shown that this performance is affected by variations in the evaporative efficiency of the boiler, due doubtless to irregularities in firing, but which are in fact unaccounted for. One of the purposes of the discussion which occupies the preceding chapter has been to reduce the values actually resulting from the tests to a summarized statement which may be accepted as a general definition of performance, assuming all irregularities to have been eliminated. Such a summarized statement is that which is shown by Fig. 9. It is also expressed by the equation

$$E = 11.305 - 0.221\ H.$$

It is now proposed to determine the coal consumption per indicated horse-power, assuming the boiler efficiency to have been in all cases that which is expressed by this equation.

It appears, also, from the data that the steam consumed by the cylinders varies for each different pressure with changes in speed and cut-off, and it has been sought in the preceding paragraphs to summarize the facts derived from the experiments into a single expression. This appears in the form of the curve *AB*, Fig. 12, which is to be accepted as representing the performance of the cylinders under different pressures without reference to speed or cut-off. Combining this general statement expressing cylinder performance with that already obtained covering boiler performance, it should be possible to secure an accurate measure of the coal consumption per indicated horse-power hour, for each different pressure which will represent the results of all tests at that pressure.

The steps in this process are set forth by Table 2, in which—

Column 1 gives the several pressures embraced by the experiments.

Column 2 gives the steam consumption per indicated horse-power hour for each of these several pressures as taken from the curve *AB*, Fig. 12.

Column 3 gives the number of thermal units in each pound of steam at the several pressures assuming the feed-water in all cases to have had a temperature of 60 deg. F. The values of this column show at a glance the rate of change in the amount of heat required to supply steam at the different pressures embraced by the experiments.

Column 4 gives the pounds of water from and at 212 deg. F. per indicated horse-power hour. It equals Column 2 × Column 3 ÷ 965.8.

Column 5 gives the pounds of water evaporated from and at 212 deg. F. per pound of coal and is calculated as follows: Assuming that a fair average load for the locomotive tests is 440 h.p., and that this unit of power is delivered under all pressures, the corresponding rate of evaporation may be found by multiplying this value by those of Column 4 and dividing by the area of heating surface; that is, the rate of evaporation = 440 × Column 4 ÷ 1322. The equivalent pounds of water per pound of coal is found by substituting the rates of evaporation found for H in the equation,

$$E = 11.305 - 0.221\ H.$$

TABLE 2.—*Engine Performance Under Different Pressures.*

Boiler Pressure	Steam per Indicated Horse-power per Hour Values from Curve	B.t.u. Given to 1 Pound Steam Feed-water Temp.—60. °	Equivalent Pounds of Water per Indicated Horse-power Hour	Equivalent Pounds of Water per Pound of Dry Coal	Pounds of Coal per Indicated Horse-power Hour	Coal Saving for Each Increment	
						Lb.	Per cent
1	2	3	4	5	6	7	8
240	24.7	1176.6	30.09	9.10	3.31	.06	1.8
220	25.1	1174.4	30.52	9.06	3.37	.06	1.8
200	25.5	1172.0	30.94	9.03	3.43	.07	2 0
180	26.0	1169.5	31.48	8.99	3.50	.09	2.5
160	26.6	1166.8	32.14	8.94	3.59	18	4 8
140	27.7	1163.8	33.38	8.85	3.77	.23	5 8
120	29 1	1160.5	34 97	8.73	4 00	..	...

Column 6 gives the pounds of coal per indicated horse-power per hour and equals Column 4 ÷ Column 5.

Column 7 gives the pounds of coal saved per horse-power hour for each 20-lbs. increment in steam pressure.

Column 8 gives the percentage saving in coal for each 20-lbs. increment in steam pressure.

The values of Table 2, especially those of Columns 2 and 6, are of more than ordinary significance. They represent logical conclusions based upon the results of all tests. Comparisons between them will show the extent to which the performance of a locomotive will be modified by changes in the steam pressure under which it is operated. They show in the matter of steam consumption (Column 2) that—

Increasing pressure from 160 to 180 lbs. reduces the steam consumption 0.6 lbs., or 2.3 per cent.

Increasing pressure from 180 to 200 lbs. reduces the steam consumption 0.5 lbs., or 1.9 per cent.

Increasing pressure from 200 to 220 lbs. reduces the steam consumption 0.4 lbs., or 1.6 per cent.

Increasing pressure from 220 to 240 lbs. reduces the steam consumption 0.4 lbs., or 1.6 per cent.

In the matter of coal consumption (Column 6) they show that

Increasing pressure from 160 to 180 lbs. reduces the coal consumption 0.9 lbs., or 2.5 per cent.

Increasing pressure from 180 to 200 lbs. reduces the coal consumption 0.7 lbs., or 2.0 per cent.

Increasing pressure from 200 to 220 lbs. reduces the coal consumption 0.6 lbs., or 1.8 per cent.

Increasing pressure from 220 to 240 lbs. reduces the coal consumption 0.6 lbs., or 1.8 per cent.

These values are from actual tests. Those who are inclined to insist upon basing their conclusions upon observed data will perhaps find in them a satisfactory conclusion of the whole investigation. The results show how slight is the gain to be derived from any increment of pressure when the basis of the increments is above 160 lbs. But they do not in fact tell the whole story. In order to secure such results from a single locomotive it was necessary to employ a machine designed for the highest pressure experimented upon. Obviously, for the tests at lower pressure, the locomotive was needlessly heavy for its dimensions. If, for the tests under each of the lower pressures, the excess weight could have been utilized in providing a boiler of greater heating surface, the difference in performance with each increment of pressure would have been less than that to which attention has already been called. It is for this reason that the results already quoted, while significant and concise in their meaning, are nevertheless to be accepted as insufficient when regarded as a relative measure of the value of different steam

*This curve represents the performance of an engine working on Carnot's cycle, the initial temperature being that of steam at the several pressures stated, and the final temperature being that of steam at 1.3 lbs. above atmospheric pressure. This latter value is the assumed pressure of exhaust in locomotive service.

pressures. An extension of the discussion leading to a more general view of the matter will be found set forth in Chapters VI. to VIII.

V. MACHINE FRICTION AND PERFORMANCE AT DRAW-BAR.

18. *The Cylinders vs. the Draw-bar as a Base from Which to Estimate Performance.*—In the latter paragraphs of the preceding chapter results are given disclosing the performance of boiler and engine as based upon cylinder performance. This is a correct basis from which to proceed in discussing the relative advantage of different steam pressures; for the process of the cylinders represents the last of the thermodynamic changes by which the heat of the fuel is transformed into work. The cylinders are in fact one step nearer the problem in question than the draw-bar, which for many purposes is properly regarded as a better basis from which to determine the performance of a locomotive. This being the case, the purpose of the present chapter will be entirely served if attention is called to a few of the more significant facts which center in the output of power at the draw-bar, leaving the general discussion as to the relative values of different steam pressures to be continued in the chapters which follow.

19. *Machine Friction.*—This is the difference between work done in the engine cylinders and that which appears at the draw-bar. It is difficult to summarize the facts concerning engine friction. This is not due to defects in the experimental process underlying the data, but to the fact that the frictional resistance of the machinery of the locomotive varies greatly from day to day.* Evidence of this is accessible even to the casual observer. During any given test it is likely that an axle-box or a crank-pin may run warm, while during another test under identical conditions of power the same part will remain perfectly cool. For this reason many variations in the frictional resistance of the machine occur. It is a fact, however, that the friction varies but slightly with increase in steam pressure, and that changes in cut-off are most effective in modifying engine friction. Acting upon this suggestion, all results have been plotted in terms of cut-off. The results do not, of course, fall in line, but they take such positions as readily to suggest the form of a curve which in an approximate way may be employed to represent them. From such a curve the values set forth in Fig. 13 have been derived.

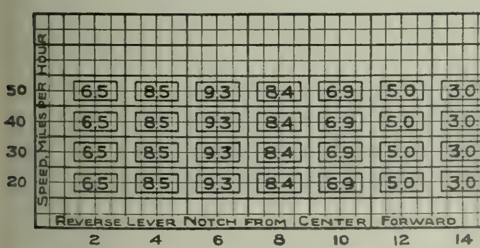


Fig. 13—Corrected Friction, Mean Effective Pressure Applicable to All Pressures.

It is proposed to accept these values as an approximate measure of the frictional loss for locomotive Schenectady No. 2 under all pressures. They are probably a little low for pressures above 200 lbs. and are perhaps somewhat high for pressures below this limit. It cannot be assumed that they apply to any other locomotive than that which was involved by the experiments. The machine friction as expressed in pounds pull at the draw-bar may be found for any test by multiplying the mean effective pressure for that test by the constant 88.75.

20. *Steam per Dynamometer Horse-power per Hour.*—Values covering this factor express the combined efficiency of the cylinders and machinery of the locomotive. They disclose the fact that there are few conditions of running for which the locomotive requires more than 30 lbs. of steam per dynamometer horse-power hour, and the consumption may fall below 27 lbs. While differences in performance for all pressures above 200 lbs. are not great, the steam consumption is much greater when the pressure is as low as 120 lbs. The data show, also, that for best results the cut-off must be lengthened as the pressure is decreased. The facts as disclosed by the data are as follows:

For 240 lbs. pressure the best cut-off is approximately the second notch, 14 per cent.

For 220 lbs. pressure the best cut-off is approximately the fourth notch, 19 per cent.

*A general discussion of this question with data will be found in *Locomotive Performance*

TABLE 3.—*Comparative Performance of the Locomotive, Assuming Irregularities in the Results of Individual Tests to Have Been Eliminated.*

Number	Designation of Tests: Laboratory Symbol	Equivalent Steam to Engine per Hour Feed-water at 60° F	Equiv. Evap. per Pound of Dry Coal by Equation $E = 11.305 - .231 H$	Dry Coal Fired per Hour Corrected by Equation, pounds	Dry Coal per I H P per Hour, pounds	Equiv. Steam per I. H. P. per Hour, pounds	Machine Friction: M. E. P	Machine Friction: H P	Machine Friction: Per cent I H P	Dynamometer Horse-power	Draw-bar Pull pounds	Coal per D H P per Hour pounds	Equiv. Steam per D H P per Hour pounds
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	20-2-240	8803	9.835	895	3.24	31.84	6.5	30.8	11.1	[illegible]	[illegible]	[illegible]	[illegible]
2	20-4-240	12008	9.298	1291	3.29	30.59	8.5	40.2	10.2	[illegible]	[illegible]	[illegible]	[illegible]
3	20-6-240	13614	9.029	1508	3.23	[illegible]	9.3	44.0	9.4	[illegible]	[illegible]	[illegible]	[illegible]
5	30-2-240	11444	9.392	1218	3.28	30.82	6.5	46.1	12.4	325.2	4060	3.74	35.19
6	30-4-240	13888	8.983	1546	3.28	29.51	8.5	60.4	12.8	440.2	5127	3.77	33.85
8	40-2-240	12320	9.245	1333	3.16	29.20	6.5	61.5	14.6	[illegible]	[illegible]	[illegible]	34.19
9	40-4-240	16320	8.576	1903	3.36	28.82	8.5	80.5	14.2	485.8	[illegible]	3.91	33.59
11	50-2-240	14066	8.953	1571	3.37	30.21	6.5	76.9	16.5	[illegible]	[illegible]	4.04	[illegible]
13	20-2-220	8533	9.878	864	3.38	33.42	6.5	30.8	12.0	224.5	4210	3.84	38.01
14	20-4-220	10681	9.519	1122	3.27	31.15	8.5	40.2	11.7	302.6	5670	3.71	35.29
15	20-6-220	13294	9.082	1463	3.39	30.81	9.3	44.0	10.2	387.4	7200	3.77	34.31
16	20-8-220	16653	8.521	1954	3.66	31.24	8.4	39.8	7.5	493.2	9250	3.96	33.76
17	30-2-220	10286	9.585	1073	3.35	32.11	6.5	46.1	14.4	274.2	3430	3.91	37.51
18	30-4-220	12976	9.136	1420	3.20	29.06	8.5	60.4	13.5	386.1	4820	3.68	33.60
19	30-6-220	15915	8.644	1841	3.29	28.44	9.3	66.0	11.8	493.5	6170	3.73	32.25
21	40-2-220	11471	9.387	1222	3.29	30.87	6.5	61.5	16.5	310.0	2910	3.94	37.00
22	40-4-220	14549	8.873	1638	3.21	28.57	8.5	80.5	15.8	428.6	4020	3.82	33.94
24	50-2-220	12017	9.296	1292	3.41	31.72	6.5	76.9	20.3	301.9	2260	4.28	39.80
25	50-4-220	16343	8.573	1906	3.39	29.08	8.5	100.6	17.9	461.7	3460	4.13	35.40
29	20-2-200	7632	10.029	761	3.40	34.14	6.5	30.8	13.8	192.7	3610	3.94	39.61
30	20-4-200	9100	9.784	930	3.23	31.64	8.5	40.2	14.0	247.4	4640	3.75	36.78
31	20-6-200	11774	9.337	1261	3.35	31.33	9.3	44.0	11.7	331.8	6220	3.80	35.48
32	20-8-200	15011	8.795	1707	3.60	31.74	8.4	39.8	8.4	433.1	8120	3.94	34.66
33	30-2-200	8768	9.839	891	3.31	32.60	6.5	46.1	17.1	222.8	2780	4.00	39.35
34	30-4-200	11354	9.406	1207	3.29	30.92	8.5	60.4	16.4	306.7	3830	3.93	37.02
35	30-6-200	14685	8.850	1659	3.39	30.00	9.3	66.0	13.5	423.2	5290	3.92	34.70
37	40-2-200	9934	9.644	1030	3.36	32.40	6.5	61.5	20.0	245.1	3300	4.22	40.53
38	40-4-200	13361	9.071	1473	3.28	29.76	9.5	80.5	17.9	368.4	3450	4.00	36.27
39	40-6-200	17822	8.321	2142	3.54	29.54	9.3	88.0	14.5	517.2	4850	4.14	34.46
41	50-2-200	10206	9.599	1074	3.26	31.02	6.5	76.9	23.4	252.1	1890	4.26	40.48
42	50-4-200	14431	8.892	1623	3.49	31.08	8.5	100.6	1.6	363.6	2730	4.46	39.69
46	20-2-180	6638	10.195	651	3.40	34.57	6.5	30.8	16.0	161.2	3020	4.04	41.18
47	20-4-180	8475	9.888	858	3.25	32.15	8.5	40.2	15.3	223.4	4190	3.84	37.94
48	20-6-180	10226	9.595	1066	3.19	30.61	9.3	44.0	13.2	290.1	5440	3.67	35.25
49	20-8-180	12833	9.157	1401	3.40	31.17	8.4	39.8	9.7	371.9	6970	3.77	34.51
51	30-2-180	7523	10.047	749	3.18	31.91	6.5	46.1	19.5	189.6	2370	3.95	39.68
52	30-4-180	9722	9.680	1004	3.16	30.65	8.5	60.4	19.1	256.7	3210	3.91	37.87
53	30-6-180	11633	9.360	1243	3.16	29.58	9.3	66.0	16.8	327.3	4090	3.80	35.54
54	30-8-180	16156	8.604	1878	3.44	29.57	8.4	59.6	10.9	486.7	6080	3.86	33.20
56	40-2-180	8069	9.956	810	3.12	31.14	6.5	161.5	23.7	197.6	[illegible]	4.10	[illegible]
57	40-4-180	11177	9.436	1184	3.07	28.94	8.5	80.5	[illegible]	305.7	[illegible]	[illegible]	[illegible]
58	40-6-180	14907	8.813	1691	3.23	28.41	9.3	88.0	[illegible]	436.1	[illegible]	[illegible]	[illegible]
59	40-8-180	18949	8.137	2329	3.82	31.07	8.4	79.5	13.0	530.4	[illegible]	[illegible]	[illegible]
61	50-2-180	8578	9.871	869	3.24	32.01	6.5	76.9	28.7	191.1	1430	4.55	[illegible]
62	50-4-180	12061	9.288	1299	3.16	29.37	8.5	100.6	24.5	310.0	[illegible]	[illegible]	[illegible]
63	50-6-180	16567	8.535	1941	3.51	29.94	9.3	110.1	19.9	443.2	[illegible]	[illegible]	[illegible]
67	20-4-160	7396	10.068	734	3.34	[illegible]	8.5	40.2	18.4	[illegible]	[illegible]	[illegible]	[illegible]
68	20-6-160	9379	9.737	963	3.27	[illegible]	9.3	44.0	14.9	[illegible]	[illegible]	[illegible]	[illegible]
69	20-8-160	11392	9.400	1212	3.51	33.02	8.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
71	30-4-160	[illegible]	9.836	[illegible]	3.28	32.28	8.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
72	30-6-160	11663	9.355	1246	3.25	[illegible]	9.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
73	30-8-160	14347	8.906	1611	3.46	[illegible]	8.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
76	40-4-160	[illegible]	9.615	1051	3.31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
77	40-6-160	[illegible]	9.065	1478	3.43	31.65	9.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
78	40-8-160	[illegible]	8.421	[illegible]	3.76	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
80	50-4-160	10982	9.469	1160	3.43	32.47	8.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
81	50-6-160	[illegible]	8.807	1696	3.56	31.39	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
85	20-4-120	5215	10.433	500	3.73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
86	20-8-120	8592	[illegible]	871	3.44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
87	20-12-120	[illegible]	9.244	1333	3.73	34.52	[illegible]	23.7	6.5	[illegible]	[illegible]	[illegible]	[illegible]
88	30-4-120	6269	[illegible]	611	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
89	30-8-120	10683	9.519	1122	3.45	32.80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
90	30-14-120	[illegible]	8.186	2278	[illegible]	[illegible]	3.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
91	40-4-120	[illegible]	[illegible]	652	3.54	36.13	8.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
92	40-8-120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
93	40-12-120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	47.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
94	50-4-120	[illegible]	[illegible]	704	[illegible]	[illegible]	[illegible]	100.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
95	50-8-120	14371	[illegible]	1614	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
96	50-11-120	19317	[illegible]	[illegible]	[illegible]	[illegible]	6.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

For 180 lbs. pressure the best cut-off is approximately the eighth notch, 33 per cent.

For 120 lbs. pressure the best cut-off is approximately the twelfth or fourteenth notch, 47 per cent. or 56 per cent.

21. *Coal per Dynamometer Horse-power per Hour.*—This factor represents the combined performance of the boiler, the cylinders and the machinery of a locomotive. It connects the energy developed in the boiler by the combustion of fuel with that which is developed at the draw-bar. In all cases where data are given, the fuel consumed was of the same quality; hence all results are comparable. Under a pressure of 240 lbs. the range is between 3.35 and 5.01, while at a pressure of 160 lbs. the range is between 3.79 and 4.78, results which are of interest from at least two points of view: first, because of the small difference in performances resulting from a relatively large change in pressure; and second, because of the significance of the values quoted when accepted as a measure of the locomotive performance. It is doubtful if any other type of steam engine exhausting into the atmosphere can be depended upon to deliver power from the periphery of its wheel in return for the expenditure of so small an amount of fuel.

22. *Corrected Results.*—The values representing coal and steam consumption which have thus far been referred to as performance at the draw-bar are those actually observed. A close comparison of these sometimes fails to give consistent results because of irregularities in boiler performance or in the frictional resistance of the machinery growing out of causes already discussed.

In Table 3 values are presented from which all such discrepancies have been eliminated. They are those which would have been obtained if the evaporative efficiency for all tests had been that indicated by the equation:

$$E = 11.305 - 0.221\, H$$

and if the machine friction for all cases had been that shown by Fig. 13. Column 13 giving the corrected coal per dynamometer horse-power, and Column 14 the corrected steam per dynamometer horse-power, may be accepted as representing the best information derived from the entire research.

(To be continued.)

ELECTRIFICATION OF THE SOUTHERN PACIFIC SUBURBAN LINES.

The power plant for the electrification of the suburban lines of the Southern Pacific across the bay from San Francisco is under construction. It is situated on Oakland Harbor, formerly called the Estuary, an arm of the bay separating the cities of Oakland and Alameda. The main station will have four turbine units of approximately 30,000 h.p. capacity. The station is designed for oil fuel, with provision for conversion to coal firing later, if desirable. The boiler room and turbine room are parallel. The circulating water tunnels of the station will be fed by gravity from the Estuary.

Four Parsons type turbo-generators will supply three-phase, 25 cycle, alternating current at 13,000 volts, when running at 1,500 revolutions per minute. These units will weigh about 323,000 lbs. each. A part of this power will be transformed and converted into direct current for the propulsion of the trains in the immediate vicinity. The more remote divisions of the same service will be supplied from local sub-stations. The turbines will work with 175 lbs. steam pressure, superheated to about 125 deg. at the throttle.

Worthington surface condensing units are connected directly to each turbine, and are designed to maintain 28 in. of vacuum. The tubes in the condensers are not tinned. The circulating pump is a 10,000-gal., high-speed, centrifugal unit, driven by a steam turbine. Each condenser has 12,000 sq. ft. of cooling surface. If the tubes in these condensers were placed end to end they would extend a distance of 36 miles.

There will be 16 boilers, with a total heating surface of about 105,000 sq. ft.. A short stack provides natural draft. It is large enough to give economical results while burning oil. Should coal be substituted later, provision has been made for the installation of a mechanical draft system to give the necessary increase.

Other equipment includes a 60-ton electric traveling crane in the station. Each turbine has a 125 k.w. 250 volt exciter mounted on an extension of the main shaft. The excitation is further reinforced by a motor-driven exciter and a storage battery. The output of the turbines is carried in lead-covered cables drawn through fiber ducts in the walls of the power station to the automatic main switches and then to one or the other of a double set of bus-bars—the main and feeder buses, which are carried on insulators in separate fireproof cells. The bus structure is in the sub-station basement. Over this is the switch structure, similarly made and equipped throughout with distant electrically-controlled switches. The switchboard is carried in a gallery across the end of the local sub-station.

The local sub-station is a part of the main station. The conversion apparatus and operating gallery are at one end of an extension of the turbine room. The sub-station is to be equipped with 2,000 h.p. converting units, every unit being supplied with power by oil-insulated transformers. The sub-station switchboard is set on the gallery at right angles to, and close by, the power station board, so that a single attendant can conveniently look after both. The outputs of the power station and sub-station are carried through underground conduits to an outlet tower some distance from the main building, and are there distributed to their respective pole lines. For transmitting to very remote points, a transformer house is provided, close to the end of the building, where the high tension circuits can be carried directly to their tower lines. The West Oakland and Berkeley sub-stations are similar in equipment to the local sub-station at the power plant, and are fed by duplicate transmission lines. The cost of the power station and its local sub-station will be about $1,800,000. The cost of each additional sub-station will be about $250,000.

The motive power and equipment are to be distributed in trains consisting of from three to ten cars, each car seating approximately 100 passengers and measuring 73 ft. long over all. There will be 62 motor cars, each having a capacity of 500 h.p. and 58 trail cars. The multiple unit system of control will be used. The cost of equipment complete will be $1,869,-000.

Inspection and general repair shops for the running and maintenance repairs of the equipment will be located at Alameda Point. These shops will have a steel frame on concrete foundations, the upper structure having brick veneer walls and a saw-tooth roof. This building will be 460 ft. long and 200 ft. wide. The total cost of the shop completely equipped for handling 200 electric cars will be $350,000.

The trolley wire will be No. 4/0. A part of the installation will have side poles with span wire supports, and a part center poles with bracket supports.

FOREIGN RAILWAY NOTES.

Dr. Zemp, many years at the head of the Swiss department of railways and several times President of the Swiss confederacy, died December 8 last, at the age of 75.

The Italian State railways in the year ending with June, 1908, earned net 2.185 per cent. on the capital invested in them. The government pays 3½ per cent. on most of the bonds it has issued.

On Nov. 15, 1908, the entire Austrian ministry resigned, and with it Dr. von Derschatta, since June 2, 1906, Railway Min-

ister, and as such engaged in the very important acquisition of the most important private railways for the state.

The railway in German Southwest Africa, from Lüderitz Bay eastward 227 miles to Keetmanshoop, was completed to the latter place last June and in July earned gross $11,805, or $52 per mile. It was built largely for military purposes, and military traffic is not charged.

An express train from Hanover to Berlin, 158 miles, ran through without stopping Nov. 26, 1908, for the first time, hauled by a 4-cylinder Atlantic locomotive with a tender, the tank of which holds 1,095 cu. ft. of water, of which 318 remained after making the run. The tender tanks heretofore have held but 742 cu. ft.

RAILWAY BROTHERHOODS AND DISCIPLINE.*

BY R. L. CAIRNCROSS.

It is not so many years ago when railway brotherhoods came into existence in this country. They were created by a necessity, were bred by secret ties, and they grew in strength because they advocated better conditions for their members. These brotherhoods have been invariably fortunate in having had their affairs managed by wise and able leaders, who have conscientiously endeavored to secure for their members every concession possible from the railway managements.

Among the uses to which the organizations have been put in the past might be mentioned the mutual benefit insurance feature; the increased compensation now received; the uplift and improvement of members, morally, physically and socially; the weeding out of drunks, dead beats and those whose conduct was such as to reflect upon the organizations; the endeavors to secure reinstatement of discharged employees; the binding together by fraternal ties of men in the same capacities, and the creation of a brotherly feeling that has made railway employees the most charitable lot of men to their fellows that there is in the world to-day. In fact, the brotherhoods have been so well employed in these commendable ways that they have given but little thought to the all-absorbing subject of safety.

Now, while we may candidly differ from the managements upon the question of remuneration and other matters, upon the all-important question of the safe handling of trains there should not exist any difference. It may seem strange, but it is true, that it is a very rare occurrence to find individual employees discussing an accident with the desire to learn a lesson from the event. They discuss such subjects more to extend their sympathy to those at fault, and the object lesson is then passed over and forgotten. In all my experience in lodge room meetings I have never heard the subject discussed there; and I also note that it is an extremely rare thing to find anything in the numerous brotherhood magazines touching thereon. If self-preservation is the first law of nature, why have we been so indifferent? The premiums we pay for accident insurance show conclusively that we men who handle trains are considered an extra hazardous risk. Let us look this question squarely in the face and realize that our turn may come all too soon to appear before the great General Manager of the Universe to render an account of our stewardship in the handling of the people entrusted to our care. * * * People are saying: "You brotherhood men, what are you doing? What have you done in the past?" * * * I would suggest that brotherhood men request their representatives to take up before the executive meetings of their organizations the desirability of embodying in the procedure of business of the subordinate lodges an allotment of time for a discussion on the question of safety. What we need is not a great soul-stirring revival of interest in the subject, but rather a moral awakening to a fuller sense of how deeply we are all concerned in the safe handling of trains.

The power of the railway brotherhoods when used to interfere with disciplinary measures has a very direct bearing on the question of the safe handling of traffic. This abuse owes its origin to a deep sympathy for a brotherhood man in trouble; also to an inconsistent view as to what constitutes justice between officials and employees, and last, but not least, to the feeling among brotherhood men that it is their duty as such to work for a reversal of the decision given a brother, even though there be but the remotest possibility of securing it.

Now this manner of doing business may appeal to sympathetic members, but it is also apparent that such methods can keep their brotherhoods perpetually embroiled with the management. Such courses lower their standing in the estimation of all fair-minded men just in the ratio to which each individual organization is guilty in this respect. Besides, it has a tendency to make employees have greater respect for the powers of their organizations than for a conscientious attention to those duties which the companies have a right to expect from them.

The result is that certain classes of employees are careless in their observance of the rules and regulations. We all know that such a condition exists. And yet brotherhood men, through a mistaken sense of loyalty or fealty to their order, refuse to admit, except to other members, that such things are done. This is a very serious abuse of power. When railway brotherhoods place the bright shining jewel of consistency above them in their lodge rooms to light and guide their work, "Safety" will have one of the strongest links welded in its chain and brotherhoods will receive from officials and the public respect and fair treatment.

TRAIN RULES.

A young man entering the service does so with some knowledge of the dangers to be met, and he has a high respect for the rules and makes conscientious effort to live up to them. If his fellow-workers have the same respect and display obedience, this young man soon acquires a deep-rooted desire to follow their example, but if he is placed in contact with employees who sneer at and find fault with their requirements, and who only obey them when necessary, his viewpoint is changed and he can hardly help dropping into the rut of the easiest way. This being so, to play fast and loose with the rules is to court disaster. Wrecks are not caused by expected occurrences, except possibly derailment on bad tracks. It is the unexpected and unlooked-for that brings disaster, and this to a great extent is the natural sequence of the trivial violation of the rules. It is this lack of attention to the small business details which slowly but surely grows and multiplies, ever widening its scope, breeding grosser carelessness and recklessness, and lessening each day the respect for the rules and their use. It lowers the sense of loyalty or fealty until prudence is no longer a virtue, when carefulness brings but a sneer from the careless ones and recklessness is something to brag about—"loyalty," but another name for a "despicable company man"—while the easiest way is insidiously adopted as the best.

Eternal vigilance is the price that must be paid to insure safety. Not the vigilance of officials only, but that of every employee engaged in the handling of trains. Not the methods of officials who give tacit approval to the violation of trivial requirements when they believe the blocked condition of the lines necessitates unusual chances being taken, but the vigilance of officials whose watchfulness over trivial details shows to employees that they will not countenance the violation of any rule. Not the way some employees have of living up to a rule at one place and violating it at another, but the eternal vigilance of men who realize that the strength of the chain of safety lies in the weakest link. Watch the little, trifling requirements of the rules, and the big ones will take care of themselves.

*Extracts from an article in *Santa Fe Employees' Magazine*. The author is a conductor on the Gulf, Colorado & Santa Fe.

Re-examination.—There are a number of lines that require employees to become conversant with the rules and then pass a written examination. If anyone is laboring under the impression that employees remember all the questions they have answered he is greatly mistaken. Employees remember those that have a direct bearing on the duties which they fill, but a quick change to different duties, or being confronted by an emergency where knowledge of a certain rule would show the proper course to be taken proves they have not got it. It has been forgotten. If you don't believe me try it yourself. Ask yourself some leading question not used in your usual routine of duty and see if you know the rules that cover it. There is no use in beating about the bush on this subject. I know, and you know, that we are not as conversant with the rules as we should be, simply because we don't have to make a study of them after passing the examinations. I believe in, and would offer as a suggestion, the plan that all employees engaged in the operation of trains be required to pass an examination every year. — — — !!! — ? — ?? — ??? — Help!

Phew! Such a fracas! Who threw that brick? Wait a minute—gee! but that was an old-timer.

Now let me explain. I certainly woke you up then, but the proposition is not as bad as it looks, and it need cost no employee his position who has any desire to become conversant with the rules. My scheme is this: Employees entering the service or qualifying for higher positions should be required to pass the present written examinations, and the questions should be so absolutely clear and to the point that any employee may readily understand them. Take and divide these questions into groups of, say, ten each. Set aside a month when business is light and have each interested employee sit down at a table in the trainmaster's office and draw one of the groups of ten questions, making written answers to the same without assistance from books or persons, failure to answer all ten correctly to be punishable by being compelled to answer twenty additional ones, failure to answer the twenty to be punishable by being compelled to answer them all. Five demerit marks for each failure, with a limit of twenty, would have a stimulating effect to be better prepared next time. Ten merit marks should be given to each employee who gives correct answers to each of the ten questions.

Before putting such a scheme into effect employees should be given ample notice, so as to have an opportunity of posting themselves.

The idea of having employees draw a book containing ten questions from a pile of, say, fifty such books is to free the plan from even the slightest possibility or appearance of partiality being shown anyone.

The suggestion of requiring answers to only ten questions is to make the scheme as easy as possible on all employees, because it is quite evident that, if an employee does not know what ten questions he may draw, he will necessarily have to study so as to be able to answer any ten of five hundred. Besides, it would be useless for one employee to post another on the ten he has answered, because the latter realizes that there is only one chance in fifty for him to draw the same series.

Another advantage would be that employees could wait for an opportunity to pass the examination without loss of time from their work.

It would be possible also that these questions could be changed each year to meet new conditions or any alterations that had been made in the rules.

Before such examination employees should be given every assistance from officials to make clear to them the meaning of any rule, and when they fail to pass the examination every effort should be made to teach them wherein they made their mistakes.

With a thorough knowledge of the rules implanted in the minds of all employees, there will be bred in them a greater respect for the rules.

REBUILDING THE CAIRO DIVISION OF THE BIG FOUR.

A preliminary account of the rebuilding of the Cairo division of the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) was published in the *Railroad Gazette*, October 27, 1905. A brief history, the character of the existing line, and the nature of the improvement work to be done, were given, accompanied by detailed drawings and descriptions of the most interesting bridges. This work has been completed and we give below some further account of the methods used in the work, of the terminal facilities, operation of the road, etc.

As mentioned in the previous article, the Cairo division, which is 260 miles long, extends from Cairo, Ill., northwardly along the valley of the Wabash river to a point opposite Vincennes, Ind., thence bearing more directly north and terminating in Danville, Ill. Prior to 1905 this road differed but little in its physical characteristics from the standard adopted at the time of its construction in the early '70's. Some steel rail had been laid, not exceeding 65 lbs. in weight at any point, and mostly not exceeding 60 lbs.; and a scattering of ballast, of a poor quality and very scant, had been applied. A few fair-sized permanent structures had been installed, the remainder of the important openings being wooden trestles. Of the minor openings, many had been replaced with cast-iron pipe. The existing ruling gradient was 1.14 per cent. northbound and 1.11 per cent. southbound; the maximum de-

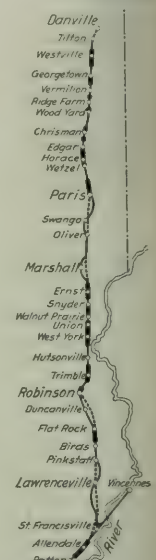
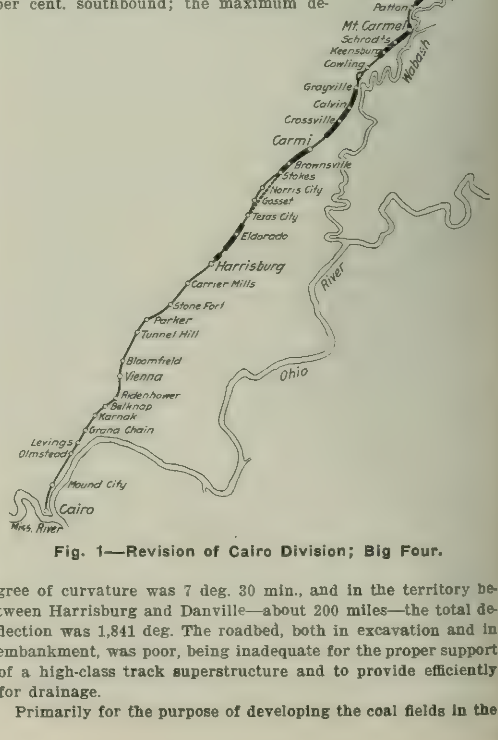



Fig. 1—Revision of Cairo Division; Big Four.

gree of curvature was 7 deg. 30 min., and in the territory between Harrisburg and Danville—about 200 miles—the total deflection was 1,841 deg. The roadbed, both in excavation and in embankment, was poor, being inadequate for the proper support of a high-class track superstructure and to provide efficiently for drainage.

Primarily for the purpose of developing the coal fields in the

Fig. 2—Reinforced Concrete Subway at Crossville.

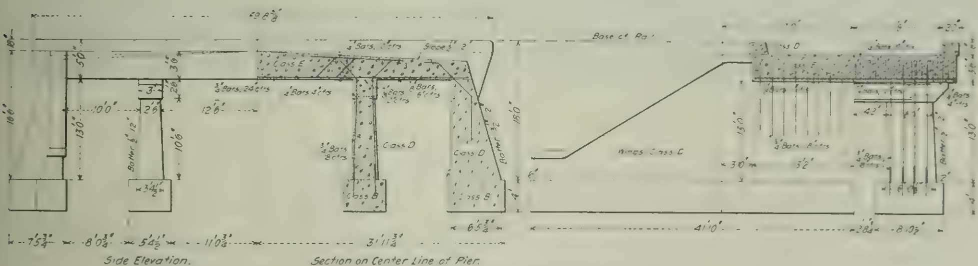


Fig. 3—Details of Crossville Subway.

Fig. 4—Mulberry Street Bridge, Mt. Carmel.

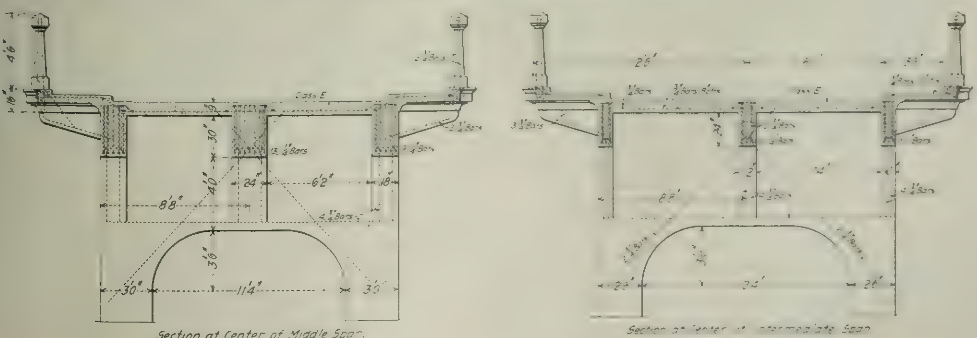


Fig. 5—Cross Sections of Mulberry Street Bridge, Mt. Carmel.

vicinity of Harrisburg, Saline county, Ill., the reconstruction of the line from Harrisburg to Danville, 199 miles, was begun early in 1905. The ruling gradient adopted northbound was 0.3 per cent., and southbound 0.5 per cent., and the maximum degree of curvature 2 deg. The standards of construction were of a high character and involved wide cuttings and fills and permanent bridges of such character as to make possible the operation of the heaviest class of locomotives. The track superstructure consisted of 80-lb. rail throughout, laid in ballast 12 in. deep beneath the tie. and provision was made for ample operating facilities, such as side-tracks, terminal yards, locomotive terminals, shops, water and fuel stations, depot buildings, both freight and passenger, a complete block system, and interlocking plants at all crossings and block stations. Short stretches of the line were also double-tracked where this seemed desirable.

Investigation of the problem of reconstruction, as above outlined, developed the fact that in many territories a complete departure from the original location was essential. The aggregate length of such relocations was some 35 miles, the longest single relocation occurring in the vicinity of Norris City, White county, which was 11.5 miles long. The total length of grade reduction, including relocations, was approximately 100 miles, or about half of the distance from Danville to Harrisburg, involving approximately 65 miles of grade reduction where the alinement could not be radically disturbed. In order to avoid the heavy expense and serious disturbance to traffic incident to the reduction of grades upon the actual existing location, the use of offset locations was adopted. These offset locations were sufficiently removed from the original line to permit the maximum cutting to be made below the main track rails and the maximum fill made above them, without general disturbance of the original roadway. The excavations and embankments were not generally brought to a full width before traffic was turned over the new grade, necessitating the widening of both cuts and embankments upon the main track side after the new track had been put into service.

Prior to 1905 the northern terminus of the Cairo division was actually at Tilton, a small town about 3 miles south of Danville, and connection was made with the Wabash for entrance to Danville. In addition to the work above described, an extension of the line was made from Tilton northwardly to a junction with the Peoria & Eastern line of the Fig Four. This extension was double-tracked and involved very heavy work, both in grading and bridges. It passes beneath the Wabash and crosses the valley of the Vermilion river at an elevation of 95 ft. above the bed of the stream.

A good understanding of the scope of the work will be got from the accompanying map, which indicates in dotted lines the relocations and extensions, and in heavy black lines the territory within which grade reduction was undertaken without serious departure from the original location. The entire project involved a total volume of earthwork of something over 5,500,000 yds. and concrete structures to the amount of 65,500 yds. These figures include not only the earth and concrete work involved in the relocation and grade revisions, but also the construction of permanent structures in the territory where grade revision was not undertaken, and the widening of both cuts and fills and the establishment of adequate drainage ditches in the same territory.

The methods used in doing the grading are of interest, more particularly in the method of handling the offset locations. In the majority of these instances the contractor was permitted to use the main track so far as he was able, loading his trains by means of a steam shovel upon the main track; and wherever the embankment was close enough to the original main track to permit, the material was dumped from the old main track and spread by a ballast spreader. For the most part, where embankments were higher than the original main track this lift was made by the contractor raising an independent unloading track instead of by the use of trestles. Trestles were used mostly on the relocations—notably upon the Danville-Tilton extension, where a trestle 85 ft. high and 1,500 ft. long was built over the Vermilion river bottoms of sufficient stiffness to carry standard gage equipment unloaded by a Lidgerwood unloader.

Fig. 6—Reinforced Concrete Trestle in Lawrenceville Bottoms.

Fig. 7—Riprap Protection.
Showing protection of embankment from washing by floods in ditches.

BRIDGES.

There are a number of interesting designs of bridges, some of which, as already mentioned, were shown in the previous article. One of these was the design for the crossings, respectively, of Vermilion river, near Danville, and of Big Creek, near Marshall, the plans being shown in the previous article, and the methods used in building the Vermilion river bridge being described July 13, 1906. It is formed of concrete arches of the spandrel type, with a central span of 100 ft. flanked by spans of 80 ft. The first-named bridge is 95 ft. from bed of stream to base of rail, and the second 87 ft.

At several points, notably at Crossville, subways had to be

provided over the streets of the town, but the limited head room precluded the use of arches, and box culverts had to be used. One of these is shown in the illustrations. It has a total span length of 46 ft. and is supported at two points so as to give a central span of 25 ft.

Where the cuttings necessitated overhead highway crossings, reinforced concrete bridges of the type which has been generally adopted on the Big Four were put in. The first of these, which are on the St. Louis division, were described in the *Railroad Gazette*, May 18, 1906. The accompanying illustrations show one of these bridges built in the town of Mt. Carmel, which has, in addition to the driveway, sidewalks on each side.

One of the relocations was near Lawrenceville, across the bottoms of the Embarras river. This is a territory which is subject to annual floods, due both to headwaters from the Embarras river and back water from the Wabash river. To insure protection against these floods the railroad was rebuilt at an elevation some 6 ft. above its former grade, and ample passage way for flood waters was provided by two concrete trestles having an aggregate length of 1,562 ft. The detail drawings of these trestles were given in the previous article, and photographs of the finished structure are shown herewith. The fill is protected by riprap from washing by the floods, as shown in one view. As a result of this work interruption to traffic from high waters is a thing of the past.

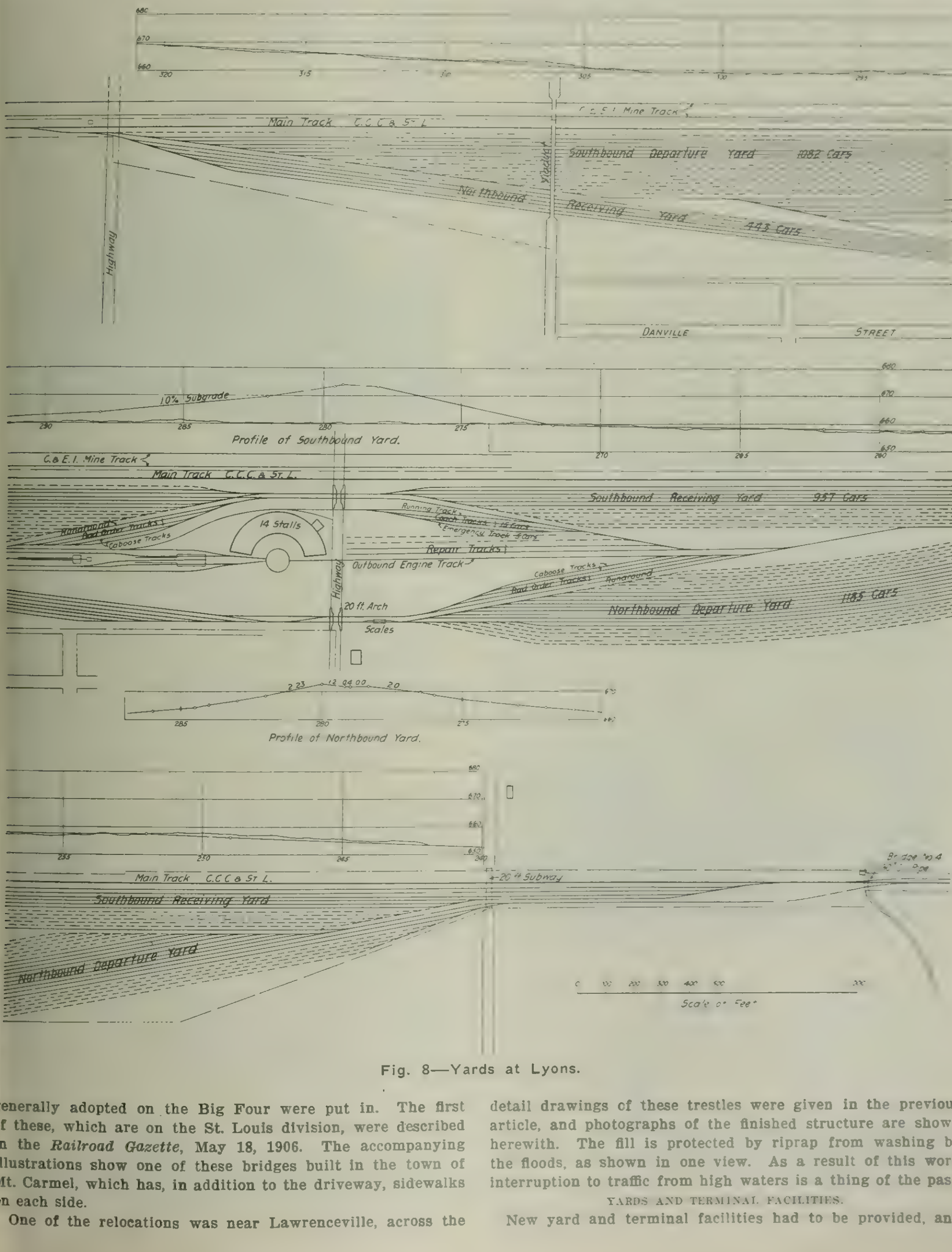


Fig. 8—Yards at Lyons.

YARDS AND TERMINAL FACILITIES.

New yard and terminal facilities had to be provided, and

yards were built at Harrisburg, Mt. Carmel, Paris, and near Danville. All of these except the yard at Paris, which takes care of deliveries to and from the St. Louis division, are hump yards, with inbound and outbound receiving and classification yards, the tracks in each being long enough to accommodate a maximum train. A general plan of Lyons yard, the one near Danville, is shown. Less than half of the tracks have been laid, those for future addition being shown in dotted lines. This being the northern terminus of the division, trains—mostly coal—are made over here for convenience of delivery to connecting lines or consignees at Chicago. The yard is therefore designed to facilitate the through passage of freight from one road to another, the main object being to enable cars to be classified quickly and trains made up therefrom for further movement. The classification consists chiefly of the following:

1. Air and non-air.
2. Chicago loads.
3. Loads for other roads.
4. Dead freight from manifest freight.
5. Bad order cars from good-order.

Special provision is thus made to take care of bad-order cars, which are separated from the rest and set aside for delivery to the repair tracks.

Close study was given to the matter of proper grades for the humps to give a car or cut of cars the proper acceleration to send them over the scales at a speed of about 4 miles an hour to insure efficient operation of the automatic weighing device; and then by further acceleration to cause the cars to pass by gravity alone to the desired location in the yard. The profile of the northbound hump represents the latest studies of the Big Four engineers in this connection.

What has been said in the foregoing concerning this yard applies to northbound movements only. For the southbound series no scales were provided, as the movements consist largely of empty cars, which need not be weighed. Classification is greatly lessened also, as practically the only division necessary is between good and bad-order cars. Each hump

Fig. 9—Typical Siding and Block Station.

has a high semaphore signal, worked by hand, to give signals to the enginemen.

Locomotive terminal facilities were provided at Harrisburg, Mt. Carmel and Lyons, and at Mt. Carmel new shops of sufficient capacity to take care of the repairs of this division were built. Gravity coaling stations, with 20 per cent. inclines, operated in one case by an electric motor and in two other cases by gasolene engines, were installed at Mt. Carmel, West York and Danville. Additional water stations, comprising tanks of 100,000 gal. capacity and 10-in. cranes, were provided at intervals of approximately 25 miles.

SIDINGS AND BLOCK SYSTEMS.

Ample passing track facilities were established at intervals of not less than 5 miles. Owing to the very low maximum gradient, the actual length of railroad built upon maximum grade was very much increased, and this necessitated almost uniformly the establishment of block stations at summits. A typical view of such a block station, with its accompanying signals and interlocking plant, is included in the illustrations. When the view was made the plant was not yet completed, the semaphore blades being absent, and the old switchstand still in place. It should be noted that provision is made for the entering of a siding by a train at the tower, the switch being thrown by the towerman. The train having entered such a siding, will be on a down grade, and therefore in an advantageous position to proceed from a stop when

Fig. 10—Mt. Carmel Passenger Station.

the block is cleared. Permission to proceed is given by means of a starting signal at the far end of the siding. All railroad crossings with other lines have been interlocked, and wherever it was possible to do so a combination of such interlocking plant with a block station was effected.

FREIGHT AND PASSENGER DEPOTS

Seven new passenger stations and three new freight depots were built. The largest of the passenger stations is at Mt. Carmel, a view of it being shown.

The work was carried out under the general supervision of W. M. Duane, at that time Superintendent of Construction and later Chief Engineer of the Big Four. F. W. Smith, Construction Engineer, was in immediate charge of the work.

THE SMOKE NUISANCE IN CITIES.*

BY A. W. GIBBS.

Comparisons are continually being made between the railways of this country and those of foreign lands, and these comparisons, while admitting certain great accomplishments performed by our roads, also dwell on our shortcomings, and in no direction more vigorously than as regards the emission of smoke.

Ignoring, for the present, any difference which naturally exists in the fuels used, it should be remembered that on some foreign roads, particularly those of the continent, state ownership is quite general, and such roads have behind them the financial as well as the moral backing of the states; each road is not obligated to the same extent to pay its way, the comparison being somewhat like that of the postal service of our government, for, if the revenue of the postal department is not equal to the expenditures, a deficiency bill remedies the difficulty.

With the railways of this country, the prime essential in

*In response to a request from the American Civic Federation, which has interested itself particularly in the so-called "smoke nuisance" in large cities, A. W. Gibbs, General Superintendent Motive Power of the Pennsylvania Railroad, has prepared the above paper showing the nature of the problem and the difficulties confronting those attempting to deal with it, together with a statement of what has actually been accomplished in the direction of progress.

manufacturing cheap transportation is the possibility of hauling large train units. In this, we differ radically from the railways of other countries, with which comparisons are most frequently made. This means that in this country the locomotive has developed into a power plant of the most concentrated character, for instance: Where with a stationary plant we are satisfied to burn from 15 to 25 lbs. of coal per square foot of grate surface per hour, in many of our locomotives we must be able to burn not less than 100 lbs. of coal per square foot of grate surface within the same period of time. In a stationary plant, fluctuations in the demands are comparatively slight, while with the locomotive, on the other hand, we must be able to vary the output enormously within an extremely short period of time, for instance. A locomotive may be working at full power, producing little smoke, and be suddenly forced to shut off or stop, under which condition the fire will not adapt itself immediately to the changed requirements, and even with care, under such circumstances, the emission of smoke is certain. The reason for this is that while working with forced draft, there is a fair balance between the rate at which the coal is consumed and the air drawn over the fire to complete the combustion, and the volatile material is distilling off at a fairly uniform rate. With the cessation of the draft, but with the coal still emitting quantities of volatile gases, air is not drawn in in sufficient quantity, with the result so frequently experienced. Again, many coals which when burned in a leisurely manner give little or no visible smoke, will give great annoyance when the rate of combustion is doubled or trebled, as the case may be. Consequently, it may reasonably be expected that the terminals in level country, where trains can be handled in and out of the station without excessive demands on the locomotive, are likely to be more nearly smokeless than those where the locomotive must be overworked from the start.

Limitations of space restrict us in the possible dimensions of the locomotive power plant; consequently, the boiler is operated at an intensity nowhere else required. This is the crux of the whole situation, for while it is possible to burn almost any fuel smokelessly, provided the operation be not too hurried, it requires considerable skill and the best appliances to do so when the rate of combustion is forced to the utmost.

The question may now very properly be asked, how do the conditions of the present day differ from those of the past, and why is this question of smoke prevention more important now than ever before?

In answer to this it may be stated: First, that while the locomotive differs but slightly from the older types, there has been a great increase in the number and size of the locomotives and in the demands made on them. Secondly, the complaints against smoke usually come from cities and towns, rather than from the country. This is natural, for the reason that there are more people and more locomotives at the terminal, and it is just there that conditions are naturally the worst, for it is at the terminals where old fires must be cleaned and new ones started. It is then, of all times, that smoke is most unavoidable. It is also true that many railways have built their terminals in what was then the country, but cities have grown up around them, and with the growth comes the complaints.

Again, it must be borne in mind that the railways alone are not the only factors in the problem. In any city where bituminous coal is used for domestic fires and for stationary plants, the increase in the amount of smoke made over previous years is almost directly proportional to the increase in population.

In the case of the domestic fire, little or no progress has been made. While one of these little chimneys may not attract much attention from the smoke which it emits, they are responsible, in the aggregate, for a very great part of the total defilement. It has been proved that the combustion in the domestic fire is apt to be far less complete than in the case of industrial or locomotive fires, for the reason that the consumption is usually very sluggish and a considerable amount of tarry matter exudes and is carried off as soot, whereas in the other fire the temperature is high enough to insure relatively complete combustion.

The means which the railway has at its command for the elimination of smoke, are:

First.—The use of comparatively smokeless fuel;

Second.—The use of devices of various kinds which may allow the use of otherwise smoky fuels; and

Third.—The education of the men operating locomotives and supervising their work.

It is evident that the railways must produce power with the fuel of the country through which they run, and a glance at a geological map of this country, will convince anyone that bituminous coal is that with which this question must be settled. Anthracite is confined to practically a few counties in the eastern part of Pennsylvania. The amount of anthracite mined is a trifle more than 70,000,000 tons each year. It is the ideal fuel for domestic purposes and for use in plants where its cost is not prohibitive. The total amount is so limited, however, that were the demand to be on this fuel alone, the supply would be inadequate, in illustration of which we submit the following statement* of the consumption for the fiscal year ending June 30, 1907, on 20 railways:

These roads consume annually some 39$\frac{3}{10}$ million tons, 5½ million tons of which is anthracite. Some of the anthracite roads use considerable amounts of bituminous coal. In many cases, this bituminous coal is used as an admixture in order to make it possible to burn under locomotive conditions, the very small sizes of anthracite otherwise not available. This mixture of two coals is not smokeless. Assuming that the entire consumption of these roads were anthracite, it will be seen that this small group alone would consume more than one-half of the total amount of anthracite mined. While such action would doubtless stimulate the production, it would but hasten the disappearance of this most valuable fuel, to say nothing of the enhancement in price which would most assuredly follow. Granting that the anthracite thus absorbed by the railways were replaced by bituminous coal for domestic purposes, the smoke situation would be far worse than at present. The item of cost to the railways would be such a tremendous increase in their expenses as to make it absolutely prohibitive..

The total production of coke is about 36 million tons annually, which is almost entirely used in metallurgical work, for which there is no substitute. While it may be admitted that the production of coke could be largely increased, it should be remembered that in the production of coke from bituminous coal, there is an initial waste of about one-third of the heating value of the fuel, with further losses from breakage in handling, it is evident that this attempted solution would be an unpardonable waste of our natural resources.

However, in the endeavor to obviate smoke, a great many attempts have been made to use coke, and the records of the tests show that the results have been very unsatisfactory, owing to the difficulty with which the fuel is handled, at times the heat being entirely too intense and at others the fire being almost stopped up by the ashes produced. It must not be forgotten that in the process of burning coal to coke, the ash originally in the coal remains in the coke, so that in burning a ton of coke, much more ash results than from the consumption of a ton of the coal from which it was made. The coke, when used, is satisfactory in but one particular, namely, its freedom from smoke.

The reason that anthracite and coke are smokeless is because of the large percentage of fixed carbon and the small percentage of volatile or flame-and-smoke producing material.

Of bituminous coal, somewhat over 400,000,000 tons are mined annually, and the total consumption of this fuel by the

*Omitted.—EDITOR.

railways of this country is estimated to closely approximate 100,000,000 tons. This railway consumption, it will be noticed, is almost sufficient to exhaust the present total production of both anthracite and coke, so that we may as well admit that this being a bituminous coal country, it is this fuel alone that we must consider in solving this smoke problem.

The composition of our various bituminous coals differs widely. Some of them are relatively smokeless. Chemically, these are characterized by the great amount of fixed carbon and the small amount of volatile or flame-and-smoke producing constituents. Approximately, these may range from 70 to 80 per cent. fixed carbon, from 15 to 22 per cent. volatile matter, the remainder being moisture, ash and sulphur. On the other hand, some of the highly bituminous coals will contain less than 50 per cent. fixed carbon, and over 40 per cent. volatile material, and it is with such wide variations in composition that the question must be settled.

It is customary to group under the head of "volatile material," all the substances which will distill from the coal when heated in a closed tube, but on examination it is found that the composition of this material is quite complex, and it does not follow at all that the volatile material of one coal differs only in amount from that of another grade. While much has yet to be learned of the ultimate composition of this material, it is safe to say that some coals contain more of the smoke or soot producing constituents than others. In other words, some bituminous coals while containing approximately the same percentage of volatile material, are more difficult to burn without the emission of smoke.

The low-volatile bituminous coals have, unfortunately, the peculiarity that they are extremely friable and even though mined in lumpy form, will very speedily break up into small size, and although this does not interfere with their usefulness where burned slowly, it is a very serious hindrance to their use in locomotive boilers when worked to the fullest capacity, for the reason that the powerful draft throws out of the chimney a very large part of the fuel put into the firebox, and while at low rates of combustion this is the most efficient of our bituminous coals, this condition does not hold true when the demands on the locomotive are increased. For locomotive purposes, the physical structure of the coal is actually more important than the chemical composition. The important requirements are that the coal shall be fairly lumpy; that it shall be fairly uniform in size; that it shall not readily break up in the atmosphere; and that it shall retain its form in the firebox. When these conditions are met, such fuel can be burned with comparatively little smoke.

A possibility of the future, not yet fully developed, is the use of smokeless or low-volatile coals made into briquettes by the addition of suitable binding material, after which the fuel is pressed into large blocks. The conservation of our natural resources makes it imperative that we should be able to utilize all sizes and kinds of coal, so that instead of selecting the best of the coal and leaving the inferior grades in the mine, the vein which is being mined should have all the fuel removed, as otherwise, the settling of the ground causes the total loss of all the unmined fuel. To the extent that briquetting helps to attain this result, its extension is desirable.

Oil fuel is largely used in some parts of the Southwest, where there are great deposits of oil, otherwise of little value. Owing to the distance and the difficulties of transportation, it is not likely that this fuel can be considered as one available for railways other than those in the territory where such oil abounds, and may be dismissed from our consideration.

To recapitulate: Anthracite, coke and low-volatile bituminous coal are all being used, to a greater or lesser extent, at various points where the smoke condition is most pronounced, in order to minimize the annoyance, but the great question remains: By what appliances or methods, without annoyance to the community, shall we successfully burn the bituminous coal which must be our reliance?

The basis of the requirements for smokeless combustion are as follows:

First—To distill the volatile gases at as uniform a rate as possible.

Second—To present to the burning gases an adequate supply of air to effect complete combustion.

Third—To thoroughly mix this air with the gases.

Fourth—To effect this mixture while the gases are still at a very high temperature.

Fifth—To allow sufficient time for this mixture and combustion of the air and gases to take place before the heat is absorbed and the temperature reduced below the combustion point.

The first condition is the manual one of introducing the coal steadily and in small quantities, preferably allowing it to coke near the door.

The brick arch placed across the lower forward end of the firebox and inclined upward and toward the rear, to act as a baffle to increase the distance that the burning gases must flow before the cooling of the flame is effected. In this process the arch becomes intensely hot, thus maintaining the high temperature while the firedoor is momentarily opened. This device partly meets conditions 4 and 5, and when supplemented by judicious air admission above the fire, partly meets the last four conditions. This, one of the oldest devices, is probably the best and was once the general standard for locomotives. The reason why it was not maintained is that its presence in the firebox is a very serious obstacle to the proper and frequent inspection of the interior, on the perfection of which examination safety hinges. The arch remains incandescent for a long period, thus making proper inspection impracticable. The other reason for its disuse is that the locomotive is a power plant of such concentrated character and so highly forced that the arch alone, without very intelligent firing, will not prevent smoke. To illustrate, it is perfectly practicable to operate at moderate power with such an absence of smoke that for periods of more than one-half hour not a particle of smoke will be visible, but let the conditions change, now shutting off, now working to the utmost limit of capacity, and smoke at once appears because the device will not adapt itself to these extreme conditions.

Other devices embody one or more of the following: Air pipes through the sides of the firebox to admit air to meet conditions 2 and 3; this is only partially effective. Again, air pipes more or less exposed to the heat of the fire so as to preheat the air, are tried, thus attempting to meet conditions 2, 3 and 4. The difficulty with this type is that the heat of the fire usually destroys the device. Still others employ steam jets, sometimes superheated, to thoroughly mix the gases and comply with conditions 2 and 3. Then there is the constantly recurring attempt to bring back to the firebox some of the smokebox gases, as well as the partly burned cinders there collected. This has never been developed to an extent to afford any promise.

In this connection, while considering devices, we cannot omit all reference to the question of automatic stokers. The general progress demands transferring the burden of great manual exertion from the man to a machine. With this end in view, a great deal has been and is being done in the direction of developing automatic stokers which will do the firing with a certain amount of manual supervision. Of these devices, quite a number have been devised and put into use on locomotives. So far, they have not proven satisfactory and, from their imperfections, have not improved the smoke conditions, but the demand for them is so urgently recognized by the railways, not only from the mere smoke question, but also on account of the saving in money and relief to labor, that there is ground for hope that in the comparatively near future a satisfactory automatic stoker will be developed.

The automatic stoker, when perfected, promises to be one of the most effective appliances to aid in smoke suppression.

The gist of the matter is that devices alone, unless supplemented by intelligent and unremitting attention, never long survive. The real reason is, that while new they received a degree of attention that makes them more or less successful, and the credit is ascribed largely to the device when it is actually due to the care.

Evidently, the real line of progress is to stimulate and maintain the intelligent care.

Let us now consider what we believe to be the ultimate solution of the problem, without which the best fuel, and the best appliances, will not be effective in reducing smoke, namely, the education and supervision of the men running and firing locomotives.

It must be remembered that on a large railway system there are thousands of men firing and handling locomotives: First, we have the engineman, who runs the machine and upon whose careful and judicious handling the ease of proper firing largely depends; secondly, we have the fireman, whose skill and interest in properly firing the locomotive must never flag for an instant; third, we have engine preparers and ashpit men at engine houses, who must understand how to clean old fires and build new ones with a minimum amount of smoke.

With the rapid growth of business and consequent increase in the number of employees, it must be realized that supervision in this sense requires a large force of men.

The supervision to be effective involves, first, accurate instruction, and, secondly, repeated personal visitation, and, third, discipline if the instruction is persistently disregarded.

To show how this supervision is being effected, it must be understood that the organization of the railway is practically a military one. On each division, the man in charge of the enginemen and firemen, under the superintendent, is the road foreman of engines, who has assistants, each in charge of districts containing a certain number of locomotives and men. In some cases it is the practice for these assistants to have subordinates to instruct in firing, although the tendency is to put in this position men taken from the ranks of the enginemen, so that their rank will carry authority to instruct both enginemen and firemen. In addition, smoke inspectors, whose entire duty is to report locomotives emitting black smoke, are stationed at various points along the division.

The management has prepared definite and uniform instructions, in printed form, which have been placed in the hands of all men responsible for operating, firing and attending to locomotives on the road and at terminals. From these instructions we quote the following which pertain particularly to the elimination of smoke, namely:

"Enginemen and firemen must work together so as to save coal and reduce smoke."

"The burning of bituminous coal in a locomotive requires air, which must be admitted through the grates and through the fire-door."

"Smoke means waste of coal and must be avoided."

"Large quantities of coal placed in the firebox at one time cool down the fire, cause smoke and waste coal; small quantities at regular intervals will keep the fire bright, prevent smoke and take less coal to keep up steam pressure."

"Lumps of coal should be broken in pieces not larger than 3 in."

"A bright and level fire over the whole grate must be carried wherever possible. When a sloping fire is used, no more coal should be banked at the door than is necessary."

"To prevent smoke and to save coal, the fire-door must be placed on or against the latch after firing or using the scraper, slash bar or hook, and when on siding, at yards, at terminals, or before starting."

"Before the throttle is closed, the blower must be used and the door placed on the latch. Firemen must stop firing long enough before steam is shut off to prevent smoke and waste of coal."

Under present day conditions, more supervision is required than formerly, on account of the rapid increase in railway business, necessitating the employment and promotion of men who have not been through the long course of probation formerly the rule. At Altoona the locomotive testing plant is being used to educate the Pennsylvania officers interested in the fuel question as to its possibilities, so that they may thoroughly understand how to instruct the men to carry out the definite printed instructions.

Furthermore, this road is recognizing the necessity for greater supervision by the appointment of a greater number of supervising officers so that the number of men under the jurisdiction of each will be small enough to admit of constant personal contact.

It must not be forgotten in this connection, that the cost of the supervision mentioned in the foregoing is a very serious burden on the cost of operation, and while the railways would not provide such supervision but for the belief that it will yield adequate return, or from realization of the duties which the railways owe the public, there must be a limit to the amount of money which they can so expend.

As stated before, the cost of fuel is from 8 to 11 per cent. of the total operating cost of a railway, and, therefore, economy in the consumption of fuel is one of the most obvious ways of reducing operating expenses. Fortunately, the methods described in the foregoing for the elimination of smoke from locomotives, are also those which must be followed in order to obtain the maximum economy in locomotive fuel consumption; in other words, the crew making the least smoke is also apt to save the most coal. It follows, therefore, that the railways have a direct financial interest in the elimination of smoke to the lowest possible limit.

It should be clearly understood that there is no one remedy which can be generally applied. Each situation must be treated as a separate problem, giving attention to such points as the character of the road, as to grades, the loading and speed of the trains, the distance which must be run through thickly populated districts, and whether we are considering a terminal or a through station. For instance, the remedy which has so improved the Washington situation will not apply to Baltimore, because the latter is a through station having adverse tunnel grades on each side. The Chicago situation, with Illinois coal, is still another problem. In brief, an intelligent study of the local conditions must be made in each case.

It will be noted that so far, nothing has been said of the possible solution by electrification.

The cost of everything electric is tremendous. The electric locomotives, such as they are, cost more than double the steam locomotives that they replace, and with this but a small part of the story has been told, as we must add the cost of track preparation, of the power plants, and all that goes to make the electric system as a whole.

While anything of the kind is possible from an unlimited expenditure of money, we do not hesitate to say that the time has not yet come when the enormous outlay of capital for the purpose of the electrification of the railways would be justified by the returns, and, further, we assert that the capital thus diverted would be far more useful in other directions.

POOLING OF FREIGHT CARS IN GERMANY.

The agreement for the co-operation of the State railways of the different states of Germany in use of cars requires that each state contribute a certain number of cars to the pool, dating from April 1, 1909, when the joint use begins. Some of these states have to add comparatively few to their existing stock, but two of them must provide comparatively a large number. Future additions will be made as traffic grows. The total joint stock, April 1, is fixed at 455,256, of which the lines under the direction of the Prussian Minister of Public Works are to contribute 379,669. This minister directs not only the Prussian and Hessian lines, long worked under one management, but those of Alsace-Lorraine, which are the property not of any one state, but of the Empire, and as the sovereign of Prussia is the Emperor, naturally his minister has charge of the imperial railways, whose organization is not otherwise connected with the administration of the Prussian railways. Bavaria is next in order in number of cars, having 42,391.

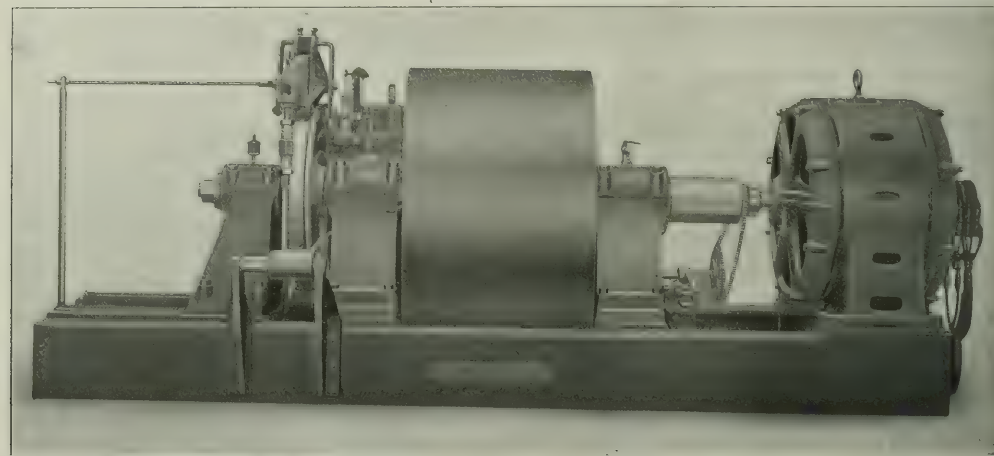
BRAKE SHOE TESTING MACHINE.

The attached illustrations relate to a brake shoe testing machine made by Wm. Sellers & Co. for the American Brake Shoe and Foundry Co., Mahwah, N. J.

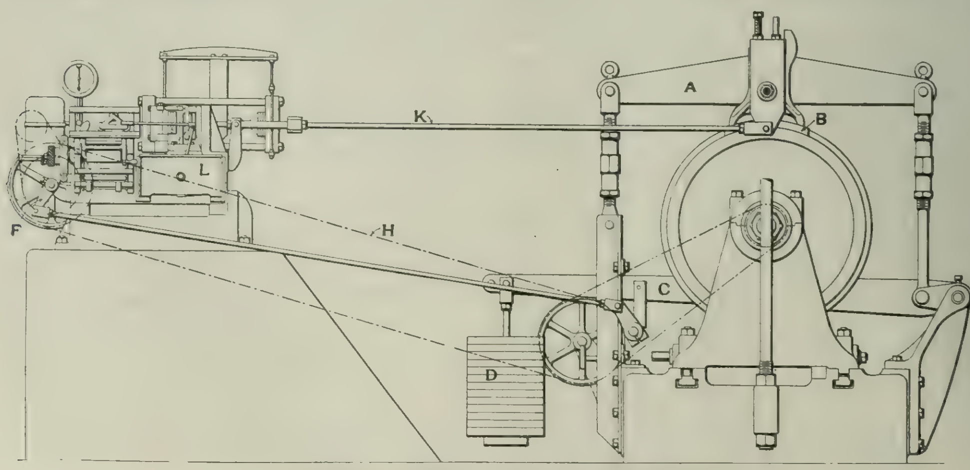
This machine is a development of the Master Car Builders' machine now at Purdue University, and is of more massive and substantial construction and of greater capacity. It is also arranged to be driven by a direct connected motor. By it, brake shoes of various types may be tested under conditions similar to those to which they are subjected in actual service. Broadly stated, its method of action is as follows: A test wheel is mounted on a fly wheel shaft, so that it can be rotated at any desired speed, the inertia of the rotating mass being comparable with the energy imparted to a single freight car wheel by the moving car. The brake shoe to be tested is arranged so that it may be suddenly applied to the wheel under a known load when the driving power is cut off and the tangential pull on the brake shoe, while the wheel is coming to rest, is indicated by a curve drawn by the pencil lever of a special dynamometer on a moving card.

In this machine the flywheel shaft is carried in three bearings mounted on a massive bed plate, which also carries the driving motor coupled directly to the shaft, so that the inertia of the motor may be included in that of the system and the necessary weight of the flywheel proportionately reduced. The test wheel is carried between two bearings, the outer one of which is movable for changing test wheels. This outer bearing was added to relieve the strain on the main bearing due to the higher velocity and greater inertia for which this machine is designed.

The fly wheel is of rather novel construction and admirably adapted to withstand the heavy centrifugal strain. It has the further advantage that its radius of gyration is very large; that is, the weight is concentrated to a great extent in the rim, and thus its total weight could be relatively small. That these are important considerations is apparent when it is realized that the speed and stored energy are equivalent to those of one wheel of an 80-ton car, running at 80 miles per hour. The total weight of the fly wheel itself is 10,800 lbs., and its maximum speed 800 r.p.m. As the fly wheel is 54-in. in diameter, the peripheral speed is 11,350 ft. per minute. It is made in the form of a hollow drum whose heads are steel plates 1⅝ in. thick, and whose circumference is made of rolled



Sellers Brake Shoe Testing Machine.

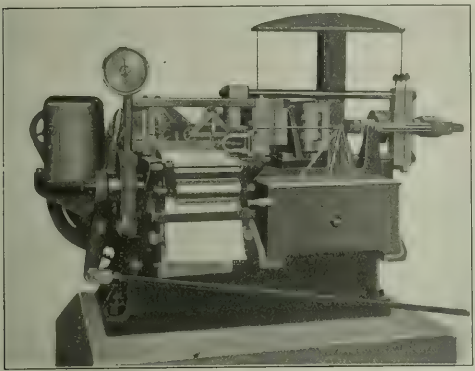


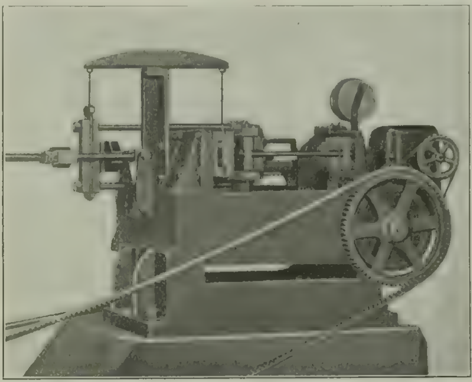
End Elevation of Sellers Brake Shoe Testing Machine.

steel rings tongued to one another and clamped together with heavy rivets.

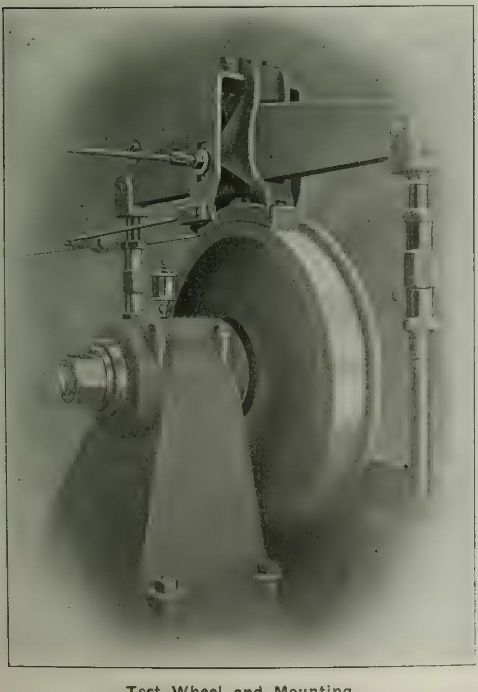
The drawing shows an end view of the machine in its relation to the dynamometer. The brake shoe B is carried by a device, similar to the brake hanger, from a beam A, in a position directly above the wheel, but not in contact with it. A multiplying lever C is arranged with weights D, which may be varied to produce any required load upon the brake shoe. A tension rod K, is attached to the brake shoe support for transmitting the tangential load to the dynamometer. There is a speed recorder driven by a chain belt H, from the motor shaft, having a dial on which the speed of the test wheel may be read in terms of miles per hour.

The dynamometer is of the Emery design, especially adapted to the requirements of this machine. The tangential load of the brake shoe is received upon a flat spring, the deflection of which is multiplied by levers and transmitted to the pencil carriage. The spring is of such a size as to give, after calibration to known weights, a movement of 4 in. to the pencil for the maximum capacity of the dynamometer, of 4,000 lbs. load on the tension rod. The transverse scale of the diagram, therefore, is 1,000 lbs. per inch. The levers are fulcrumed upon thin steel plates in place of the ordinary bearings and knife edges, thus eliminating friction and greatly increasing the durability.





Front and Rear Views of Recording Mechanism; Sellers Brake Shoe Testing Machine.



Test Wheel and Mounting.

When it is desired to make a test the brake shoe is placed in the holder and the motor started, slowly bringing the heavy fly wheel to a speed somewhat above that required. The current is then cut off. The shaft is allowed to slow down until it reaches the desired speed, as observed on the indicator. When this point is reached, the trip lever F is thrown by hand, bringing the brake shoe into contact with the wheel and simultaneously starting a revolution counter. The record, which consists of a blank strip of specially prepared paper, is started in motion immediately prior to applying the brake shoe, the pencil being in contact with the paper at the time. To minimize vibration, a dash pot L is used in connection with the pencil carriage. The pencil draws a curve representing the pull of the brake shoe due to friction between the shoe and the wheel, and a time pen marks seconds on a straight line.

From the diagram and the revolution indicator can be derived the distance traveled after the application of the brake; the average co-efficient of friction and the co-efficient at any time during the test; also the time consumed in stopping, and the number of turns of the wheel. The induction motor drives the machine, which is of the slip ring type regulated by a drum controller, to admit of the slow starting and gradual acceleration necessary when starting the heavy fly wheel.

Since the Sellers machine was installed at Mahwah there has been added a Warner speed indicator from which the speed is obtained accurately within a small fraction of a mile per hour. This instrument is found to be an ideal one for the purpose. There has also been applied a chronograph marking seconds on the paper by which the speed recorder can be accurately checked. An air cylinder connection has been added to raise the weight level, also a tank for cooling the wheel with water if necessary or for applying the brake shoes on a wet wheel. Guards are used to prevent the oil being thrown from the fly wheel. The auxiliary equipment includes a very delicate set of scales, manufactured by H. Kohlbusch & Co., Jersey City, N. J., which will weigh from 50 lbs. to 1 grain, the weights being marked in decimals of a pound. They also

have a very useful machine which faces off a brake shoe or test block to the exact curvature of the test wheel in a few minutes time, doing away with the excessive labor which is often necessary to grind the shoe down to intimate contact with the wheel before making a test.

At present no means are at hand for duplicating exactly the conditions of wearing tests obtained from the M. C. B. machine at Purdue. What is done, however, in this connection, is to run three tests stopping the wheel from a speed of 20 miles an hour with a load of 2,000 lbs., carefully weighing the shoe before and after the test, and comparing the weight with the foot-pounds of work done as indicated on the diagram. This is a more severe test than is made with the M. C. B. machine where the wheel does not actually stop and the shoe certainly gets hotter. In the Mahwah test it has been found that with a test block, having a bearing 12 sq. in. in area the mean co-efficient of friction is practically the same as with a full size shoe having 45 sq. in. bearing area, but that the rate of wear is correspondingly greater with the reduced area in contact up to the point where the heat becomes so high that fusion takes place.

EXPERIMENTAL SIDE DOORS IN THE NEW YORK SUBWAY.

The photograph shows the ends of two cars in an experimental express train which has been running in the New York subway during the past ten days. These cars, originally made by the American Car & Foundry Company at its Berwick shops, were remodeled at the Interborough Rapid Transit Company's shops in New York City. Eight seats were removed and four side doors were cut through, and these side doors, as well as the vestibule doors, are operated by the hand power of the guard, who stands in the vestibule and controls the four doors opposite the platform. The new side doors operate somewhat stiffly; that is to say, the mechanical arrangement is such that it requires either a sturdy or a skilful guard to operate them. The changes made are on the lines shown in the *Railroad Gazette* of February 18, 1908. Bion J. Arnold, consulting engineer, was employed by the New York Public Service Commission, First District, to suggest such improvements in the subway operation as would reduce the congestion and possibly increase the capacity of the line. He recommended some changes in the signaling system, and these side doors, which were to be used for passengers leaving the car, while, at the same time, incoming passengers were using the vestibule doors. The new train did not at first meet with favor from the guards; the operation of the doors required somewhat more than twice as much physical energy at each stop. Frank Hedley, General Manager of the company, has contended that this type of car would be unsuccessful, and expressed himself rather freely at the beginning of the trials; nevertheless, he is giving the train a fair trial. Mr. Arnold has been observing the working of the train and considers it fully up to his predictions. The observed times of unloading and loading at express stations have been about two-thirds of the times required under like circumstances with vestibule door cars only. This would indicate a material increase in the capacity of the express tracks for additional trains during the rush hours.

Side-Door Subway Train; Interborough Rapid Transit.

CAR EFFICIENCY AND CAR SURPLUS.*

BY ARTHUR HALE.

The car surplus has now been in existence for fourteen months† and there is every likelihood that it will continue for eight or nine months longer. When a car shortage does come, as we all hope it will come, it will be a long time before anyone can seriously say that the railways are at fault in not being able to supply all the cars that are needed. This record will stand showing hundreds of millions of useless capital tied up in cars for two years and more.

I am sorry to be obliged to say that we have made little or no progress this year in this common use of cars. To be sure, a few of the railways in the east have made arrangements covering an equal interchange of equipment which involves the common use of cars to some extent. Possibly these arrangements may spread westward, but nothing general in the matter has been done, because with this large surplus, none of us have needed it. I trust that the shippers will not entirely forget the question until the next car shortage comes.

The business of the Committee on Car Efficiency is not confined to the collection of statistics. When there was a car shortage, we were very much interested in the interchange of cars between railways. We kept in close touch with this interchange and whenever we found surplus cars on any one road we did our best to see that the cars were transferred to roads which could use them.

Unhappily, we have had very little opportunity to help in the utilization of surplus cars for a long time. The only material shortages which there have been in the last twelve months have been in the extreme Northwest, when the wheat was moving freely, and these shortages were only indicated because the wheat growers all wanted to ship at once and the northwestern lines could not move the empties to them quite fast enough.

Under these circumstances the committee has had very little to do recently with the movement of empty cars and it has, therefore, turned its attention to the movement of loaded cars.

The question of improving the movement of freight is a question of detail—of infinite detail. I do not mean to take your time by going with any thoroughness into this question, but there is one difficulty which has recently been straightened out, which I feel is of general interest. I refer to the "set-back" rule, which has been in effect at a great many points, especially in the central and western parts of the country, and especially the "set-backs" which have been made on account of defects in safety appliances.

All of us who have had occasion to trace cars have noticed the cases where cars have been delivered by one railway to another, returned the same day or the next day and then redelivered. I have seen a number of cases where this setting back of a car has occurred not only once but twice or three times before the car could pass a junction point and proceed on its journey, and a friend of mine, a car service officer, who has interested himself in the subject, tells me he has seen a case where the same car has been set back five times. I need not tell you that this setting back of cars for repair or for any other reason is a fruitful source of delay, and in considering the general movement of cars, this consideration of the "set-back" was forced on the Committee on Car Efficiency.

Of course, it is primarily a question for the mechanical department and for this reason the transportation men and the transportation committees had not gone into the question very thoroughly, but on taking the matter up with the Committee on Safety Appliances of the American Railway Association and with the committees of the Master Car Builders' Association we found they felt that as their powers were only recommendatory it was not their function to straighten out a matter of this kind.

*From an address before the Traffic Club of Chicago.
†This paper was written in January. Editor.

The Committee on Car Efficiency therefore took the matter up and after a full investigation we presented the facts to the Interstate Commerce Commission. We found that there was a very general impression that the safety appliance law demanded this "set-back." Our investigation, however, showed that this impression was entirely erroneous and that there was nothing in the law to prevent immediate repair of safety appliance defects. Railways are of course at liberty to reject cars with such defects, but the law does not compel this. It would indeed appear that such of the set-backs as involve the hauling of cars with defective safety appliances are absolutely against the law.

Our friends at Washington received us cordially and straightened out the difficulty very promptly. Indeed, their instructions to the Interstate Commerce inspectors were amended so as to remove all possible misunderstanding.

With this basis, the committee is presenting the matter to all the railways at all the junction points in the country, and although it is taking a good deal of time and trouble to cover the ground we are making a great deal of progress in showing the railways that the set-back is not necessary.

I make this announcement to you, gentlemen, because I feel that it is something that is of interest to every one here, and whenever you find a case where a car is set back I trust you will take the matter up and have it straightened out so that this source of delay can be entirely eliminated.

A certain amount of delay is necessary at every inspection point, and this being the case, it is all the more necessary that every unnecessary delay should be done away with in order that the freight of the country move regularly and freely.

STEAM AND TROLLEY IN CONNECTICUT.

The annual report of the board of three Railway Commissioners of Connecticut just at hand represents the product of a "political" rather than a scientific commission. There is, therefore, the usual lack of positive and constructive suggestion and of expressions of policy. The compilations of figures and the records, steam roads and street railways, however, supply the data from which by analysis, can be derived some interesting facts partly obtained by comparison with former reports.

Out of all the steam railways operating within the state the New York, New Haven & Hartford now owns or controls all but two. One of these is the South Manchester line, a private concern operating a total of less than six miles of single track and owned by a manufacturing company. The other is the New London Northern, leased through the Central Vermont by the Grand Trunk, by which the latter reaches the seaboard at New London and carries freight west at differential rates. The line in Connecticut is 56 miles long and, in general character, a kind of "long bridge" with little local traffic and of chief value as an outlet and inlet of the Grand Trunk system. It is interesting to observe that the net income over operation and taxes reported by the lessee is but $72,501, while under the lease it pays the stockholders nine per cent, or $135,000, on the common stock and $71,120 interest on bonded debt denoting the pretty high price that the Grand Trunk pays for its Southern New England outlet. Except some 62 miles the New Haven company thus owns or controls the whole steam mileage in Connecticut. The New Haven system in the four states, Connecticut, Rhode Island, Massachusetts and New York, now contains what were once nearly 100 independent or subsidiary steam lines under separate titles.

The grasp of the same corporation on the Connecticut street railways is impressive. The Commission's report returns a total trolley mileage of 895 in the state. Of this the New Haven company owns directly and has practically merged 486 miles. But in addition it has control of what may be called a sliding scale lease of 215 miles of the Connecticut Railway & Lighting Company, making that 701 miles owned

or controlled out of the whole 895 miles in the state or about 79 per cent., which chiefly is vested and operated in the name of the New Haven's "holding" corporation, the Connecticut Company. Out of some 35 street railway companies in the state originally independent only six are so now. The rest have passed under the New Haven's ownership or control.

In the course of the rapid mergers and transfers—during which the New Haven company itself, while retaining its old title, has shifted to the more expansive charter of one of its trolley corporations—the trolley capitalizations in various shapes have been changed into obligations of the steam company and become inseparable. As a consequence Connecticut will never have official returns of her street railways as a whole relating to capitalization and debt which will be of the slightest value. For an example, not long ago some $12,000,000 of trolley obligations of a single class were converted by outside holders, for the most part living in Massachusetts, into stock of the steam corporation. It is incidentally to be noted that, of the trolley lines in the state still making capitalization returns, outstanding stock and debt represent about $102,000 per mile or nearly double the capitalization in Massachusetts, where the general rule of replacement value has prevailed as a basis for capitalization. Nevertheless, historically, only one trolley corporation in Connecticut has gone under a receivership while many companies have done so in Massachusetts. The paradox is accounted for largely by the fact that in Connecticut the New Haven and the Connecticut Railway & Lighting Company have "carried" the weak and subsidiary lines.

Results of extinguished competition of steam and trolley with the absorption of parallel trolley lines by the big steam corporation are suggested by an increase of trolley passengers from 127,701,425 in the fiscal year 1907 to 138,530,816 in 1908, an increase of 10,829,391 or about 8.5 per cent., while during the same period steam railway passengers, reported by the New Haven Company, increased only from 76,687,838 to 77,145,337, or a little more than one half of one per cent. The year, ending June 30, 1908, included six months of acute business depression. But the increased trolley traffic in Connecticut, due to diminished rivalry must be qualified by the fact that in general street railways suffered less from hard times than the steam roads.

A UNIQUE EXCURSION CAR.

The South Dakota Central has had an unique passenger car built by Hotchkiss, Blue & Co., Railway Exchange building, Chicago. The car has a Pullman body, is 60 ft. long, and has a seating capacity of 160 persons. This large seating capacity, as shown by the illustration, is secured by placing four benches the full length of the car. The benches are finished in hard pine. The car is to be used for handling excursion parties and hauling workmen. It was built at the works of Hotchkiss, Blue & Co., Harvey, Ill. The following gives some of its special equipment: Interior finish, imitation mahogany; light, 4 double chandelier lamps; curtains, new Pantasote; heating, 2 Spear stoves; trucks, 6-wheel, steel tired; air brakes, Westinghouse; toilet, one.

Excursion Car on the South Dakota Central.

TRAIN ACCIDENTS IN JANUARY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of January, 1909. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Train Accidents in the United States in January, 1909.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No persons reported Kil'd.	No persons reported Inj'd.
4.	St. L. & S. F....	Fisher, Okla.	bc.	P. & Ft.	2	20
8.	Boston & Me....	Hollis.	bc.	P. & P.	0	4
14.	Chic. & N. W...	Chicago.	rc.	P. & P.	1	6
†15.	Denver & R. G..	Dotsero.	rc.	P. & Ft.	25	45
16.	Chic. & N. W...	Peoria.	bc.	Ft. & Ft.	3	0
†22.	Pennsylvania ..	Summerhill.	rc.	P. & P.	3	6
29.	Pitts. & L. Erie.	Beaver Falls.	xc.	Ft. & Ft.	1	4

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
3.	Phila. & Rdg....	Trenton.	runaway.	Pass.	0	1
5.	Ches. & Ohio...	Caperton, W. Va.	ms.	Pass.	2	3
7.	Great Nor......	Bellingham.	malice.	Pass.	1	1
12.	M., K. & Texas.	Hamburg, Mo.	b. truck.	Pass.	0	22
26.	Pennsylvania ...	Adams Mills.	b. rail.	Pass.	0	8
†26.	Union Pacific...	Dana.	d. track.	Pass.	1	30
28.	Southern	New Albany.	d. rail.	Pass.	0	20
30.	Union Pacific...	North Platte.	d. switch.	Pass.	1	1

The butting collision at Dotsero, Col., on the evening of the 15th. was between a westbound passenger train and an eastbound freight. It occurred at 9.47 o'clock. Twenty-four passengers and one employee were killed or fatally injured and thirty-five passengers and ten employees were injured. The passenger train had an order to wait at Dotsero until 9:55, but, in violation of the order, passed there at 9:46 and met the freight about 80 rods west of the west switch. The passenger train consisted of engine, tender, baggage car, two coaches, 2 tourist sleeping cars, 1 dining car and 3 standard sleeping cars. The freight was drawn by two engines. The passenger train was running down grade at 30 miles an hour and the collision was unusually violent, two of the engines, minus their wheels, being left standing locked together in a vertical position. Most of the persons killed were in the chair car and the tourist car, both of which were completely wrecked. The collision occurred on a curve where a high bluff made the view very short. The passenger engineman and conductor are said to have been experienced men.

The rear collision near Summerhill, Pa., on the 23d occurred about 1 a.m. It resulted in the death of one passenger, one Pullman car conductor and one Pullman porter, and the injury of two passengers, four mail clerks and a fireman. The second section of westbound passenger train No. 21 ran into the rear of the preceding section, which had been stopped by freight trains ahead, and the rear car of the first section, a parlor car, was completely wrecked. The three persons killed were in this car, and they were the only persons in it. The engine of the second train and the second car were badly damaged, but the first car—a new steel mail car—was but slightly damaged.

The butting collision near Fisher, Okla., on the 4th was between a westbound passenger train and an eastbound freight, and three engines were badly wrecked. There was a dense fog at the time and neither train was visible from the other until a few seconds before the collision. One engineman was killed and three trainmen were injured. The collision was due to inefficient flagging. The freight had stopped for lack of steam and had sent a man forward to call the passenger engine to its assistance. But after the flagman had gone the men in charge of the freight got up steam and started ahead.

The butting collision near Peoria, Ill., on the 16th was between two extra freight trains and both were going at full speed. Both engines were badly wrecked and one engineman, one fireman and two brakemen were killed, and two employees were injured. The collision was due to the error of the conductor and the engineman of the northbound train. The engineman assumed that the southbound train, which he had orders to meet, had arrived. His cooductor told him that the trains which they were to meet had arrived and he then started out without consulting the register.

The derailment at Adams Mills, Ohio, on the 26th was caused by a broken rail. The train was running at full speed and two cars went off the track, but all of the injuries to persons were reported as slight.

The derailment at Dana, Wyo., on the 26th was reported as due to a loose rail, left loose by the negligence of track repairers. Five coaches were ditched.

The derailment at Hamburg, Mo., on the 12th was reported as caused by a broken truck. Seven cars were overturned. The accounts say that the only available help in the distress of the passengers had to be called by telephone from St. Charles, 36 miles away.

Only three street car accidents reported in the newspapers in January were of marked severity, one each at Portland, Ore., Los Angeles, Cal., and Cincinnati, Ohio. All were runaways. At Los Angeles the runaway car ran into the side of a passenger train. Each of the other two caused a considerable number of injuries, one or more being fatal in each accident.

Four serious passenger train derailments were reported in Canada in January. In the Frazer canyon, on the Pacific coast, a Canadian train was precipitated into Frazer river and two enginemen were killed. On the Grand Trunk, near Guelph, a car derailed by a broken truck fell down a bank and 20 passengers were injured. On the Temiskaming & Northern Ontario a part of a passenger train fell down a bank and 20 passengers were injured. On the Intercolonial near Campbellton, N. B., a whole train was ditched and one engineman was killed.

[1] Abbreviations and marks used in Accident List:
rc. Rear collision——bc. Butting collision——xc, other collisions——b. Broken——d. Defective——unf. Unforeseen obstruction——unx. unexplained——derail. Open derailing switch——ms. Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire. Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

FREIGHT TRAFFIC ON THE ILLINOIS TRACTION SYSTEM.

The Illinois Traction System, operating 419 miles and running from St. Louis to Peoria and Danville, owns and operates 18 express motor cars, 40 express trailers, 12 electric locomotives and about 500 box and gondola cars. Nearly 20 per cent. of the gross earnings come from freight and express business, and of this business 60 per cent. is in the form of package freight handled on express cars and 40 per cent. heavy freight handled on freight cars. The heavy freight tonnage includes coal hauled for the use of the company.

Package freight is handled by electric motor cars with trailers attached, and coal, grain and other carload freight is hauled in freight trains by electric locomotives. No interchange of freight cars is made with any steam railway, so that the freight business is entirely local. The United States Express Co. has operating privileges in the cars of the Illinois Traction. This business is handled separately from package freight, the express cars being attached to passenger trains as well as express trains.

No attempt is made to compete with steam roads for the haul of freight destined for distant points, but the rates on freight for short distances are fixed more nearly on a mileage basis than are the rates on a steam road, and in this way

the electric company can underbid the steam company. For instance, the rate on coal from Springfield, Ill., to Decatur, 40 miles, is 40 cents a ton, or at the rate of one cent per ton-mile. The rate from Worden to Staunton, 6 miles, is 32 cents, or at the rate of 5.33 cents per ton-mile. By catering to this short-haul traffic, the average length of haul on coal is about 30 miles and the average revenue per ton-mile is 1.2 cents as against an average revenue of 0.5 cents per ton-mile received by steam roads in the same territory.

The cost of operating the freight department is estimated to be about 50 to 55 per cent. of the freight department's gross earnings.

All carload and heavy freight is handled at night between 9 p.m and 6 a.m. by regular express trains having a fast schedule. For instance, the night express out of East St. Louis and Peoria makes a through run of 175 miles in nine hours. Three nights a week refrigerator cars are run from St. Louis to Hillsboro, Springfield and Peoria, and considerable business in hauling fresh meat out of St. Louis is being developed.

Beside the night expresses there are what are called "noon runs" by express trains that leave Peoria, Bloomington, Decatur, Danville, Springfield and East St. Louis at about noon and carry small package freight. A merchant in a small town on the line can thus telephone orders to St. Louis to a wholesaler and get goods delivered the same afternoon.

The electric locomotives in the heavy freight service are fitted with 73-C motors, with type M control automatic couplers and Westinghouse E. L. automatic air brakes. The body is sheathed with steel. The gear ratio is 17 to 73, and the locomotive is said to be capable of hauling 14 loaded cars at 20 miles an hour.

PURCHASE OF RAILWAY COAL.

At the January meeting of the Western Railway Club Eugene McAuliffe, fuel agent of the Rock Island, read a paper on the "Purchase of Railway Coal," in which he pointed out the expense to railways due to the irregular supply of coal and the necessity of storage. He said:

"There is plenty of coal, but the mines do not work as regularly as they should, and they cannot be depended on for smooth operation. Every two years it is the fashion of the miners to take a ten weeks' vacation, and the next one is due March 31, 1910. A few months before that time the miners get out about double the usual quantity of coal to tide over the consumer during the strike period, but he does not do it intentionally; he works for money to tide himself and family over; but the result is the same. The real loser is the consumer, the loss to the railways in storing coal, including labor, depreciation of coal, with consequent increase in operating expenses, all amounting to 40 or 50 cents per ton." Mr. McAuliffe suggests that something ought to be done "to avoid this biennial shutdown and prevent this waste of energy and material. If the two parties cannot agree, then a national arbitration committee should be appointed or a conciliation law, like that in force in Canada, should be enacted."

The quantity of coal used by railways in the United States in 1907 was 115,000,000 tons, or 24 per cent. of the total coal mined in the United States; and a day's consumption equals 7,876 forty-ton cars, or a train 60 miles long.

Fuel contracts should not be given as a reward for commercial tonnage, for when you get the contractor's tonnage you are liable to lose that of his competitor and they both pay the same rates of freight. Quality and price coupled with reliability of delivery are the conditions that should govern. Dividing contract tonnage on a percentage basis is not a good thing either, because it eliminates all competition as to price and grade.

The empty car is always a live issue in connection with coal transportation, and, paradoxical as it may seem, coal car shortages on railways always go hand in hand with coal shortage. Plenty of coal, plenty of cars; but this is not an argument for tying up cars. In regard to inspection, Mr. McAuliffe said:

"The best inspection is that which can command on the part of the inspector the whole force of the producer's organization to the end that good coal will be produced. It is not a good thing for the purchaser to employ men to stand around coal mines looking at the coal as it goes into the cars. That means that the buyer is furnishing superintendents that the seller should provide and pay for. I intend to gradually withdraw the inspectors in my department from the mines, and, instead, put them on work that the railway company should look after. The purchase side, as well as the selling side, of the coal business calls for the application of honest principles. The livest item in the coal line to-day is the question of car lot weights, both empty and loaded. There is very little dishonesty practiced in the handling of weights of car lot coal, but there are many inaccuracies. One car has an over-weight and the next one an underweight. The one who gets good measure does not complain, but the one who suffers does. The 50-ton coal car loaded to as much as 156,000 lbs. calls for extra good track scales, well set, maintained and handled. Weight is a factor of equal importance to that of the rate when figuring freight on a car of coal; and every railway having a mileage warranting the same should have a weighing bureau with a competent man in charge. Due consideration should be given to what may be called legitimate shrinkage of coal weights particularly that of evaporation of moisture. It is possible to weigh cars accurately without uncoupling at either end, and cars cut at one end can be weighed with accuracy, provided they are stopped on the scale, with minimum expenditure of time and expense."

The paper was discussed at length by W. E. Symons, who presented a mass of statistics from the government bureaus; first, relating to the quantity of coal produced in the United States as compared with other countries and in individual states, with the value of the coal per ton at the mines. He presented statistics relating to strikes and lock-outs in the United States, showing that of all industries miners were the first in number of strikes and employees thrown out of work. The coal industry has suffered more from the result of labor troubles than any other industry in this country, and some means should be provided whereby differences between miners and their employers could be adjusted without the possibility of numerous strikes pending a revision of the wage scale. In the past 25 years 5.7 per cent. of the coal miners' strikes were settled by joint agreement and 1.6 per cent. by arbitration; and of the lock-outs 12 per cent. were settled by agreement and 2 per cent. by arbitration.

Mr. Symons also quoted from the Bulletin of the University of Illinois, relating to the weathering of coal, in which it is concluded that outdoor exposure results in a loss of heat value from 2 to 8 per cent. Dry storage has no advantage over storage in the open except with high sulphur coals. In most cases the loss in storage seems to be practically complete at the end of five months. Mr. Symons emphasized the importance of purchasing coal according to chemical composition and said:

"Assuming a ton of coal at 2,000 lbs. has 14,000 heat units and costs $2 per ton, the cost to the railway is 70 units for 1 cent; and if the coal is furnished with only 10,000 units there is an actual loss to the railway in value of the fuel of 28½ per cent. This is not only a money loss in purchasing the material, but causes poor work by the locomotive, resulting in train delays, overtime work of crews and increased boiler repairs. The railways would not tolerate this method of purchasing in such supplies as ties, lumber, paint, rails, car wheels, etc.; but the fuel item, which constitutes about 12 to 14 per cent. of the operating expense, is given very little attention on the majority of lines and on some is almost ignored."

General News Section.

Registered mail is now carried between Chicago and New York on the Twentieth Century Limited of the New York Central lines.

The Oregon legislature has passed a resolution proposing an amendment of the state constitution to enable the state to own and build railways. In the discussion of the resolution, E. H. Harriman was accused of refraining from developing lines that he controls in central Oregon, and also of preventing other lines from being built in that section.

The United States Civil Service Commission announces an examination on March 10-11, 1909, to secure eligibles from which to appoint civil engineers in the Philippine service. The entrance salary is usually $1,400 a year. It especially wants men who have had experience in river or harbor work to fill two positions, one at $1,800 and one at $2,000 a year.

At New York City, February 17, Charles R. Stocker, a passenger conductor of the New York, New Haven & Hartford, running a through night train between New York and Boston, was arrested on a charge of violating the Interstate Commerce law in carrying two passengers through from Boston to New York for $2 apiece, which is less than half the regular fare; and berths were thrown in. Stocker had been suspected and two detectives and an agent of the Interstate Commerce Commission were put on the train to test him. One of the three men paid full cash fare—$4.65. The significant difference between arresting a dishonest conductor under state laws and under the federal law lies in the much greater penalty prescribed by the federal law, the maximum being $5,000 fine or two years imprisonment, or both fine and imprisonment. Also federal prosecutors are known to be very persistent in their prosecutions.

At Delmar, Del., on the morning of February 22, about 3 o'clock, a southbound passenger train of the Pennsylvania Railroad collided with two locomotives standing on the main track, and the engines and the first two cars of the passenger train were wrecked. One engineman, one baggageman, one express messenger and four mail car employees were killed, most or all of them being burned to death in the fire which immediately enveloped the wreck, having been started by coals from one of the fireboxes. The two standing engines were waiting to take this or a following passenger train south over the New York, Philadelphia & Norfolk. Why they were on the main track without protection has not been explained. According to one statement, the men in the yard understood that the passenger train, which was a second section, was 15 minutes behind the first section, whereas it was actually only about four minutes behind.

Safety Valves.

The discussion on safety valves given before the American Society of Mechanical Engineers at a meeting in New York City, on Feb. 23, impressed upon the society the vital need for the appointment of a research committee, the duty of which should be to conduct investigations with the view of settling upon some standard method for determining a basis on which to calculate the size and rating of safety valves. It was noticeable that there were as many seemingly correct opinions as there were speakers. Various rules and formulas were suggested, such as basing calculations on the grate surface, on the effective lift of the valve or on the discharge. Perhaps the most convincing arguments were those given by P. G. Darling, Mechanical Engineer of the Ashcroft Manufacturing Co., New York, in an exhaustive paper covering the results of a large number of tests. The main point of this paper was that the factor of safety of a valve is its capacity, disregarding mechanical reliability. Tests were made upon a number of standard makes of valves to determine the lifts which they really had. These valves were commercially rated as being of the same capacity, but the tests showed a great variation in the lifts even as much as 300 per cent. The point was made that the capacity of safety valves should be determined in terms of the effective diameter and lift.

The discussion brought out an opinion which seems to be a very sound one—namely, that if the manufacturers of safety valves would indicate, in addition to the size of the valve, its capacity at different adjustments for exhausting steam, it would help conditions materially, both from the standpoint of the manufacturers of boilers and inspectors. The subject of valve springs was gone into at some length by A. B. Carhart, Superintendent, Crosby Steam Gage & Valve Co., Boston, Mass., who advocated that valves should not be rated according to their discharge or capacity alone, taking a practically opposite standpoint from previous speakers. The question of round or square section wire for springs was also discussed, and there seemed to be as many advocates of the square section as of the round.

The final result of the discussion was that there are available no reliable data upon which to base calculations of safety valves, and that a research committee, such as will undoubtedly be appointed in the near future by the American Society of Mechanical Engineers, will have a large amount of work before it.

Complete abstracts of the papers and discussion given at this meeting will appear in the *Railroad Age Gazette* in an early issue, and will contain a large amount of information and data which will assist materially in the understanding of a subject not now very well understood.

The Mauretania's New Speed Record.

The Cunard steamship Mauretania arrived at the lightship off Sandy Hook on Thursday, February 11, at 10.35 p.m., having made the run from Daunts rock, Queenstown, 2,890 miles, in four days, 17 hours, 50 minutes. For the last two days strong head winds were encountered. This is one hour 46 minutes less than the best previous record, which was made by the Lusitania. The Mauretania left Liverpool on Saturday night, February 13, and Queenstown Sunday morning. She could not land her passengers in New York until Friday morning, as the deep channel at the entrance of the harbor has not yet been lighted and cannot be used at night by large vessels. In the 25 hours from noon Sunday to noon Monday the Mauretania made 671 knots, or an average of nearly 31 miles an hour, as we measure on land. This is 21 knots better than the best previous day's record, which was made by the Lusitania last August.

Electric Passenger Trains in Colorado.

The Inter-Mountain Railway now runs trains by electric power between Denver, Colo., and Golden, 13 miles. Steam engines are still used for freight trains. The branch of this road from Denver to Barnum, five miles long, already had electric power.

Chinese Railways.

The Canton authorities have received instructions from the ministry of posts and communications to open a railway college and admit a number of students there to be trained for three years. On the completion of their course of study in Canton the students will be sent to foreign countries to pursue further studies in railway engineering for a period of three years.

A company has been organized with sufficient capital to build a railway from Tam Sui to Au Tou, in the province of Kwangtung. Work on this road was ordered to begin during October, 1908.

It is reported that the gentry and wealthy merchants of Shantung propose to build a railway from Fushan to Weishan, a distance of 40 miles, with a capital of $80.000, which will be divided into 16,000 shares at $5 per share. The capital

will be increased in due course. A deputy has been sent to that port to canvass for 1,000 shares.

The concession for the Canton-Macao Railway has been canceled by the Chinese government, with the sanction of the Portuguese minister, as the concessionaires have failed to construct the line within the stipulated time. The Portuguese minister at Peking has agreed that a Chinese company may build this line.

It is stated that the proposed railway extension of the line connecting with the Pinghsiang mine is to be undertaken by the Canton-Hankow Railway Company. The Pinghsiang coal mine proposed to make this extension on their line from Chuchow to Shanshan, but the Hunan division of the Canton-Hankow Railway considered that this line should be built by the railway company as part of the main line. The necessary consent of the board of posts and communications has already been obtained.

It is said that the Canton-Kowloon Railway will be in a position before many months to accept tenders for rolling stock on their line, and that they will receive bids from all companies wishing to forward estimates for construction cars and general railway supplies.—*Consular Report.*

Railway Business Association.

The story of four months' accomplishment by this association since the time of the conception, in the minds of a number of supply manufacturers, of a plan to conserve the interests of railways and those of its members who are dependent for their business on railway prosperity, is interestingly told in a pamphlet just issued. The methods employed and the actual results obtained are given along with the list of membership, to date, which follows:

Adams & Westlake Co., Chicago.
Ajax Forge Co., Chicago.
Allis-Chalmers Co., Milwaukee, Wis.
American Brake-Shoe & Foundry Co., New York.
American Locomotive Co., New York.
American Steel Foundries, Chicago.
American Locomotive Finished Material Co., Atchison, Kan.
American Balance Valve Co., Jersey Shore, Pa.
American Brake Co., St. Louis, Mo.
American Valve & Meter Co., Cincinnati, Ohio.
Anglo-American Varnish Co., Newark, N. J.

Baldwin Locomotive Works, Philadelphia, Pa.
Barney & Smith Car Co., Dayton, Ohio.
Bass Foundry & Machine Co., The, Fort Wayne, Ind.
Beaver Dam Malleable Iron Co., Beaver Dam., Wis.
Bettendorf Axle Co., Davenport, Iowa.
Boston Belting Co., Boston, Mass.
Bowser, S. F., Co., Inc., Fort Wayne, Ind.
Bradley, Osgood, & Sons, Worcester, Mass.
Bridgeport Malleable Iron Co., Bridgeport, Conn.
Buckeye Steel Castings Co., Columbus, Ohio.
Buda Foundry & Manufacturing Co., Chicago.
Buffalo Brake-Beam Co., New York.

Camel Co., Chicago.
Central Railway Signal Co., Pittsburgh, Pa.
Chicago Pneumatic Tool Co., Chicago.
Chase, L. C., & Co., Boston, Mass.
Chicago Railway Equipment Co., Chicago.
Cleveland Frog & Crossing Co., Cleveland, Ohio.
Columbia Nut & Bolt Co., Inc., Bridgeport, Conn.
Commonwealth Steel Co., St. Louis, Mo.
Crerar, Adams & Co., Chicago.
Curtain Supply Co., Chicago.

Dayton Malleable Iron Co., Dayton, Ohio.
Dayton Manufacturing Co., Dayton, Ohio.
Dearborn Drug & Chemical Works, Chicago.
Devoe, F. W., & C. T. Raynolds Co., New York.
Dickson Car Wheel Co., Houston, Texas.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Farlow Draft Gear Co., Baltimore, Md.
Fairbanks, Morse & Co., Chicago
Flannery Bolt Co., Pittsburgh, Pa.
Flood & Conklin Co., Newark, N. J.
Franklin Railway Supply Co., Franklin, Pa.

Galena Signal Oil Co., Franklin, Pa.
General Electric Co., New York.
Gifford-Wood Co., Hudson, N. Y., and Chicago.
Gold Car Heating & Lighting Co., New York.
Gould Coupler Co., New York.
Griffin Wheel Co., Chicago.

Hammett, H. C., Troy, N. Y.
Haskell & Barker Car Co., Michigan City, Ind.
Hibbard, Spencer, Bartlett & Co., Chicago.
Hunt-Spiller Manufacturing Corporation, South Boston, Mass.
Hunt, Robert W., & Co., Chicago.
Hutchins Car Roofing Co., Detroit, Mich.

Independent Pneumatic Tool Co., Chicago.
International Steam Pump Co., New York.
Inland Steel Co., Chicago.
Interstate Iron & Steel Co., Chicago.

Jenkins Bros., New York.
Johns-Manville, H. W., Co., New York
Joseph, Isaac, Iron Co., Cincinnati, Ohio.

Kay & Ess Co., Dayton, Ohio.
Keasbey & Mattison Co., Ambler, Pa.
Keith Car & Manufacturing Co., Sagamore, Mass.
Kerite Insulated Wire & Cable Co., New York.
Kirby Equipment Co., Chicago.

Long, Charles R., Jr., Co., Louisville, Ky.

Manning, Maxwell & Moore, Inc., New York.
Maryland Car Wheel Works, Baltimore, Md.
McConway & Torley Co., Pittsburgh, Pa.
McKay, The James, Co., Pittsburgh, Pa.
Metal Plated Car & Lumber Co., New York.
Miner, W. H., Co., Chicago.
Morden Frog & Crossing Works, Chicago.
Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill.

Nathan Manufacturing Co., New York
National Lock Washer Co., Newark, N. J.
National Machinery Co., Tiffin, Ohio.
National Malleable Castings Co., Cleveland, Ohio.
New York Air Brake Co., New York.
New York Belting & Packing Co., Ltd., New York.
Niles-Bement-Pond Co., New York.

Pantasote Co., New York.
Parkesburg Iron Co., Parkesburg, Pa.
Patterson-Sargent Co., Cleveland, Ohio.
Peerless Rubber Manufacturing Co., New York.
Pettibone, Mulliken & Co., Chicago.
Pickands, Brown & Co., Chicago.
Pittsburgh Spring & Steel Co., Pittsburgh, Pa.
Portland Iron & Steel Co., Boston, Mass.
Pneumatic Gate Co., Chicago.
Pratt & Lambert, Inc., Buffalo, N. Y.
Pratt & Letchworth Co., Buffalo, N. Y.
Prentice, L. H., Co., Chicago.
Pyle-National Electric Headlight Co., Chicago.

Quaker City Rubber Co., Philadelphia, Pa.

Railroad Supply Co., Chicago.
Rand, McNally & Co., Chicago.
Ramapo Iron Works, Hillburn, N. Y.
Republic Iron & Steel Co., Pittsburgh, Pa.
Rodger Ballast Car Co., Chicago.

Safety Car Heating & Lighting Co., New York.
Schieren, Charles A., Co., New York.
Scully Steel & Iron Co., Chicago.
Sellers, William, & Co., Inc., Philadelphia, Pa.
Sherburne & Co., Boston, Mass.
Sherwin-Williams Co., Cleveland, Ohio.
Simmons Hardware Co., St. Louis, Mo.
Sipe, James B., & Co., Pittsburgh, Pa.
Standard Car Truck Co., Chicago.
Standard Coupler Co., New York.
Standard Railway Equipment Co., Pittsburgh, Pa.
Standard Steel Car Co., New York.
Storrs Mica Co., Owego, N. Y.

Treat, C. A., Manufacturing Co., Hannibal, Mo.
Tyler Tube & Pipe Co., Washington, Pa.

Union Steel Casting Co., Pittsburgh, Pa.
Union Switch & Signal Co., Swissvale, Pa.
U. S. Metal & Manufacturing Co., New York.
U. S. Metallic Packing Co., Philadelphia, Pa.

Walsh, P. T., Davenport, Iowa.
Ward Equipment Co., New York.
Western Electric Co., New York.
Westinghouse Air Brake Co., Pittsburgh, Pa.
Westinghouse, Church, Kerr & Co., New York.
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
White Enamel Refrigerator Co., St. Paul, Minn.
Wood, Guilford S., Chicago.
Worth Bros. Co., Coatesville, Pa.
Wyckoff Pipe & Creosoting Co., New York.

Courtesy on the Harriman Lines.

M. J. Buckley, General Superintendent; R. B. Miller, General Freight Agent, and William McMurray, General Passenger Agent, of the Oregon Railroad & Navigation Company and the Southern Pacific lines in Oregon, with the approval of J. P. O'Brien, Vice-President and General Manager, have issued the following circular on courtesy:

"TO EMPLOYEES ON THE LINE:

"Courtesy costs nothing and yields large returns. Cordial relations with customers are an asset. You increase this property's value to owners and patrons, as well as the value of your service, by making friends.

"Rules necessary in a business so complex cause less dissatisfaction than unfortunate methods of enforcement. Your training renders familiar to you matters not understood by the public, and inquirers are entitled to prompt, courteous and complete replies. If something seems at fault beyond your power to correct, explain how and through whom to seek the remedy. Manner outweighs words. The salesman of transportation should make his customers as welcome as would any business man, inspiring the wish to come again.

"TO GENERAL OFFICE AND DIVISION EMPLOYEES:

"Above equally applies; and remember your duties concern one department, where you should be expert, while the 'boys out on the line' deal with requirements of all departments. Courtesy between and among you reflects credit on all, rendering easier and pleasanter the task of each.

"TO PATRONS:

"The management's wishes and instructions are published for information. It is hoped complaints may never, and believed they will seldom, be necessary.

"If received they will be vigorously investigated and remedied."

Merits on the Atchison.

The Santa Fe Employees' Magazine gives a statement of merit marks placed to the credit of various employees on the Atchison, Topeka & Santa Fe within a recent month. We copy some of the less common kind of items:

Miss N. Gazot, operator, Albuquerque Division, ten. Miss Gazot overheard a message sent to another office instructing conductor to pick up loads at her station. When conductor arrived and reported ready she asked him if he was not going to get out the loads. He said he had no instructions to do so. She obtained copy of message and delivered it, thus preventing serious delay to important freight.

O. G. Fuller, brakeman, Pecos Valley Lines, fifteen, for discovering bent axle under car.

T. Cole, conductor, and E. G. Fletcher, brakeman, Southern Division, five each, for sanding rail up a hill to avoid doubling.

R. G. Randolph, operator, Lamar, Colo., five, for reporting to despatcher that train passing his station had brakes sticking.

S. C. Underwood, fireman, Southern Division, ten, in appreciation of good work performed while tied up under the sixteen-hour law.

C. E. Ray, agent, Valley Division, five, for stopping a train under which a brake-beam was dragging, thus preventing a possible serious accident.

C. Turner, engineer, Los Angeles Division, five, in appreciation of unusual repairs made on an engine while on the road. In this instance the pipe broke off the front end of the main reservoir, and engineer made repairs by cutting a piece of pipe out of the reservoir with a chisel and filing threads on the part that remained, doing the work while on a siding waiting for an opposing train.

The Average P. R. R. Engineman.

Statistics compiled by the Pennsylvania Railroad January 1, 1909, show that the average age of its 4,802 enginemen is 44 years, and the average length of service 21 years. The average age at which they were appointed enginemen was 31 years, while the age at which they entered the service was 23 years. Included in these figures are 134 enginemen who have been retired from active service and are now reciving pensions granted them by the company. Their average age is 72 years. Up to the time they were retired these men had served the company an average of 43 years, 36 of which had been spent as enginemen. Their present retired pay amounts to 43 per cent. of the average wages for ten years preceding retirement.

New York Central Rails.

The rails recently ordered by the New York Central are being rolled under the tentative specifications which the company prepared for its 1908 rails. They are arranged to secure, as far as possible, the best principles of Bessemer practice. The rails made last year under these specifications were much better than those received immediately previously.

It is difficult to make any specifications with a sufficient carbon content, with the 0.10 phosphorus which the company has to accept, to give the rails such physical properties that they can withstand the severe abrasion on curves, and also have a slow rate of wear. The first consideration has been safety, and that factor has been markedly increased. There will also be some improvement in the resistance to abrasion on curves, and also to wheel tread wear. The company is sure that it will reduce the number of rails which, after four or five years service, develop split heads. Last year there was a marked reduction in second quality rails, the mills in that way co-operating with the railway.

This year the company wants to carry out more systematically the specifications of 1908 to see what the uniform improvement in the quality of the rails will be. Then it will prepare specifications indicating the general lines of Bessemer practice which it is willing to accept. It does not want to introduce anything in its specifications except what it considers essential to good practice with large output. The high-grade rails made 10 to 16 years ago gave excellent service. These rails are in many cases still in track and do not wear rapidly on tangents, abrade on curves or fail as girders. The mills have been asked to make the new rails, as far as they can with the change in ores, similar to those rails made many years ago. The rail section has not been changed. The company considers that the first requisite is to get a reasonable Bessemer practice which will tend to make a good quality of steel in sound ingots, and then roll it so as not to injure the metal in the rolling. To get a better quality of rail, it had to introduce some tentative conditions which restrict the output for these trials. Rolling differs so much in the different mills that it has been very hard to adjust all these different conditions among them. The company does not intend to make the specifications public for a year or two, as it wants first to make sure that the specifications are satisfactory.

Central and Western Association of Car Service Officers.

The Central and Western Associations of Car Service Officers met in Chicago on February 18. F. M. Luce (C. & N. W.) was chairman of a committee that made a report on "Discrepancies in Interchange Accounts." Mr. Luce said that the number and aggregate amount of such discrepancies had been much reduced by the harmonious efforts of car service officers. His office is reporting 98 per cent. of per diem within a month after it accrued. The members were requested to prepare detailed figures showing unsettled per diem at the end of 1908.

A recommendation was adopted that hereafter the receiving road prove the accuracy of its records instead of requiring the delivering line to prove the accuracy of its records, the owner of the car, where the car does not belong to either the delivering or receiving line, not to be brought into any such controversy.

A committee, of which W. M. Harvey (C., M. & St. P.) was chairman, reported on the equated system of tonnage. The report indicated that while there is general agreement as to the desirability of equated tonnage, those who report tonnage do not always make their reports accurate, and railway officers are equally careless in requiring accurate reports.

J. M. Daly (I. C.) described what is being done to collect information at Chicago regarding interchange and inspection of cars, with a view to determining if the establishment of a joint interchange and inspection bureau is desirable.

G. H. Waldo (C., H. & D.) told what is being done along the same line at Indianapolis and Cincinnati. He said it was proposed to establish at Cincinnati in addition to an interchange bureau one local record to show the arrival, the transfer and the departure of all cars. All roads would have access to this record and would abolish their individual records.

The following officers for the ensuing year were elected: President, J. W. Nowers (A., T. & S. F.); Vice-President, J. A. Wagner (Des Moines Union); Secretary, W. E. Beecham (C., M. & St. P.); Treasurer, F. M. Luce (C. & N. W.); Member Executive Committee, J. M. O'Day (C. & E. I.).

Average Demurrage Rule Condemned.

D'Arcy Scott, Assistant Chief Commissioner of the Railway Commission of Canada, has sustained the Canadian car service rules with regard to allowing only 48 hours under ordinary circumstances for the unloading of cars, and has refused to issue any rule by which shippers could be credited with time saved within this limit to be applied to cars held beyond the two days. The Wallaceburg Sugar Company asked for an order establishing in Canada what is generally known as the average demurrage plan, or practically the setting off of overtime on some cars against the speedier unloading of others. The board ruled that the car service rules, giving the straight 48 hours for unloading, without demurrage either way, were in the interest of all shippers, big or small, and therefore dismissed the application. In his decision Mr. Scott said: "The average system might have the effect of making a consignee dilatory about unloading so long as he had free time to his credit, and if he had not free time to his credit the circumstances would be the same as they are under the present rules. If the average plan were in force, I can well see

that an injustice would be done the small dealer. Suppose a dealer with a large capacity for storage received 50 cars of merchandise, which under the rules he has two days to unload, and unloaded them all the first day. He would then have 50 days to his credit. The next day, he and a small competitor each received one car. The small competitor would have to unload in two days or be penalized, while the other could hold his car for 50 days, free time, which might prove to be a very material advantage. * * * If the applicant cannot get redress under the rules from the Car Service Bureau, he may apply to this board, and his complaint will be heard. Application should be dismissed."

Moving Platform Proposition.

The Continuous Transit Securities Company, of 45 Broadway, New York, has petitioned the State Public Service Commission for the invitation of proposals for the construction of eight lines of continuous railways or moving platforms from various points in Manhattan. Important financial interests are said to be back of the company. As outlined by the company, the proposed routes are four, extending in all directions, the most important being on Broadway from 14th to 42d street. The company proposes that connections be made, whenever practicable, at points where the routes proposed cross or closely approach existing transportation lines. Should the commission decide favorably upon the proposed plan the Securities Company stands ready to bid on the construction of the different routes.

Max E. Schmidt, President of the company, expects to get the right for at least one of the routes, preferably the one under Broadway above mentioned. The matter of the location of stations or the question of fare has not yet been taken up. Besides Mr. Schmidt, the directors of the company are Albert R. Gallatin, A. Polhemus Cobb, David L. Gallup and Eads E. Schmidt.

Chicago Street Railway Improvements.

Plans for continuing the rehabilitation of the Chicago Railways Co. during 1909 have been announced. Over $11,000,000 is to be spent this year. The work includes the rebuilding of 112 miles of track, at a cost of $5,040,000; the purchase of 350 double-truck pay-as-you-enter cars to cost $2,100,000; new underground system, $1,252,983; completing the car barn at Lincoln and Wrightwood avenues, $81,000; building car barn at the city limits, $192,530; car barn at Kedzie avenue and Van Buren street, $465,885; car barn at Twenty-second street and Ogden avenue, $313,000; car barn at North and Forty-eighth avenues, $457,750; erecting new car shops, $350,000; new rotaries for substations, $450,000; new trolley construction, $363,840. The car barn at the city limits will accommodate 89 double-truck cars and will have club room facilities for employes, men's quarters, etc. The Wrightwood and Lincoln avenue barn will have a capacity for 95 double-truck cars; the Kedzie avenue station, 291 cars; the Twenty-second street and Ogden avenue station, 214 cars; and the North and Forty-eighth avenues station, 360 double-truck cars. Bids have been received on the 350 pay-as-you-enter cars.

Melville, the Metropolis.

Another metropolis is springing up on the prairies of western Canada. A year ago there was a spot on the line of the Grand Trunk Pacific without a name or any special significance. But on that spot has sprung up Melville, the operating center for nearly 1,000 miles of the Grand Trunk Pacific, and already its population numbers over 1,200 people, with modern houses, stores and hotels. In six months its population will have doubled and by the end of the present year it is confidently expected 4,000 people will be living in the future distributing point of western Canada. Melville is the center of the richest farming country of Saskatchewan. A branch line is to be built this spring to Regina, and another northward toward Hudson's Bay.

In addition to all this, the boomers of the future metropolis can see, in their mind's eye, a great movement of grain through Hudson's Bay to Europe—great enough to put Duluth and Chicago in the shade.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Omaha Railway Club.

At a meeting of subscribers to membership in the new Omaha Railway Club, the following officers were elected: President, J. A. Munroe, Freight Traffic Manager, Union Pacific; Vice-Presidents, C. E. Spens, General Freight Agent, Burlington, and S. F. Miller, General Freight and Passenger Agent, North Western; Treasurer, L. Beindorff, City Passenger and Ticket Agent, Union Pacific; Secretary, W. P. Stillman, Chief Clerk, Union Station.

The purpose of the club is stated to be "to promote personal acquaintance, social intercourse, the advancement of the professional and personal interests of its members, and the forwarding of the interests of the railways entering Omaha, having due regard for the rights of the general public."

New York Railroad Club.

At the regular meeting of this club on February 19 the topic was "The Bureau for the Safe Transportation of Explosives," and a paper by Colonel B. W. Dunn was presented. Colonel Dunn dealt with the details of the operation of the bureau, with which the readers of the *Railroad Age Gazette* have already been made acquainted.

Canadian Society of Civil Engineers.

At a sectional meeting on February 25, a paper entitled "Phototopography," by P. W. Greene, was read, and illustrated with lantern slides.

Traffic News.

A bill has been introduced in the Kansas legislature to reduce the freight rates on a large number of commodities 15 to 20 per cent.

The Puget Sound fast mail of the Great Northern will start from St. Paul at 10.20 p.m. daily, beginning February 28, instead of at 3 p.m. This will enable the Badger State express of the North Western, which leaves Chicago at 9 a.m. daily, to connect with it at St. Paul.

The State Railroad Commission of Ohio has allowed the Baltimore & Ohio and the Baltimore & Ohio Southwestern to suspend, until May 31, the demurrage rules on coal cars loaded with coal and held at mines waiting billing instructions. This is done to give employment to men who otherwise would be idle.

The executive committee of the Western Passenger Association has resolved that, until executive officers act, no further rates of less than 2 cents a mile should be made by western lines, except in territory in Illinois common to the Central Passenger Association lines. The report of the executive officers will be heard on March 3, either by the executive committee or by the entire Western Passenger Association.

The Wisconsin Demurrage Bureau reports that it handled 93,633 cars in January, 1909, as compared with 77,553 cars in January, 1908. The average day's detention of cars by the railway was 0.15 this year as compared with 0.19 last year, and the average day's detention by consignee was 1.36 this year as compared with 1.66 last year. Thus the total average day's detention was 1.51 in 1909 as compared with 1.85 in 1908.

The Dominion Government Engineer has officially stated that with the dam now completed at St. Andrew's Locks the channel of the Red river will be opened for vessels as soon as the ice breaks up this spring, enabling craft of all kinds to run through to Lake Winnipeg. Large quantities of lumber, wood and other material can now be delivered in Winnipeg at greatly reduced rates. A local company is preparing to build large docks at Winnipeg.

The Judicial Committee of the Privy Council of Canada has confirmed the decision of the railway commission requiring the Grand Trunk to run, daily, between Montreal and Toronto, at least one train having cars in which passengers may ride at 2 cents a mile. This requirement is part of the act of incorporation under which the railway was organized. Complaint was made about two years ago that the road was not performing its duty, and this order was the result.

"Milling-in-transit" is now applied not only to grain and lumber, but to iron as well; and next we shall probably hear of it in connection with grindstones and millinery if the traffic men continue to exercise their marvelous ingenuity. It was announced last week in Pittsburgh by the Wabash that iron articles shipped from that city to the West would be allowed a "stop-over privilege" for 1½ cents per 100 lbs. extra. A few days later the Hocking Valley made a similar announcement. It is said that these concessions in rates have been made for the benefit of factories at Toledo and Massillon.

The traffic on the Great Lakes during the season of 1908 was 60,518,000 net tons as compared with 83,506,991 and 75,609,648 net tons during the 1907 and 1906 seasons, respectively. The decrease in 1908 was due mainly to the falling off in shipments of iron ore, though all other principal items, except hard coal and salt, also show smaller totals than in 1907. The iron ore shipments of 1908, exclusive of 228,784 gross tons exported to Canada as reported to the Bureau of Statistics of the Department of Commerce and Labor, totaled 24,939,185 gross tons, as compared with 40,727,972 gross tons in the 1907 season. About 1,000,000 gross tons of ore are credited to the two new receiving points of Indiana Harbor and Gary, thus placing Chicago and vicinity on practically the same level as Cleveland as an ore receiving center.

The dispute between the Wabash-Pittsburgh Terminal and its competitors regarding passenger rates between Chicago and Pittsburgh has been settled. On the new basis the various lines will charge the following rates: The Pennsylvania lines, $10.50 single trip and $9.35 each for parties of ten or more; the Baltimore & Ohio and the Pittsburgh & Lake Erie, single trip, $9.50 and ten rides, $8.45; the Wabash-Pittsburgh Terminal, single trip, $9, and ten rides, $8. The Wabash-Pittsburgh Terminal heretofore has had no differential party rate, and its new party rate applies only on westbound business. The settlement also provides that during the calendar year 1909 the Wabash-Pittsburgh Terminal may run five excursions between Chicago and Pittsburgh at a rate of $9 for the round trip, but such excursions may not be run at the time of a convention or when a special rate made by the Central Passenger Association lines is in effect.

INTERSTATE COMMERCE COMMISSION.

Prescribing a Specific Rate.

Michigan Buggy Co. v. Grand Rapids & Indiana et al. Opinion by Commissioner Clark.

A joint through rate higher than the sum of the local rates of the same carriers via the same route found to be unreasonable. Reparation awarded.

As the defendant carriers have a right to increase their separate local rates, an order that the joint through rate may not, for a stated period, exceed the sum of the local rates could, by such increase in local rates, be made ineffective. A specific rate is therefore prescribed.

C. O. D. Shipments of Liquor.

Royal Brewing Co. v. Adams Express Co. et al. Opinion by Chairman Knapp.

Under date of June 15, 1907, defendants established a rule which provides that they will not undertake to collect for shippers the purchase price of intoxicating liquors—that is to say, they will not perform for that traffic what is known as "C. O. D." service. In view of the practical difficulties attending the "C. O. D." carriage of intoxicating liquors, the discrimination against that traffic resulting from the rule in question is not undue, and therefore not in violation of the statute.

Joint Rates.

Crane Railroad v. Philadelphia & Reading et al. Opinion by Chairman Knapp.

The complainant, a railway company having 1.9 miles of track, connecting the Crane Iron Works and five other industries at Catasauqua, Pa., with defendants' tracks, asked for the establishment of through routes and joint rates upon interstate shipments between points on its line and all points on defendants' lines. All the facts and circumstances disclosed did not show that the complainant is a common carrier and therefore it is not entitled to the order sought in this proceeding.

Increased Cost of Operation and Higher Rates.

Shippers' & Receivers' Bureau of Newark v. New York, Ontario & Western. Opinion by Commissioner Harlan.

An increase in the cost of labor, and in the price of railway materials and supplies, does not necessarily imply a decrease in the net earnings of a carrier or preclude the possibility even of an increase in its net earnings, due to an increase in the volume of its traffic or to a decrease in the ratio of its operating expenses to its operating revenues; nor is an increase in the cost of labor and materials, accompanied by a decrease in the net revenues of a carrier, necessarily inconsistent with the possibility that its net earnings may still

suffice to afford it a fair return on the investment without an increase in its rate schedules.

On the record the defendant's rate of $1.60 per net ton for the transportation of stone in carloads from East Branch, N. Y., to Weehawken, N. J., a distance of 150 miles, is found to be unreasonable, and a rate of $1.40 per net ton is prescribed as a maximum for the future.

Differences in Minimum Carload Weights on Connecting Lines.

J. G. Falls & Co. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Harlan.

A carrier's own published tariffs are the measure of its obligations to shippers; it cannot be controlled by the terms of the separate tariffs of its connections. Under a local any-quantity rate a shipper has no right to demand a car of a given size; the carrier may use any available equipment, notwithstanding the fact that the separate tariffs of a connecting line provide a minimum weight under a carload rate. The initial carrier, in the absence of a definite agreement with the shipper as to the size of car to be used is not liable to the shipper for the increased rate charges imposed on him because it delivers to the connecting line in two cars a shipment, moving under the two local rates, the weight of which comes within the carload minimum weight provided in the tariffs of the connecting line.

The Commission is without authority to enter an order requiring a shipper to make good an undercharge, but shippers must understand their liability under the law for the failure or refusal to pay the published rates.

Rates on Ice Should be Very Low.

Mountain Ice Co. et al. v. Delaware, Lackawanna & Western. Opinion by Commissioner Prouty.

Defendants' rates on natural ice from points of harvest in New Jersey and Pennsylvania to various consuming interstate destinations found unreasonable, and just and reasonable maximum rates prescribed for the future, when the ice is carried in ordinary box cars. The service rendered by defendants in the movement of this traffic may properly be styled a "special" service; but it is not in any proper sense an "expedited" service, nor is it an expensive service. The value of this ice when taken up for transportation is almost nothing, and the cars readily load to their physical capacity, on the average more than 27 tons, therefore to few if any kinds of business should lower rates be applied by defendants. This is especially true since the business of complainants has been built up under much lower rates, voluntarily established and long maintained by defendants, and the investment so induced must be largely destroyed if the present rates are maintained. All that, however, would be no reason for requiring defendants to perform this service for a sum which would not fairly compensate them. Cost of service, rate per ton per mile, and other factors in making present rates have been considered and discussed; but when taken into account they still leave the present rates excessive.

Rates on Coal from the Black Mountain District of Virginia.

Black Mountain Coal Land Co. et al. v. Southern Railway et al. Opinion by Chairman Knapp.

The charge of 10 cents more per ton upon shipments of coal in carloads from the Black Mountain coal district, in the state of Virginia, than from the Apalachia district, in the same state, to Morristown, Tenn., and all points east and south thereof on defendants' lines, is unjust and unreasonable. The rates from the Apalachia coal district in Virginia, including the Black Mountain coal district, which exceed 25 cents above the rate from Coal Creek to all points on defendants' lines east and south of Morristown, Tenn., as far south as Charleston, S. C., and Augusta, Ga., unduly discriminate against the Black Mountain and Apalachia operators and unduly prefer Coal Creek operators.

A carrier cannot lawfully so group its mines with respect of rates as to unduly discriminate against any locality. The duty imposed by law is to give equal treatment to all shippers who are in position to demand it, and this includes the right to reach competitive markets on relatively equal terms. Carriers are not required by law, and could not in justice be required, to equalize natural disadvantages, such as location, cost of production, and the like. Where, however, the same carrier serves two districts which, by their location, the character of their output, and distance from markets where their product must be disposed of are in substantially similar circumstances and conditions, the serving carrier cannot lawfully prefer one to the other in any manner whatsoever.

Rates on Bananas from Central America.

D. M. Payne v. Morgan's Louisiana & Texas et al. Opinion by Commissioner Clark.

For six years bananas originating in Central America have been shipped from New Orleans, upon bills of lading executed at that point, as local traffic and under a rate that has not until now been challenged. Complainants contended that a subsequently issued tariff, applicable to "import traffic," should apply to these shipments because, technically, they were "import traffic." The bananas are not moved under any through bill of lading. No ship's manifest is issued for them. They are brought to New Orleans in ships that are owned by the grower and owner of the bananas. On arrival at New Orleans the bananas pass to the custody and possession of a selling agency which distributes them under and on local bills of lading.

Although inadvertent or careless wording of tariffs afforded some opportunity for misunderstanding and misconstruction, it is shown that the rate which is complained of and which has applied for several years was not canceled or changed during the period covered by these complaints. The period during which conflict in tariffs could be claimed extended only from February 15 to May 7, 1908. The complaint is as to shipments moved between September 3, 1906, and May 26, 1908.

The rate of 82 cents per 100 lbs. for transportation of bananas in carloads from New Orleans, La., to El Paso, Tex., is not unreasonable and reparation is denied.

Exceptions to Demurrage Charge.

American Creosoting Works, Limited, v. Illinois Central et al. Opinion by Commissioner Clark.

Manifestly it is the duty of the carrier to accommodate the needs and necessities of its shippers in regard to supplying cars as much as possible without undue discrimination; but as a practical matter it is not possible for carriers to furnish all shippers with just such cars as they would like and in such numbers and at such days and hours as would best serve the interests of shippers.

There is nothing unreasonable or unlawful about a tariff rule which provides that in the event of the carrier's bunching a shipper's cars and delivering them in excess of the shipper's facilities and ability to load or unload demurrage will not accrue.

Complainant, desiring to ship creosoted lumber from near New Orleans, La., to points in Texas, Arizona and Mexico, requested 200 empty flat cars to be delivered at the rate of four a day; these cars were not delivered as requested, but on many days no cars were furnished and on some days more than four cars were furnished. Numbers of these cars were not loaded within the free time prescribed in the Car Service Association's rules, and demurrage accrued on them. Complainant contested these demurrage charges on the ground that defendants failed to deliver the cars at the rate of four cars per day, as requested. On the whole record, the Commission is unable to find these demurrage charges were in this case unreasonable or unjust. Complaint dismissed.

If complainant had no voice in directing the setting in of more than four cars per day, or if it were shown that complainant protested against the setting in of so many at one time, and its voice and protest had been ignored, there might be room to find that the demurrage charges resulting were unjust and unreasonable; but there is, however, no such showing in the record in this case.

Reconsigning Rules.

Kile & Morgan Company v. Deepwater Railway et al. Opinion by Commissioner Clements.

Through failure of the Chesapeake & Ohio to forward a carload of lumber consigned to New Haven via Harlem river, as specifically routed by shipper, complainant was deprived of alleged privilege of reconsignment without extra charge offered by the New York, New Haven & Hartford at the Harlem river. On claim for reparation for expense of local haul from New Haven to Nashua, N. H., the point to which shipment would have been reconsigned had misrouting not occurred, it is held that since provision therefor was not filed with the Commission this reconsigning practice cannot afford basis for reparation.

A shipper cannot be deprived through a carrier's negligence of any lawful privilege offered by another carrier, but such privilege must itself be not only one which the carrier may lawfully allow, but it must also be duly established and filed with the Commission. Reconsigning rules required to be signed by shipper and subject to cancelation at the option of the carrier are inconsistent with the law governing the establishment and modification of tariff schedules.

A cause of action accrues under the act to regulate commerce on the date freight charges are paid. All claims, whether arising prior or subsequent to August 28, 1906, effective date of the act, are entitled to two years for presentation to the Commission, the one year proviso applying only to claims that accrued more than two years prior to that date.

STATE COMMISSIONS.

The Oklahoma Corporation Commission has issued an order requiring all telegraph companies in the state to file reports of the physical value of their properties by April 1.

The Railroad Commission of Indiana has ordered the reduction of rates on coal from the Brazil-Linton (Indiana) coal district to South Bend and Mishawaka. It was claimed that the roads discriminated against the Indiana towns in favor of cities outside the state, principally Chicago. Manufacturing concerns at South Bend come into direct competition with Chicago factories and the Commission held that coal moves to South Bend under as favorable transportation conditions as to Chicago, and the distance is 66 miles less, so that a rate 15 to 20 cents per ton higher to South Bend constitutes discrimination. It was held that the discrimination against South Bend and Mishawaka as in favor of Gary, Ind., Whiting and Michigan City, which take the Chicago rate, was even clearer than in favor of Chicago. The carriers object to the reduction on the ground that it would affect coal rates as far east as Buffalo, but the Commission said that the objection that it could not legally disturb a single rate because of the probable effect on other rates was not tenable.

The Texas Railroad Commission has ordered, effective on March 5, that the destination of any carload shipment originating at a point in Texas may be changed in transit at a charge of $1 per car when the substituted destination is a point in Texas in the direction of the original movement. Requests for the change must be made in writing to the agent at the first destination while the car is in transit or before demurrage accrues at first destination. When the change of destination involves a back haul or indirect service, an additional charge of 1 cent per ton per mile, with a minimum of $5 per car, may be made. If the rate to the substituted destination is higher than that to the original destination, such higher rate plus the extra service charge, if any, will apply. When the rate to the substituted destination is less than to the original destination and the order for the destination change is received before the shipment arrives at or moves beyond such substituted destination, such lower rates plus the extra service charge, if any, will apply. Only one change of destination is authorized.

Colorado. Affording Facilities to Competitors.

Gerber et al. v. Union Pacific.

The defendant had been in the habit of storing freight cars, its own and those delivered to it by other roads, on a team track in the city of Denver, known as Ryan's spur. Owing to congestion of traffic, the defendant refused to store the cars of other railway companies on this track but continued to place its own cars there for unloading and storing. In both the act to regulate common carriers in Colorado and the Interstate Commerce Commission act the respective commissions are given jurisdiction over cars furnished by any common carrier to be delivered at any station, but in the Interstate Commerce Commission act there is a further clause which adds that "this shall not be construed as requiring any such common carrier to give the use of its tracks or terminal facilities to another carrier engaged in like business," while the Colorado act has no such additional provision. The commission therefore orders that the Union Pacific set all cars, those of competitors as well as its own, on the team track when requested. Furthermore, if the privilege of using this Ryan's spur as a team track is withdrawn from some it must be withdrawn from all.

California. Unjust Rates and Discrimination.

In the matter of alleged discriminations by the Southern Pacific, the Atchison, Topeka & Santa Fe and the San Pedro, Los Angeles & Salt Lake.

It is not claimed nor does the Commission find that any of the rates, examined at an investigation as to alleged discriminations in freight rates and transportation facilities between intrastate shippers, were unreasonable. It was found, however, that there were a number of discriminations in rates by the Southern Pacific and the Atchison, several of which the Commission regards as in violation of the act of the legislature of April 1, 1878. In respect to unjust discriminations, it was found that the San Pedro, Los Angeles & Salt Lake had not been guilty of any unjust discriminations and the case against it was dismissed.

There were discriminations in rates by the Southern Pacific, some of which were found to be unquestionably cases of unjust discrimination. Others cannot be properly classed as unjust, as there was no discrimination between the parties. Secret rates, even when not discriminatory by reason of their being no competitive shipper or shippers, are condemned as tending to create monopoly and limit markets.

There were six findings of unjust discriminations against the Santa Fe. Rates on oil were found to have been legally fixed and established by the Commission and to have been disregarded by the Santa Fe, and for this offense the company was fined $5,000. In all instances except this one, the Commission found that the shipper must get redress for the alleged unjust discrimination against him only by himself proceeding against the railway under the statute.

COURT NEWS.

The Supreme Court of the United States has affirmed the validity of the clause of the Interstate Commerce Law amendments of 1906 relating to express companies and affirmed the judgment of the federal court in Chicago in enjoining six express companies from issuing franks to their employees or to other express companies. The law, said Justice Day, did not give those companies the same privileges in that regard as were given railway companies. Franks for the free transportation of goods by express are treated substantially as passes.

The Railroad Commission of Arkansas has petitioned Judge Vandeventer, of the Federal court, to dissolve the injunction restraining the Commission from enforcing or the railways from obeying its orders for reductions in rates. It is alleged that the railways have violated the spirit of the injunction by going to the extreme in exacting exorbitant charges. G. W. Swain, Rate Clerk of the Commission, has filed an affidavit with the court, estimating that the Rock Island increased its rates 71 per cent. after the granting of the injunction, the Cotton Belt 84 per cent. and the Iron Mountain 77 per cent. on grain, cotton, lumber, sand, brick, stone and merchandise, and that the increases in passenger and freight rates since the injunction was issued amount to three millions a year.

Missouri River Jobbers' Case.

The taking of testimony in the Missouri river jobbers' case was finished at Chicago on February 19. E. B. Boyd, Assistant to the Vice-Presidents of the Gould lines, contended that the order of the Interstate Commerce Commission making the through class rates from the Atlantic seaboard to Missouri river points less than the sums of the local rates was based on a false principle. No railway accepts less than the sum of its local rates for through traffic unless compelled to do so by competition or by other conditions which he must meet or not take the business. Mr. Boyd presented a large amount of data and argued at length to show that the effect of the Commission's order, if enforced without reductions in rates being made from jobbing points intermediate between the seaboard and the Missouri river, would be to greatly injure the intermediate jobbing points.

Representatives of a number of large Chicago jobbing houses appeared before Special Master in Chancery Bennett, who is taking testimony in the Missouri river jobbers' case, to oppose the reduction in proportional rates from the Atlantic seaboard to the Missouri river that has been ordered by the Interstate Commerce Commission. Two of these witnesses were Arthur Hawxhurst, Department Manager of Marshall Field & Co., and Albert G. Jones, Traffic Manager of Franklin MacVeagh & Co. Mr. Hawxhurst said that the rates fixed by the Commission would increase the handicap of Chicago in selling goods to merchants beyond the Missouri river. Mr. Jones gave similar testimony. L. B. Boswell, Commissioner of the Quincy (Illinois) Freight Bureau, testified that the reduction ordered by the Commission would be disastrous to the shippers of Quincy unless accompanied by a corresponding reduction in jobbing rates from Quincy.

New York Central Fines Affirmed.

The Supreme Court of the United States has affirmed the fines aggregating $126,000 imposed upon the New York Central and $6,000 upon Fred L. Pomeroy, Assistant Traffic Manager, for paying rebates to the American Sugar Refining Company of 5 cents per 100 lbs. on sugar shipped from New York to Detroit and of 6 cents on sugar sent to Cleveland. The company was found guilty and fined $18,000 on each of six counts, while Pomeroy, who conducted the negotiations, was fined $1,000 on each of the six shipments to Detroit.

In its appeals the railway filed 101 assignments of error for the Detroit case and 80 for the Cleveland case, raising many new points against the validity of the law. Justice Day delivered the opinion of the court, which was unanimous. Taking up the contention that the law was void because Congress had no authority to impute to a corporation the commission of criminal offences or to subject it to a criminal prosecution by reason of the things charged, thereby in reality punishing the innocent stockholders and depriving them of property without due process of law; that the statute deprived the corporation of the presumption of innocence, which was part of due process in criminal prosecutions; that as there was no authority shown by the board of directors or the stockholders for the criminal acts of the agents of the company in contracting for and giving rebates they could not be charged against the company, Justice Day said that as no action of the board of directors or the stockholders could legalize a crime the argument practically amounted to saying that owing to the nature and character of the company's organization and the extent of its power and authority a corporation could not commit a crime of the nature charged in this case.

While he acknowledged that some of the earlier writers on common law held that a corporation could not commit a crime Justice Day said that the modern authorities universally held to the contrary, as he showed by quoting many decisions of the courts. It was also well established that a corporation might be held responsible for damages for acts of an agent done within the scope of his employment, but not wantonly, recklessly or against the express orders of his principal.

It was true, he said, that there were some crimes which in their nature could not be committed by corporations. But there was a large class of offences, of which rebating under the federal statutes was one, wherein the crime consisted in purposely doing the things prohibited by statute. In that class of crimes there was no good reason why corporations might not be held responsible and charged with the purpose and knowledge of their agents acting within the authority conferred upon them. If it were not so, many offences might go unpunished and acts be committed in violation of law, whereas in the present case the statute required all persons, corporate or private, to refrain from certain practices forbidden in the interest of public policy.

There was no valid objection in law and every reason in public policy, Justice Day continued, why the corporation which profited by the transaction and could only act through its agents and officers should be held punishable by fine.

Justice Day asserted that there was no question of the power of Congress to regulate interstate commerce, to prevent favoritism and to secure equal rights to all engaged in interstate trade.

Another case against the New York Central which the court below had quashed because the joint rate upon which the road had paid rebates to the Brooklyn Cooperage Company on shipments of barrel staves from Poplar Bluff, Iowa, had been filed by another road, was also decided against the road, the judgment of the lower court being reversed. Any road participating in a through rate and in a rebate from that rate is as guilty as the initial road.

The Santa Fe and Railway Regulation in Texas.

Officers of the Gulf, Colorado & Santa Fe gave testimony before Commissioner Harlan, of the Interstate Commerce Commission, at St. Louis on February 18, that illustrates finely the methods and results of railway regulation in Texas. The hearing was on the complaint of the Railroad Commission of Texas against advances in freight rates to Texas points.

C. F. W. Felt, Chief Engineer of the Gulf, Colorado & Santa Fe, said that in the five years since the last valuation of its property was made by the Texas Commission his road had made important improvements. Wooden trestles had been replaced by permanent structures; sags in the roadway had been filled; modern stations had been built at Dallas, Ft. Worth and other cities, and large shop buildings at Cleburne; and numerous interlocking signals had been installed. The original rails on the line were 60 lbs., while new rails of 65 lbs., 70 lbs. and 75 lbs. have been laid. He estimated the total cost of reproduction of the present lines at $35,189 per mile. Mr. Felt said the management of his road does not think it good policy for a railway to accept donations of land, and that it recently had refused to accept a donation and instead bought the preferred property at from $10 to $60 an acre.

J. H. Keefe, Assistant to the Second Vice-President and General Manager, testified that the road paid $123,000 in taxes in 1903, when it had 1,202 miles of track, and $377,000 in 1908, when it owned 1,518 miles, the increase per mile being 136 per cent. The amount spent in improvements from 1888 to 1907 had aggregated $13,335,000 and no dividend on stock had been paid since 1889. Referring to state legislation and orders of the Commission, Mr. Keefe said that in 1908 a new law increased the expense for telegraph operators $10,000; additional trains, required by a law which prevented full tonnage on the Beaumont division, alone caused an increase in expenses of $27,750; the order of the Railroad Commission made February 23, 1908, requiring passenger trains to run within 30 minutes of their schedules, compelled the running of special trains when regular trains were delayed, which had cost $30,345 during the year; additional interlocking signals required by another state law had cost $31,854. The gross earnings per mile of the Gulf, Colorado & Santa Fe were shown to be $7,300, and of the Atchison, Topeka & Santa Fe, $10,643; the Gulf lines' operating expenses were $6,300, and those of the Atchison $6,774; damage claims on the Gulf lines amounted to 3.4 cents a mile and on the Atchison 1 cent a mile. Owing to the extraordinary amount of railway litigation in Texas, the Gulf lines had spent during the previous year $79,000 for legal services out of gross earnings amounting to $11,000,000, while the Atchison proper, with earnings of $75,000,000, spent $233,000.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1908.
(See also issues of February 5, 12 and 19.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$98,131	$48,936	$157,878	$24,564	$29,040	$3,392	$47,082	$5,345	$109,423	$48,455	.....	$4,760	$43,695	$12,417
Atlanta & Birmingham Air Line	237	61,008	21,897	86,458	10,987	7,001	2,097	33,848	2,161	56,094	30,364	.....	4,813	25,551	13,108
Bessemer & Lake Erie	201	298,680	21,342	325,203	34,094	92,416	8,619	121,227	24,457	280,813	44,390	.....	35,000	9,390	31,536
Central New England	294	175,754	25,386	214,661	29,090	17,584	1,587	78,131	2,442	128,834	85,827	.....	5,600	80,227	35,463
Central Vermont	411	191,575	62,730	275,903	29,812	59,782	6,865	144,995	7,590	249,044	26,859	$454	9,025	18,288	§16,394
Chicago, Cincinnati & Louisville	285	97,794	23,624	127,038	17,870	24,645	8,178	56,047	6,393	113,133	13,905	.....	3,250	10,655	33,432
Chicago Great Western	818	522,466	146,583	716,692	79,665	153,028	36,471	319,503	32,013	620,680	96,012	266	17,919	78,359	23,155
Chicago, Indiana & Southern	329	235,208	20,048	263,200	837	49,395	8,599	98,592	7,600	165,023	98,177	3,852	12,542	89,487	65,973
Chicago, Peoria & St. Louis	255	109,469	25,576	142,146	18,648	29,409	6,208	60,465	4,730	119,460	22,686	.....	4,600	18,086	24,606
Cleveland, Akron & Columbus	210	112,242	34,830	162,014	12,568	28,846	1,894	57,070	2,850	103,228	58,786	.....	7,145	51,641	38,279
Cleveland, Lorain & Wheeling	194	161,723	18,858	193,390	23,034	55,125	5,799	99,062	5,986	189,006	4,384	.....	9,406	5,022‡	10,441
Cumberland Valley	162	144,896	43,351	198,382	9,289	16,669	4,265	74,269	8,693	113,185	85,197	405	3,713	81,889	2,262
Elgin, Joliet & Eastern	239	197,283	14	202,286	20,550	31,945	2,983	75,408	16,298	147,184	55,102	.....	9,500	45,602	7,730
Florida East Coast	584	128,032	87,354	248,766	35,247	33,161	5,548	85,445	7,384	166,785	81,981	.....	11,000	70,981	20,080
Fort Worth & Rio Grande	196	85,641	38,596	130,088	12,150	10,549	2,532	38,087	6,356	69,674	60,414	.....	1,681†	62,095	43,037
Gulf & Ship Island	307	135,098	34,849	181,262	33,821	23,793	1,174	51,817	7,748	118,353	62,909	.....	3,683	59,226	33,990
Houston East & West Texas	191	82,771	28,288	116,630	15,448	9,059	841	34,482	3,018	62,848	53,782	.....	4,230	49,552	6,041
International Ry. of Maine	233	79,328	29,599	116,254	25,283	20,536	4,307	56,035	3,823	109,985	6,270	.....	5,000	1,270	§266
Kanawha & Michigan	177	125,178	26,689	156,097	53,319	52,634	2,643	49,070	2,977	160,643	4,546*	28*	6,626	11,200‡	5,348
Mason City & Fort Dodge	386	121,686	36,731	166,471	15,324	23,323	1,740	76,602	877	117,866	48,605	524	6,000	43,129	§2,666
Midland Valley	324	69,926	23,879	98,441	21,750	28,329	1,800	31,669	4,746	88,294	10,147	.....	8,000	2,147	§29,069
Nevada & California	379	76,218	17,278	101,339	6,651	13,754	1,083	34,402	2,335	58,225	43,114	1,081*	6,000	36,033	§2,215
New Orleans & North Eastern	196	227,171	53,176	300,654	21,636	56,743	6,871	103,253	12,790	201,293	99,361	.....	8,500	90,861	34,970
New York, Philadelphia & Norfolk	112	186,418	31,473	233,928	19,857	48,083	3,313	92,069	10,828	174,150	59,778	.....	6,215	53,563	17,664
New York, Susquehanna & Western	151	140,767	47,641	213,826	19,049	23,351	1,450	76,457	5,068	125,375	88,451	2,113*	15,089	71,249	1,644
Pittsburgh & Lake Erie	191	794,017	96,084	925,054	125,779	116,693	12,109	242,412	22,150	519,143	405,911	357*	10,026	395,528	182,562
Quincy, Omaha & Kansas City	262	44,950	17,397	68,279	17,082	12,354	1,497	31,798	3,648	66,379	1,900	.....	2,960	1,060‡	3,975
St. Louis Merchants' Bridge Terminal	9	....	5,022	111,214	16,345	4,270	230	45,929	3,362	70,136	41,078	.....	4,300	36,778	1,660
San Antonio & Aransas Pass	727	237,342	70,662	325,894	47,262	37,093	4,777	135,615	8,875	233,622	92,272	.....	8,500	83,772	29,735
Southern Indiana	237	71,969	14,037	87,992	9,526	17,316	1,400	28,485	5,082	61,809	26,183	.....	6,929	19,254	§36,198
Toledo, Peoria & Western	248	54,859	32,921	92,191	10,888	20,143	2,015	37,089	3,259	73,394	18,800	.....	4,000	14,800	2,715
Trinity & Brazos Valley	455	241,668	17,020	260,958	41,425	29,360	4,520	117,137	13,156	205,598	55,360	.....	6,299	49,061	186,673
Vicksburg, Shreveport & Pacific	171	80,256	53,633	143,478	31,330	22,493	3,062	40,449	4,584	101,918	41,560	.....	6,052	35,508	20,111
Virginia & South Western	184	90,140	11,798	105,022	11,859	20,897	842	36,178	4,168	73,944	31,078	.....	5,640	25,438	22,270
Western Maryland	543	132,668	55,887	509,315	41,029	79,837	6,600	176,148	12,450	316,073	193,242	.....	16,500	176,742	24,158
Wisconsin, Minnesota & Pacific	271	38,465	14,893	57,702	7,249	7,275	283	23,108	496	38,411	19,291	4*	2,308	16,979	§3,636

SIX MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$501,340	$241,584	$798,258	$125,333	$166,951	$19,408	$258,623	$29,499	$599,814	$198,444	.....	$23,920	$174,524	§$6,364
Atlanta & Birmingham Air Line	237	329,061	126,821	479,282	72,974	33,325	8,033	184,868	12,487	311,687	167,595	.....	28,880	138,715	29,886
Bessemer & Lake Erie	201	3,419,820	175,850	3,627,857	320,611	592,363	35,192	918,161	57,423	1,923,750	1,704,107	.....	55,000	1,649,107	§39,395
Central New England	294	1,004,962	183,792	1,259,680	223,411	124,002	10,033	417,468	16,442	791,356	468,324	.....	33,600	434,724	232,173
Central Vermont	411	1,122,243	575,335	1,832,684	283,317	304,101	46,925	820,685	40,838	1,495,866	336,818	5,915	54,150	288,583	§80,889
Chicago, Cincinnati & Louisville	285	504,175	156,990	694,534	176,965	151,023	46,319	292,515	35,809	702,631	8,097*	.....	19,500	27,597‡	§18,700
Chicago Great Western	818	3,013,143	1,050,047	4,380,866	624,007	750,120	218,955	1,828,140	180,614	3,601,836	779,030	3,921*	110,160	664,949	§60,378
Chicago, Indiana & Southern	329	1,208,487	133,915	1,388,786	157,100	269,186	46,654	536,540	41,501	1,050,981	337,805	13,402	87,543	263,664	64,575
Chicago, Peoria & St. Louis	255	606,660	182,736	829,520	118,286	184,462	36,554	327,158	28,402	694,862	134,658	.....	27,600	107,058	19,368
Cleveland, Akron & Columbus	210	697,257	238,407	1,014,727	119,600	170,969	13,935	324,304	17,727	646,535	368,192	.....	40,222	327,970	33,186
Cleveland, Lorain & Wheeling	194	1,919,897	122,354	2,182,125	198,540	377,906	36,076	699,043	34,783	1,346,348	835,777	.....	56,438	779,339	§165,974
Cumberland Valley	162	909,234	307,561	1,277,535	120,304	111,763	23,098	394,194	34,145	683,504	594,031	3,626	22,278	575,379	§36,253
Elgin, Joliet & Eastern	239	1,194,301	268	1,237,613	134,718	201,348	15,137	391,357	48,054	790,614	446,999	.....	57,000	389,999	§84,362
Florida East Coast	584	565,315	337,724	1,058,146	258,659	239,402	28,811	479,054	51,371	1,057,297	849	.....	66,000	65,151‡	§54,405
Fort Worth & Rio Grande	196	389,673	184,565	606,837	79,718	59,851	15,526	201,347	30,815	387,257	219,580	.....	4,271	215,309	164,196
Gulf & Ship Island	307	693,926	188,992	939,953	197,915	149,449	8,388	310,633	43,449	709,834	230,119	.....	22,109	208,010	§50,103
Houston East & West Texas	191	440,278	145,358	619,289	102,248	48,291	7,415	185,074	18,569	361,597	257,692	.....	16,059	241,633	55,061
International Ry. of Maine	233	257,384	116,230	413,809	99,342	74,103	23,043	176,430	18,099	391,017	22,792	.....	30,000	7,208‡	20,048
Kanawha & Michigan	177	1,000,360	173,591	1,200,114	232,513	296,624	14,444	351,712	16,575	911,868	288,246	120*	39,959	248,167	183,830
Mason City & Fort Dodge	386	705,976	242,933	1,008,368	121,963	132,117	10,315	394,304	4,051	662,750	345,618	3,057	36,000	312,675	9,845
Midland Valley	324	350,656	133,052	512,105	125,319	113,143	10,312	165,007	25,932	439,713	72,392	.....	44,083	28,309	§106,803
Nevada & California	379	338,473	133,193	516,637	79,364	72,757	5,031	188,488	12,048	357,688	158,949	1,239*	40,067	117,643	§375,310
New Orleans & North Eastern	196	1,128,773	278,117	1,504,104	147,215	285,685	43,793	499,389	61,392	1,037,474	466,630	.....	44,000	422,630	7,060
New York, Philadelphia & Norfolk	112	1,123,325	202,520	1,421,822	111,807	251,267	18,895	514,426	67,855	964,251	457,571	.....	37,290	420,281	§94,776
New York, Susquehanna & Western	151	790,957	513,849	1,246,470	149,936	132,074	8,684	439,218	24,572	754,484	491,986	14,239*	59,482	418,265	21,464
Pittsburgh & Lake Erie	191	5,462,509	642,672	6,294,906	777,948	565,954	78,881	1,419,287	129,478	2,971,548	3,323,358	1,792*	97,526	3,224,040	§954,000
Quincy, Omaha & Kansas City	262	276,936	113,345	423,041	111,177	67,692	9,345	186,056	17,234	391,504	31,537	.....	15,210	16,327	20,614
St. Louis Merchants' Bridge Terminal	9	....	23,981	674,147	106,719	29,328	1,315	266,711	20,603	424,676	249,471	.....	27,233	222,238	§81,718
San Antonio & Aransas Pass	727	1,563,116	441,619	2,108,721	280,905	217,321	25,294	747,380	52,300	1,323,200	785,521	.....	53,200	732,321	183,082
Southern Indiana	237	515,578	87,304	617,482	88,393	114,867	10,105	172,987	39,410	425,762	191,720	.....	41,571	150,149	§182,055
Toledo, Peoria & Western	248	341,246	209,443	580,168	92,137	109,001	12,517	208,234	19,586	441,475	138,693	.....	24,000	114,693	31,786
Trinity & Brazos Valley	455	1,016,505	89,897	1,123,010	192,544	159,426	26,172	502,519	66,993	947,654	175,356	.....	18,799	156,557	378,609
Vicksburg, Shreveport & Pacific	171	403,407	255,980	711,515	113,827	146,975	19,904	213,996	25,090	519,792	191,723	.....	36,453	155,271	42,610
Virginia & South Western	184	535,801	77,550	634,971	70,529	104,338	5,343	183,133	22,442	385,785	249,186	.....	25,443	223,743	65,655
Western Maryland	543	2,489,136	462,970	3,094,266	340,459	449,682	43,514	963,971	70,142	1,867,768	1,226,498	.....	99,000	1,127,498	2,705
Wisconsin, Minnesota & Pacific	271	257,213	96,149	379,688	82,828	39,142	1,735	133,926	1,838	259,769	119,919	91	15,187	104,823	20,654

*Deficit. †Credit. ‡Loss. § Decrease.

Freight Car Balance and Performance.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting statistical bulletin No. 40-A, giving comparative figures by groups, covering car balance and performance from April, 1907, to September, 1908, inclusive, says:

"This bulletin is a reprint of the statements attached to the committee's report at the November, 1908, meeting of the Association, with the addition of averages for June, July, August and September, 1908.

"The comparative table of adjusted averages which appears in our monthly bulletin, follows:

	Average miles per day. Inc.surp. cars.	Average miles per day. Exc.surp. cars.	Average ton-miles per car per day. Inc.surp. cars.	Average ton-miles per car per day. Exc.surp. cars.	Average earnings per car per day. Inc. surp. cars.	Average earnings per car per day. Exc. surp. cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908	21.2	25.5	290	348	1.95	2.34
April, 1908	19.6	24.5	258	324	1.83	2.29
May, 1908	19.3	24.8	254	329	1.72	2.22
June, 1908	19.6	24.7	276	347	1.88	2.37
July, 1908	20.0	24.8	275	342	1.84	2.26
August, 1908	20.8	25.1	292	354	1.98	2.40
Septmbr. 1908	22.0	25.2	320	367	2.24	2.57

"The statement as originally published contained a complete analysis of the performance for the 14 months ended May, 1908, from which we quote as follows, with additional comments on the performance for subsequent months:

"'The "per cent. of loaded mileage," quite graphically reflects the results brought about by the car surplus and the desire of the railways to rid themselves of foreign cars, the possession of which constituted a drain on their revenues. From the high figure of 72.9 per cent. reached in October, 1907, when the roads were enjoying an unprecedented traffic, the loaded mileage dropped to 70.2 per cent., 64.6 per cent. and 61.4 per cent. in November, December and January, respectively. February reports show a reaction to 66.5 per cent., which continued through March and April, while a further slight increase to 67.5 per cent. appears in May, 1908.'

"The increase continued throughout June was temporarily checked in July, when the figure was 67.3 per cent., but August and September show increases to 68.8 per cent. and 69.6 per cent. respectively.

"The reduced demand for cars also had its effect on the number of cars held out of service account of bad order. The October and November percentages of shop cars (5.55 per cent. and 5.27 per cent. respectively), gradually increased until in May, 1908, the figure reached 8.98 per cent. This figure continued to increase, reaching 10.18 per cent. in July, 1908, since which month the decrease has been steady although somewhat slight.

"The car balance percentages provide information showing the disposition of the freight car equipment of the country. In April, 1907, the railways reporting had on their lines only 54 per cent. of their own equipment, this being the lowest percentage of which we have any record since the year 1903, the earliest period for which there are any general car balance statistics. With the lessening demand for equipment, the tendency was toward a return of cars to their owners, and by August the per cent. of cars at home had increased to 62 per cent., the same average which appears in the report for the first six months of 1906. That the percentage was no higher during a month of light business than during a period which may be fairly considered as normal (notwithstanding the fact that the per diem rate was 50 cents during August, 1907, as against a rate of only 20 cents during the first half of 1906), indicates rather plainly that the common use of cars is being quite rapidly extended.

"With the fall revival in traffic, the per cent. of cars at home again shows a reduction, dropping to 60 per cent. in September and 58 per cent. in October, when the scattering of equipment was suddenly halted by the general business depression. In November, 1907, the number of cars returned to their owners exactly offset the number loaded off their home lines, while in December the returns exceeded the outward movement to such an extent as to increase the per cent. of cars at home to 64 per cent. From December this increase was continuous until April, 1908, when the figure reached 78 per cent., a total change of 20 points since November, 1907. The percentage for May was the same as for April. This percentage was maintained throughout June, but began to decrease with July, reaching 73 per cent. in September.

"Some of the group figures show still more remarkable changes. The roads in group 3 (Middle), which held but 49 per cent. of their cars during October, 1907, had this percentage increased to 85 per cent. in May, 1908. Group 9 (Southwestern) increased from 41 per cent. in November, 1907, to 66 per cent. in May, 1908, and group 2 (Eastern), from 56 per cent. in November to 75 per cent. in May. Group 1 (New England), while bringing about a net reduction in its total cars on line from 131 per cent. in November to 108 per cent. in May, shows an increase in its own cars at home from 58 per cent. to 78 per cent., plainly indicating a considerable cross movement of empty cars.

"With a few exceptions the subsequent changes by groups were similar to those in the general average. In group 1, the number of cars at home continued to increase and reached 81 per cent. in July and August, dropping to 76 per cent. in September."

CAR BALANCE AND PERFORMANCE.

Month.	Roads reporting. No.	Roads reporting. Mileage operated.	No. revenue freight cars owned.	Per cent. ry.-owned cars on line. Home.	Per cent. ry.-owned cars on line. Foreign.	Per cent. ry.-owned cars on line. Total.	Per cent. cars in shop.	Av. cars on line per frt. eng. owned.	Average miles per car per day.	Per cent. of loaded mileage.	Average ton miles. Per car.	Average ton miles. Per loaded car.	Average ton miles. Per car per day.	Average daily earnings. Per car owned.	Average daily earnings. Per ry.-ownd car on line.	Average daily earnings. All cars on line.
April, 1907..	154	197,135	1,867,405	54	44	98	5.14	66	24.8	70.6	13.9	19.8	348	2.63	2.71	2.56
May, 1907 .	155	210,733	1,935,740	55	43	98	5.24	65	25.6	69.9	13.7	19.8	354	2.66	2.75	2.60
June, 1907..	155	211,314	1,952,501	57	41	98	5.61	66	25.0	70.0	13.8	20.4	347	2.60	2.68	2.54
July, 1907..	154	215,781	1,976,871	60	38	98	5.77	65	23.1	69.3	13.9	20.0	331	2.50	2.56	2.42
Aug., 1907..	151	214,509	1,981,919	62	37	99	6.21	65	24.1	70.8	14.6	20.8	351	2.52	2.58	2.44
Sept., 1907..	158	220,273	2,088,051	60	38	98	6.02	64	24.0	71.8	14.6	20.5	354	2.58	2.64	2.50
Oct., 1907..	157	216,229	1,999,423	58	40	98	5.55	64	24.8	72.9	15.4	21.3	382	2.79	2.85	2.67
Nov., 1907..	168	217,385	2,006,892	58	41	99	5.27	64	24.2	70.2	14.6	20.9	354	2.52	2.56	2.43
Dec., 1097..	163	217,680	2,020,365	64	34	98	5.57	63	21.9	64.6	13.1	20.5	289	2.05	2.09	1.98
Jan.,* 1908..	151	217,794	2,072,851	71	26	97	5.63	63	20.8	61.4	12.8	21.4	277	1.85	1.90	1.81
Feb., 1908..	149	218,410	2,082,450	74	23	97	6.57	63	19.7	66.5	13.7	20.8	271	1.86	1.91	1.82
Mar., 1908..	153	218,516	2,084,689	74	23	97	7.29	63	21.2	66.5	13.6	20.6	290	1.99	2.05	1.95
Apr., 1908..	154	219,990	2,087,020	78	21	99	8.40	64	19.6	66.5	13.3	20.0	258	1.90	1.92	1.83
May, 1908..	161	220,745	2,090,612	78	20	98	8.98	63	19.3	67.5	13.1	19.7	254	1.77	1.81	1.72
June, 1908..	163	220,563	2,091,073	78	20	98	9.69	63	19.6	67.9	13.9	20.6	276	1.93	1.98	1.88
July, 1908.	159	220,086	2,084,787	77	21	98	10.18	64	20.0	67.3	13.8	20.6	275	1.89	1.92	1.84
Aug., 1908..	162	220,080	2,085,356	76	23	99	9.99	63	20.8	68.8	14.1	20.7	292	2.04	2.08	1.98
Sept., 1908 .	159	221,307	2,081,303	73	26	99	9.69	64	22.0	69.6	14.7	21.1	320	2.31	2.35	2.24

*Total for months prior to January, 1908, includes three or four Mexican roads.

Hearing in Portland "Gateway" Case.

For the first time since the law gave the Interstate Commerce Commission power to require connecting railways to make through routes and joint rates, two great systems have locked horns before the Commission over that question. The Hill and Harriman lines are the parties. The Commission has issued some orders for through routes and joint rates, but these have heretofore been in proceedings brought by an electric interurban road or by some very small steam line to compel a large one to take through business from it. In this proceeding the Harriman lines are trying to make the Northern Pacific join in through passenger tickets through the Portland (Oregon) gateway to Seattle, Wash.

The hearing on the question was ordered on the Commis-

sion's own motion; but when Commissioner Prouty took testimony in Chicago last week representatives of the Union Pacific appeared to introduce evidence tending to show that the gateway ought to be opened.

E. L. Lomax, General Passenger Agent of the Union Pacific, said that thousands of travelers annually desire to go from the East and Middle West over his lines through Portland to Puget Sound. One reason is that they want to see the land that is being reclaimed by the government by irrigation. Many desire to go over the Union Pacific or the Denver & Rio Grande because of the scenery along these lines, and there are constant demands for through tickets via Portland. He said it had been the policy of the Union Pacific when it opened a gateway to open it to all lines alike; but the Northern Pacific is discriminating against the Harriman roads.

The testimony showed that in order to get passengers for Puget Sound points, the Harriman lines have been giving free tickets from Portland over the Northern Pacific. Passengers buying tickets at Omaha, Kansas City and other points on the Union Pacific are given orders for these side trip tickets, which are honored. These side trip tickets have been bought from the Northern Pacific at the regular rates, and by giving them free to passengers the U. P. has made the rate to Seattle and other Puget Sound points the same as it would be over the Hill lines (the Northern Pacific or Great Northern). The testimony of ticket agents at a number of points on the Harriman lines was introduced to show that the inconvenience of the change and re-ticketing at Portland caused many passengers, especially women, to prefer to buy their tickets over the Hill lines.

J. G. Woodworth, General Traffic Manager of the Northern Pacific, was the principal witness for the Hill lines. He argued that for each railway to insist on the long haul for freight or passengers moving to or from points in its territory, is the general practice, and departures from this rule are voluntary. When not forced by competition they are influenced by an allowance of excess or indemnifying provisions or by other considerations. He gave a number of illustrations. The Oregon Railroad & Navigation Company (Harriman) will not join with the Northern Pacific in equalizing via Spokane or other gateways, rates in effect between stations on its lines in Washington, Oregon or Idaho and points in eastern states. The Pennsylvania Railroad will not accept from the Wabash or the Lake Shore at Pittsburgh business from Chicago, St. Louis or other western common points destined to points on the Pennsylvania Railroad east of Pittsburgh. Usually the Union Pacific will not handle via junction points west of the Missouri river at equal rates passengers moving between points on its own line and points on or east of the Missouri river.

Mr. Woodworth said that new through trains over the Burlington from Kansas City, St. Louis and Chicago, in connection with the Northern Pacific and the Great Northern, to Puget Sound points will soon be put on, and probably be maintained not only during the Alaska-Yukon-Pacific exposition but permanently. He said the Hill lines would be able to give as satisfactory service as could be secured by any other route, and he contended that under these conditions they ought to be allowed to retain the advantage of the long haul to Puget Sound points. The Harriman lines were trying to get the benefit of a line from Portland to Seattle without incurring the expense of building it. F. C. Dillard, Counsel of the Harriman lines, intimated that this route might be satisfactory to the Hill lines, but that he did not think it would be as satisfactory to the passengers as would a through route over the Union Pacific. Mr. Woodworth contended that the scenery along the Northern Pacific was as good as that on any other route.

C. A. Cairns, General Passenger Agent of the Chicago & North Western, gave testimony indicating that his road could route passengers either via St. Paul over the Northern Pacific or via Omaha over the Union Pacific, but in many cases passengers preferred to go via Omaha, and he thought that the Portland gateway ought to be opened. P. S. Eustis, Passenger Traffic Manager of the Burlington, contended that the Burlington's route via Billings, in connection with the Northern Pacific, was a better one than any competing route, and that when representatives of his line got a passenger into the ticket office they could always sell him a ticket. He said he would prefer to have the Portland gateway closed tighter than it is now.

Several other witnesses were called for each side, including A. M. Cleland, General Passenger Agent of the Northern Pacific, and William McMurray, General Passenger Agent of the Oregon Railroad & Navigation Company. Commissioner Prouty announced that final argument in the proceeding would be heard on April 7. The Harriman lines were represented at the hearing by F. C. Dillard, Commerce Counsel; the Northern Pacific by C. W. Bunn, General Counsel, and the Chicago & North Western by S. A. Lynde, General Attorney.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

B. M. Waldron has been appointed Freight Claim Agent of the Cincinnati, Hamilton & Dayton, with office at Cincinnati, Ohio, succeeding F. J. Sweeney.

L. B. Houck, Superintendent of Traffic of the Chester, Perryville & Ste. Genevieve, has been elected First Vice-President and his former office has been abolished.

H. M. Bouck has been appointed Freight Claim Agent for steamship lines between New York and New Orleans and New York and Galveston of the Southern Pacific.

F. O. Waldo has been appointed Secretary of the Chicago, Kalamazoo & Saginaw, with office at Detroit, Mich., succeeding W. J. Kealey, deceased. J. E. Griffiths has been appointed Treasurer, with office at Detroit.

J. F. Dusenbury, whose resignation as Secretary and Treasurer of the Georgia, Florida & Alabama has previously been announced in these columns, has been elected President of J. R. Saunders & Co., Naval Stores Factors.

George F. Moore has been elected President of the Manufacturers Railway, with office at St. Louis, Mo., succeeding Adolphus Busch, resigned. He was born February 22, 1862, at Bloomington, Ind. In 1884, just after graduating from the Indiana State University, he began railway work as Assistant Cashier of the local freight office of the Louisville, New Albany & Chicago, now a part of the Chicago, Indianapolis & Louisville, at Chicago. In 1890 he was made Agent for the Louisville Southern, now a part of the Southern Railway. In 1894 he was appointed Freight Agent in charge of terminals of the Chicago & Alton, at Peoria, Ill., and in 1900 was made Chief Traveling Auditor of the same road. During the year 1900 he was also connected with the North Shore Despatch, a fast freight line operated from Chicago in the interest of the Michigan Central. In 1904 he was appointed Auditor of the Parral & Durango, and in 1906 he was made Auditor, Traffic Manager and Superintendent of the Boyne City, Gaylord & Alpena. In 1907 he was appointed General Manager of the St. Joseph Valley. In 1908 he was appointed an Examiner of the Interstate Commerce Commission at Washington, D. C., which position he held until his recent appointment.


George F. Moore.

Hunter H. Laughton, whose appointment as Auditor of the Southern Railway was recently announced in these columns, was born in Richmond, Va., and after a public school educa-

tion began railway work in 1885 as messenger boy on the Richmond & Danville, now part of the Southern Railway. By 1887 he had become clerk in the freight auditor's office, and two years later was transferred as clerk to the General Auditor's office. On April 1, 1894, he was made clerk in the disbursing office, and on January 1, 1901, was made auditor of disbursements, which position he held until his recent appointment.

Operating Officers.

C. H. Stengel has been appointed Superintendent of Coal Terminals of the Virginia Railway, at Sewalls Point, Va.

C. M. Bryant, Acting Trainmaster of the Missouri, Kansas & Texas, at Denison, Tex., has been appointed Superintendent at Smithville.

George R. Raine, Chief Inspector of the Southern Demurrage & Storage Bureau, New Orleans, La., has been appointed General Manager, succeeding Seeley Dunn, resigned to go into another business.

W. Rudd, Chief Train Despatcher of the Missouri, Kansas & Texas of Texas, at Smithville, Tex., has been appointed Trainmaster at Smithville, succeeding W. W. Hoffman, resigned to engage in other service.

George W. Clark, General Yardmaster of the Central New England, has been appointed Assistant Superintendent, with office at Poughkeepsie, N. Y., succeeding F. W. Danks, resigned to take a position with another road.

W. J. Witte, Assistant Superintendent of Dining Car Service of the Chicago & Alton, has been appointed Superintendent of Dining Car Service, succeeding Fred McIntosh, resigned, to accept the management of a hotel at Dwight, Ill. Effective March 1.

J. A. Boyers has been appointed Assistant Superintendent of the Nashville, Chattanooga & St. Louis at Nashville, Tenn., succeeding J. T. C. Davis, resigned. E. A. Hibbett has been appointed Trainmaster of the Chattanooga and Nashville divisions; G. J. Hearn has been appointed Chief Despatcher of the Chattanooga division, and W. H. Smith has been appointed Chief Despatcher of the Nashville division.

J. C. Vining, General Superintendent of the Colorado Midland, has resigned and his office has been abolished. F. B. Miller, Trainmaster at Cardiff, Colo., has been appointed Superintendent, with office at Colorado City, and will assume the duties heretofore assigned to the General Superintendent. F. D. Weidenhamer, Trainmaster at Colorado City, succeeds Mr. Miller and his former office has been abolished.

F. H. Dever, Superintendent of the Houston Belt & Terminal, has been appointed Inspector of Passenger Service of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., and the position of Superintendent of the Houston Belt & Terminal Railway has been abolished. In all likelihood, J. J. Flynn, Superintendent of the Trinity & Brazos Valley, will be made General Manager of the Houston company some time in March, and will assume charge of the construction work contemplated for Houston. This is a new position.

J. E. Hurley, General Manager of the Atchison, Topeka & Santa Fe, has been appointed General Manager, Eastern Lines, which includes all divisions east of Newton, Kan., and Wellington, with office at Topeka. C. W. Kouns, Assistant to the Second Vice-President, has been appointed General Manager, Western Lines, which includes all divisions west of Newton and Wellington and east of Silver City, N. Mex., and Isleta, with office at Amarillo, Tex. This division of territory was made necessary by heavy increases in traffic. The appointments are effective March 31.

Traffic Officers.

C. J. Payton, Commercial Agent of the St. Louis, Brownsville & Mexico, at Corpus Christi, Tex., has resigned.

C. S. Riley, Agent for the Gulf, Colorado & Santa Fe, at Ardmore, Okla., has been appointed Agent of the Houston Belt & Terminal.

S. C. Greusel has been appointed General Freight and Passenger Agent of the Chicago, Kalamazoo & Saginaw, with office at Kalamazoo, Mich.

S. H. Johnson, Assistant General Freight Agent of the Chicago, Rock Island & Pacific, has been appointed Assistant Freight Traffic Manager, with office at Chicago.

J. R. Peachy has been appointed Traffic Manager of the Chester, Perryville & Ste. Genevieve, with office at St. Louis, Mo., succeeding L. B. Houck, promoted. The office of Superintendent of Traffic, which was formerly held by Mr. Houck, is abolished.

Engineering and Rolling Stock Officers.

S. S. Riegel has been appointed Mechanical Engineer of the Delaware, Lackawanna & Western, at Scranton, Pa., succeeding J. A. Mellon, resigned.

W. H. Potter has been appointed Superintendent of Telegraph of the Southern Railway, with office at Washington, D. C., succeeding C. P. Adams, deceased.

James M. Reid, Chief Engineer Construction of the National Lines of Mexico, has been appointed Chief Engineer of the National Railways of Mexico, with office at Colonia station, Mexico City.

B. W. Benedict has been appointed Bonus Supervisor of the Atchison, Topeka & Santa Fe, at Topeka, Kan., and will have territorial charge of bonus work on the Eastern Grand division and functional supervision over standardization of schedules.

The officers of the Maintenance of Way and Bridges and Buildings department of the Rutland, formerly reporting to George L. Moore, whose resignation as Chief Engineer we have previously announced, will hereafter report to M. H. Elkin, Assistant Engineer, at Rutland, Vt.


E. B. Thompson.

Edgar B. Thompson, whose appointment as Superintendent of Motive Power and Machinery of the Chicago, St. Paul, Minneapolis & Omaha has been announced in these columns, was born March 18, 1859, at Woburn, Mass. After taking a special course in the Massachusetts Institute of Technology he began railway work on May 18, 1882, with the Chicago & North Western, at Chicago. On February 26, 1885, he was made chief draftsman, and on February 2, 1895, was appointed Mechanical Engineer. On March 12, 1897, he was appointed Mechanical Engineer of the Northern Pacific. From March to August, 1899, he had charge of some special work in the car department of the Chicago & North Western. On August 5, 1899, he again assumed the duties of Mechanical Engineer of the Chicago & North Western, and on January 1, 1903, he was made Master Mechanic at Mason City, Iowa. On June 1, 1903, he was appointed Master Mechanic at Winona, Minn., and on July 1, 1906, was made Assistant Superintendent of Motive Power and Machinery, which position he held until his recent appointment.

OBITUARY.

Thomas E. Swann, formerly Assistant General Passenger and Ticket Agent of the Denver & Rio Grande, died at Pueblo, Colo., on February 16. He was born December 21, 1862.

Andrew W. Conners, formerly Trainmaster of the Chicago & North Western, and for 50 years continuously in the service of that road, died at Chicago on February 16 from pneumonia.

Railroad Construction.

New Incorporations, Surveys, Etc.

Allentown & Reading Traction.—Press reports say that this company is making surveys for a cut-off from the present line at Lyons, Pa., northeast via Bowers, Topton, Hancock, Shamrock and Alburtis to the main line at either Trexlertown or East Texas, about 15 miles.

Altoona, Hollidaysburg & Bedford Springs (Electric).—An officer writes that work will be started this year on its proposed electric line from Altoona, Pa., via Everett to Bedford Springs. All the right of way is about secured. W. W. Rudisill, President; F. Bendheim, Treasurer, and J. F. Kaufmann, Secretary, all of Altoona. (Jan. 29, p. 235.)

Asherton & Gulf.—The Nueces Valley, Rio Grande & Mexico was organized to build a line from Eagle Pass, Tex., east to Aransas Pass, about 300 miles. Work is now under way by the J. F. Burns Construction Co., of Devine, Tex., on the 32-mile section from Artesia, Tex., west to a point on the International & Great Northern at Asherton, Dimmet county. An officer writes that the name of the company has been changed to the Asherton & Gulf, with headquarters at Asherton. Grading finished on 20 miles and tracklaying to be begun March 1. A. Richardson, President, and R. H. Gresham, Chief Engineer, Artesia. (Jan. 29, p. 236.)

Atlantic, Quebec & Western.—An officer writes that the work carried out by this company last year on the extension building from Port Daniel, Que., northeast toward Gaspe included grading 26 miles, 20 of which was between Port Daniel and Grand Pabos, and six miles on the Gaspe end. From Port Daniel to Pabos nearly all of the grading was heavy rock work. At Port Daniel an 850-ft. tunnel was finished, and last summer foundations for nine steel bridges were put in between Port Daniel and Pabos; the steel superstructures are now being erected. The heaviest foundations put in were at North river, Port Daniel, where there will be three spans of 100 ft. and one span of 200 ft. over the river. Between Port Daniel and Grand Pabos there will be one-half mile of steel bridges, one-half mile of pine trestles and one mile and a half of temporary trestles. All the rock work through to Gaspe has been finished. From 1,500 to 1,800 men were at work during the summer on the lines. From Pabos to Gaspe, 62 miles, work is now under way by the New Canadian Co., Ltd., New Carlisle, Que. (Dec. 18, p. 1608.)

Denver, Colorado Springs & Pueblo Interurban.—Incorporated in Colorado, with $4,500,000 capital and office at Denver. An officer writes that surveys are being made for a projected line from Denver south via Colorado Springs to Pueblo, 119 miles. The section from Denver south to Colorado Springs, 74 miles, is to be built first. L. M. Pfeiffer, A. E. Van Deusen, Denver; W. T. Brinford, Salt Lake City; C. Ledener and F. C. Lewis, of Chicago, are interested.

Evansville & Southern Indiana Traction.—According to press reports this company will extend its line from Patoka, Ind., north to Hazleton, eight miles, this year, and may build a further extension next year to Vincennes and eventually to Terre Haute, 75 miles.

Gainesville, Whitesboro & Sherman Interurban.—An officer writes that work has been discontinued on this proposed line from Gainesville, Tex., east to Sherman, 39 miles. About 12 miles of grading has been completed from Gainesville. Track laying has been indefinitely postponed.

Loop & Lookout.—See Sewell Valley.

Manitoba & Great Northern.—A bill is before the Manitoba Legislature to incorporate this company with $2,500,000 capital. Permission is asked to build railway lines from Winnipeg, Man., west to Brandon, thence west via Elkhorn, Man., to a point at the western boundary of Saskatchewan; from Morden north via Rathwell to the Winnipeg-Brandon line. The company also asks permission to buy lines from Gretna at the United States boundary north to Portage la Prairie, and from Morden south to the United States boundary. The incorporators include L. W. Hill, J. Fisher, C. P. Wilson, J. F. Fisher and R. I. Farrington. The general offices are to be in Winnipeg. About two years ago Chairman James J. Hill, of the Great Northern, was quoted as saying that that company would build an additional line across western Canada. It is thought that the present company has been incorporated to carry out that project.

Marietta & Lake.—Incorporated in Ohio, with $100,000 capital and headquarters at Cambridge. The company proposes to build a line from Lore City, Ohio, east thence north through Guernsey, Belmont and Harrison counties to Freeport, about 30 miles. C. S. Sheppard, S. R. Heade, E. D. Shively, C. Cosgrove and D. R. Wallace are incorporators.

Mexican Railway.—In the betterment work on this line during the past year, some 4,000 tons of 85-lb. British section rails were laid. A sample section of 10 miles of line was laid with 85-lb. rail placed on creosoted American pine ties, with the object of making a comparison of the life of wood and steel ties. With the exception of this 10-mile section, all of the line is now laid with steel ties. A lot of 4,000 tons of 85-lb. rail is now on order for delivery in March. All of the bridges are being strengthened with new girders, designed to carry an axle load of 50,000 lbs., and this work should be completed by the end of this year. The Missouri Valley Bridge Co. are contractors for the steel work. An engineering party is at present in the field running lines on the Plateau, reducing the grades from 1½ per cent. to 1 per cent., and the curves to a maximum of one degree. It is not at present decided when the construction work on this section will begin.

Norfolk & Western.—An officer writes that this company has finished the Tug Fork branch extension for 3.84 miles above Pageton, W. Va., to Anawalt-Operation No. 12 U. S. Coal & Coke Co.

The Spice Creek branch in Roderfield, W. Va., has been built for 4.54 miles to the Premier Pocahontas Collieries operation, and is now in operation.

The Poplar Creek branch near Cedar, W. Va., has been built and is now in operation for 2.07 miles, to the Majestic Collieries operation.

Work is now in progress double-tracking the line between Huger, W. Va., and Welch. This improvement includes a double-track tunnel at Welch. It is expected to have this section of the double-track work finished about July 1.

On the Big Stony Railway track has been laid to the West Virginia state line, 16.70 miles from the junction of the Big Stony Railway with the N. & W., near Ripplemead, W. Va.

The Interior & West Virginia is under construction through Monroe county, W. Va., from the terminus of the Big Stony Railway at the Virginia state line, to a connection with the Virginia & Potts Creek Railroad, 17.55 miles. The roadbed and bridging are about 90 per cent. finished, and it is expected to have the line in operation by July.

The Virginia & Potts Creek has grading about 98 per cent. finished on the 4.2 miles under construction from the end of the Interior & West Virginia Railroad to Paint Creek, Va. These lines are being built to develop extensive iron ore properties in Potts Creek valley.

Nueces Valley, Rio Grande & Mexico.—See Asherton & Gulf.

Palestine & Dallas Interurban.—An officer writes that contracts are to be let in May for building this line, projected from Palestine, Tex., northwest via Corsicana, Waxahachie to Dallas, 110 miles, with a branch from Waxahachie east to Ennis, 10 miles. There will be one small bridge over the Trinity river. J. V. Watkins, President, and G. A. Duren, Chief Engineer, Corsicana. (See Texas Roads, Jan. 22, p. 187.)

Rangeley Lakes & Megantic.—Incorporation has been asked for by this company in Maine to build 30 miles of railway from Oquossoc, Me., north to the Quebec boundary. The incorporators include L. Tuttle, H. B. Cleaves, E. P. Ricker, S. M. Carter, F. A. Wilson, M. McDonald and J. W. Symonds.

St. Louis, Brownsville & Mexico.—An officer writes that the Buckeye spur line from Buckeye, Tex., has been extended and is now nine miles long. The line may eventually be further extended for a branch to have a total length of 20 miles. Surveys made for an extension from Donna, Tex., to Sugar Mills, two miles. (Dec. 18, p. 1609.)

SAN DIEGO, EL PASO & ST. LOUIS.—An officer writes that this company was organized to build a line from El Paso, Tex., northeast through the southeastern corner of New Mexico, and through Texas to the Texas-Oklahoma boundary on the Red river, about 500 miles. The company has been granted a charter in Texas, with a capital of $100,000, to build the first 100 miles northeast from El Paso to the New Mexico line. Application will shortly be made for a charter in New Mexico, with a capital of $4,000,000, to cover about 200 miles to cross that territory. Surveys are now being made locating this part of the line. Rights of way and sites for terminals have been secured for almost the entire line. There will be bridges at Pecos, Yellowhouse and Peace rivers. L. P. Atwood, Chief Engineer, El Paso.

SEATTLE-EVERETT TRACTION.—This company and the Everett Railway, Light & Water Co. have given a contract to the Stone & Webster Engineering Corporation, Boston, Mass., for building an interurban railway from Halls Lake, Wash., to Everett, a distance of 13 miles. A nine-mile section of interurban railway between Seattle and Halls Lake is built, and this, together with the new section, will form a through interurban connection between Seattle and Everett. The Seattle Electric Co. will provide the connecting line between the interurban at the city limits and its own system.

The road will be built entirely on private right-of-way. Catenary overhead construction will be used and current will be supplied from a substation to be located half-way between the Freemont substation of the Seattle Electric Co., in Seattle, and the power station of the Everett Railway, Light & Water Co., in Everett. The Freemont substation receives current from either the Puyallup water power plant or the Georgetown turbine station. From this substation the current will be carried at 13,000 volts to the new substation for the interurban. The present arrangements provide for improvements in the present line from Seattle to Halls Lake as well as all the work involved on the new section. (Oct. 2, p. 1076.)

SEWELL VALLEY.—An officer writes that contract has been given to the Morasco-Pasqua Lichie Co. for building two miles of the line now under construction from Meadow Creek, W. Va., into the mountains to coal and timber lands, 21 miles. The company is building with its own forces the remaining 19 miles. Grading is finished for about two-fifths of the way to the mouth of Sewell creek on Meadow river, at which point it joins the survey for the Loop & Lookout Railroad to be built along the Meadow river, about 25 miles, on which some grading has been done. (Nov. 13, p. 1374.)

SOUTHERN UTAH.—An officer writes that this company, which is building a line from Miller Creek coal mines northeast to Price, Utah, about 20 miles, has grading finished on about six miles and expects to begin track laying April 1. The Ely Construction Co., of Springville, are the contractors. J. F. Williamson, Price. (Dec. 11, p. 1561.)

SPOKANE & INLAND EMPIRE (ELECTRIC).—An officer writes that work is to be started this month on the tunnel in the business district of Spokane, Wash., through which this line is to run. (Dec. 11, p. 1561.)

STAMFORD & NORTHWESTERN.—We are told that this company, which is building a line from Stamford, Tex., westerly to Dickens, 75 miles, expects to have all the grading finished and several miles of track laid by July 1. P. M. Johnston, Son & Allhands, of St. Elmo, Ill., have contracts for grading, buildings, bridges, etc. Sub-contract is let to J. L. McSpadden for the first five miles out of Stamford. About 350 teams are now at work. Track laying is to be carried out by the company's forces. P. J. Burns, Chief Engineer, Stamford. (Jan. 29, p. 236.)

TWIN CITY & LAKE SUPERIOR (ELECTRIC).—An officer writes that additional contracts are to be let about April 1 by this company building a double-track third-rail line from Minneapolis, Minn., northeast via St. Paul, Minn., and Superior, Wis., to Duluth, Minn., 130 miles. Contracts let as follows: From the lower St. Croix river to upper St. Croix, 33 miles, to Westerdahl & Carlson, and from upper St. Croix to Superior, Wis., 60 miles, to Smith & Jones. Track laid from Minneapolis to Coon Lake, 25 miles. There will be two large bridges. J. H. Thomas, Chief Engineer, 440 Railway building, Minneapolis. (June 5, p. 47.)

Railroad Financial News.

ATLANTA, BIRMINGHAM & ATLANTIC.—The Old Colony Trust Co., Boston, Mass., has brought suit to foreclose the mortgage of 1906, under which $14,443,000 bonds are outstanding. Construction claims amounting to $771,300 have also been filed, the contractors asserting that their claims are a first lien on the property of the road.

BALTIMORE & OHIO.—It is understood that the directors, in company with J. P. Morgan & Co., New York, are considering the purchase of control of the Cincinnati, Hamilton & Dayton.

CENTRAL TRUNK.—See Jamestown, Franklin & Clearfield.

CHICAGO & MILWAUKEE (ELECTRIC).—Suit has been brought by the trustee of the Illinois division mortgage of 1902, under which $4,000,000 bonds are outstanding, to foreclose. The interest coupons due January, 1908, and January, 1909, are in default.

CHICAGO & NORTH WESTERN.—Outstanding Ottumwa, Cedar Falls & St. Paul first mortgage 5 per cent. bonds, amounting to $1,600,000, are to be paid at maturity on March 1.

CINCINNATI, HAMILTON & DAYTON.—See Baltimore & Ohio.

DENVER & RIO GRANDE.—Blair & Co., William Salomon & Co. and Wm. A. Read & Co. have bought an additional $5,000,000 first and refunding mortgage 5 per cent. bonds of 1908-1955, and have sold the bonds at a subscription price of 93. This makes $22,500,000 of these bonds outstanding. The proceeds of the sale of the additional $5,000,000 bonds are to be used to buy equipment and to pay for improvements.

DULUTH, RAINY LAKE & WINNIPEG.—D. R. Hanna, Vice-President of the Canadian Northern; L. W. Mitchell, D. J. Morton and W. D. Bailey have been elected new directors, and W. H. Cook has been re-elected a director.

FRANKLIN & CLEARFIELD.—See Jamestown, Franklin & Clearfield.

HUDSON & MANHATTAN.—The Guaranty Trust Co., New York, has sold at a price to yield 6 per cent., $920,000 5 per cent. car trust certificates, dated March 1, 1909, maturing $46,000 semi-annually. The certificates are secured by 90 cars, costing $1,143,180, of which $223,180 was paid in cach.

HUDSON COMPANIES.—Harvey Fisk & Sons, New York, are offering at par $1,500,000 6 per cent. secured convertible notes due 1911. The notes are convertible into Hudson & Manhattan first mortgage 4½ per cent. bonds, the bonds to be taken at 85 per cent. (Oct. 16, p. 1178.)

JACKSON COAL ROAD.—See Jamestown, Franklin & Clearfield.

JAMESTOWN & FRANKLIN.—See Jamestown, Franklin & Clearfield.

JAMESTOWN, FRANKLIN & CLEARFIELD.—Stockholders of the Franklin & Clearfield, the Jamestown & Franklin, the Central Trunk and the Jackson Coal Road are to meet to-day to vote on consolidating the four roads under the name of the Jamestown, Franklin & Clearfield. The roads are controlled by the Lake Shore & Michigan Southern.

KANSAS CITY, MEXICO & ORIENT.—The United States & Mexican Trust Co., Kansas City, and W. Franklin Burnham, Boston, Mass., are offering $1,000,000 Kansas City, Mexico & Orient first mortgage 4 per cent. bonds of 1901-1951 at par, each bond carrying with it a bonus of 40 per cent. of 4 per cent. non-cumulative preferred and 40 per cent. common stock.

LAKE SHORE & MICHIGAN SOUTHERN.—See Jamestown, Franklin & Clearfield.

NEW LONDON NORTHERN.—This company, whose property is leased to the Central Vermont, has applied to the Connecticut legislature for authority to issue $1,500,000 bonds for refunding and improvements and additions.

NEW ORLEANS TERMINAL.—Potter, Choate & Prentice, New York, are offering $3,000,000 New Orleans Terminal 5 per cent. notes of 1909-1911 at 100½, yielding about 4¾. The authorized issue of these notes is $3,500,000, of which $2,500,000

is issued to retire a like amount of 6 per cent. notes maturing April 10, 1909, and the proceeds of $500,000 is to be used for additional improvements, the remaining $500,000 being held in the treasury. Both the present issue and the issue to be retired are guaranteed principal and interest by the Southern Railway and the St. Louis & San Francisco. The earlier issue was secured by a deposit of $4,000,000 New Orleans Terminal first mortgage 4 per cent. bonds, the bonds themselves being guaranteed by the Southern and the 'Frisco, and the present issue of notes is secured by a deposit of $5,000,000 bonds. The notes that are to be retired were offered in March, 1908, at 98¼, by the same bankers that are now offering the new notes, and since they were 6 per cent. notes, at the offering price they yielded about 7¾ per cent.

SOUTHERN PACIFIC.—Stockholders are to vote on April 7 on the question of authorizing an increase of the common stock by $100,000, of which as much as necessary shall be set aside to provide for an issue of 4 per cent. 20-year bonds, convertible until June 1, 1919, at the option of the holder, into common stock, at the rate of 130 per share. The holders of both common and preferred stock are to be given the privilege of subscribing on or before April 20 for $82,000,000 of these convertible bonds. The offering price is 96 and stockholders may subscribe to the extent of 30 per cent. of their holdings. After deducting the amount of bonds allottable to the Oregon Short Line, there are $44,500,000 bonds left to offer to other stockholders, this amount having been underwritten by Kuhn, Loeb & Co., New York. Advances to proprietary companies for construction and additions and other expenditures for such purposes up to June 30, 1908, amounted to $103,332,545. Details of these expenditures are given in the annual report as follows:

Construction of new lines not yet financed by the companies directly owning them	$44,310,194
Purchase of new lines not yet financed and other properties	11,309,291
Advances for account of electric lines	5,526,914
Rolling stock	18,424,447
Steamships and other floating equipment	7,900,952
Real estate and other properties, principally terminals in San Francisco and other localities	15,860,787
Total	$103,332,585
Cost of stocks of Pacific Fruit Express & Los Angeles Ry.: stocks and bonds of Associated Oil Co., Pacific Electric Ry., Northwestern R.R., and of other companies, as shown in last annual report, which are a free asset of the company	38,606,586
Total	$141,939,171
Advances and expenditures from July 1, 1908, to December 31, 1908, for similar accounts amounted to	12,439,733
Total, December 31, 1908	$154,378,903
As a result the company now requires:	
For the discharge of outstanding loans	35,838,945
For additions and betterments heretofore authorized, principally for the reduction of grades, improvement in alinement and additional main track and sidings	3,756,320
For new equipment under contract	7,467,658
For construction of new lines heretofore authorized and already under way, as stated in the last annual report	19,796,045
Total	$66,858,968

To provide the funds necessary to meet these present requirements and for future betterments and additions to the property, and for other corporate purposes, an issue of such bonds to the amount of about $82,000,000 at this time is deemed advisable by the directors.

SOUTHERN RAILWAY.—It is said that J. P. Morgan & Co. have bought sufficient general mortgage and development 4 per cent. bonds of the Southern Railway to provide the Southern with money to redeem the $16,000,000 outstanding 5 per cent. notes that mature April 1.

TEXAS & PACIFIC.—The interest due March 1 on $24,660,975 5 per cent. second income bonds is to be passed, since no surplus from operations is properly available therefor. Five per cent. was paid from 1902 to 1907, inclusive, and 3½ per cent. was paid in 1908.

WESTERN MARYLAND.—A new issue of $2,000,000 5 per cent. receiver's certificates dated March 1, 1909, and payable on or before March 1, 1911, has been authorized by the United States Circuit court. Of these certificates, $866,371 are to be issued to pay for new rolling stock and $1,133,629 are to be issued to refund receiver's certificates issued under order of June 5, 1908.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Woodward Iron Co., Woodward, Alb., has ordered one locomotive from the Baldwin Locomotive Works.

The New York, Chicago & St. Louis inquiry for 20 locomotives reported in the *Railroad Age Gazette* of February 12, includes 10 ten-wheel freight and 5 six-wheel switching locomotives.

The Chicago, Rock Island & Pacific, as reported in the *Railroad Age Gazette* of December 25, has ordered 33 simple Pacific locomotives from the American Locomotive Co. for delivery beginning March 1.

General Dimensions.

Weight on drivers	149,000 lbs.
Weight, total	220,000 lbs.
Cylinders,	23 in. x 28 in.
Diameter of drivers	73 in.
Boiler, type	Extended wagon top
" working steam pressure	185 lbs.
" diameter at smallest ring	68⅝ in.
Heating surface, tubes (approximate)	3,375 sq. ft.
" " firebox "	180 "
" " total "	3,555 "
Tubes, number	About 328
" diameter	2 in.
" length	19 ft. 9 in.
Firebox, length	108 in.
" width	60 in.
" depth	Front, 80½ in; back, 68½ in.
Grate area	45 sq. ft.
Tender, style	Water bottom
" truck	Equalized pedestal
" water capacity	7,500 gals.
" coal capacity	13 tons

Special Equipment.

Bell ringers	Gollmar
Blow-off valves	Crane
Boiler covering	Franklin
Couplers	Latrobe
Headlights	Pyle-National
Injectors	Simplex
Lubricators	Nathan
Metallic Packing	United States
Safety valves	Ashton
Sanding device	Leach
Springs	Railway Steel-Spring Co.
Steam gages	Ashton
Tender brake-beams	Creco
Valves	Richardson

CAR BUILDING.

The Virginia & Southwestern has given an order to the Western Steel Car & Foundry Co. for repairing 10 forty-ton gondola cars.

The Isthmian Canal Commission will receive bids until March 8, 1909, for 20, twelve-ton, 3-ft. gage flat cars. (Circular No. 495.)

The Intercolonial, reported in the *Railroad Age Gazette* of February 19 as having ordered five baggage cars from Canadian builders, has also ordered 10 colonist cars; 3 from the Silliker Car Co.; 3 from the Crossen Car Manufacturing Co., and 4 from Rhodes, Curry & Co.

IRON AND STEEL.

The Delaware, Lackawanna & Western is said to be in the market for 4,000 tons of rails.

The New Orleans & Northeastern has ordered 1,400 tons of rails from the Illinois Steel Co.

The El Paso & Southwestern has ordered 6,200 tons of rails from the Colorado Fuel & Iron Co.

The Long Island is in the market for 400 tons of structural steel for use on the Dutch Kills bridge.

General Conditions in Steel.—The announcement, last week, of an open market on steel did not specially mention rails, and the present indications are that the independent manufacturers and the United States Steel Corporation have this yet to settle. Chairman Gary is quoted as saying that: "The price of steel rails will not be reduced by the United States Steel Corporation at present." The price of $28 per ton has been maintained for the past eight years. Market reports

indicate that over 200,000 tons of rails will be placed if the price be cut to $25, which places a decided temptation before the independents.

SIGNALING.

Absolute Block System on the Northern Pacific.

The Northern Pacific on February 8 adopted the "A B C" block signal rules on the lines between Billings, Mont., and Livingston, 115 miles. The company is planning to adopt the same signal rules on the Washington Central branch, extending 142 miles northwest from Spokane, and on the Palouse and Lewiston branches, which extend south from Spokane, 146 miles; and in connection with the change a telephone line will be put up and all communications will be made by telephone. As all of the trains on these branches do local business, many of the less important stations will be equipped with telephones arranged for use by the conductors of the trains, and no station operator will be required.

Oil Burning Locomotives on the Mexican Railway.

Two new Fairlie mountain locomotives have just been received for use on the 4 per cent. mountain grades of this line. These locomotives carry 125 tons on the drivers, and are said to be about the heaviest locomotives of this class ever built. This company now has 15 locomotives burning oil and about 40 additional ones will be equipped for this fuel by the end of June, and all of the motive power will be thus equipped by the end of the year. Large oil storage tanks are being built at Vera Cruz, Orizaba, Esperanza and Mexico.

South Manchurian Trains.

Consul Roger S. Greene, of Dalny, reports that the South Manchuria Railway on October 27 made a trial run of the new American first-class cars which are to be used for its express trains connecting with the Chinese Eastern at Changchun. The train, consisting of a first-class day coach, two sleepers, one dining car, and one baggage car, took a party of invited guests, leading Japanese officials, foreign consuls, foreign and Japanese merchants and newspaper men, to the station of Chinchou, a run of about one and one-fourth hours from Dalny. After an hour's stay the return trip was made at the speed at which the express trains are to be run, an average of about 30 miles an hour, reaching a maximum of about 45 miles per hour, so that the guests were able to observe the behavior of the cars under actual service conditions.

The company officials were greatly pleased with the finish, equipment and smooth running qualities of the cars. The sleepers, diners and first-class coaches are all standard cars, and fitted with all improvements. They are heated by steam and lighted by electricity. The sleepers are of the usual American type with two drawing rooms at one end, each having three berths and a private lavatory.

The express trains on which these cars will be used are to be run twice a week, leaving Dalny on Mondays and Fridays, thus connecting with only two of the Trans-Siberian express trains, the International Sleeping Car Co.'s train and the St. Petersburg express. The South Manchuria Railway's liner Kobe Maru will continue to run weekly between Dalny and Shanghai to connect with the International express. It will leave Dalny Mondays at 2 p.m. and arrive at Shanghai Wednesdays, while on the return trip it will leave Shanghai Friday morning and reach Dalny early Sunday morning.

The first express train left Dalny on October 30 at 8 a.m. The journey from Dalny to Changchun, which has hitherto taken 25 hours, will now be made in 21 hours, thus bringing the passengers to Changchun at 5 a.m., an arrangement made unavoidable by the time-table of the Russian trains with which connections must be made. The southbound train will leave Changchun at 8.40 p.m. on Tuesdays and Saturdays, and will arrive at Dalny at 6.15 the following evening.

Supply Trade News.

The Wells Light Manufacturing Co. has moved its general office from New York City to the factory at Jersey City, N. J.

The Marion Steam Shovel Co., Marion, Ohio, is planning large additions to its machine shops, erecting department and other parts of the plant. The new steel foundry is now in operation.

The Sargent-Hollingshead Co., Fisher building, Chicago, which was incorporated last August to manufacture and sell railway equipment and supplies, has increased its capital stock from $5,000 to $10,000.

The Knight Pneumatic Sander Co., Huntington, Ind., has been incorporated to manufacture a pneumatic sander for railway service. The directors are William F. Yergens, Charles E. Knight and G. F. Knight.

The New Castle Forge & Bolt Co., New Castle, Pa., has increased its capital stock from $300,000 to $450,000 to provide additional working capital. No large additions or improvements are planned at present.

The Ralston Car Works, Ralston, Neb., has been incorporated with a capital of $300,000 by C. A. Ralston, Fisher building, Chicago; George T. Ross, M. S. Dean, W. J. Lacey, William Hassman, H. H. Baldridge and L. Howard.

The Railroad Appliance Co., Columbia, S. C., has been incorporated to make patented railway devices. Alexander Rowland is President and Treasurer; Lysander D. Childs, M.E., Vice-President; James B. Edwards, General Manager, and F. C. Hack, Secretary.

The Spiral Journal Bearing Manufacturing Co., St. Louis, Mo., has been incorporated to manufacture and sell railway journal bearings and supplies. Capital stock, $200,000. The incorporators are George J. Kobusch, W. S. McCall, Abraham Cook and W. B. Phelps.

An American consular officer of Latin America says that an official of a local railway wants catalogues and price lists of railway and river steamboat materials and supplies, including machine tools, rails, cars, etc. (Inquiry No. 3,071, Bureau of Manufactures, Washington, D. C.)

Alexander B. Wetmore has been appointed Sales Manager of the Monarch Steel Castings Co., Detroit, Mich., effective March 1. Mr. Wetmore leaves a long period of service with the Detroit Lubricator Co., Detroit, to take up the sales of the Monarch couplers and Monarch graduated draft gear.

Another British patent has been revoked under the new patent law. It is that of an American sewing machine, the patentees having taken no steps to comply with the law requiring manufacture in England. They had to pay $200 costs to the applicants who asked for the revocation of the patent.

Bids will be received until March 8, 1909, by the Isthmian Canal Commission, Washington, D. C., for furnishing the following: Rail braces, dipper doors for steam shovels, band saws, twist drills, pipe chucks, bridge reamers, hand jointer knives, belt studs, carborundum wheels, etc. (Circular No. 495.)

The Marshall & Huschart Machinery Co., Chicago, made a formal opening of its demonstration room, at 62 South Canal street, on Saturday evening, February 20. The Superintendents' and Foremen's Club of the Chicago branch of the National Metal Trades Association held its regular meeting in the store room on the same evening.

According to a consular report, tenders for the construction of an American steel bridge, to the order of the Japanese Government Railways, were opened recently, resulting in favor of Frazer & Sale. The amounts of the tenders were as follows: Frazer & Sale, $74,270; Mitsui Bussan Co., $74,490; American Trading Co., $76,500; Okura & Co., $78,228; Nishizawa Co., $78,750.

The Blue Island Car & Equipment Co., Chicago, has purchased a 10-in. and an 18-in. merchant bar mill, with shear and miscellaneous equipment, from the United Engineering & Foundry Co., Pittsburgh, Pa. This machinery will be in-

stalled in a new rolling plant that will be operated in connection with its other manufactures at West Pullman.

The plant, business and good will of the John Davis Co., Chicago, manufacturer of cast iron pipe and fittings, which has been in existence for 40 years, has been sold to the National Tube Co., Pittsburgh, Pa., with the exception of the "Eclipse" steam specialties. These will continue to be made and sold by the Hughson Steam Specialty Co., 860 South Halstead street, Chicago, agent for the Byers wrought iron pipe.

The Northern Pacific is installing electric lights on all its main line passenger trains. Curtis turbo-generating outfits, instruments, etc., have been bought from the General Electric Co., Schenectady, N. Y. The apparatus will probably be used in conjunction with storage batteries and other auxiliary devices. One train running between St. Paul, Minn., and Portland, Ore., has been lighted with this system for several years.

Olaf Hoff, M. Am. Soc. C. E., has opened an office as consulting engineer at 149 Broadway, New York. He will give special attention to the design of bridges, foundations, subaqueous tunnels, subways and other structures, making examinations and reports and directing new construction. Mr. Hoff was formerly Engineer in charge of bridges and buildings of the New York Central & Hudson River and was later Vice-President of the Butler Bros.-Hoff Co., New York.

Among the recent orders taken by the Crocker-Wheeler Co., Ampere, N. J., is one for a 250-kw. motor generator set for the Tennessee Coal, Iron & Railroad Co., at Ensley, Ala. It will consist of a 250-kw., 275-volt d.c. generator, driven by a 6,600-volt, three-phase, 25-cycle, synchronous motor, and will be used as an exciter. Another order is one for about 50 h.p. of small elevator motors, purchased by the Haughton Elevator & Machine Co., Toledo, Ohio. Yawman & Erbe, Rochester, N. Y., have also placed orders for a number of 2/5 h.p. motors for use on some of their specialties.

Harry Vissering, who for the past ten years has been General Sales Agent of the United States Metallic Packing Co., Philadelphia, Pa., and Superintendent of the American Locomotive Sander Co., Philadelphia, has resigned to devote his entire time to the interests of the Charles R. Long, Jr., Co., Louisville, Ky., in the capacity of Vice-President. The Charles R. Long, Jr., Co., manufacturer of railway paints, has just purchased a plot of ground in Louisville, having a frontage of 150 ft. and 300 ft. long, upon which it will erect in the near future a thoroughly up-to-date paint plant to cost about $100,000. Mr. Vissering will continue to make his headquarters in the Great Northern building, Chicago.

On January 29, during the week the sales organization of the Western Electric Co., Chicago, held its conference in Chicago, some of the old employees of the Chicago organization gathered at luncheon. Those who attended, and the dates they entered the employ of the company, are as follows:: E. W. Bennett, 1874; J. C. Cannon, 1877; F. B. Uhrig, now Western District Supervisor of the company, with office at Kansas City, 1881; D. L. Harmon, now a banker at Indiana Harbor, Ind., 1883; C. D. Wilkinson, Manager of the Minneapolis house, 1886; William Carpenter, of the Walworth & Neville Manufacturing Co., 1887; Rolo C. Hearsley, 1888, and E. S. Holmes, now Manager of the Indianapolis house, 1890.

The plan of reorganization of the Southern Steel Co., Birmingham, Ala., has been declared operative. The company was put in the hands of receivers in October, 1907, the condition of the money market making this step necessary. Early in 1908 the company was turned over to a board of trustees. The funded debt of the company and its constituents amounts to $6,154,000. These bonds, together with note issues, are ultimately to be converted to a first refunding mortgage issue of $10,000,000. The outstanding common stock, $15,000,000, is reduced to $10,000,000 and the outstanding $10,000,000 7 per cent. cumulative preferred is reduced to $7,000,000 6 per cent. non-cumulative preferred. General creditors receive 50 per cent. in new bonds and 75 per cent. in preferred stock.

The annual report of the Chicago Pneumatic Tool Co., Chicago, for the year ended December 31, 1908, shows profits of $289,625. Depreciation, repairs and renewals cost $92,000. The balance carried to surplus after fixed charges was $21,500. The surplus at the end of 1907 was $1,008,000, and of this, $208,000 had been deducted for additional working capital for foreign subsidiary companies, other extraordinary expenses, and reserves. The present surplus, including the 1908 balance, is $821,500. The amount of the company's sales was reduced 45 per cent. by the depression, which especially affected the iron and steel business. During the year, the stock of goods on hand was reduced about $140,000, and accounts receivable decreased in proportion to the lessened volume of business. Mortgage debt, accounts and vouchers payable and bills payable were reduced $167,000.

Four new motor cars for the Southern Pacific, recently built by the McKeen Motor Car Co., Omaha, Neb., left Omaha on February 13, on their own wheels and under their own power, coupled together, en route to Sacramento, Cal., where they will go into service on the branch and interurban lines of the Southern Pacific. These are the McKeen standard, all-steel, 55-ft., 200 h.p. gasolene motor cars, having a seating capacity of 75 passengers each. This makes a total of 13 motor cars and 10 trailers now in use on that road. The third motor car for the Los Angeles & San Diego Beach is almost finished and will be shipped this week on its own wheels and under its own power to San Diego, Cal. A new 70-ft. motor car which has just been completed for the Bellingham Bay & British Columbia will be shipped in like manner about the first of March to Bellingham, Wash.

The American Automatic Stoker Co., 213 Railway Exchange, Chicago, which, as previously reported, has been organized to manufacture and sell the Strouse locomotive stoker, has opened offices in Chicago and in the Park Row building, New York. The company has one of its stokers on exhibition in the engine room of the Auditorium Annex, Chicago, where the machine may be seen in operation. One of its stokers is also on exhibition in the Railway Exchange building. They were described in the *Railroad Age Gazette* of February 5, 1909, page 255. The officers of the company are: President, D. W. Ross; Vice-President, J. J. Hannahan; Secretary and Treasurer, W. L. Pepperman; Mechanical Engineer, C. A. Street. Mr. Ross, who is also Vice-President of the Interborough Rapid Transit Co., New York, will be at the head of the company and in charge of the New York office. Mr. Hannahan, who was formerly Grand Master of the Brotherhood of Locomotive Firemen and Engineers, will be in charge of the Chicago office. Mr. Street was formerly associated with the Power Station Department of the Commonwealth Edison Co., Chicago.

TRADE PUBLICATIONS.

Pneumatic Tools.—Folders describing Thor hose couplers, air hose, air hammers, drills, wood boring machines and other pneumatic tools, are being distributed by the Independent Pneumatic Tool Co., Chicago.

Locomotive Cranes.—Bulletin No. 35, just issued by The Browning Engineering Co., Cleveland, Ohio, contains a complete description of Browning locomotive cranes, including a number of photographs showing these cranes in operation.

West Indies and Central America.—The United Fruit Co. issues an admirable tourist and motor guide to Jamaica, which it sells for 25 cents; and also other interesting literature on Jamaica and Central America, for which there is no charge.

Engineering Course.—The American School of Correspondence, Chicago, is making a special offer until March 10, of its Cyclopedia of Engineering. The Cyclopedia is compiled from the regular courses and arranged especially for a practical reference library.

Chicago & North Western.—The Belle Fourche government irrigation project in South Dakota is well described in a pamphlet recently issued by the Chicago & North Western. The climate, soil, water supply, cost, crops, market, etc., are all treated in detail.

Chicago, Milwaukee & St. Paul.—"California Winter's Summer Garden," is made the subject of a handsome, five-color brochure just issued by the Chicago, Milwaukee & St. Paul. The diversions found by the tourist and health seeker in Cali-

fornia and information as to hotels, tourists' service, etc., are briefly described.

Small Tools.—The Standard Tool Co., Cleveland, Ohio, has just issued catalogue No. 16, which is a very complete one on the small tools which the company manufactures. The endeavor has been to make this catalogue as complete as possible in price lists, display of the principal goods manufactured by this company and tables of data interesting and valuable to users of small tools.

Air Compressors.—Catalogue A.A. 37 of the Ingersoll-Rand Co., New York, contains a summary of the distinctive features of Class "A.A.-2" air compressors. This summary is arranged in brief but complete form for the use of busy readers. The catalogue also contains valuable information presented as discussions of the important considerations in air compressor design and performance.

Generators.—Bulletin No. 110, just issued by the Crocker-Wheeler Co., Ampere, N. J., contains a list, covering 15 pages, of the names and addresses of companies and individuals using engine type d.c. generators made by this company. Industrial plants, steam and street railways, machine shops, office buildings, etc., are included in this list. An accompanying leaflet contains an index of bulletins from No. 70 to No. 109 inclusive.

Gasolene Motor Cars.—A 50-page catalogue having to do with the gasolene motor cars, and freight and passenger trailers to be used in the same service, has just been issued by the McKeen Motor Car Co., Omaha, Neb. A two-page article, descriptive of the McKeen car, being a reprint from the *Railroad Age Gazette* of January 15, accompanies the catalogue. The special features of this type of car are given in detail, with photographs and drawings showing the exterior, interior and floor arrangements of the various designs. A list of some of the services now established by different roads and a number of testimonial letters from prominent railway officers are incorporated in the publication.

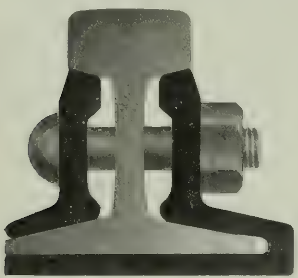
Steel Castings.—The Commonwealth Steel Co., St. Louis, Mo., has issued a number of folders that concisely call attention to the essential features of some of its steel castings. These include its locomotive tender frame, combining all sills, body bolsters, needle beams and other parts into one single casting; pilot beams and tender bumpers; composite underframes for passenger cars; four and six-wheel passenger trucks. One of the folders shows a picture of an unbroken turning of steel 40 ft. 2 in. long that was recently taken off a Commonwealth casting, which if straightened out would make a continuous strip of steel over 90 ft. long, showing that the casting was of solid, tough steel. Blue prints and full information may be obtained from the company upon request.

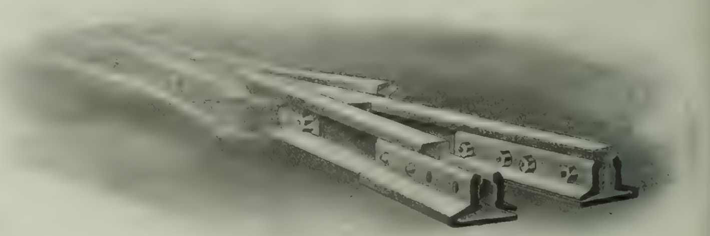
Blake Calling Apparatus.

The Blake Signal & Manufacturing Company, 246 Summer street, Boston, is to exhibit its standard railway signaling apparatus at the Coliseum, Chicago, March 15-20, on the occasion of the meetings of the Railway Signal Association and the American Railway Engineering and Maintenance of Way Association. The spaces reserved by the company are numbers 142 and 143. The Blake apparatus for calling and for controlling semaphore signals at a distance, which has been in use for five years on electric railways, has been adapted for calling on telephone lines, and its use for this purpose on train despatchers' lines will be demonstrated at Chicago. With the Blake apparatus, both visual and audible "calls" can be produced at the stations along the line. The company proposes also, where desired, to set the train-order signal to display stop, even before the operator responds to the call. In the Blake system a separate wire is used for the calling circuit, thus avoiding any overloading of the telephone line and simplifying the work of discovering troubles in the lines. The Blake apparatus, as is well known, is simple in its details, depending on the varying time of vibration of pendulums of different lengths, a different pendulum being assigned to the calling of each station. Experience with the apparatus on electric railways has shown it to be reliable and economical.

Continuous Frog and Switch Joint.

The Rail Joint Co., New York, is just putting on the market a modified type of its Continuous rail joint. The usual Continuous joint has horizontal flanges extending outward from the base of the rail, making the joint too wide at the base to apply conveniently to frog and switch joints, as these joints occur on converging rails close to their points of meeting. The new type, as the illustrations show, retains the particular advantages of the Continuous joint, giving base support and consisting of but two parts aside from the bolts. The development of the new joint has taken some time because of the hard problem of designing rolls to make it. These difficulties have been surmounted, however, the new joint requiring only two more passes than the usual Continuous joint; and the price has not been increased. After trying it out during the past year on several railways, the company is now putting it on the market.



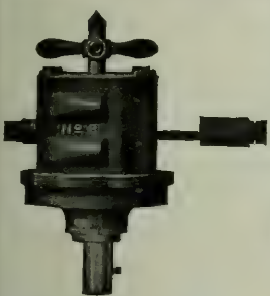


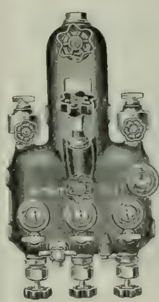
Continuous Frog and Switch Joint.

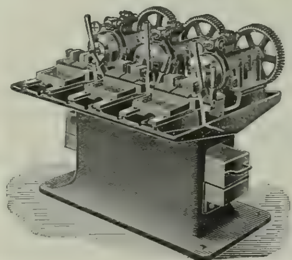
Westinghouse-Leblanc Condensers.

A number of contracts have been closed during the last six months for Westinghouse-Leblanc condensers, most of which are in connection with new turbine equipment. The Narragansett Electric Light Co., Providence, R. I., is installing two units, 7,000-h.p., in connection with new turbine equipment. The B. F. Goodrich Rubber Co., Akron, Ohio, has ordered one unit in connection with a new turbine for its central power plant. Heretofore most of the experience of this company has been with the surface type condenser in connection with Westinghouse turbines. The Coronet Phosphate Co., Plant City, Fla., has ordered three units for use also in connection with turbines, and the Portland Cement Co., Trinidad, Colo., one unit. Likewise the City of Logansport, Ind., and the Bristol (Tenn.) Gas & Electric Co. Other equipments are being built for the Jersey Central Traction Co., the Washington & Mt. Vernon Railway, in connection with its new turbine plant; and the Cleveland Electric Co. This equipment is about to go in service.

The Westinghouse-Leblanc condenser is compact and maintains high vacuum with limited supply of cooling water. Upon repeated tests it has been able to operate within from 1 to 5 degrees difference between the temperature corresponding to the exhaust steam and that of the cooling water discharge. This represents an efficiency of the condenser of 96 to 99 per cent. These results are obtained by the method of handling the entrained air and are particularly effective in cases of high cooling water temperature, 80 to 85 degrees. They also favor the employment of cooling towers in connection with the condensing plant, reducing the quantity of water to be pumped and increasing the effectiveness of the cooling tower surface by delivering water to the tower at the highest possible temperature.







WILLARD TRAIN LIGHTING BATTERIES

THE WILLARD STORAGE BATTERY CO., CLEVELAND, OHIO

PETTIBONE, MULLIKEN & CO.

MANUFACTURERS OF — 725 MARQUETTE BUILDING, CHICAGO

"Strom" Clamp Frogs, "Channel," "Transit" and "Gauge" Split Switches,
"Banner," "Star," "Globe," "Crown" and "Axel" Switch Stands.
"Samson" Head Chairs, Tie Bars and Crossings.

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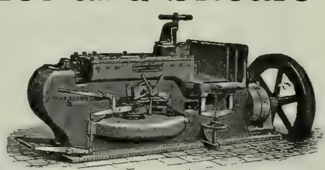

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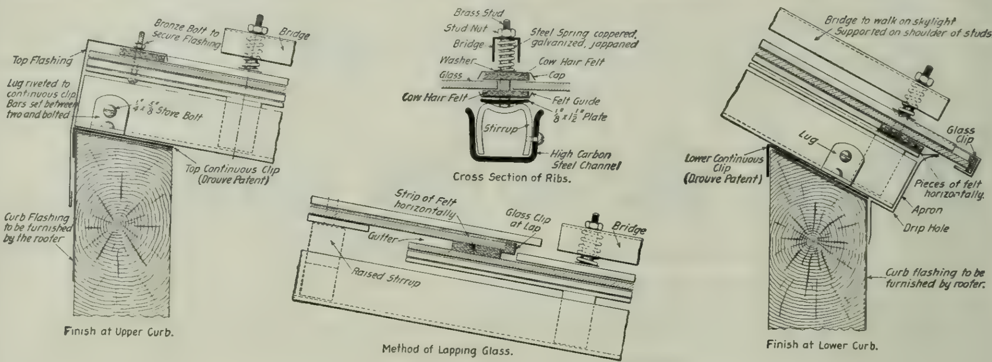

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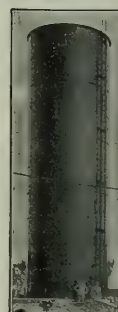

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CONTENTS

The committees of the American Railway Engineering and Maintenance of Way Association are especially to be commended this year on the excellence of their work. There will be nineteen reports submitted to the convention week after next, the majority of them being unusually voluminous, and all containing matter of much professional worth. These valuable reports should, and undoubtedly will, receive the careful study of the members of the association, and the resulting discussion in the convention will doubtless add considerably to the value of the material gathered by the committees. Indications point to an unusually successful convention for 1909, and it is to be hoped that every member road of the association will see that it not only is desirable but is its duty to have at least one representative present throughout the convention.

The question of abolishing smoking cars on suburban trains, electric and steam, is being agitated at Chicago. The city commissioner of health and the presidents of three of the four elevated railways have expressed themselves as in favor of the proposed change. The abolition of special accommodations for "smokers" on suburban trains on the steam lines that run to Flossmoor, Elgin, Waukegan and other points, the trips to which take an hour or more, does not seem needful or desirable. These trains ordinarily are not over-crowded, and their schedule time is so long that it would be a species of cruelty to deprive the male passengers of the comfort and pleasure of the morning and evening cigars with which, aided by the newspapers, they while the time away. But the argument for abolishing the smoking cars on the elevated electric trains, and on the steam trains that compete directly with them, is very strong. These trains usually reach their ultimate destinations in not more than 30 minutes, and anybody but a "cigarette fiend" should be able to get along that long without smoking. The trains always are over-crowded during the rush hours, and the air in the smoking cars, due both to their over-crowded condition and to the smoke that fills them, is of the vilest. Worse still, it seems impossible to prevent many of the habitual patrons of the smoking cars from spitting on the floors. In consequence of these conditions many men who smoke at their offices and homes avoid the smoking car when they can find any place else to sit or stand. When, owing to the packed state of other cars, women are forced to go into the smokers, they find them extremely disgusting. On the grounds both of public health and common decency, either the habits of many of those who smoke should be reformed, or smoking cars should be taken off all suburban trains except those running relatively long distances. And this applies to many cities besides Chicago.

SOME NEGLECTED FACTORS OF FAIR VALUATION.

A difference of opinion that is said to have arisen between Governor-elect Stubbs and the Railroad Commission of Kansas over the way the railways of that state ought to be valued for rate regulation shows that a more intelligent view of this subject is beginning to be taken by some public authorities. It is said that the commission does not think the state valuation would be very useful in fixing rates. Mr. Stubbs favors a valuation for rate regulation, but thinks that it should not be based solely on the physical properties, but that some allowance ought to be made to the older roads for the business they have built up. The absurdities to which a valuation based on physical properties alone leads have been illustrated in the testimony taken by the Interstate Commerce Commission in the proceeding of the Railroad Commission of Texas against the advance in interstate class rates to the Southwest. It was shown by the Chief Engineer of the Texas Commission that a much higher valuation per mile has been placed by this commission on the Trinity & Brazos Valley, a relatively new road, with comparatively small traffic and earnings, than on older roads with more traffic and larger earnings, such as the Galveston, Harrisburg & San Antonio, the Houston & Texas Central and the Missouri, Kansas & Texas. Of two roads, differing only in that one is new and the other old, the valuation of the older, based upon the cost of reproducing it in its present condition, is pretty sure to be less than the valuation of the newer, owing to the greater depreciation charged against the property of the older, although the older is almost sure to have more traffic and to be worth more as a "going" concern. All intelligent public officials must see in due time, as those of Kansas seem to see already, that there is something radically wrong with a method of valuation that leads to conclusions that contradict common sense.

Mr. Stubbs is on the right track when he says that valuation should take account of established business. The two factors that determine the actual "going" value of any concern are its physical plant and its earnings. It has been argued that the earnings of railways cannot be taken into account in

making valuations as a basis of rate regulation because present earnings depend on existing rates and the reasonableness of existing rates is the thing to be determined. But earnings do not depend entirely on rates. They depend also on the amount and nature of the traffic handled. A road with a dense traffic and low rates may have larger gross and net earnings than a road with less traffic per mile and higher rates. Therefore, while commissions may, perhaps, properly disregard earnings in making valuations, because earnings depend on rates, they ought to give weight to density of traffic, because nothing could be plainer than that, other things being equal, a road with a heavy traffic has more value per mile than one with a light traffic. The amount of traffic a road has always depends largely on the way it is managed, and a road that has built up a large traffic deserves the wages of good management.

Another factor that should enter into valuations is the cost of handling business. Of two roads having plants representing approximately the same investment, and hauling approximately the same kind and amount per mile of traffic, the one whose operating expenses are the lower will have the larger net earnings and should be given the higher valuation. Other things equal, low operating expenses, like heavy traffic, are due to good management, and not to take operating expenses into account in making valuation tends to deprive a road of the benefit of good management and to put a premium on bad management.

A heavy traffic, relatively low operating expenses and resultant large present and prospective net earnings, are all largely due to superiority of strategic location, which, in turn, is due to the good judgment that has been shown in choosing the routes of the main lines and in throwing out branches, and the genius that has been exercised in laying down a railway is as much entitled to its reward as the skill later shown in operating it.

Valuations based upon and giving due weight to not only the cost of reproducing the physical plants, in their present conditions, but also to strategic location, to density of traffic and to operating expenses, would not lead to such grotesque results as valuations based solely on cost of physical reproduction. One strong argument against physical valuation is the harm it would do to the weaker of any two parallel and competing lines if logically applied in regulating rates. Good examples may be found in every part of the country. As good as any, perhaps, is that afforded by the Union Pacific and the Denver & Rio Grande. Owing to the difficult country through which it runs, and the consequent high cost of construction, the physical valuation placed on the Denver & Rio Grande would no doubt be much higher in proportion to its traffic and earnings than that placed on the Union Pacific. But if the valuation led to a reduction of the rates of the Union Pacific the Denver & Rio Grande would have to reduce its rates on all of the business for which it competes with the Union Pacific, and its earnings would be curtailed, although on the basis of the physical valuation it should have been shown that it was already getting less than a reasonable return upon the investment it represents. On the other hand, if the strategic location, density of traffic and operating costs of the two roads were given due weight, the valuation put on the Union Pacific would be relatively much higher than that which would be put on it on the basis of cost of physical reproduction alone, and there would be less danger that its less prosperous competitor would be ruined in the attempt to reduce the Union Pacific's earnings to what might, by anti-railway agitators, physical valuation doctrinaires and shippers regardful of their own interests, be regarded as fair.

It may be objected that it is impracticable, in making a valuation, to take accurately into account such factors as density of traffic and operating expenses. A competent engineer can make a fairly close estimate of the cost of rebuilding a mile of track, but who can say approximately how much a given density of traffic or a given cost of operation adds to the value of a mile of road? But an argument that says that approximately due weight cannot be given to all factors that should enter into valuation is not an argument against giving due weight to such factors, but an argument against making a valuation.

We have never believed that a valuation could be made that could be applied usefully or fairly in regulating the rates of all the railways of the United States or even the rates of the roads of a single state. The valuations in various states either have produced almost no effects on rates, or, as in Texas, have been unfairly made and recklessly used, and have hurt the roads and proved boomerangs to the states. But if the state and interstate commissions are to continue to make valuations as a basis for rate regulation it would seem that they should try to give due weight to all the factors that enter into the value of the roads, and should seek light not only from engineers who can tell them what it would cost to rebuild the various roads, but also from operating experts and traffic experts competent to estimate how much weight should be given, under the special conditions of each case, to operating costs and traffic density.

We should think the regulating authorities would see the desirability, from their own standpoint, of taking other factors than the cost of reproduction into account. The ground of all subsequent agitation for valuation of railways has been the statement of the Supreme Court of the United States in the case of Smyth v. Ames that "the basis of all calculations as to the reasonableness of rates * * * must be the fair value of the property being used by it (the railway) for the convenience of the public." But the court was far from saying that valuation should be based solely upon cost of physical reproduction. It mentioned as "matters for consideration" the original cost of construction, the amount expended in permanent improvements, the amount and market value of stock and bonds, the cost of reproduction, the probable earning capacity under the rates prescribed, the sum required to meet operating expenses, and added: "We do not say that there may not be other matters to be regarded in estimating the value of the property." It seems evident, from this, that if any commission or legislature should seek, by means of a valuation based on cost of physical reproduction alone, to defend low rates that it had fixed, the Supreme Court would hold the valuation worthless, and disregard it. The expense of making it would then have been put upon the public to no purpose.

FREIGHT TANK LOCOMOTIVES FOR THE PRUSSIAN STATE RAILWAYS.

An article was published in the *Railroad Gazette* April 10, 1908, giving an outline description of some freight tank locomotives for the Prussian State Railways, with especial attention to the Schmidt smoke-tube superheater with which they are equipped. A further consideration of the engines may serve to call attention to some of their interesting and characteristic features.

In the arrangement and design of details the engines may be taken as representative of German practice, and a study of them will be of value as indicating the points of resemblance and variation between it and the practice of the United States, though the reasons for variation may not always be apparent. Of course, the frame is of the typical plate design in universal use in England and on the Continent, and is the fundamental point of departure from American practice. Then, the cylinders are cast without the half saddle and are bolted to the frames. The connection and bracing between them is formed of plates and angles in what seems a rather light construction here, accustomed as we are to the heavy castings and thick ribs of the half-saddles and cross-ties. The plates used are but 0.4 in. thick, but they

have a width both for the vertical and horizontal plates that secures the requisite stiffness and strength. The draft gear, instead of taking hold of the front buffer beam and putting the load on its fastening, passes back beneath the smokebox to a short cross-bar resting on two volute springs, which, in turn, bear against a brace at the back of the saddle. This drawbar is of a round section, 2 in. in diameter, so that its working area is but 3.14 sq. in. With a tractive effort of 40,700 lbs. as calculated by the American formula, this gives a working stress of about 12,960 lbs. per sq. in. of metal. Undoubtedly this leaves an ample margin of safety, but the size seems very weak in comparison with the very heavy bars with which we are accustomed to connect engine and tender, a section of 12 sq. in. being not uncommon in engines of this size. But when all of the features of the coupling are considered the reason for this discrepancy appears. In America there is always a play or lost motion between any two adjacent freight cars, amounting to several inches of slack in a long train. When this is taken up with a jerk, the stress put upon a drawbar, of even the large size used in the United States, is often enough to break it. But with the screw coupling and spring compression buffers used in Germany, this jerking is not apt to occur, and the drawbar need only be made of sufficient size to take care of the regular tractive effort of the engine with a reasonable factor of safety. This evidently accounts for the present design.

In the smokebox we find an arrangement of netting that is not used in America, but has been developed to meet German requirements. The blower, too, is a great improvement over current practice here. We usually simply run a steam pipe into the smokebox and turn it up so that it will discharge into the stack, and make no further attempt to effect an even distribution of the draft. We have spent a great deal of time and money investigating and experimenting with the adjustment of diaphragm and netting in the smokebox so that the engine will produce the greatest amount of steam with the least possible back pressure in the cylinders and with as even a flow and distribution of the products of combustion through the tubes as can be obtained: and yet, when the blower is used, when every ounce of steam blown out counts, and time is of the utmost value, we proceed to use a blower that works as badly as possible and wastes steam and fuel in a way to make one's heart ache. The German, on the other hand, having adjusted his nozzle and netting and stack so as to put an even pull on his fire over the whole of the grate area, with an even distribution of his gases in the tubes, encircles the nozzle with a perforated pipe and thus reproduces as nearly as possible the conditions set up by the exhaust, and saves fuel, steam and time. And in doing so he has at least emphasized one of the ways not to do it.

In the *Railroad Gazette* for Nov. 29, 1907, there was an illustrated description of the pistons and valves that are used on German railways where superheated steam is used. In their experiments along these lines, the Germans have found that neither pistons, rings or stuffing boxes ought to carry the weight of the body of the piston, and for that reason tail rods are used, as in this case. Especial provision is also made for cooling the stuffing boxes by air, so that they will not become overheated, and the projecting ends of the tail rods are run in airtight sheaths to protect them from the dust that would otherwise score them. It is probably by attention to these details as much as to any other thing that the successful operation of the superheater on the Prussian roads is due; and if those progressive officials in this country who are trying to use superheaters and meeting with indifferent success would look into the arrangement of these minor details more thoroughly and carefully, it is quite probable that many of the present troubles would disappear.

The dome will be found to possess three points at variance with American practice. In the first place, the whole upper portion can be unbolted at the ring and lifted off, giving free access to the stand pipe and throttle, and evidently greatly facilitating inspection and repairs. For, instead of being obliged to work over the top of a dark hole, with the fumes of a smoky torch rising into his face, the workman has the whole thing in the open and is far less likely to shirk his job or scamp his work, than where called upon to labor under disagreeable conditions. The second point is the use of a steam separator at the dome joint. This is an inexpensive refinement that, if it does any good at all, will certainly pay for its installation. The third point is the throttle. This is of the slide valve or gridiron type that was discarded from American railroads many years ago, and it would be a hard task to secure its readoption. It is difficult to operate, presents a multitude of opportunities for sticking and wire drawing, and has but one feature superior to the balanced poppet, and that is that it is probably less expensive to fit.

Back of the dome is the sand box, small as compared with American practice, and indicating that sand is not used as lavishly in Germany as it is in the United States. The safety valves and whistle arrangements are peculiar to the country, but have no especially noteworthy characteristics, other than that they are mounted directly upon the boiler shell instead of upon a small dome on which they are usually set here. The raising of the safety valves to a point on the main or auxiliary dome is probably to be preferred to a direct connection to the shell, because of the fact that by being more remote from the water surface they will discharge dryer steam, and thus do their work more economically than where an amount of water is entrained. The same thing holds true with the whistle, with the added consideration that the dryer the steam the clearer and more penetrating the blast, and the quicker it begins to sound after the valve is opened. Further back in the roof of the cab we find a Pintsch gas lamp, which is certainly a novelty. As for the cab itself, it does not differ materially from American construction. There is a difference in the shape of the windows, and the arrangement of the side doors is different. As for the cab fittings, they present some novelties that may or may not appeal to the American observer. Speaking broadly, they do not appear to be arranged with quite so strict an observance of the requirements of handiness as might be expected. The use of the screw reversing gear is slower than the lever, but has the advantage of an accurate adjustment of the cut-off and a complete control of the mechanism at all times, which is a very decided advantage when handling heavy gears with steam on. Speed of handling is a minor matter, except in switching service, as rapid reversing is seldom required. The location of the throttle handle, with its pivot on the center line of the boiler, puts it pretty well out of reach of the engineman when occupying his stool, and then to push the lever away from him, at right angles to his line of vision, seems an awkward arrangement. It is not only out of reach, but makes the use of a single hand necessary for the performance of nearly all of the operations of the engineman. Then, too, the connections to the throttle are such that it is lowered on its face to open it, so that should a pin or connection break, the valve would drop open instead of dropping shut. This would not, necessarily, cause a disaster, but is contrary to American ideas and is illustrative of another's viewpoint.

The use of copper in the firebox is, of course, distinctly foreign to our practice, while the short brick arch and the peculiar method of forming the fire door opening, with the heavy ring for protecting the inner sheet, are variations that are interesting, although the deep ash pan, dropped down between the axle and close to the rails, quite agrees with American work. The use of the button-head stay for the crown is also a matter to which we are giving more attention than formerly, as a detail by means of which the holding

power of the bolts can probably be considerably increased. Finally, in this review of the firebox, it may be noted that the fixed grates are not what we are accustomed to.

The running gear will be found replete with novelties in the details of its arrangements. The boxes and the equivalents of the wedges, pedestals and binders differ from American practice, but in ways that are not brought out with sufficient clearness in the engraving to warrant discussion here. The use of underhung springs suggests our own work, but the adjustable screw hangers are details that have not yet found a place in American designs. But the most marked novelty in the running gear is to be found in the brake rigging. It will be seen that there are no shoes bearing on the first, third or fifth wheels, but that there are two shoes on each of the second and fourth wheels. This scheme of putting a brakeshoe on each side of the driving wheels for the purpose of relieving the boxes and rods due to their unequalized thrust, was strongly urged in the United States a number of years ago, and is used by one or two roads, but with that arrangement two shoes were put on each wheel. With the arrangement shown on this Prussian engine, the disadvantage of being able to use but two-fifths of the weight of the engine is incurred, coupled with the added liability of unequal wear of the tires due to the grinding effect of the shoes on two of the tires and the freedom of the others from such action.

These are a few of the marked points of resemblance and of contrast in German and American practice that can be seen by a study of the engine under consideration. That the contrasts would be more numerous were a more careful study to be made of the details goes without saying, but these few are sufficient to suggest the possibilities of the case, for those who wish to take up the matter with a greater thoroughness than has been possible here.

BONDS IN RAILWAY FINANCE.

At the opening of the year 1907 it seemed likely that a long "bond period" in financing railways during which issues of bonds had considerably exceeded issues of stock was likely to be reversed and stock issues forge ahead. It was just then a period of pretty high railway income when stocks were earning well and new stock likely to be taken up. The same was true of convertible bonds which had poured out in great volume and diversity while the 1906 authorizations in new stock of four companies—New York Central, Great Northern, St. Paul and Northern Pacific—had alone amounted to somewhat more than $400,000,000. Moreover, it was a period of the "undigested" bond security when the market was a good deal overloaded with bonds and there was more or less, in the case of high class dividend paying roads, a tendency to revert to new stock and the attendant "rights," or else to the convertible bond, running for longer or shorter periods to convertibility—sometimes very short—a form of bond but one degree removed from stock and only differing by a factor of time if the transfer power is exercised. We here use the term "bond" as a broad generality and including debentures, a shape which the convertible security often took on.

But the prognosis of a "stock" period at the beginning of 1907 was not realized. The mid-way of that year, which ended the fiscal twelve-month, returned bond and bond obligations of all railways of the country outstanding represented by a ratio of about 18 in bonds to 15 of stock. The short note period had also begun to play havoc with the figures embodying as it did a "tide over a crisis" policy of many corporations not all of them, by any means, railways. The later autumnal panic of 1907 naturally disturbed all omens and they were not certified by the year 1908, which was a very bad twelve-month for oracles. Now we seem to be entering a bond period once more and an intensive one. There are more than $100,000,000 of short term railway obligations to be refinanced this year and more than double that amount in 1910. And just now, in any refunding processes, as well as in issues absolutely new, demand is out-running supply. Bond sales, indeed, have been of late almost phenomenal in volume. They reach between $30,000,000 and $40,000,000 a week at the New York Stock Exchange alone, of which our rapid analysis indicates about four-fifths railway bonds. To these are to be added sales at other exchanges and private sales which presumptively reflect the same demand. Bond sales, to be sure, are not the same thing as new bond issues; but bond demand forecasts bond financing and bond transactions, which are only in minor degree speculative, are the genuine index of a situation.

The underlying cause of the exceptional bond demand is obvious. After the vicissitudes of the railways in 1908, fiscal and civic, and not yet out-lived, conservative investment naturally seeks the senior security first. The interesting point to be watched hereafter is the time element in this persistency of the bond demand and its general results in future railway capitalization. Will or will not the railway stock hold its own or gain in the fiscal race against the bond? In the long pull following the panic of 1873 we saw the railway bond—that is to say the good railway bond—appreciate, the railway stock fall. Are we at the opening of such a period now or is conservative demand, passing from the senior to the junior railway mortgage security, next to the debenture or time note, then, to overtake ere long the stock? Primarily the question is one of *net* railway earnings. If they swell and rise high the bond will probably lose its present dominance. But with the great increase of fixed charges due to a protracted bond period one looks forward with some curiosity, to say the least, to the future ratios of bonds to stocks in American railway finance. One of the immediate results of a compulsory situation has been, in the case of a good many railway presidents, the extinction of the theory of substitution of the higher but uncertain dividend charge for the lower but inexorable interest on the bond.

In this future problem of bond versus stock and their ratios there are manifestly other components. One is the maturing of convertibility in the case of a large number of convertible bonds. There are some $70,000,000 of them financed by the New York, New Haven & Hartford Railroad Company alone. To what extent will such bonds be converted? Another important but indeterminate component is the future rivalry of the industrial, street railway and municipal bonds—not to mention prospective federal issues—with those of the steam railways. That rivalry in the bond market seems, on the whole, very likely to increase as the years go on and, if it does so, will tend to establish in railway capitalization a stock and bond equation or, at any rate, level downward existing disparities. But it may also increase the interest rate on the railway bond and bring us no nearer to the ideal of a railway that pays a fair dividend almost as surely as its fixed charge. Finally, as a component of the question, is the attitude of state and national authority toward the railway which, if adverse favors the bond as compared with the stock investment and *vice versa*. We shall know more about that branch of the subject ere long. Meanwhile railway bond investment goes along with the minor railway stock investment which expresses itself in stock distribution and the cheering increase of the number of stockholders and decreased individual holding.

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Letters to the Editor.

CLEARING CAR HIRE.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The universal practice of railways throughout the entire country of interchanging cars for the despatch of traffic has made the settlement for car hire a burdensome and annoying expense, with no end of detail in checking up between roads for adjustment. We need a better and more modern system than the one now used.

A system has been proposed, which is settlement with direct connections daily and monthly, by crediting them each day with every car received from them and charging them with every car delivered to them, regardless of the car ownership, thus making every road its own clearing house. Statements between the lines to be made and rendered connections daily to be checked and O.K.'d by them. In this manner you will know each day exactly how many foreign cars you have on your own line and how many of your own cars are off the line and at what points cars were received and delivered; the differences between the receipts and deliveries being the debits and credits, to be added each day to the connecting line's account until the end of the month, when settlement is made.

The great trouble in contemplating this system seems to have been to establish a proper start, in other words, to be able to adjust accounts with car owners for a commencement. This seems to me to be as easy and in every way as just and proper as keeping the record after the start is obtained. To illustrate my idea I will take the Denver & Rio Grande as an example.

For instance, at 12 o'clock, midnight, on the last day of any month when it is proposed to start the system, we will suppose that the D&RG has 6,800 foreign railway cars on its system, the ownership of which includes all the railways in the country, and 4,900 of its own system cars on foreign lines. This does not include private cars which are settled for on a mileage basis. In making a start with our connections we should simply take an inventory of the 6,800 foreign railway cars on the D&RG, making a list showing the numbers, initials, date and point received from connections and also making a statement of our own 4,900 system cars off the line, showing the numbers, dates and points delivered to connections. The situation would then be as follows:

At 12 o'clock midnight last day of month.				No. of cars on first day of month	
Foreign cars on hand.			System cars off line.	We pay connect'ns	Connect'ns pay us.
Received from			*Delivered to*	*Debit.*	*Credit.*
Mo. Pac.	Pueblo	2,000	1,000	1,000	.....
C., B. & Q.	Denver	1,000	500	500	.....
C., R. I. & P. ...	Denver	500	400	.....	.....
C., R. I. & P. ...	Pueblo	700	500	.....	.....
		1,200	900	300	.....
Colo. & So.	Denver	400	500	.....	.....
"	Pueblo	800	750	.....	.....
"	Walsens	500	500	.....	.....
		1,700	1,750	.....	50
Union Pac. ...	Denver	300	250	.....	.....
Union Pac. ...	Ogden	200	100	.....	.....
		500	350	150	.....
Ore. Sh. Line..	Ogden	300	200	.....	.....
Ore. Sh. Line..	Salt Lake....	50	100	.....	.....
		350	300	50	.....
S.P.,L.A. & S.L.	Provo	50	100	.....	50
		6,800	4,900	2,000	100
		4,900	.....	100	.....
Balance against Den. & R. G.		1,900		1,900	

It will be seen by this that we will pay our direct connections for exactly the number of foreign cars we have on the line less the number of our system cars off the line, delivered to the same connections. The statement of these cars both received and delivered being sent to our direct connections and being checked by them, should establish without question the exact condition upon which the start can be made.

A start having been made correctly, the sending of statements each day between the direct connecting lines to be checked and returned and the debits and credits added each day should make the system almost perfect and a settlement could be made at any time.

If all railways throughout the country would adopt this system they would each pay for exactly the number of foreign cars they have on their system and receive pay for exactly the number of their system cars off their lines. It matters not between connections whose cars they handle or on what lines their own cars are, the adjustment under this plan would regulate itself. It seems to me that a system of this kind would simplify the work of car accounting and end most of the troubles in delay in checking up. Settlement could be made in full for all cars when you settle with your direct connections.

While this system of settling for car hire and per diem is up, there is another thing which I wish to mention and that is a more modern method of settling for what are now known as reclaims. At present where one road delivers cars to another for loading or unloading, where there is a switching charge made for the service the road performing the switching service reclaims on the delivering road for the equivalent in per diem to the time consumed by the switching road where the car is being loaded or unloaded and returned to the delivering line. This is a nuisance which should be done away with at the earliest possible moment as it is nearly always the source of contention and delays, making settlements often run for months. The remedy, in my opinion, is quite simple and as easy as the proposed method of settling for per diem.

My proposition is for the switching road to add the per diem reclaim to the switching bill when the charge for switching the car is made. It could be added and collected at the same time as the switching charge, and that the switching bill may not be made large and objectionable to the Interstate Commerce Commission, the amount could be shown on the switching bill as a separate item, collected in the same manner as the switching bill and credited through the railway's own office to car hire account.

If these two proposed methods could be adopted the difficulties in per diem settlement would be nearly over. I have not gone extensively into detail because it seems apparent to me that every car accountant would understand the merits of the propositions without further explanation. During my railway experience I have found it difficult to introduce a modern and improved system, but it seems to me that the above is worthy of consideration and should lead to something better than we have.

E. M. HORTON,
Car Accountant; Denver & Rio Grande.

DEMURRAGE AND FREE TIME.

Pittsburgh, Pa., February 19, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

With reference to the communication of "Woolly West," as published in your issue of February 12.

While reading it I was reminded of a conference between railway representatives and representatives of a Merchants' Exchange, held for the purpose of solving the question of reasonable rules and regulations to apply to cars that were exceptionally handled. The whole situation was thoroughly developed, and the last thing presented by one of the exchange representatives was that the railways had practically allowed them the world, with a down-hill pull, and were now demanding that they should reorganize their business in 30 days.

The railways cannot attain to ideal service by promulgating rules to be drastically applied. Railways' rules and regulations, to the end of improved car movement, must follow the line of least resistance, the rules being accepted as reasonable rules, to the end of an improvement in conditions. Practically, a railway is a clearing house between the producer and the consumer, and it must work in harmonious relation-

ship with the developed practice of the commercial interests.

In giving consideration to demurrage, you must not only consider the loading and unloading of the car, but you must consider all the commercial practices that have been generally adopted by the country at large. It cannot be maintained that those practices are ideal, but it must be admitted that the practices have been adopted, and the conditions because of those practices must be considered, and if rules and regulations are introduced, to the end of reformation where practices are bad, there must be an exhibit of the bad practice and the results that ensue.

"Woolly West" says that the free time for loading and unloading should be cut in half; that the dollar per day is not an equivalent for the service performed. As an abstract proposition, it must be admitted that 48 hours is an unreasonable length of time for the detention of cars for loading or unloading; that $1 is not an equivalent for the value of the car in service, but you must not lose sight of the fact that, if rules are properly applied, the average time is much less than 48 hours, and, additionally, that, although the dollar is not an equivalent for the earning capacity of the car, it is about all the public will stand in the nature of a fine for breach of contract after the secondary relationship has been established, although the public may eventually appreciate the fact that it is in their interest that a larger charge should be assessed, if it can be demonstrated that the larger charge will move the car.

Again referring to the 48 hours free time allowed, calculated from the first 7 a.m. after the car is placed. If there should be an attempt to reduce the time below 48 hours, the difficulty the railways would encounter would be in keeping records that would develop the exact time of detention.

Forty-eight hours is not the time allowed on all cars, but it is agreed upon that no charge will be made on any one car until after the expiration of 48 hours, that time having been established as a reasonable time in the courts.

If every consignee's endeavor was to hold each and every one of his cars for 48 hours, instead of endeavoring to unload all cars received inside of 48 hours, the railways would have to solve the problem of applying rules in a reasonable manner with less time.

Forty-eight hours is simply a compensating time; it is a give and take as between the railways and the consignees, and when the public admit that it is a reasonable time and make reasonable preparation for the loading and unloading of the car, they will, and do, load and unload over 50 per cent. of the cars in less than one day.

Referring to your correspondent's statement that there is no obligation on the part of the carrier to give free use of the equipment for storage purposes, that the practice is entirely voluntary. To the contrary, the railways insist that the public should unload their cars within a given period, and they deprecate any procedure on the part of the public where the car is detained beyond the maximum limit of the free time allowed without charge, and the demurrage rules are in evidence as proof positive of that, as, when forced into a secondary relationship, they will apply a charge of $1 per car per day, or fraction of a day.

What we lack in this country is a thorough understanding, both by the railways and by the public as to what are reasonable rules and regulations, to be enforced along the line of least resistance, those rules to be developed in accord with the actual practice both of the railways and of the public.

When we arrive at a practical agreement, there is an immediate decrease in the average time consumed in unloading the car, which is followed by a decrease in the time consumed by the railway for service. It is of record, in the Pittsburgh territory, that, with the same number of cars in actual service, handling ore in the lake-and-rail trade, the railways doubled the tonnage handled, the consignee having determined that all unnecessary delay to the car was detrimental to his individual interests, and that prompt unloading of a car after delivery was followed by sequence in service.

Demurrage rules should be only to one end—improved car movement, and the railway cannot improve the movement of the car when on its rail if the public fails in an understanding of the necessity for co-operation. They must do their part. The consignor, the railway and the consignee are vitally interested in the interdependent service in both loading, transporting and in the unloading of the car. All must pull together if service is to be improved and satisfaction attained to.

Demurrage rules, and practice under the rules, must be developed along the line of mutual interest, and it must not be forgotten that the charge, whether $1 a day, or $2 or $3 a day, is, in the language of the courts, a charge in the nature of a penalty; in other words, it is a fine for breach of contract; consequently, the rules must be applied just as any police law is applied, and they must fully cover all conditions surrounding the service of the railway, the service of the loader and unloader, the service that is agreed upon where cars are moved under a privilege, or where cars are distributed, or where a necessary preliminary time must be granted in order to equalize the rule as towards all consignees, from the largest plant to the smallest dealer, insuring to all alike the same time.

I have found that, when the public understand that these rules are in their interest, antagonism is practically eliminated, the result being a quasi-agreement between the railways and the public, to the end of mutual benefits.

No railway can be benefited unless the rules as applied benefit its patrons. W. M. PRALL.

ELECTRIC HEADLIGHTS.

New York, February 11, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The article in your issue of January 22, reporting a discussion at the Southern & Southwestern Railroad Club, sets forth in all necessary fullness the arguments in favor of the use of 2,000-candle-power electric headlights on locomotives, with powerful reflectors. Knowing the views of many of your readers, and with a view to giving a fair exhibit of the facts in connection with headlights of different intensities, I take the liberty of giving you herewith some of the considerations on the other side of the question. At the hearing before the Railroad Committee of the Georgia Senate, preliminary to the passage of the compulsory law in that State, some very interesting testimony was given by railway officers who opposed the bill.

These officers were practically unanimous in their testimony that electric headlights do not increase the safety of trains; they do prevent enginemen from distinguishing signals on opposing trains; they sometimes make colored lights appear white; they increase danger in yards because of their blinding brilliancy; they daze animals, causing them to stand motionless on the track until struck by the locomotive; they are expensive to install and maintain; they have been tried and abandoned by the Pennsylvania and other large roads.

The General Manager of the Georgia Railroad Company testified that the use of electric headlights on his road had not lessened accidents. He quoted in confirmation of this view Mr. Higgins, General Manager of the New York, New Haven & Hartford, who also said that the lights were objectionable on double-track; they blind the enginemen of opposing trains. Vice-President Potter, of the Baltimore & Ohio, said that this difficulty on double-track was the main objection of that company to the electric headlight. On the Philadelphia, Wilmington & Baltimore, where lights were used for a time, people living along the line objected to having the intense light thrown into their windows. The use of powerful lights and reflectors has been forbidden on electric cars in some cities.

It was shown that the Central of Georgia, with 150 engines equipped with electric headlights, paid $42,000 for animals killed by trains in the year 1907, as against less than $10,000 in 1899 with ordinary headlights. The light seems to paralyze cattle with fear. Mr. Gaines, Superintendent of Motive Power, estimated that an electric headlight would cost $230 a year as compared with $40 for an oil headlight. These figures do not include depreciation. The Central had stopped putting on electric headlights because they found no special advantage in their use. R. E. Smith, of the Atlantic Coast Line, said that his company had tried electric headlights on a number of engines; if they had been found useful in reducing the accidents the company would have increased their use without waiting for a compulsory law.

Otto Best, of the Western & Atlantic, explained how the lights blind enginemen and often make red lights appear white. Several other railway officers gave testimony which need not be here rehearsed, confirming that which I have quoted.

T. H. Curtis, Superintendent of Machinery of the Louisville & Nashville, in a report which was sent to the Legislature of Alabama, showed how a red, green or white light, like those used on trains, held at the side of an electric headlight, would be invisible to a person standing 500 ft. away. An electric headlight in a yard is a nuisance, almost obliterating hand lanterns. In rain or mist the effect on enginemen's vision is annoying, often producing a curtain of light which it is almost impossible to see through. Mr. Curtis told of his experience on the highway in an automobile equipped with two powerful acetylene lamps. These would make visible a carriage 500 ft. away, but on meeting an electric street car equipped with an arc light, he was temporarily made totally blind. From the time that he got within 1,000 ft. of such a car he found himself so dazzled that it was dangerous to keep the automobile moving. His acetylene lights were overcome by the electric.

Electric headlights are of no practical advantage to the man on the engine behind them, because, first, they do not enable him to see objects around curves, and, second, they cannot be depended upon to make visible fixed signals a long enough time before reaching them to make it practicable for the engineman to depend on them. CYRUS.

TIGHTENING THE GRASP OF GOVERNMENT.

Iowa City, Iowa, February 27, 1909.

To the Editor of the Railroad Age Gazette:

I am not sure that Mr. Graves' letter published in your issue of February 19 will do much harm because its spirit is so evidently far from that of the careful student of railway affairs seeking the truth—but, being by training and early affiliation much interested in the ultimate success of all legitimate railway enterprises, I sometimes wonder if these enterprises are not in more danger from their friends than their foes. I am therefore disposed to answer Mr. Graves very briefly.

Granted that the majority of American railways are not overcapitalized, I think that even Mr. Graves will concede that some American railways *are* overcapitalized; that a western railway that is capitalized at over $100,000 a mile, and whose stock is worth six or seven in the market is overcapitalized, and that any railway capitalized at more than the capitalized value of its absolutely safe net excess of receipts over expenditures is overcapitalized.

Possibly one may safely assert that the American people as a whole are honest; but there are robbers and thieves among them, and laws and courts and jails designed to protect the honest from the dishonest are deemed to be necessary and have been established. Probably it is safe to say that the average American banker is honest and wise in his business methods, but it is certain that not all are honest or wise, and out of the experience of the past have grown laws to protect the honest banker and the confiding and impotent single citizen from the dishonest banker.

There are people—many of them besides those mentioned by Mr. Graves—who believe in, and demand, a wholesome and just regulation of railway business that will protect the honest railway management from the dishonest management; that will protect again the confiding and impotent single stockholder from the selfish and dishonest manipulator, and that, finally, will protect the honest railway management from the constantly recurring attacks of the selfish, ambitious, ignorant or unprincipled politician. WILLIAM G. RAYMOND,

Dean of the College of Applied Science, State University of Iowa.

[We have high respect for Dean Raymond's ethical standards, and an excellent opinion of his judgment, but we think he is confusing theoretic overcapitalization with actual overcapitalization. We are inclined to doubt if anybody can say whether a new project is overcapitalized or not; the test is operation. If the Humdrum Valley Railway, facing competition, either of carriers or of markets, real or potential, is able to pay its charges, and to earn five per cent. on its stock, we maintain stoutly that it is not overcapitalized, and the simplicity of this method of calculation lies in the fact that we do not know, nor want to know, how much it cost to build the road, what the replacement value is, or how much stock is outstanding.—Editor.]

Contributed Papers.

TIME-TABLE RIGHTS ABOLISHED ON A BURLINGTON SINGLE TRACK LINE.

The use of the space interval system on single track lines, under regulations which permit the abolition of time-table rights and of written and repeated train orders, is now to be seen not only with the train staff, as on the Southern Pacific, and under the Beamer system, as on the Northern Pacific, but also with controlled manual block signals, with track circuit throughout the section; this on the Chicago, Burlington & Quincy.* The Burlington has this time-saving arrangement in use on five block sections (not all on the same division) and is preparing to adopt it on six more. An officer of the road writes:

We have at present three sections of single track between Kansas City and Napier, Mo., operated under the controlled manual system. Each forms a connection between double tracks on either side. These three sections are 11, 4 and 7 miles in length, the 11-mile section being divided into two blocks. The average train movement consists of twenty passenger and from twelve to sixteen freight trains per twenty-four hour period.

The movement of trains upon these sections is first authorized by the train despatcher, and his action is followed by the concurrent action of the signal men at each end of each block, preceding the admittance of a train to a block. Two block instruments, one at each end of the block, are so interlocked with each other and with the signals controlling admittance of trains to the block at either end, as to require consultation and agreement between the two signal men preceding the permission of either signal man to the other to admit a train.

The signals are locked also through the medium of the track circuit, if the block is already occupied by another train, the track circuit being maintained the whole length of each block. The presence of a train in the block also controls the block instruments, depriving the signal man at either end of the power of unlocking the other, and both from clearing a signal or admitting another train.

In the sections referred to the trains are governed exclusively as to their right to proceed by the indication of block signals,

*The abolition of time tables and standard train orders on a two-mile single-track line safeguarded by automatic signals alone was reported in the *Railroad Age Gazette* of February 19, page 372

the signals superseding all time-table and train order rights.

The maximum use of tracks is thus obtained, as unavoidable time-table and train order waits are done away with, and the maximum economy of time secured. A similar installation is in operation between Quincy, Ill., and Moody, Mo., a distance of five miles, where the volume of traffic is about the same as that on the sections before mentioned.

Four six-mile consecutive sections are about ready to be put in operation on the main line between Red Oak and Balfour, Iowa, between long stretches of double track on either side.

The result of the operation of the "controlled manual and semi-automatic" block system is to increase the capacity of the line 25 per cent. This is the judgment of those who have operated the same tracks under previous methods. The controlled manual apparatus is similar to that used on other parts of the road where the track circuit feature is not introduced.

EMPLOYMENT, TRAINING AND ADVANCEMENT OF MEN.*

BY J. S. PYEATT,
Superintendent, Pere Marquette.

Of the manifold problems met by the operating officer none can concern him more than the selection of his men, their education and proper training, to insure the highest possible development of good character, loyalty and competency so necessary in his organization; and I believe a majority are ready to admit that some assistance is needed beyond that of immediate subordinates to investigate, in a more thorough and systematic manner, the record, habits, and general fitness of each individual taken into the service, to whom responsibility in its varied degrees must ultimately gravitate. For this purpose, a number of roads have established separate departments—notably the Erie, Great Northern and Burlington—that carefully collect and preserve information as to the record, experience, physical condition, etc., of their employees, and I am informed very satisfactory results are produced. While it is true that most of the roads conduct a sort of perfunctory investigation of the record of men employed on certain work, it is too indifferently handled to be of much value, and often not concluded until the defects of the applicant have been demonstrated by experience, and frequently at considerable loss to the company in money and reputation. Even the most careful employer, possessing unusual ability to judge men quickly, will be mistaken and employ men who would not be considered, if their past records were known, which, perhaps, are not fully divulged until months later.

I suggest that the Superintendent and Trainmaster should, so far as practicable, encourage the employment of young men with homes at or near their work—sons of station agents, conductors, engineers, section foremen, etc., old in the service, who will, by their associations, have gained at least an elementary knowledge of the work when they begin, and enter the service with a feeling of loyalty and interest in the company, and a determination to succeed, accentuated by the encouraging influence of their family connections, that should be very valuable. By placing them with old, experienced men, they soon master the details of their duties and can be depended upon in emergencies with greater reliance than others more or less indifferent as to where they reside or work. The correspondence school has assisted materially, when adequately encouraged and supported, in educating all classes of railroad men, especially for work requiring the application of a technical knowledge that the employee has not had the opportunity of gaining in schools before beginning his work.

Until recently, the employer has not been free to exercise a very critical attitude toward applicants by reason of the scarcity of all kinds of labor; but now that conditions are reversed—the supply so far exceeding the demand—an opportune time is afforded to gradually dispense with the services of men lacking in efficiency, loyalty, and interest in their work; who encumber rather than assist, and exercise a degrading influence over their fellow workers. By so doing, your company is not only benefited by being relieved of an objectionable class, but the example to those remaining may impress upon them the idea that a day's work, instead of a day's time, shall be given for a day's pay, and that their interests are best served by devoting unreserved energy and thought to their work rather than the superficial article with which we have had to deal during the past few years of unrivaled prosperity. It is not contended that labor organizations and their purposes are totally bad—on the contrary they have done much good, both to their members and employers, by specializing work, condemning irregular conduct and encouraging education, when properly and conservatively advised by the leaders; but during the late prosperous period, immoderate demands have been made, not alone for advanced pay, but for various privileges and concessions far more vital to the roads, since their tendency has in many cases been toward a less regard for discipline, and a growing indifference to rules and orders, the effect of which—reflected by the Interstate Commerce Commission Bulletins—is appalling to the public and to the railroad managers as well, who have been hampered beyond measure in their efforts to check it.

Public opinion, which has contributed so conspicuously toward the difficulty experienced in dealing with the men and the organizations representing them, it is cheerful to note, is beginning to realize the fallacy of its prejudice against railroads, and its too liberal sympathy for the rank and file of men working for them, regardless of the question at issue, and will, I hope, assist toward bettering conditions by substituting for the present lawmaker, who has gained pre-eminence by agitating the "sins of the trusts" and the "woes of labor" (with never a thought or impulse higher than his own selfish interests) real men, who will see not only the misdeeds of corporations, but the abusive power of labor trusts, and regulate both with the conviction that all have rights, and each can commit a wrong. To enforce the law of seniority for promoting men, popularly urged by professional labor leaders, is as unfair as to assume that all men are created mental and physical equals, and if followed must inevitably put men into positions of responsibility to which they can never well adapt themselves; while others capable of doing the work are restrained from accepting it, and their spirit and ambition is thus hampered and practically destroyed.

The primary purpose of every employer should be to create and preserve harmony between the men and their immediate superiors and to develop and promote enthusiasm in their work. To insure this, fair and reasonable treatment is always the first essential, augmented by firm, consistent discipline, an aggressive policy, and the same disposition to commend good conduct and good work as to condemn misconduct and poor work. No man will do his best who is unfailingly criticised for his mistakes with never a praise for his successes. In my opinion we will eventually accomplish the greatest good toward educating and training men, harmonizing the differences between capital and labor, employers and employees, and reuniting all, so far as may be, upon one common ground, by adopting a co-operative plan in some practical form, not based on any of the many intangible theories conveniently classed under Socialism, but one similar perhaps to that worked out by the United States Steel Corporation, whereby the fruits of good work and good organization can, in a measure, be shared by all, and conspicuous effort, ability, and loyalty recognized in a substantial way; thus defining broadly the difference between excellence and mediocrity, thrift and idleness, industry and indifference, and generating a spirit of competition that will develop the full capacity of men and give the greatest benefit and gain to both company and individual.

*A paper read at the annual meeting of the Central Association of Railroad Officers, Peoria.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.

BY W. F. M. GOSS,
Dean of the College of Engineering, University of Illinois.

IV.

BOILER PRESSURE AS A FACTOR IN ECONOMICAL OPERATION.

23. *The amount of steam consumed* by the locomotive per unit power developed, when operated under various pressures between the limits of 120 and 240 lbs., has already been defined (Fig. 12). Basing conclusions on results thus disclosed, it is now proposed to determine the increase in efficiency which may be secured through the adoption of higher pressure for any given increase in the weight of the boiler and its related parts. That this may be done, it is essential to determine the relation between boilers of a given size when designed for different pressures.

24. *Weight of Locomotive as Affected by Steam-Pressure.*—The parts of a locomotive which are affected by changes in steam-pressure, assuming the power to remain constant, are the boiler and certain portions of the engine. The boiler to be adapted to a higher steam-pressure requires thicker plates, heavier riveting and stronger staying, all tending to augment its weight. The effect of the change upon the engine, however, is to make it lighter, for since with increased pressure, cylinders, pistons, and valves become smaller, their weight will generally diminish. As a basis for exact values, defining their relationship, lines were laid down for a boiler of the following dimensions:*

TABLE 4.—*Weight of Those Parts of a Locomotive which are Affected by Changes in Boiler Pressure.*

Boiler Pressure	Weight of Boiler pounds	Weight of Cylinders, Valves, and Pistons pounds	Weight of Water pounds	Weight of All Parts Affected by Changes in Pressure pounds
1	2	3	4	5
160	30679	12580	16349	59608
190	32913	12240	16536	61689
220	36076	11990	16661	64727
250	38953	11620	16848	67421

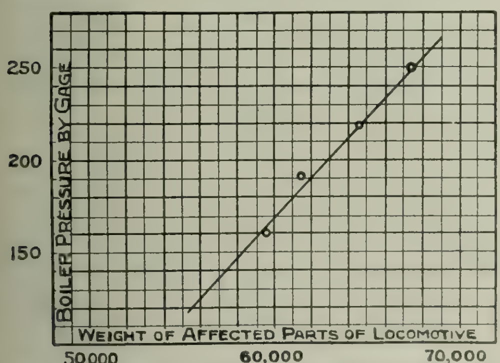


Fig. 14—Weight of Boiler as Affected by Changes in Pressure.

Diameter of first ring .... 63 in.
No. of 2 in. tubes 258
Length of tubes .... 14 ft.
Total heating surface .... 2,024 sq. ft.
Length of grate .... 90 in.
Width of grate .... 60 "
Area of grate .... 37.5 ft.
Boiler pressure .... 190 lbs.

Four designs were made, adapted to four different pressures, respectively, from which designs weights were calculated, with results shown by Table 4.

The weight of the cylinders, valves, and pistons which would be used with a boiler having 2,024 sq. ft. of heating-surface in making up a representative locomotive carrying the different pressures designated is set forth in Column 3. The weight of water when the boiler is filled to the second gage appears as Column 4. The weight of steam is negligible. The total weight of all parts of the locomotive directly affected by the changes in pressure is given in column 5, and the values of this column, for the purpose of interpolation, have been plotted in terms of steam-pressure, with results as set forth by Fig. 14.

With these data it is proposed to show the extent to which the performance of a typical locomotive using saturated steam may be improved by increasing the pressure carried within its boiler. For convenience, six different pressures having values between 120 and 220 lbs. will be utilized as bases from which to assume an increase of pressure. The increase of pressure from each base will be such as may be possible upon the allowance of definite increments in the weight of those portions of the locomotive affected by pressure, and in like manner the improvement in performance will be expressed as a per cent. of that which is normal to the base. The results of the process outlined are presented in Table 5. An explanation of the columns of this table whose meaning is not self-evident follows:

TABLE 5.—*Total Saving When a Possible Increase of Weight is Utilized as a Means of Increasing Boiler Pressure.*

Increase of Weight per cent	Boiler-pressures Selected as Bases pounds	Weight of Those Parts of a Locomotive Which Are Affected by Changes in Boiler-pressure pounds	Weight of Affected Parts Increased by per cent Given in Column 1 pounds	New Boiler-pressure Obtainable by Utilizing the Increase of Weight in Making a Stronger Boiler, pounds	Steam per Indicated Horse-power per Hour at the Pressures Given in Column 2, pounds	Steam per Indicated Horse-power per Hour at the New Pressures Given in Column 5, pounds	Direct Saving in Steam Consumption Resulting from an Increased Weight Equal to per cent Shown in Column 1, per cent	Indirect Saving Due to Reduced Rate of Evaporation, per cent	Total Saving per cent
1	2	3	4	5	6	7	8	9	10
5	120	55560	58340	150	29 1	27.1	6.87	1 67	8.54
	140	57390	60260	171	27.7	26.3	5.05	1.23	6.28
	160	59220	62180	192	26.6	25.7	3.39	.82	4.21
	180	61050	64100	213	26.0	25.2	3.08	.75	3.83
	200	62880	66020	234	25.5	24.8	2.75	.67	3.42
	220	64710	67940	255	25.1	24.5	2.39	.58	2.97
10	120	55560	61120	181	29.1	26.0	10.65	2.59	13.24
	140	57390	63130	203	27.7	25.4	8.31	2.02	10.33
	160	59220	65140	225	26 6	25.0	6.02	1.46	7 48
	180	61050	67150	247	26.0	24.6	5.38	1.31	6.69
15	120	55560	63890	211	29.1	25.3	13.06	3.17	16.23
	140	57390	66000	234	27.7	24.8	10.46	2.51	13.00
	160	59220	68100	257	26 6	24.5	7.90	1.92	9.82
20	120	55560	66670	241	29.1	24.7	15.12	3.67	18.79

Column 3. Weight of those parts of a typical locomotive affected by changes in steam pressure, including water in boiler.—The values of this column, for each of the several pressures stated in Column 2, are taken directly from the diagram of Fig. 14, the basis of which has already been explained.

Column 5. New boiler-pressure obtainable by utilizing the increase of weight in making a stronger boiler.—The values in this column for each of the several weights stated in Column 4 were taken from the diagram in Fig. 14.

Column 6. Steam per indicated horse-power per hour at the pressures given in Column 2.—Values for this column are taken directly from the curve of Fig. 12.

Column 7. Steam per indicated horse-power per hour at the new pressures given in Column 5.—These values, also, were taken directly from the diagram (Fig. 12).

Column 8. Direct saving in steam consumption, resulting from an increased weight equal to the per cent. shown in Column 1.—Values of this column are equal to 100 times those of Column 6 minus those of Column 7 divided by those of Column 6.

Column 9. Indirect saving due to reduced rates of evaporation, per cent.—Assuming the locomotive to work at the same power at whatever pressure it may carry, the saving in steam

*These and other determinations involve weights of boilers which were supplied by the courtesy of the American Locomotive Company.

resulting from the increased pressure set forth in Column 8 diminishes the demand upon the boiler, and, as the efficiency of the boiler increases as the rate of evaporation is reduced, there results an indirect saving with each increase of pressure. The relation between the evaporative efficiency of the boiler and rate of evaporation has already been defined (Fig. 9). Assuming the normal rate of evaporation for the boiler under initial conditions to be 10, then a reduction of 1 per cent. in the rate of evaporation will effect an increase in the evaporative efficiency of 0.243 per cent. The values in Column 9, therefore, are those of Column 8 multiplied by the constant 0.243.

Column 10. *Total saving.*—The total saving is the sum of Columns 8 and 9.

The significance of this table may best be appreciated by the following examples:

By line 1 of the table it appears that the base is 120 lbs. (Column 2). The parts of the typical locomotive designed for this pressure, which are affected by changes in steam-pressure, weigh 55,560 lbs. (Column 3). If, now, in designing a new lot of locomotives, it becomes possible to increase this weight by 5 per cent. (Column 1), the weight of these parts for the new locomotive may be 58,340 lbs. (Column 4). This weight, if put into a boiler of the same capacity, will allow the pressure to be increased from 120 lbs. (Column 2) to 150 lbs. (Column 5), and as a result its steam consumption per horse-power hour will fall from 29.1 lbs. (Column 6) to 27.1 lbs. (Column 7), or 6.87 per cent. (Column 8). But the saving of 6.87 per cent. in steam consumption diminishes the demand which is made upon the boiler for steam, and at the lower rate of evaporation the boiler becomes 1.67 per cent. (Column 9) more efficient, giving a total gain as a result of the change in pressure of 8.58 per cent. (Column 10). In a similar manner each line of the table presents a measure of the improvement to be expected from some definite increase of pressure.

A study of the analysis which has preceded will show that the values of Column 10 may be accepted as fairly representing the increase in efficiency which may be secured in return for a given increase in steam-pressure, or, as is more clearly shown by Table 4, in return for a given increase in the weight of those parts of the locomotive affected by increase of pressure.

While the comparison is based on improved efficiency, it will, of course, be understood that, at the limit, the saving shown may be converted into a corresponding increase of power. It would have been possible by assuming constant efficiency to have shown the improvement in terms of increase of power.

VII.

BOILER CAPACITY AS A FACTOR IN ECONOMICAL OPERATIONS.

25. ***In the preceding chapter there is considered the advantage to be derived*** through the utilization of any possible increase in the weight of a locomotive, as a means by which to secure an increase of pressure. It is the purpose of this chapter to consider the benefit which may be derived by utilizing similar increments in weight to secure an increase in boiler capacity, the pressure remaining constant. The weights of boilers and related parts involved by such a comparison have been ascertained from considerations similar to those which controlled in the preceding case. A boiler of the dimensions already given (paragraph 24), designed for 190 lbs., was made the starting-point from which values were ascertained for boilers of different capacities designed to carry 160 lbs. pressure. The characteristics of the several boilers thus designed are set forth in Table 6.

TABLE 6.—*Characteristics of Four Boilers Designed for 160-Lbs. Pressure and Different Capacities.*

Diameter of Boiler inches	Number of 2-inch Tubes	Length of Tubes feet	Length of Grate inches	Width of Grate inches	Area of Grate sq. ft.	Area of Heating-surface sq. ft.	Weight of Boiler pounds	Weight of Water in Boiler pounds	Weight of Parts of Locomotive Which Are Affected by Changes in Heating-surface pounds
1	2	3	4	5	6	7	8	9	10
63	258	14	90	60	37.4	2024	30,679	16,349	47,028
67	338	16	102	65	46.1	3013	41,013	20,092	61,105
69	326	14	102	65	46.1	2538	36,321	19,344	55,665
70	396	16	96	75	50.0	3498	42,894	21,965	64,859

The steam-pressure being constant, the dimensions and consequently the weight of the cylinders and related parts for the development of a given power remain unchanged. It is obvious, also, that since the only change in the locomotive is in the size of its boiler, the cylinder performance will be the same for locomotives having boilers of different sizes. The saving which will result from the employment of boilers of greater capacity will be only that which results from the diminished rate of evaporation per unit area of heating-surface. The relation of evaporative efficiency and rate of evaporation has already been defined (Fig. 9), so that both factors in the problem now are known, namely, the increase in weight necessary for a given increase in capacity and the effect of any increase in capacity in improving the evaporative efficiency. By means of relations thus established values have been determined which are presented in Table 7. An explanation of the columns of this table whose meaning is not self-evident is as follows:

TABLE 7.—*Saving When a Possible Increase of Weight is Utilized as a Means of Increasing Heating Surface.*

Increase of Weight per cent	Boiler-pressures Selected as Bases pounds	Weight of Parts of a Typical Locomotive (Boiler, Cylinders, Valves, Pistons, and Water) pounds	Allowable Increase of Weight pounds	Heating-surface of Typical Locomotives Whose Weights Are Given in Column 3 sq. ft.	Increase of Heating-surface Obtainable by Utilizing Increase of Weight in Making a Larger Boiler sq. ft.	Increase of Heating-Surface per cent	Saving in Evaporative Performance Due to Reduced Rate per cent
1	[illegible]	3	4	5	[illegible]	7	8
5	120	55560	2778	2000	234.7	11.73	2.85
	140	57390	2869	2000	242.5	12.12	2.95
	160	59220	2961	2000	250.1	12.50	3.04
	180	61050	3052	2000	257.7	12.88	3.13
	200	62880	3144	2000	265.3	13.26	3.22
	220	64710	3235	2000	272.9	13.64	3.31
10	120	55560	5556	2000	469.4	23.47	5.70
	140	57390	5739	2000	484.9	24.24	5.89
	160	59220	5922	2000	500.4	25.02	6.08
	180	61050	6105	2000	515.9	25.79	6.27
15	120	55560	8334	2000	704.2	35.21	8.55
	140	57390	8608	2000	727.3	36.36	8.84
	160	59220	8883	2000	750.6	37.53	9.12
20	120	55560	11112	2000	939.0	46.95	11.41

Column 3 is the weight of boiler, the contained water, and the cylinders, pistons, and valves. While the cylinders, pistons, and valves do not change for any given pressure, their weights are included to make the values comparable with those employed in the analysis of the preceding chapter. They are in fact identical with the values of Column 3, Table 5.

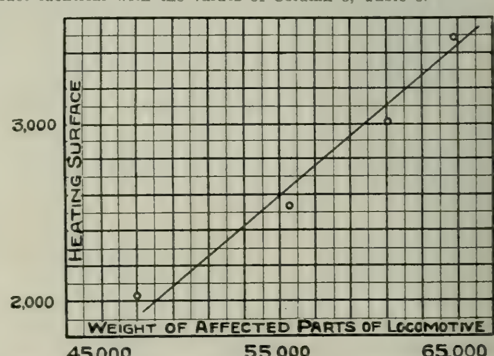


Fig. 15—Weight of Boiler as Affected by Changes in Heating Surface.

Column 4. Allowable increase in weight.—The values of this column are the percentages indicated by Column 1 of the values of Column 3.

Column 6. Increase of heating-surface.—Values for this column have been obtained by plotting weight of affected parts in terms of heating-surface (Columns 7 and 10, Table 5). The results appear in Fig. 15. From a representative line drawn through points thus obtained showing the relation between the weight of the boiler and water, and the number of square feet of heating-surface, it can be shown that an increase of 10,000 lbs. in the weight of boiler and affected parts permits an increase of 845 sq. ft. in heating-surface. Therefore, in Table 6, Column 6 equals Column 4 multiplied by 0.0845. This relation was obtained from data of a boiler designed for 160 lbs. pressure and is assumed to be approximately true for boilers of other pressures.

Column 7. Increase of heating-surface, per cent, is Column 6 multiplied by 100 divided by Column 5. It also shows the per cent. reduction in the rate of evaporation.

Column 8. Saving in evaporative performance due to reduced rate, per cent.—Values in this column have been obtained from those of the preceding column by means of a relationship already established controlling evaporative efficiency of boiler and rate of combustion. (Fig. 9). This relation is such that a reduction of 1 per cent. in the rate of combustion increases the evaporative efficiency 0.243 per cent. Values of Column 8 are, therefore, those of Column 7 multiplied by this factor.

The significance of Table 6 will be understood from the following illustration, based upon the first line of the table. Assuming an existing locomotive operating under a pressure of 120 lbs. (Column 2) to have a boiler containing 2,000 sq. ft. of heating-surface (Column 5) weighing with the contained water 55,560 lbs. (Column 3), an increase of 5 per cent. (Column 1) or 2,778 lbs. (Column 4), will permit an extension in heating-surface of 234.7 sq. ft. (Column 6) which, compared with its original surface in an increase of 11.73 per cent. (Column 7). This increase in the extent of heating-surface, assuming the power developed to remain unchanged, will result in an improvement in the performance of the boiler of 2.86 per cent. (Column 8). The facts underlying the analysis are primarily the results of tests.

(*To be continued.*)

SOUTHERN RAILWAYS AND THEIR NEEDS.*

BY JOHN F. WALLACE.

For the purposes of this address the South is described as that portion of the United States lying south of the Potomac and Ohio rivers and east of the Mississippi.

Shortly after the close of the Civil War, the South, realizing the changed order of things, accepted the situation in the spirit of American manhood and started on a new era of industrial and commercial development.

One of the first necessities was a comprehensive system of transportation facilities. The railways, which prior to the Civil War, had compared favorably with those in the North, at its close were practically bankrupt financially and physically, and were more the shadow than the substance of what they should have been.

Southerners with brains and energy, starting with 11,587 miles of detached, dilapidated and crippled railways, immediately commenced to lay the foundation of the present industrial and commercial prosperity in the South by reconstructing its lines of railway.

The efforts of these men and the confidence they were able to inspire in northern and foreign capital are best illustrated by the fact that to-day the South is served with 46,434 miles of railway, serving 11 states, 20 million people, and representing a total investment in round numbers of two billion dollars.

Of these 46,434 miles of railways, only 1,134 miles approximately, or 2½ per cent., are double track. It is possible that the next ten years will see at least one-fourth, or over 10,000, additional miles of second track.

It must be borne in mind that while transportation is the burden bearer of both production and commerce, it is only able to perform the full and complete measure of its functions when properly nourished and assisted by finance.

In ancient days the birth of civilization started with the ability to preserve food products. This grew from the temporary necessity of accumulating sufficient food to last from one chase to another, or to enable journeys to be performed or winter climates endured, to the storage of vast quantities of food to enable nations to survive years of famine, as was exemplified by the storage of grain in Egypt in the days of Joseph, which period history shows us was the crowning epoch of Egyptian civilization.

To-day the measure of our modern civilization is our transportation system. It has been our custom in America to anticipate future needs in transportation, and in a measure attempt to forestall and provide for them. The policy of foreign countries has been practically the reverse. The railway systems of England and of Europe have been built to take care of and supply a demand for transportation facilities that already existed.

The railways of the United States in the South and West have been projected and built, and to a great extent financed, by men whose inspiration was a firm belief in an unseen future and whose assets were largely composed of hope and an undying faith in the future development of their country.

The railway of to-day is no sooner completed as a single track, than it becomes necessary to provide industrial spurs; additional or enlarged terminals; replace its temporary structures by permanent ones; widen its excavations; strengthen its embankments; provide passing tracks, additional shop facilities enlarged passenger and freight stations, warehouses, elevators, docks and wharves at water terminals, additional tracks, heavier rail, rock ballast, elimination of curves, reduction of grades, block signals, elimination of grade crossings, heavier engines, larger and better cars, to the end that the constantly growing requirements and exactions of modern traffic conditions may be met; all of which requires increased expenditures, which it is easily seen could not in any event be provided for out of earnings.

During the next ten years the railways of the South will require $1,000,000,000 to enable them to fully provide for the increased demands for transportation facilities, an average of $100,000,000 per annum. Including the estimated increased mileage and the present capital investment, the resulting average capitalization would amount to $53,000 per mile, being $20,000 per mile under the present average capitalization of all the railways of the United States to-day, which is $73,000 per mile.

Meeting the requirements of the railway situation in the South by the expenditure of a round billion dollars during the next ten years as outlined above, would make the total investment in southern railways at the end of that period three billions of dollars on an estimated mileage of 56,000.

It would require average earnings of $9,000 gross per mile per annum, with operating expenses at 70 per cent. of the gross, to yield sufficient net income to provide a return of 5 per cent. on this total investment.

When these figures are compared with the present average gross earnings of the railways of the United States, of $11,400 per mile per annum, with an average cost of operation of $7,757 per annum, resulting in a ratio of operating expenses to gross earnings of 68 per cent. the above estimates appear reasonable and conservative.

Even if this expenditure is made and the results predicted

*From an address before the Southern Commercial Congress, Washington, D. C.

obtained at the end of the ten-year period, southern railways will still fall approximately 25 per cent. short of yielding the present average gross earnings per mile per annum of the railways of the United States to-day.

To provide funds to meet these ever-growing and incessant demands for additional facilities, the railway companies must necessarily be large borrowers.

The prosperity of the South in the next decade, and in those to follow after, depends upon the ability of the owners and managers of southern railways to foresee and provide for future necessities, and upon the promptness with which the work is accomplished.

The ability of railways to make these improvements, which are so essential to the future prosperity of the South, depends upon the willingness of capital to furnish the necessary funds for the purpose.

While legislation may control and regulate the returns upon invested capital, there is no process by which it can compel that investment originally. While investment is easily retarded it is difficult to attract. There is probably no form of capital investment more open to attack or more liable to depreciation through unfair or unwise legislation than the railway investments of to-day.

While the speaker is a firm believer in the principles of government control and supervision over the corporate entities which have been created by the people and for the people, it must not be forgotten that every shield has its reverse, and that the exercise of such control and supervision must necessarily be along the lines of right and justice, which no mere legislative enactment can change. Any variance brings its own reward, which frequently spells disaster.

The power to control, regulate and supervise necessarily carries with it responsibilities from which there can be no escape. Every tax, every restriction, every requirement which costs money or reduces revenue to our southern railways is a tax which must ultimately be paid by the communities which they serve. The prosperity of the southern railways and the prosperity of the South are irrevocably bound together, and the needs of the South are identical with the needs of the railways.

The basis of securing capital must necessarily be the ability of the borrower to inspire confidence in the lender that his capital will ultimately be returned to him intact, and that he will receive regularly and promptly adequate hire therefor.

No section of our great country has such reputation for united action as the South. In political matters this unity of action for years has led to the designation "The Solid South." What the railways in this section need to-day is a solid South behind and beneath them; a solid South taking a calm and rational view of the immense factor the railways have been and always will be in the development of its future greatness. The recent reversion of sentiment in the state of Georgia, brought about by a calm and deliberate analysis of the present situation by the business men of that state, should be the keynote of the future action of the solid South.

The adoption of a policy of fairness and liberality towards the railroad interests on behalf of all the southern states, and the ability to convince the financial world that this action is sincere and genuine and will be permanent, is the great paramount need of the railways of the South to-day.

Prompt action along these lines will enable the railway companies of this section successfully to compete in the markets of the world for the capital needed to carry out the improvements outlined, and thus provide the facilities which will enable the producers of the South to ride the crest of the wave of coming prosperity.

In its calls for capital the southern railways must come into competition in the markets of the world, not only with the railway requirements of the North, of the East and the West, but with all the lines of human industry and endeavor throughout the wide world.

The difference between the 5 or 6 per cent. paid by southern railways for the money which goes into their additional facilities or equipment, and the 3 or 4 per cent. which may be yielded by the high-class world investments is merely the gage by which the confidence of the capitalist is measured in the integrity of his investments.

I might talk to you for hours about the evil and unfairness of legislative enactments to retard and make unproductive railway investments; of the injustice of any body of men attempting by legislation, without giving the railway corporations proper hearing, to arbitrarily adjust their rates of toll for either passenger or freight, simply because politicians consider it a popular thing to do.

I might suggest a multitude of things which could be done to increase the credit of railways throughout your section. I might mention a multitude of things which have been done to injure and impair and prevent railways securing the necessary capital to provide for their needs. I might also attempt to enumerate the ill-advised actions of railway managers and employees toward the public. I might expatiate upon the foolishness and unwisdom of a corporation—the creature of the public—attempting to dictate to its master or declining to obey its commands.

It is doubtful, however, if the enumeration of the errors and shortcomings of the fellow-members of the same family ever tends to a better understanding or more harmonious relationships. The need of the hour is a recognition of the interdependent relations which exist between us all, and to remember—intensely, actively, potently remember—that an injury to one is an injury to all.

SAFETY VALVE CAPACITY.

BY PHILIP G. DARLING, M.A.S.M.E.

The function of a safety valve is to prevent the pressure in the boiler to which it is applied from rising above a definite point, to do this automatically and under the most severe conditions which can arise in service. For this, the valve or valves must have a relieving capacity at least equal to the boiler evaporation under these conditions. If they have not this capacity, the boiler pressure will continue to rise, although the valve is blowing, with a strain to the boiler and danger of explosion consequent to over-pressure. Thus with the exception of a requisite mechanical reliability, the factor in a safety valve bearing the most vital relation to its real safety is its capacity.

It is the purpose of this paper to show an apparatus and method employed to determine safety valve lifts, giving the results of tests made with this apparatus upon different valves; to analyze a few of the existing rules or statutes governing valve size and to propose a rule giving the results of a series of direct capacity tests upon which it is based; its application to special requirements, and finally to indicate its general bearing upon valve specifications.

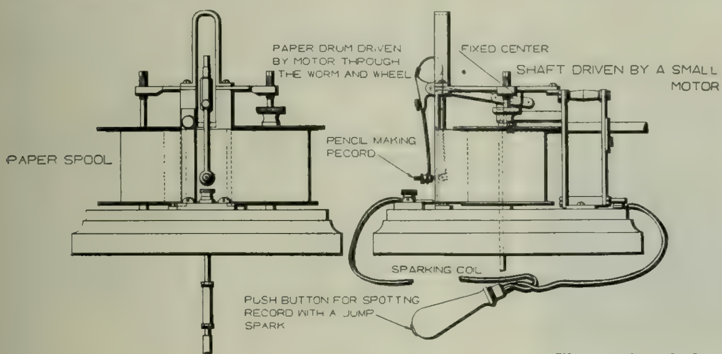
Two factors in a safety valve geometrically determine the area of discharge and hence the relieving capacity; the diameter of the inlet opening at the seat and the valve lift. The former is the nominal valve size, the latter is the amount the valve disc lifts vertically from the seat when in action. In calculating the size valves to be placed on boilers, rules, which do not include a term for this valve lift, or an equivalent, such as a term for the *effective* area of discharge, assume, in their derivation, a lift for each size valve. Nearly all existing rules and formulas are of this kind which rate all valves of a given nominal size as of the same capacity.

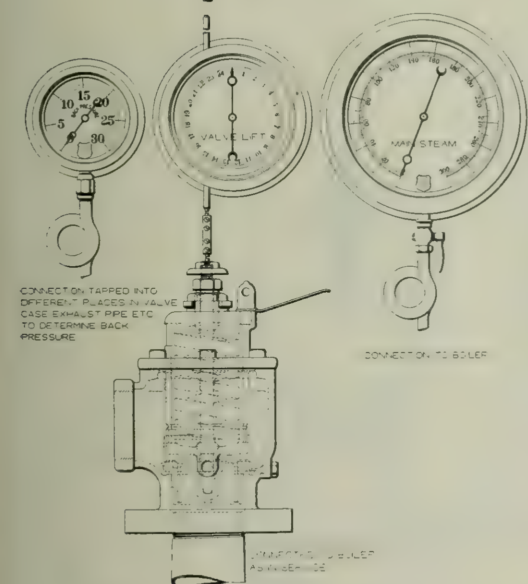
To find what lifts standard make valves actually have in practice and thus test the truth or error of this assumption that they are approximately the same for the same size valve, an apparatus has been devised and tests upon different makes of valves conducted. With this apparatus not only can the valve lift be read at any moment to thousandths of an inch, but an exact permanent record of the lift during the blowing of the valve is obtained somewhat similar to a steam engine indicator card in appearance and of a quite

similar use and value in analyzing the action of the valve.

As appears in the accompanying engraving, the valve under test is mounted upon the boiler in the regular manner, and a small rod is tapped into the top end of its spindle, which rod connects the lifting parts of the valve directly with a circular micrometer gage, the reading hand of which indicates the lift upon a large circular scale or dial. The rod through this gage case is solid, maintaining a direct connection to the pencil movement of the recording gage above. This gage is a modified Edson recording gage with a multiplication in the pencil movement of about 8 to 1, and with the chart drum driven by an electric motor of different speeds, giving a horizontal time element to the record. The steam pressures are noted and read from a large test gage graduated in pounds per square inch, and an electric spark device makes it possible to spot the chart at any moment, which is done as the different pound pressures during the blowing of the valve are reached. The actual lift equivalents of the pencil heights upon the chart are carefully calibrated so the record may be accurately measured to thousandths of an inch.

In testing, the motor driving the paper drum is started and the pressure in the boiler raised. The valve being mounted directly upon the boiler, then pops, blows down and closes under the exact conditions of service, the pencil recording on the chart the history of its action.





Apparatus Used in the Valve Lift Tests.

With this apparatus, investigations and tests were started upon seven different makes of 4-in. stationary safety valves, and these tests were followed with similar ones upon nine makes of muffler locomotive valves, six of which were 3½ in., all the valves being designed for and tested at 200 lbs. The stationary valve tests were made upon a 94 h.p. water-tube boiler made by the Babcock & Wilcox Co. The locomotive valve tests were made upon locomotive No. 900 of the Illinois Central Railroad, the valve being mounted directly upon the top of the main steam dome. This locomotive is a consolidation, having 50 sq. ft. of grate area and 2,953 sq. ft. of heating surface. Although a great amount of additional experimenting has been done only the results of the above will be quoted in this paper. These lift records show (with the exception of a small preliminary simmer, which some of the valves have) an abrupt opening to full lift and an almost equally abrupt closing when a certain lower lift is reached. Both the opening and closing lifts are significant of the action of the valves.

The results of the 4-in. iron body stationary valve tests summarized are as follows: Of the seven valves the average lift at opening was .079 in. and at closing .044 in., or excluding the valve with the highest lifts, the averages were .07 in. at opening and .037 in. at closing. The valve with the lowest lifts had .031 in. at opening and .017 in. at closing, while that with the highest had .137 in. and .088 in. Expressing the opening lifts as per cents of the highest, the lowest had 31.4 per cent., the next larger 40.8 per cent., and the next 46.6 per cent. Of the six 3½-in. muffler locomotive valves, the summarized lifts are as follows: Average of the six valves, .074 in. at opening and .043 in. at closing. Average excluding the highest, .061 in. at opening and .031 in. at closing. The lowest lift valve had .04 in. opening and .023 in. closing; the highest .140 in. opening and .102 in. closing. As per cents. of the highest, the lowest lift valve was 36.4 per cent., the next larger 39.8 per cent. and the next 46.4 per cent.

The great variation—300 per cent.—in the lifts of these standard valves of the same size is startling and its real significance is apparent when it is realized that under existing official safety valve rules these valves, some of them with less than one-third the lift and capacity of others receive the same rating and are listed as of equal relieving value. Three of these existing rules are given as an illustration of their nature; the United States Supervising Inspectors' Rule, The Boiler Inspection Rule of Philadelphia, and the Rule of the Board of Boiler Rules of Massachusetts.

RULE OF THE UNITED STATES BOARD OF SUPERVISING INSPECTORS.

$$A = .2074 \times \frac{W}{P}$$

A = area of safety valve in sq. in. per sq. ft. of grate surface.
W = lbs. of water evaporation per sq. ft. of grate per hour.
P = boiler pressure (absolute).

In 1875 a special committee was appointed by this Board to conduct experiments upon safety valves at the Washington Navy Yard. Although the pressures used in these experiments (30 x 70 lbs. per sq. in.) were too low to make the results of much value to-day, one of the conclusions reported is significant.

"First.—That the diameter of a safety valve is not an infallible test of its efficiency.

"Second.—That the lift which can be obtained in a safety valve, other conditions being equal, *is* a test of its efficiency."

The present rule of the board as given above, formulated by Mr. L. D. Lovekin, Chief Engineer of the New York Shipbuilding Co., was adopted in 1904. Its derivation assumes practically a 45 deg. seat and a valve lift of $\frac{1}{32}$ of the nominal valve diameter. The discharge area in this rule is obtained by multiplying the valve lift $\frac{D}{32}$ by the valve circum-

ference ($\pi \times D$) and taking but 75 per cent. of the result to allow for the added restriction of a 45 deg. over a flat seat. The 75 per cent. equals approximately the sine of 45 deg., or .707. This value for the discharge area, i.e. ($.75 \times \pi \times \frac{D^2}{32}$) is substituted directly into Napier's formula for the flow of steam $W = a \times \frac{P}{70}$. Thus in the valves to which this rule is applied the following lifts are assumed to exist:

1 in. valve.. .03 in.	3 in. valve.. .09 in.	5 in. valve.. .16 in.
2 in. " .. .06 in.	4 in. " .. .13 in.	6 in. " .. .19 in.

Referring back to the valve lifts, it is seen that the highest lift agrees very closely with the lift assumed in the rule and if the valve lifts of the different designs were more uniformly of this value or if the rule expressly stipulated either that the lift of $\frac{1}{32}$ of the valve diameter actually obtain in valves qualifying under it or that an equivalent discharge area be obtained by the use of larger valves, the rule would apply satisfactorily to that size of valve. However, the lowest lift valve actually has but ¼, the next larger less than ½, and the average lift of all but the highest lift valve, which average is .07 in., is but 56 per cent. of the lift assumed in the rule for these 4-in. valves.

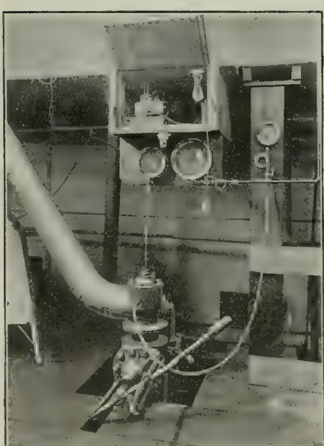
View of Locomotive in Burnside Tests.

MASSACHUSETTS RULE OF 1909.

$$A = \frac{W \times 70}{P} \times 11$$

A = total area of safety valve or valves in sq. in.
W = lbs. of water evaporation per sq. ft. of grate surface per second.
P = boiler pressure (absolute).

One of the most recently issued rules is that contained in the pamphlet of the new Massachusetts Board of Boiler Rules, dated March 24, 1908. This rule is merely the United States rule given above with a 3.2 per cent. larger constant and hence requiring that amount larger valve. The evaporation term is expressed in pounds per second instead of per hour and two constants are given instead of one, but when reduced to the form of the United States rule it gives $A = .214 \times \frac{W}{P}$ Figuring this back as was done above with the United States rule and taking the 75 per cent. of the flat seat area as there done, shows that this rule assumes a valve lift of $\frac{1}{33}$ of the valve diameter instead of the $\frac{1}{32}$ of the U. S. rule. This changing of the assumed lift from $\frac{1}{32}$ to $\frac{1}{33}$ of the valve diameter being the only difference between the two rules, the inadequacy of the U. S. rule just referred to applies to this more recent rule of the Massachusetts Board.



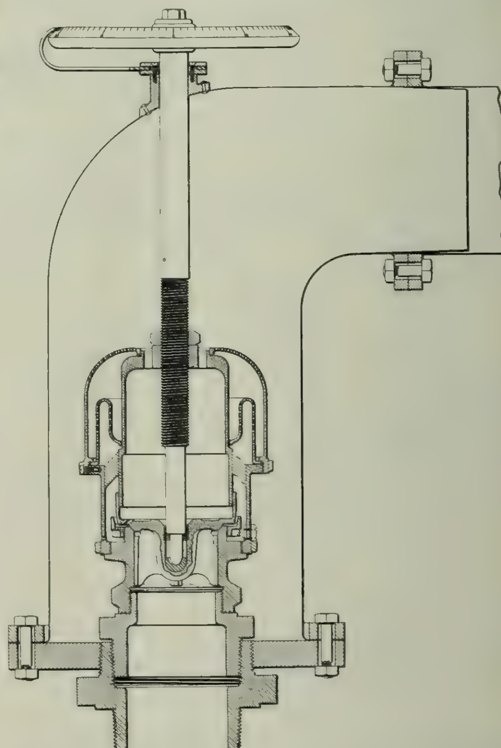
Apparatus Used in Laboratory Tests.

PHILADELPHIA RULE.

$$A = \frac{22.5\,G}{P \times 8.62}$$

A = area of safety valve in sq. in. per sq. ft. of grate.
C = grate area in sq. ft.
P = boiler pressure (gage).

The Philadelphia rule now in use came from France in 1868, being the official rule there at that time and having been adopted and recommended to the city of Philadelphia by a specially appointed committee of the Franklin Institute, although this committee frankly acknowledged in its report that it "had not found the reasoning upon which the rule had been based." The area (a) of this rule is the effective valve opening, or, as stated in the Philadelphia ordinance of July 13, 1868, "the least sectional area for the discharge of steam." Hence if this rule were to be applied as its derivation by the French requires, the lift of the valve must be known and considered whenever it is used. However, the example of its application given in the ordinance as well as that given in the original report of the Franklin Institute Committee, which recommended it, show the area (a) applied to the nominal valve opening. In the light of its derivation this method of using it takes as the effective discharge area, the valve opening itself, the error of which is very great. Such use, as specifically stated in the report of the committee above referred to, assumes a valve lift at least ¼ of the valve diameter, i.e., the practically impossible lift of 1 in. in a 4-in. valve.



Valve Arrangement in the Direct Capacity Tests at Barberton.

The principal defect of these rules in the light of the preceding tests is that they assume that valves of the same nominal size have the same capacity, and they rate them the same without distinction, in spite of the fact that in actual

practice some have but ⅓ of the capacity of others. There are other defects, as have been shown, such as varying the assumed lift as the valve diameter, while in reality with a given design the lifts are more nearly the same in the different sizes, not varying nearly as rapidly as the diameters. And further than this the lifts assumed for the larger valves are nearly double the average actually obtained in practice.

The direct conclusion is this, that existing rules and statutes are not safe to follow. Some of these rules in use were formulated before, and have not been modified since, spring safety valves were invented, and at a time when 120 lbs. was considered high pressure. None of these rules takes account of the different lifts which exist in the different makes of valves of the same nominal size, and they thus rate exactly alike valves which actually vary in lift and relieving capacity over 300 per cent. It would therefore seem the duty of all who are responsible for steam installation and operation to no longer leave the determination of safety valve size and selection to such statutes as may happen to exist in their territory, but to investigate for themselves.

The elements of a better rule for determining safety valve size exist in Napier's formula for the flow of steam, combined with the actual discharge area of the valve as determined by its lift. In "Steam Boilers," by Peabody & Miller, this method of determining the discharge of a safety valve is used. The uncertainty of the coefficient flow, that is, of the constant to be used in Napier's formula when applied to the irregular steam discharge passages of safety valves has probably been largely responsible for the fact that this method of obtaining valve capacities has not been more generally used. To determine what this constant or coefficient of flow is and how it is affected by variations in valve design and adjustment, an extended series of tests has recently been conducted at the Stirling Department of the Babcock & Wilcox Co., at Barberton, Ohio.

A 373 h.p. class K. No. 20 Stirling boiler, fired with a Stirling chain grate, with a total grate area of 101 sq. ft. was used. This boiler contained a U type of superheater designed for a superheat of 50 deg. F. The water feed to this boiler was measured in calibrated tanks and pumped (steam for the pump being furnished from another boiler) through a pipe line which had been blanked wherever it was impossible with stop valves and intermediate open drips to insure that there was no leakage. The entire steam discharge from the boiler was through the valve being tested, all other steam connections from the boiler being either blanked or closed with stop valves beyond which were placed open drip connections to indicate any leakage. A constant watch was kept throughout the testing upon all points of the feed, and steam lines to insure that all water measured in the calibrated tanks was passing through the tested valves without intermediate loss.

The valves tested consisted of a 3-in., 3½-in. and a 4-in. iron stationary valve, and a 1½-in., 3-in. and 3½-in. locomotive valve, the latter with and without mufflers. These six valves were all previously tested and adjusted on steam. Without changing the position of the valve disc and ring the springs of these valves were then removed and solid spindles threaded (with a 10 pitch thread) through the valve casing above inserted. Upon the top end of these spindles, wheels graduated with 100 divisions were placed. The engraving shows the arrangement used with the locomotive valves, the spindle and graduated wheel being similar to that used with the stationary valves. By this means the valve lift to thousandths of an inch was definitely set for each test and the necessity for constant valve lift readings with that source of error eliminated.

In conducting the tests three hours duration was selected as the minimum time for satisfactory results. Pressure and temperature readings were taken every three minutes, water readings every half hour. A man stationed at the water glass regulated the feed to the boiler to maintain the same level in the boiler during the test, other men were stationed, one at the water tanks, one firing and one taking the pressure and temperature readings. Pressure readings were taken from two test gages connected about 4 in. below the valve inlet, the gages being calibrated both before and after the series of tests was run and corrections applied. In all, 29 tests were run; 15 were 3 hours long, four 2½ hours, three 2 hours and seven of less duration.

Tests numbered 1 to 5 were preliminary runs of but one hour or less duration apiece, and the records of them are thus omitted in the accompanying table which gives the lifts, discharge areas, average pressure and superheat, and the steam discharge in pounds per hour of each of the other tests. The discharge areas have been figured for 45-deg. seats from the formula $a = 2.22 \times d \times L$ plus $1.11 \times L^2$; where a equals the effective area in sq. in., D equals the valve diameter in inches, and L equals the valve lift in inches. In tests 8 and 23, where the width of valve seat was .225 in. and .185 in. respectively, and the valve was thus slightly above the depth of the valve seat, the area was figured for this condition.

As previously stated, the application of these results is in fixing a constant for the flow of Napier's formula as applied to safety valves. The formula is $W = A \frac{P}{70}$, in which W

SAFETY VALVE CAPACITY TESTS.

Run at the Stirling Works of the Babcock & Wilcox Co., Barberton, Ohio, November 30 to December 23, 1908.

Test No.	Duration of test.	Size and type of valve	Adjustment remarks.	Valve lift, in.	Pressure, lbs. per sq.in.	Superheat, deg. F.	Discharge — Per hr., lbs. of steam.	Discharge — Area.* sq. in.	Remarks.
6	3 hrs.	4-in. R.F. iron stationary.	Reglr. adj., exhaust piped.	0.0695	151.7	43.6	5,120	0.623	No back pressure.
7	3 "	4-in. " " "	" " " "	.139	145.4	45.1	8,600	1.255	Back pressure 2 lbs.
8	3 "	4-in. " " "	" " " "	.180	135.7	49.2	11,020	1.704	Bk press. 3 lbs.; max. press.; lift > depth of seat.
9	3 "	4-in. " " "	" " " "	.1045	149.4	41.9	7,290	.9400	Back pressure, 1 lb.
10	2½"	3½ locomotive Type R.	" " without mufflr	.140	146.7	39.0	8,685	1,109	Tests 10 to 12, inclusive, with an open locomotive valve.
11	3 "	3½ " "	" " " "	.070	152.5	38.0	4,670	.5493	
12	3 "	3½ " "	" " " "	.105	150.3	41.2	6,780	.8280	
13	3 "	3½ " Type S.	" " with muffler.	.1395	146.3	38.1	8,400	1.106	Muffler valve in this and following locomotive tests.
14	2 "	3½ " "	" " " "	.140	52.2	51.3	3,620	1,109	Test at low steam pressure.
15	2½"	Do.: with lipped feather.	" " " "	.140	146.4	39.0	8,600	1.109	Different type of valve disc.
16	3 "	4-in. R.F. iron stationary.	" " exhaust piped.	.140	138.5	42.3	8,770	1.265	No bk press.; rep. of test No. 7.
17	3 "	4-in. " " "	Adj. ring one turn $\frac{1}{16}$ in. above reglr position.	.140	142.0	50.1	8,900	1,265	Bk. press., 3 lbs.; ring pos. chngd.
18	2 "	1½ locomotive Type S.	Reglr. adj. with muffler.	.107	140.8	23.0	2,515	.4272	
19	1 "	1½ " "	" " " "	.060	151.2	None.	1,550	.2038	Tests 18-21, inc., unsatisfactory; valve too small for boiler used.
20	2½"	1½ " "	" " " "	.075	146.3	None.	2,025	.2560	
21	2½"	1½ " "	" " " "	.075	147.7	None.	1,975	.2560	
22	1½"	3½ R. F. iron stationary.	" " exhaust piped.	.070	146.8	42.6	4,320	.5493	No back pressure.
23	3 "	3½ " " "	" " " "	.140	139.9	43.9	8,360	1.136	No bk press.; lift > depth of seat.
24	3 "	3½ " " "	" " " "	.105	141.6	48.7	6,300	.8280	
25	3 "	3 " " "	" " " "	.130	140.1	48.4	6,370	.8846	Tests 24 to 27, inclusive, no back pressure.
26	3 "	3 " " "	" " " "	.100	142.8	45.6	5,160	.6770	
27	2 "	3 " " "	" " " "	.070	142.4	29.5	3,705	.4716	
28	3 "	3 locomotive Type S.	" " with muffler.	.130	138.4	48.7	7,060	.8846	
29	3 "	3 locomotive Type S.	" " with muffler.	.090	139.3	43.9	4,950	.6034	

*The valves all having 45 deg. bevel seats these areas are obtained from formula: $a = 2.22 \times D \times l + 1.11 \times l^2$; except where, as in test Nos. 8, 18, 23, 25, the valve lift is greater than the depth of the valve seat, where the following formula is used: $a = 2.22 \times D \times d + 1.11 \times d^2 + \pi \times D \times (l - d)$.
a = discharge area (sq. in.). D = valve diameter (in.). l = valve lift (in.). d = depth of valve seat (in.).

NOTE.—The four wings of the valve feather or disc probably reduce the flow slightly, but as these are cut away at the seat (see sketch) a definite correction of the exit areas for them is impossible. Further, the formula constants are desired for the valves as made.

equals pounds discharged per second, P equals the absolute steam pressure behind the orifice or under the valve, and a equals the effective discharge opening in sq. in. This may be stated as $E = C \times a \times P$; in which E equals the pounds steam discharged per hour and C equals a constant, E, a and P being given for the above tests C is directly obtainable.

Figuring and plotting the values of this constant indicates the following conclusions:

(1). Increasing or altering the steam pressure from approximately 50 to 150 lbs. per sq. in. (tests 14 and 10) does not affect the constant, this merely checking the applicability of Napier's formula in that respect.

(2). Radically changing the shape of the valve disc outside of the seat at the huddling or throttling chamber, so-called, does not affect the constant or discharge. In test 15 the valve had a downward projecting lip deflecting the steam flow through nearly 90 deg., yet the discharge was practically the same as in tests 10 and 14, where the lip was cut entirely away, giving a comparatively unobstructed flow to the discharging steam.

(3). Moving the valve adjusting ring through much more than its complete adjustment range does not affect the constant or discharge. (Tests 16 and 17.)

(4). The addition of the muffler to a locomotive valve does not materially alter the constant or discharge. There is but 2 per cent. difference between tests 10 and 13.

(5). Disregarding the rather unsatisfactory 1½-in. and 3-in. locomotive valve tests, the different sizes of valves tested show a variation in the constant when plotted to given lifts of about 4 per cent.

(6). There is a slight uniform decrease of the constant when increasing the valve lifts.

The variations indicated in the last two conditions are not large enough, however, to materially impair the value of a single constant obtained by averaging the constants of all the 24 tests given. The selection of such a constant is obviously in accord with the other four conditions mentioned. This average constant is 47.5, giving as the formula ($E = 47.5 \times a \times P$). Its theoretical value for the standard orifice of Napier's formula is 51.4, of which the above is 92½ per cent.

To make this formula more generally serviceable, it should be expressed in terms of the valve diameter and lift, and can be still further simplified in its application by expressing the term E (steam discharged or boiler evaporation per hour) in terms of the boiler heating surface or grate area. For the almost universal 45-deg. seat the effective discharge area is, with a slight approximation ($L \times \text{sine } 45 \times \pi \times D$), in which L equals the valve lift vertically in inches and D the valve diameter in inches. Substituting this in the above formula gives $E = 47.5 \times L \times \text{sine } 45 \times \pi \times D \times P$, or $E = 105.5 \times L \times D \times P$.

The slight mathematical approximation referred to consists in multiplying the ($L \times$ sine 45) by ($\pi \times D$) instead of by the exact value ($\pi \times D$ plus $\frac{1}{2}$ L). To find directly the effect of this approximation upon the above constant, the values for E L D and P from the tests have been substituted into the above formula and the average constant re-determined, which is 108.1. The average lift of all the tests is .111 in. Plotting the constants obtained from the above formula in each test, as ordinates, to valve lifts, as absissae; obtaining thus the slight inclination referred to in condition 6, and plotting a line with this inclination through the above obtained average constant 108.1, taken at the .111 average lift gives a line which, at a maximum lift of say .14 in. gives a constant of just 105. At lower lifts this is slightly larger. Hence 105 would seem to be the conservative figure to adopt, as a constant in this formula for general use, giving

$$E = 105 \times L \times D \times P.$$

This transposed for D gives:

$$D = .0095 \times \frac{E}{L \times P}$$

Note that the nominal valve *area* does not enter into the use of this formula and that if a value of 12 for instance is obtained for D it would call for two 6-in. or three 4-in. valves. For flat seats these constants become 149. and .0067 respectively.

The fact that these tests were run with some superheat (an average of 37.2 deg. Fahr.) while the majority of valves in use are used with saturated steam, would, if any material difference exists, place the above constants on the safe side. The capacities of the stationary and locomotive valves, the lift test results of which have been summarized, have been figured from this formula, taking the valve lifts at opening and in pounds of steam per hour, are as follows:

Of the seven 4-in. iron body stationary valves, the average capacity at 200 lbs. pressure is 7,370 lbs. per hour, the smallest capacity valve (figured for a flat seat) has a capacity of 3,960 lbs., the largest is 12,400 lbs., and of the six 3½-in. muffler locomotive valves at 200 lbs. pressure, the average capacity is 6,060 lbs. per hour, the smallest 4,020 lbs., the largest 11,050 lbs.

To make the use of the rule more direct where the evaporation of the boiler is only indirectly known, it may be expressed in terms of the boiler heating surface or grate area. This modification consists merely in substituting for the term E (lbs. of total evaporation) a term H (sq. ft. of total heating surface) multiplied by the lbs. of water per sq. ft. of heating surface which the boiler will evaporate. Evidently the value of these modified forms of the formula depends upon the proper selection of average boiler evaporation figures for different types of boilers and also upon the possibility of so grouping these boiler types that average figures can be thus selected. This modified form of the formula is

$$D = C \times \frac{H}{L \times P}$$

in which H equals the total boiler heating surface in sq. ft. and C equals a constant.

Values of the constant for different types of boilers and service have been selected. These constants are susceptible, of course, to endless discussion among manufacturers, and it is undoubtedly more satisfactory where any question arises to use the form containing the term E itself. Nevertheless, the form containing the term H is more direct in its application, and it is believed that the values given below for the constant will prove serviceable. In applying the formula in this form rather than the original one, containing the evaporation term E, it should be remembered that these constants are based upon average proportions and hence should not be used for boilers in which any abnormal proportions or relations between grate area, heating surface, etc., exists.

For cylindrical multitubular, vertical and water-tube stationary boilers a constant of .068 is suggested. This is based upon an average evaporation of 3½ lbs. of water per sq. ft. of heating surface per hour, with an overload capacity of 100 per cent., giving 7 lbs. per sq. ft. of heating surface, the figure used in obtaining the above constant.

For water-tube marine and Scotch marine boilers, the suggested constant is .095. This is based upon an overload or maximum evaporation of 10 lbs. of water per sq. ft. of heating surface per hour.

For locomotive boilers, .055 is taken, this constant having been determined experimentally, as explained below. In locomotive practice there are special conditions to be considered which separate it from regular stationary and marine work. In the first place the maximum evaporation of a locomotive is only possible with the maximum draft obtained when the cylinders are exhausting up the stack, at which time the throttle is necessarily open. The throttle being open is drawing some of the steam and therefore the safety valves on a locomotive can never receive the full maximum evaporation of the boiler. Just what per cent. of this maximum evaporation the valve must be able to relieve under the most severe conditions can only be determined experimentally. Evidently the severest conditions occur when an engineman after a long, hard, up-hill haul with a full glass of water and full pressure, reaching the top of the hill, suddenly shuts off his throttle and injectors. The work on the hill has gotten the engine steaming to its maximum and the sudden closing of throttle and injectors forces all the steam through the safety valves. Of course, the minute the throttle is closed the steaming quickly falls off and it is at just that moment that the severest test upon the valves comes.

A large number of service tests has been conducted to determine this constant. The size of the valves upon a locomotive has been increased or decreased until one valve would

just handle the maximum steam generation, and the locomotive heating surface being known, the formula was figured back to obtain the constant. Other special conditions were considered, such as the liability in locomotive practice to a not infrequent occurrence of the most severe conditions; the exceptionally severe service which locomotive safety valves receive; and the advisability on locomotives to provide a substantial excess valve capacity.

As to the method of applying the proposed safety valve capacity rule in practice, manufacturers could be asked to specify the capacity of their valves, stamping it upon them as the opening and closing pressures are now done. This would necessitate no extra work further than the time required in the stamping, because for valves of the same size and design giving practically the same lift this would have to be determined but once, which of itself is but a moment's work with a small portable lift gage which is now manufactured. The specifying of safety valves by a designing engineer could then be as definite a problem as is that of other pieces of apparatus. Whatever views are held, as to the advantages of high or low lifts, there can be no question, it would seem, as to the advantage of knowing what this lift actually is, as would be shown in this specifying by manufacturers of the capacity of their valves. As to the feasibility of adopting such a rule (which incorporates the valve lift) in statutes governing valve sizes, this would involve the granting and obtaining by manufacturers of a legal rating for their valve designs based upon their demonstrated lifts.

This paper has dealt with but one phase of the subject of safety valves, in order that its conclusions might be drawn more clearly. The apparatus and tests shown indicate that the lifts and capacities of different make valves of the same size and for the same conditions vary as much as 300 per cent., and that there is therefore the liability of large error in specifying valves in accordance with existing rules and statutes because these rules, as shown, rate all valves of one size as of the same capacity, irrespective of the above variation. A simple rule, based upon an extended series of direct capacity tests, is given, which avoids this error by incorporating a term for the valve lift. Finally, the method and advantage of applying this rule in practice has been briefly indicated.

THE FIRST BLOCK SIGNAL SYSTEM IN AMERICA.

BY J. A. ANDERSON.

The first system of block signals for controlling train movement, in America, was devised and put in operation by the late Ashbel Welch, General President and Chief Engineer of the United New Jersey Canal & Railroad Companies, who also, as recently stated in the columns of the *Railroad Age Gazette*, introduced from England the first plant installed in this country of interlocking switches and signals.

The system devised by Mr. Welch was based upon a principle the reverse of that before used for the protection of trains by fixed signals, which new principle is now accepted as correct, and the apparatus was arranged with particular reference to preventing disaster from oversight or carelessness. His plan is discussed at length in a report made by him to a railroad convention in New York, October 17, 1866, in which he says that it had been in use for a year past between Philadelphia and New Brunswick, on the main passenger route between New York and Philadelphia.

Much of the contents of this report, with other interesting matter, appears in a letter written by him, on August 24, 1878, from which the following is quoted:

"In the year 1863 I devised and put in operation, on the railway between New Brunswick and Philadelphia, a system of safety signals now in operation between Jersey City and Pittsburg. The principle upon which it was made you will find set out in my report three years later to a railroad convention at New York, a copy of which I send you by this mail. The cardinal principle is set out in pages 3 and 4 and the system is described in pages 5 and 7.

"At the time I put this system in operation I had never heard of the English Block System, although I afterwards knew accounts of it had been published.

"The Block System used at that time was radically different from mine. If a train did not pass a station when it should, notice was telegraphed back to the next station to stop, or block, the next train till further notice.

"The radical fault of this system was that if the operator was not on the alert, or, if the apparatus failed to work, or if the notice sent back was unobserved or not rightly understood, all of which were liable to happen, then no warning was given and a collision was much more likely to happen than if no warning was expected.

"I have been assured by the best authority that in this way collisions did occur and that some experts doubted whether the danger was not increased.

"I do not know how far the English Block System has been modified so as to substantially coincide with mine.

"Many terrible accidents have occurred on other roads since these signals have been in use, which would have been prevented had the same system been adopted by those roads.

"The principle announced in this little pamphlet was deemed of so much importance by Prof. Henry that he sent copies to several of the principal libraries in Europe."

Professor Henry was the well-known scientist who invented the electro magnet and who was then at the head of the Smithsonian Institution. Briefly, the principle referred to was that a train should not go on a "block" until notified that the block was clear, instead of proceeding unless a red signal was shown, as in former practice.

The statement in the report, to which reference is made in the foregoing letter, that the plan had been in operation "for a year past between Philadelphia and New Brunswick," doubtless indicates the time of completion between those points, after the experimental operation on a part of the line, in 1863.

In the report of the Interstate Commerce Commission, in 1907, on "Block Signal Systems," of which the technical portion was prepared by Messrs. B. B. Adams and C. C. Anthony, the following note appears:

"The first block signalling in America appears to have been on the line between Kensington (Philadelphia), Pa., and Trenton, N. J., in 1863 or 1864. This statement is based on the testimony of the late Robert Stewart, who was Superintendent of Telegraph of that road about that time. The space interval was adopted after the occurrence of a disastrous rear collision of east-bound trains at night carrying soldiers from the seat of war to New York and New England. The block system was extended north from Trenton to New Brunswick some time in 1864. The earliest date of which an authentic record has been found is November 12, 1869, which appears on a circular issued by F. Wolcott Jackson, General Superintendent of the New Jersey Railroad (Jersey City to New Brunswick), and dated at Jersey City, giving the rules under which the space interval was to be maintained. The circular is signed also by R. Stewart, Superintendent of Telegraph. The block system was put in effect from Frankford Junction westward to Mantua (West Philadelphia) in 1870. In 1872 the Pennsylvania Railroad took control of all these lines, and at that time a length of 90 miles was being worked by the block system. In a statement made by Mr. Ashbel Welch, in 1866, he speaks of the block system as having been in use for a year between Jersey City* and New Brunswick. The block signals consisted of banners in boxes, some of which have been in use until within a few years and may be familiar to the reader. The box stood on a post and red flannel banners were dropped in front of a white surface or white light for the stop indication. On some of the boxes there were hoods to prevent

*"Jersey City" should read "Philadelphia." In a letter of April 19, 1882, given in full farther on, Mr. Welch states that the system was extended to Jersey City in the spring of 1867, after the consolidation with the New Jersey Railroad, which occurred January 1, 1867.

impairment of the engineman's view by the rays of the sun reflected from the glass which covered the opening in the front of the box and protected the banner from the weather."

In 1876 the system was extended over the main line of the Pennsylvania Railroad Company, as appears from the report of the company for that year, which says: "The block system of signals was extended over the entire line between Philadelphia and Pittsburgh, and between Philadelphia and Jersey City, adding largely to the security and promptness with which trains were moved."

This, of course, was a valuable aid in moving the heavy traffic of the Centennial year.

After the preliminary installation in 1863, before mentioned, the system was formally authorized in the adoption of a paper, which describes the plan in such detail that it is worth while to reproduce the most of it here.

An endorsement states that it is the "First resolution adopted by the Ex. Com. March 27, 1865. R. S." The initials are those of Richard Stockton, Secretary of the Executive Committee. The paper is as follows:

"Ordered that a system of telegraphic safety signals be established between Kensington and New Brunswick by which a train passing one of the signal stations shall be informed whether the preceding train going in the same direction has passed the next signal station and whether the track is clear.

"The signal stations, except temporarily between Trenton and Dean's Pond, to be not over six miles apart, at points as as necessary and never under any circumstances made fast or held down by other means.

"Holes in the vertical rod will be made to match holes in a permanent post when the signal is dropped out of sight. When a train passes on one track or notice is received that a track is obstructed short of the next station, a peg will be instantly inserted in the hole through the rod working the signal belonging to that track, pinning it fast to the permanent post. Should another train pass or another obstruction be reported on the same track another will be inserted in another hole and so on. On receiving notice that a train has passed the next station or that an obstruction has been removed, the peg put in on acount of it will be instantly taken out and so on until the rod is left free. Thus there will be no mistake from forgetfulness or miscalculation.

"Whistling posts will be placed half a mile each way from each station, on arriving at which an approaching train will give a long loud whistle. On hearing this the signalman will exhibit the safety signal by pulling down the signal rod, provided it is free or, in other words, provided that all trains have passed the next station and all other reported obstructions are removed. The moment the train passes he will drop the signal and insert a peg in the rod. He will then listen to see whether the departing train keeps on its way. If so he will at the end of one minute after its passage report back to the next station that it has passed. If the train should stop at or within five hundred yards of the sig-

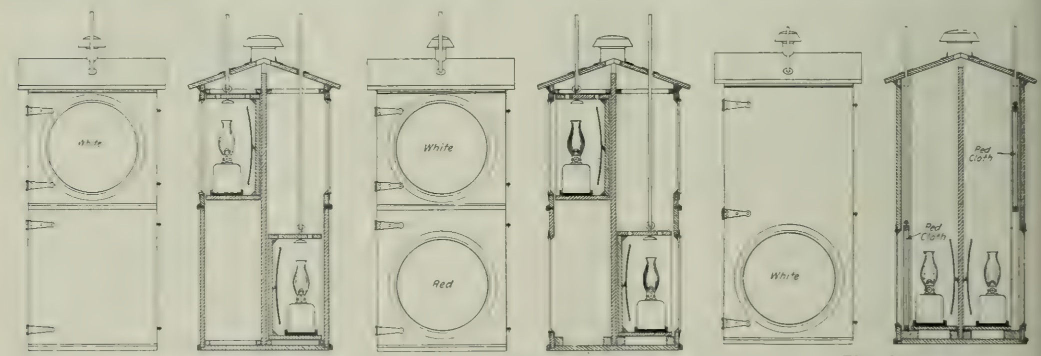


Fig. 1. Fig. 2. Fig. 3.

far as practicable where there is a good view each way. Each provided with simple telegraphic and all other necessary apparatus. An independent wire to extend from each station to the next, with an independent instrument. An attendant to be always on duty night and day and at meal times.

"The safety signal will be a white polished reflector two feet in diameter with a light in front at night, seen through an opening of the same diameter in a box projecting over the platform from the upper part of the signal station building. The signal for northbound trains will be seen through an opening on the southerly side of the signal box; that for southbound trains through an opening through the northerly side. The two signals will be separated by a vertical partition. The box and partition to be painted black. The openings to be covered with glass.

"Each signal will be placed at the outer end of a horizontal lever the inner end of which will project within the signal office. From the inner end will be suspended a vertical rod by which it will be worked. The relative weights of the signal and vertical rod will be such that on letting go the rod the signal will drop out of sight to the bottom of the signal box below the opening. A horizontal screen will be attached to the top of the signal so that when down the light cannot shine on the partition and be reflected through the opening.

"The signal must be exhibited by pulling down the vertical rod with the hand. It must then be held by the hand as long

nal station the operator will report back the facts, but will not authorize the removal of the peg nor the exhibition of the safety signal at the next station back, but the next train must be stopped and informed of the facts.

"Should a train stop within five hundred yards after passing a signal station the conductor must give notice to that station. Notice of passage if made must be countermanded, the peg representing that train left or reinserted, the next train stopped till the facts are explained, when it may proceed, taking care not to run into the delayed train. When fog or other causes prevents a signal from being seen the station will be approached cautiously so as to stop if necessary without running past.

"Regular trains will be designated by their number. Extras by description.

"When the safety signal is exhibited the engineer will give one puff of the whistle to notify the operator and conductor. When not exhibited he must whistle down brakes and stop. The train men must, of course, be on the alert. The signal man will then give the conductor all the information he possesses as to preceding trains not passed the next station or other obstruction. The conductor will then wait at least five minutes beyond the time the preceding train should have passed the next station unless the preceding train is at the next station or its position is known. He will then act according to instructions given from time to time to that par-

ticular train or class of trains. If pursuant to such instructions he goes on without the safety signal or without knowing where the preceding train is he must send a man ahead where he cannot see the track far enough to stop in time to ensure safety.

"The signal man will keep a card slip, for each track, ruled with three columns. In the first he will put down the number of every regular train or description of extra that passes on that track. In the second the exact time it passes. In the third the time that notice is given that it has passed the next station. These cards will be forwarded daily to the Superintendent's office where the motions of the trains will be plotted for inspection."

The paper contains several other paragraphs prescribing precautions which it is not necessary here to repeat. A copy has been preserved of the regulations issued in conformity with the above and dated Sept. 27, 1865.

References in this and an incomplete order preserved among Mr. Welch's papers, indicate the existence of previous rules, which no doubt were issued on the first partial installation.

The signal box, as originally designed, Fig. 1, showed a single opening. The white signal, for "safety," was movable, and when "safety" was not to be shown, the signal, with its light, was dropped below the opening, so that nothing appeared but the black partition on the box. Later, and perhaps before installation, this was so modified that when the signal with its light was dropped, a lower opening showed red (Fig. 2). Some other modifications ensued and, the final form, Fig. 3, showed a single opening and a fixed lamp. To indicate stop a red curtain was dropped before the lamp, and when the curtain was lifted "safety" was indicated. The whole arrangement was eventually superseded by the semaphore, with which, however, the principle was preserved.

On December 23, 1865, Mr. Welch made a long report, respecting his plan to the Committee of the Franklin Institute on Railroad Signals, in which he gives quite fully his views as to the importance of the principle he advocated, and describes other appliances which he had adopted, for security at switches and drawbridges. The paper enters into much detail respecting the construction of the apparatus and rules for operation, but its length precludes reproduction here.

From the letter of August 24, 1868, above quoted, it appears that at the time of devising the plan of "Safety Signals," its author had not heard of the English block system, and it seems that when he did hear of it he found it to differ radically in principle from his plan.

This is also set forth succinctly in the following letter, above referred to, dated April 19, 1882:

"I send herewith a reprint of a report which I made before the National R. R. Convention in 1866, on Safety Signals. The principles of the system now in use between Jersey City and Pittsburgh are set forth in it.

"I devised this system and put it in operation between New Brunswick and Philadelphia in the spring of 1865. After the consolidation with the N. J. R. R. I extended it to Jersey City in the spring of 1867. After the lease to the P. R. R. Co. in 1871, they extended it to Pittsburgh.

"When I put this system in operation, there was not as I believe anything like it in the world. The English Block System (of which I had never heard) was as then used, and used only in a few cases, unlike it in principle. That depended upon notice that something was wrong, without receiving which a train could go on.

"If from neglect of the operative, or failure to work of the apparatus, notice was not received, a train would go on supposing all was right and run into a delayed train. I was assured when in England in 1869, that such cases were not infrequent, and so, many railroad companies considered that the Block System increased the danger. My system instead of notice of a delayed train, required assurance that the track was clear. It is probable that now in England they have abandoned the old Block System, and that the system now so called and as now used may be the same as mine.

"But to call the system now in use between New York and Pittsburgh 'The Block System' conveys an entirely erroneous impression of its origin."

The date, 1865, in the foregoing, is that of the final authorized installation, between New Brunswick and Philadelphia.

It is stated authoritatively that the Block System was proposed in England as early as 1842, but that its introduction was very gradual. So far as has been ascertained, the use of the system there was quite limited at the time of Mr. Welch's visit to that country in 1854. This letter shows that he met with no example of it using the principle which he adopted, and the only case, mentioned in his notes, of the use of fixed signals, controlling the movements of trains, is one in which they were used simply for "spacing" trains by time intervals, which was, of course, not what is at present understood as a block system.

THE ADVANTAGES OF THE USE OF MODERATELY SUPERHEATED STEAM IN LOCOMOTIVE PRACTICE.

BY LAWFORD H. FRY.

With the growing use of superheated steam in locomotive practice a number of studies of the theoretical side of the question have been published. All of these, however, have been devoted to proving the value of very highly superheated steam, and have neglected to consider the economies which can be obtained by the use of a low degree of superheat. Recently, however, experience, with the Baldwin superheater in actual service, has shown that important advantages can be secured with steam having only from 50 to 100 degrees superheat. It is not proposed to study the theoretical side of the arrangement which gives such satisfactory results in practice. It will be shown that so far as coal consumption is concerned, a low degree of superheat offers practically the same opportunity for economy as does a very high degree of superheat. The conditions of operation are so much simpler with steam at a moderate temperature than with excessively superheated steam, that if the same economy, or even nearly the same economy, can be secured, the low degree of superheat is indicated as being the more desirable for ordinary conditions of service.

In studying the question it is necessary to take into account the operation of both boiler and engine. First let us consider the production of the steam by the boiler, and as a starting point take an ordinary locomotive boiler, having a ratio of grate area to heating surface of about 1 to 60, and a working pressure of 200 pounds per square inch above the atmosphere. Under normal conditions, with a rate of firing of 100 to 120 pounds of coal per square foot of grate area per hour, the boiler efficiency will be say 60 per cent., so that with coal of good quality, having a heating value of say 15,000 B.t.u. per pound, the boiler will take up and utilize for the production of the steam 9,000 B.t.u. per pound of coal fired. The heat above 60 degrees Fahrenheit in a pound of saturated steam at 200 pounds boiler pressure is 1,172 B.t.u., and consequently for each pound of coal fired, there will be produced $9{,}000 \div 1{,}172 = 7.68$ pounds of steam, the feed water being supplied at a temperature of 60 degrees. The temperature of the saturated steam at the boiler pressure of 200 pounds will be 388 degrees Fahrenheit. The products of combustion will leave the boiler tubes at some 260 degrees above this, say at 650 degrees, and their weight will be about 17.5 pounds per pound of coal actually burned, or say 13.5 pounds per pound of coal fired. At this rate (having a specific heat of 0.24) they carry off $13.5 \times 0.24 \times 650 = 2{,}100$ B.t.u., or 14 per cent. of the heat in the coal fired.

Now suppose that without any other change in the boiler, the working pressure be reduced to 140 pounds and a super-

heater be placed in the smoke box to utilize the heat of the waste gases to heat the steam to 400 degrees Fahrenheit, which is 40 degrees of superheat at the boiler pressure of 140 pounds. The tests made with the Baldwin superheater on the Rock Island Railway show that under these conditions the temperature of the smoke box gases will be lowered about 100 degrees so that they will now escape at say 550 degrees and thus carry off 13.5 x 0.24 x 550 = 1,780 B.t.u., or 11.9 per cent. of the heat in the coal fired. The superheater by reducing the temperature at which the smoke box gases escape, has increased the boiler efficiency from 60 to 62.1 per cent., and consequently the heat now utilized in the steam production is increased to .621 x 15,000 = 9,315 B.t.u. per pound of coal fired. Now each pound of steam at 140 pounds boiler pressure and a temperature of 400 degrees Fahrenheit has a volume of 3.1 cubic feet and has a total heat of 1,187 B.t.u. above 60 degrees. Therefore, with feed water at 60 degrees, each pound of coal fired will produce 7.83 pounds of steam and this steam will have a volume of 24.3 cubic feet.

Now examine the case of the same boiler modified to produce steam at 140 pounds boiler pressure with 290 degrees of super heat. The temperature of this steam will be 650 degrees Fahrenheit and it is obvious that the gases which heat this steam must leave the tubes at a considerably higher temperature. It seems necessary to count on a smoke box temperature of at least 800 degrees Fahrenheit, and at this temperature the heat carried off by the gases amounts to 13.5 x 0.24 x 800 = 2,590 B.t.u., or 17.3 per cent. of the heat of the coal fired. As compared with the original boiler, the efficiency has been reduced from 60 to 56.7 per cent., and the boiler now utilizes in the production of steam, only .567 x 15,000 = 8,510 B.t.u. per pound of coal fired. Now each pound of the highly superheated steam has a total heat of 1,317 B.t.u. above 60 degrees, and has a volume of 4.0 cubic feet, so that each pound of coal fired will produce 6.44 pounds of steam having a volume of 25.8 cubic feet.

The next point for consideration is the work which is done by the steam in its expansion in the cylinder. During the expansion the relation between the pressure and the volume can be represented by an equation of the form

$$p \times V^k = \text{constant}.$$

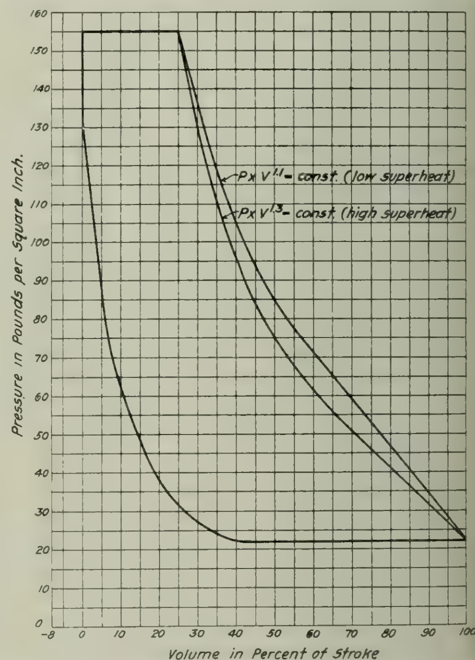
where p is the absolute pressure, V is the volume, and the value of the exponent k is determined by the state of the steam and by the conditions under which the expansion takes place. The lower the value of k, the slower is the decrease in the pressure and the greater is the work developed for a given ratio of expansion. With saturated steam, if the expansion takes place adiabatically, that is to say without the steam receiving or giving up any heat, the value of k is 1.135. In practice, however, the steam takes up heat from the cylinder walls and from the water produced by the initial condensation, and the pressure being thus maintained above that of adiabatic expansion, the exponent has the value 1.0, and the expansion follows the well known equation

$$p \times V = \text{constant}.$$

With superheated steam a similar process takes place. The adiabatic expansion of superheated steam would give the value of 1.333 to the exponent k, but in actual practice, though the initial condensation is very much less, yet the steam gives up some heat on entering the cylinder and takes a part of this heat again during the expansion. As a consequence, the pressure drops less rapidly, and the value of k is less than in the true adiabatic expansion. Wilhelm Schmidt, whose work in the use of highly superheated steam is well known, gave in the *Railroad Age Gazette* for July 17, 1908, the following values for k:

For a low degree of superheat $k = 1.1$
For a high degree of superheat $k = 1.25$

This means that the highly superheated steam shows a more rapid fall of pressure, and with the same initial pressure and ratio of expansion it develops less work than the steam with the low degree of superheat. We have now to study the application of these formulas to the expansion of the steam, of which the production has already received consideration. The ordinary conditions of operation are fairly represented by the cycle of expansion shown in the accompanying diagram, where the cylinder clearance is 8 per cent., cut off is at 25 per cent., exhaust at 60 per cent. of the stroke, while compression begins at 60 per cent. of the return stroke. The diagram shows the expansion, under these conditions, of slightly superheated steam with the exponent $k = 1.1$, and of slightly superheated steam with the exponent $k = 1.25$ for the expansion line. The saturated steam, which is not shown in the diagram, will expand with the exponent $k = 1.0$. It will be seen that the expansion line of the highly superheated steam lies below that of the slightly superheated steam, and the indicated work is found to be about 2.5 per cent. less for the same volume of steam. The saturated steam, being at 200 instead of 140 pounds



Comparative Expansion Diagrams for Slightly and Highly Superheated Steam.

boiler pressure, is not directly comparable on the accompanying diagram, but Mr. Schmidt has shown that at the same pressure and the same ratio of expansion the saturated steam gives about 7 per cent. higher indicated work than the highly superheated steam.

The diagrams plotted do not take into account the cylinder condensation, which is a matter for separate examination, but show simply the indicated steam. If the diagrams are laid down accurately to scale they can be measured with a planimeter, otherwise one can determine the indicater steam consumption by calculation. It is thus found that in passing through the cycle of expansion shown in the diagrams, from an initial pressure of 140 pounds to a back pressure of pounds, each cubic foot of the low temperature steam develops 33.980 foot-pounds of indicated work, while the highly superheated steam develops only 33,150 foot-pounds. The saturated steam, with an initial pressure of 200 pounds, in passing through the same cycle of expansion develops 62,100 foot

pounds of indicated work. The three classes of steam differ considerably in density, and if we compare them on the basis of weight we find that the indicated work per pound of steam is 105,000 foot-pounds for the low temperature steam, 132,300 foot-pounds for the high temperature steam, and 133,000 foot-pounds for the saturated steam.

Now to combine the engine and boiler efficiencies. With the low degree of superheat, each pound of coal fired produces 24.3 cu. ft. of steam, and is thus capable of developing 24.3 x 33,980 = 826,000 foot-pounds of indicated work, while with the highly superheated steam each pound of coal fired produces 25.76 cu. ft. of steam capable of developing 25.76 x 33,150 = 853,000 foot-pounds. With the saturated steam each pound of coal fired produces 16.5 cu. ft. of steam capable of developing 16.5 x 62,100 = 1,025,000 foot-pounds. Since one horse-power-hour is equivalent to 1,980,000 foot-pounds, the foregoing figures show that the indicated steam consumption for the three types of engines will be 18.9 pounds for the low temperature 15.0 pounds for the high temperature, and 14.9 pounds for the saturated steam per horse-power-hour. These are the steam consumptions shown by the indicator and are exclusive of the losses by cylinder condensation and leakage. In the saturated steam locomotive these losses are known to amount to 30 or 40 per cent. of the total steam consumption. If we assume for the present purpose, a loss of 37.5 per cent. the steam consumpton becomes 23.8 pounds per horse-power-hour, which is exactly the figure found by the Pennsylvania Railroad in its tests at St. Louis, for single expansion locomotives. [See page 704 of the report on the St. Louis tests.]

For locomotives operating with superheated steam the cylinder condensation has not been established directly, but it may be estimated by taking the difference between the actual steam consumption and the indicated steam consumption calculated above. It may be taken that as compared with the saturated steam engine, the low superheat will show a steam economy of 12.5 per cent., and the high temperature a steam economy of 30 per cent. This assumption, which is favorable to the high temperature steam, gives the following figures for the total steam consumption per horse-power-hour, for the low temperature 20.9 pounds, and for the high temperature 16.7 pounds. This agrees with the St. Louis results, which show a measured steam consumption of 16.6 pounds of high temperature steam per indicated horse-power-hour. On this basis we have for the low temperature superheat a steam consumption of 20.9 pounds actual and 18.9 pounds indicated, a difference of 9.5 per cent. for cylinder condensatiion and leakage, while the high superheat shows a consumption of 16.7 pounds actual and 15.0 pounds indicated, which is a difference of about 10 per cent. The figures thus obtained must be used with discretion, but they indicate that with superheated steam the cylinder condensation is not greatly affected by the degree of the superheat. As has been said above there are no direct measurements available in this connection, but the conclusion arrived at by the calculation seems to be justified by certain general conditions. It is probable that with saturated steam the greater part of the very large cylinder condensation is brought about by water which is carried into the cylinders with the steam. In locomotive practice the steam furnished to the cylinders usually carries from one and one-half to two per cent. of water, and it is extremely likely that the cylinder condensation, instead of being 30 or 40 per cent., would be cut down to a fraction of this if the steam were perfectly dry on entering the cylinders. If the steam is superheated, even though only slightly, although heat is lost on entering the cylinders, still the strong condensing effect of the water is completely suppressed.

To complete the investigation we have to determine the actual coal consumption, which is found from the foregoing figures to be 3.1 lbs. per horse-power-hour for the saturated steam, 2.67 pounds for the low temperature steam, and 2.60 pounds for the high temperature steam, which is only 2.6 per cent. in favor of the high as compared with the low temperature steam.

The accompanying tables enable the figures determined in the course of tne above calculations, together with some other figures of interest, to be compared.

Comparison of Saturated, and High and Low Temperature Superheated Steam.

Properties of the Steam:			
State	Saturated.	Superheated.	
Temperature in degrees Fahrenheit	388	400	650
Absolute pressure in lbs. per sq. in.	215	155	155
Degrees of superheat	0	39	289
Volume of 1 lb. in cu. ft.	2.14	3.10	4.00
Weight of 1 cu. ft. in lbs.	0.4675	0.322	0.250
Heat abv. 32 deg. F., in 1 lb. steam, B.t.u.	1,200	1,215	1,345
Heat required to produce 1 lb. steam from feed water at 60 degs. F.	1,172	1,187	1,317
Indicated work in ft.-lbs. developed by 1 lb. steam expanding in assumed diagram	133,000	106,000	132,300
Indicated work in ft.-lbs. developed by 1 cu. ft. steam expanding in assumed diagram	62,100	33,980	33,150
Properties of the Locomotive:			
Boiler efficiency in per cent.	60.0	62.1	56.7
Heat utilized by boiler in production of steam per lb. of coal fired, in B.t.u.	9,000	9,315	8,510
Lbs. steam produced from feed water at 60 degs. F. per lb. of coal fired	7.68	7.83	6.44
Cu. ft. steam produced from feed water at 60 deg. F., per lb. of coal fired	16.5	24.3	25.76
Indicated work in ft.-lbs. per lb. coal fired	1,025.000	826,000	853,000
Indicated consumption (no cylinder condensation) water per h.-p.-hr. in lbs.	14.9	18.9	15.0
Actual consumption with cylinder condensation, water per h.-p.-hr. in lbs.	23.8	20.9	16.7
Do., as per cent. of sat. steam	100.0	87.5	70.0
Cylinder cond. as per cent. of steam used.	37.5	9.5	9.5
Coal per h.-p.-hr. in lbs.	3.10	2.67	2.60
Do. as per cent. of sat. steam	100.0	86.0	84.0

HANDLING MERCHANDISE SHIPMENTS FROM CHICAGO TO THE SOUTH AND SOUTHEAST.

BY SAMUEL O. DUNN,

Western Editorial Manager, *Railroad Age Gazette.*

Co-operation between shippers and railways within the last three years has revolutionized the transportation of merchandise from Chicago to points in the South and Southeast. The Chicago Association of Commerce has used publicity to teach shippers how to ship, and to stimulate competition in service between the various roads. Its work along this line has proved of benefit in numerous ways to shippers, and, on the whole, has benefited the railways. And it has shown that intelligent, harmonious, honorable pursuit of their self-interest both by shippers and by railways will accomplish improvements in transportation service that never could be secured by recriminatory wranglings before railway commissions.

The movement of merchandise from Chicago to points in the South and Southeast formerly was subject to chronic delays. It was not unusual for goods to be in transit from 15 to 30 days. In addition, there was much loss and damage to shipments, owing to numerous transfers from car to car at junction points. Merchants in the South constantly were complaining that goods had not arrived when they were expected and needed. Jobbers at Chicago were constantly tracing their freight and bickering with the claim departments of the railways over loss and damage claims.

These conditions put the jobbers at Chicago at a serious disadvantage in competing against the wholesale merchants of New York, Philadelphia, Baltimore and other Atlantic seaboard cities for southern trade. Rates are lower from the Atlantic seaboard to most points in the South than they are from Chicago. The railways say that this is due to water competition. The business men of Chicago assert that it is due to unfair discrimination, and they are trying now to get the Interstate Commerce Commission to reduce the rates from Chicago. Whatever the cause of it the difference in rates exists. The jobbers and other business men at Atlantic seaboard points long have had close business relations with the South, and the movement of merchandise from the seaboard, both by boat and by rail, long has been large and quite expeditious and satisfactory. Under these conditions the jobbers of Chicago made

slow headway in building up business in the South. Their traveling salesmen in that territory long found it hard to earn their salt.

About three years ago J. F. Morton went to Chicago to lay before that city's jobbers a plan for getting better service to the South. Mr. Morton had been for twenty years in the employ of the Southern Railway. He had handled less-than-carload shipments at points along the line from Danville, Va., to Columbia, S. C., as transfer agent, and had been yardmaster at Danville. He had noted the delays and damage to merchandise moving to the South from the Central West, and had devoted much study to the causes and proper remedy. He had tried to get the officers of his road to adopt some more systematic method of handling L.C.L. shipments, but had failed to interest them.

As he could see that jobbers at Chicago were losing more by existing methods than any other concerns, he resigned his railway position, and on going to Chicago tried to organize its wholesale merchants in a bureau to systematize and expedite their L.C.L. shipments. He presented his plan to the Freight Traffic Committee of the Association of Commerce. The committee refused to adopt it because there was doubt as to its practicability, and the organization could not afford to father a project that might prove troublesome and expensive failure. But thirty-five jobbing houses finally decided to take up the scheme, with the understanding that the Association of Commerce would use its influence to get the railways to put on the through package cars necessary to give it a fair trial. The plan worked so successfully that in a year and a half the merchants who experimented with it recommended that the Association take it over, giving the assurance that they had found it was a good thing. The Association acted favorably on this recommendation.

In order to understand Mr. Morton's method and the results that have been secured by it, it is necessary to understand the causes of the conditions that existed before it was adopted. Formerly a shipment of merchandise from Chicago to Jacksonville, Fla., would be transferred from the car of one railway to the car of another at the Ohio river. It would be similarly transferred again at Nashville or Chattanooga and again at Birmingham or Atlanta, and again perhaps at Macon. These numerous transfers were made necessary by the fact that very few cars were run through from Chicago to points in the South; and so few package cars were run through because merchandise shipments were not so handled as to concentrate the shipments for a given point in cars that could be moved directly to that point. There were enough goods moving south to load many cars, and there were enough cars moving south to handle the goods, but the goods were not put in the right cars to make possible through transportation.

This caused the chronic delays mentioned. Transfers took an average of 48 hours each. If, therefore, three transfers were made six days were consumed that might otherwise have been used in transportation. These transfers were very expensive for the railways, costing directly from 20 cts. to 50 cts. per ton per transfer. They also caused much loss and damage to goods. Jobbers constantly were engaged in tracing their shipments, and railways constantly were engaged in settling claims.

Mr. Morton's remedy was the concentration of all shipments of merchandise from Chicago to any given point in the South in through cars that either reached that particular point or went nearer to it than any other available cars. His method was to induce the railways to put on through merchandise cars to the various distributing points, and then, by advertising these care extensively, to get as many shippers as possible to use them to the best advantage. The railways were found very willing to co-operate when assured of enough tonnage to warrant putting through cars into service. When Mr. Morton took up this work there were not over a half dozen through cars running to the South. The number has been steadily increased until the number of through routes is now about seventy-five. Generally a car is operated over each route daily, although over some routes cars are only run tri-weekly.

Shippers are induced by various means to do the necessary concentrating or their shipments. The Association of Commerce has from time to time issued a pamphlet entitled "Way to Ship," showing all through package car routes and telling in detail how to route shipments to obtain the best possible service. In addition a thorough system of tracing is used, so that it may be known just what time every car makes. Once a week Mr. Morton sends a postal card to the railway agent at the end of each through route. This card gives the initials and numbers of all of the cars that have left Chicago during the previous week over the particular route in question, and the agent is requested to fill out blanks stating the date and the hour on which each car arrived, when it was unloaded, and the reason for any failure to make schedule. A compilation of the results shown by these cards is printed every week in "Chicago Commerce," a weekly magazine issued by the Association of Commerce. In a good many cases different roads are running cars from Chicago to the same destinations. The results of operation over these competing routes being published weekly, shipper and railway officers can compare them, and the railways are constantly stimulated by publicity and competition to give the best service and make the best time practicable.

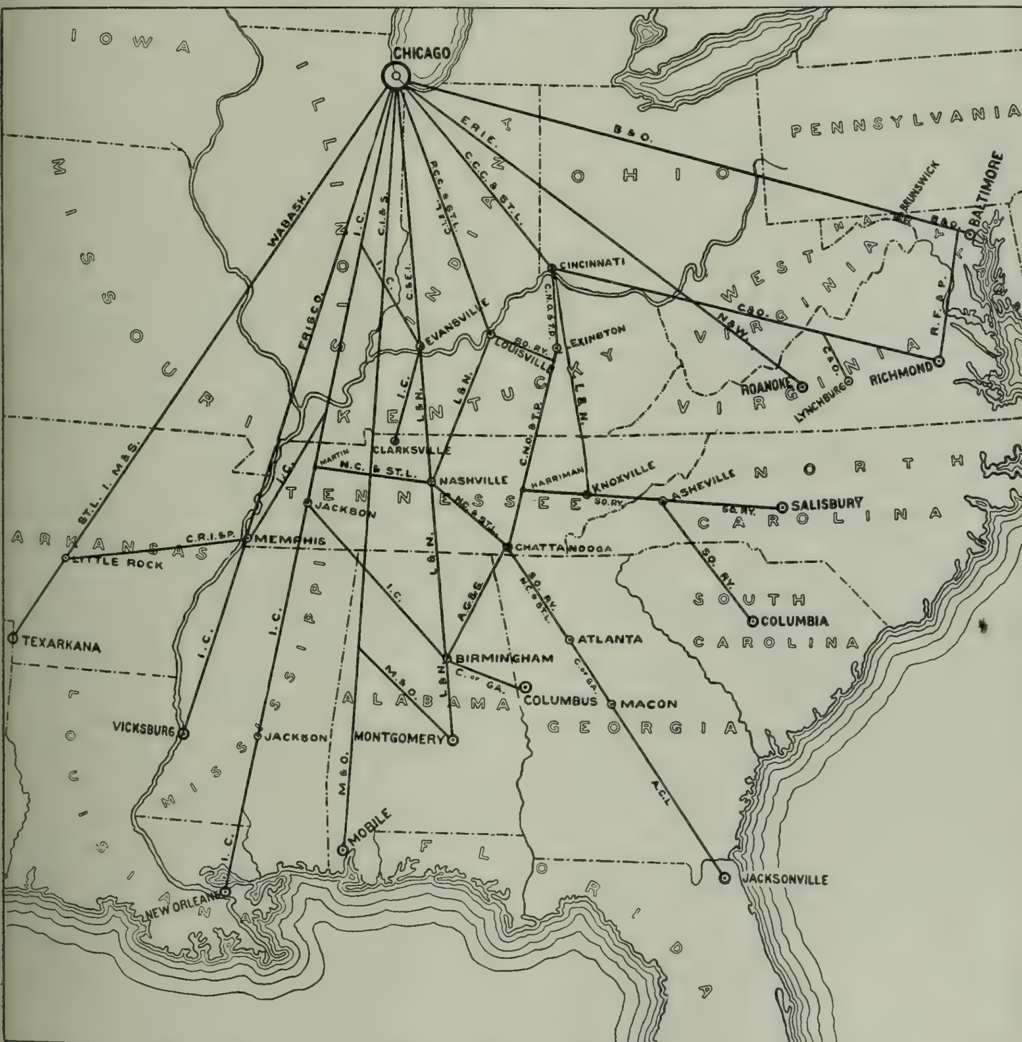
This arrangement has resulted in eliminating a very large number of the transfers from car to car formerly made. Through cars from Chicago now reach every important commercial center in the South and Southeast. In addition, the Association of Commerce has had the handling of freight beyond the destinations of the through cars carefully studied and advises shippers how best to route their shipments so as to have goods reach points beyond in the shortest time and best condition. Suppose, for example, that a jobber in Chicago has a shipment for Americus, Ga. By finding the name of this station in "Way to Ship" he learns that Americus is to be reached over route "05." This route is via the Chicago & Eastern Illinois, or the Illinois Central, care of the Central of Georgia, at Atlanta. From Atlanta the Central of Georgia runs a solid car daily to Americus, loaded with merchandise from all directions for that route. If merchandise from Chicago is loaded into one of these solid cars at Atlanta it will reach Americus in 4 days after leaving Chicago, and after being transferred but once, namely, at Atlanta. "Way to Ship" contains not only the routes of all through cars from Chicago to southern points, but also mentions all solid cars that are run from any of these distributing points to the smaller surrounding cities and towns.

Another method that has been used to save time is to so route shipments as to avoid switching. For example, a jobber wishes to send a shipment to a point in Arkansas. The Wabash and the St. Louis Southwestern use a joint station at St. Louis. Consequently, a through car from Chicago can be transferred from the tracks of the Wabash to the tracks of the St. Louis Southwestern at St. Louis with a minimum expenditure of time and money. Therefore, other things equal, the shipment should be routed via the Wabash and the Cotton Belt. Similarly, if goods are going to have to be transferred, they will, if possible, be routed to a transfer point where the road from which they are to be transferred has a joint station with the road to which they are to be transferred. Sometimes a rather roundabout route will be preferred to a more direct route because shipment via the more direct route may involve switching or transfer from one part of a city or town to another part, which may cause more expense and delay than shipment by the less direct route, but through joint terminals.

To learn what time it takes to get shipments to points that are not reached by through cars, shippers frequently send postal cards for their consignees to fill out with the date of

arrival of the shipments, these cards being returned to Mr. Morton. Thus the system of checking the movement of shipments is made practically complete.

The results of the use of this scheme have been various. It has greatly improved the transportation service secured by shippers. The keen competition between the railways which it has fostered not only has caused through routes to be established to every important distributing point in the South, but in numerous cases has caused several through routes to the same point to be established by different roads. The Illinois Central and the Nashville, Chattanooga & St. Louis are running a daily solid train from Chicago to Atlanta on a schedule of 50½ hours. Some time ago the Baltimore & Ohio was induced to put on a through car to Richmond, Va. It was doubted at that time if it would pay. The Baltimore & Ohio is now running cars three times a week and the Big Four and the Chesapeake & Ohio are also running through cars to Richmond. The movement of merchandise has been remarkably expedited. The average time consumed by shipments to the South has been reduced a week. Of course this reduction in time is a matter of great importance to the jobbers because it tends to reduce very materially the amount of capital that they have tied up in goods that are en route, and to enable them better to compete with their rivals on the Atlantic seaboard. It is estimated that the loss and damage to freight has been reduced at least 60 per cent. Whereas shippers formerly were engaged constantly in tracing their freight, there is now practically no tracing except to check up the time that is being made via the various routes. These improvements are enabling Chicago jobbers steadily to increase their sales to retail merchants in the South and Southeast.



Map Showing Routes of Through Package Cars from Chicago into Southern Territory.

The railways have been enabled to eliminate many expensive transfers, and the amount of loss and damage claims that

they have to pay has been much reduced. But, as often happens, where conditions make competition between railways especially sharp, the results on the whole have been better for the shippers than for the railways. Through cars have been put on faster than the business to be handled has grown, and the lading per car ranges from 25,000 lbs. to below 6,000 lbs. Probably the average is not more than 8,000 lbs. Of course most of the merchandise handled is high class and pays a high rate, but, nevertheless, it is apparent that for the service rendered the revenue derived is not large. The shippers are by no means entirely, or perhaps even mainly, responsible for this. In most cases the cars have been put on at the solicitation of the Association of Commerce, and sometimes perhaps against the best judgment of railway officers. In some instances when cars have been put on against the judgment of railway officers they have paid surprisingly well. Once, for example, where a railway traffic executive put on experimentally a car that he confidently predicted would never pay, he was soon handling an average of 17,000 lbs. per trip, which, of course, was highly profitable. On the other hand, the railways, for competitive reasons, have in a good many instances put on cars when the Association of Commerce objected on the ground that the additional service contemplated would not pay and argued that it would be better for the railway to establish the service over a different route where it would have less competition. In some such cases the road, by establishing the competitive service, has got a profitable business, but not infrequently at the expense of some rival whose business had been rendered less profitable or unprofitable. There is no doubt however, that the cars usually pay; and perhaps as the system becomes perfected, the railways may see the wisdom of co-operating with each other a little better and not competing quite so severely. In that event the advantages to the railways may become as certain and as great as they are to the shippers.

Following is a list of stations to which through package cars are run daily from Chicago:

Asheville, N. C.—*Fourth Morning Delivery*.—For points on and via So. Ry., Hot Springs, N. C., to but not including Salisbury, N. C., and Columbia, S. C. Route C. I. & L. (Monon), to Louisville, Ky., So. Ry. to Danville, Ky., C., N. O. & T. P. to Harriman, Tenn., So. Ry. to Asheville, N. C.

Atlanta, Ga.—*Third Morning Delivery*.—1. For Atlanta and points beyond. Via C. & E. I. to Evansville, L. & N. to Nashville, N., C. & St. L. to Atlanta.

2. For Atlanta and points beyond. Via C., C., C. & St. L. (Big 4), to Cincinnati, C., N. O. & T. P. to Chattanooga, So. Ry. to Atlanta, Ga.

3. For Atlanta and points beyond. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Danville, C., N. O. & T. P. to Chattanooga, So. Ry. to Atlanta.

4. For Atlanta and points beyond. Via I. C. to Martin, N., C. & St. L. to Atlanta.

5. For Atlanta and points beyond. Via P., C., C. & St. L. to Louisville, L. & N. to Nashville, N., C. & St. L. to Atlanta.

6. For points on and via Ga. Ry. exclusively. Via C. & E. I. to Evansville, L. & N. to Nashville, N., C. & St. L. to Atlanta.

7. For points on and via Ga. Ry. exclusively. Via I. C. to Martin, N., C. & St. L. to Atlanta.

8. For points on and via Central of Georgia exclusively. Via C. & E. I. to Evansville, N. & N. to Nashville, N., C. & St. Louis to Atlanta.

9. For points on and via Central of Georgia exclusively. Via I. C. to Martin, N., C. & St. L. to Atlanta.

10. For points on and via A., B. & A. exclusively. Via C. & E. I. to Evansville, L. & N. to Nashville, N., C. & St. L. to Atlanta.

Baltimore, Md.—For points on A. C. L., S. A. L. and Norfolk & Southern Ry.'s in the Carolinas. Via B. & O. to Baltimore, steamer from Baltimore to Norfolk, Va. Fourth morning delivery to connections at Norfolk, Va.

Birmingham, Ala.—*Third Morning Delivery*.—1. For Birmingham and points on the L. & N. south to but not including Montgomery, Ala. Via C. & E. I. to Evansville, L. & N. to Birmingham.

2. For Birmingham and points on the A. G. S. south of Birmingham, Via C., C., C. & St. L. (Big 4) to Cincinnati, C., N. O. & T. P. to Chattanooga, A. G. S. to Birmingham, Ala.

3. For Birmingham and points beyond. Via I. C. R. R.

4. For points on and via Central of Georgia exclusively. Via I. C.

Chaffee, Mo.—*Second Morning Delivery*.—For points on Frisco, south of Cape Gerardeau, Mo. Via C. & E. I. & Frisco.

Chattanooga, Tenn.—*Third Morning Delivery*.—1. For Chattanooga and points on Southern and A. G. S. Ry., south to but not including Atlanta and Birmingham. Via C., C., C. & St. L. (Big 4), to Cincinnati, C., N. O. & T. P. to Chattanooga.

2. For Chattanooga and points on Southern Ry. and A. G. S. Ry., south to but not including Atlanta and Birmingham. Via C., I. & L. (Monon) to Louisville, So. Ry. to Danville, C., N. O. & T. P. to Chattanooga.

3. For Chattanooga and points south on N. C. & St. L. Ry. Via I. C. to Martin, N., C. & St. L. to Chattanooga.

Cincinnati, Ohio.—*Second Morning Delivery*.—1. For Cincinnati and points beyond. Via C., C. & L.

2. For points on C., N. O. & T. P. exclusively. Via C., C. & L.

3. For Cincinnati and points beyond. Via C., C., C. & St. L. (Big 4).

4. For C. & O. Ry. points exclusively. Via C., C., C. & St. L. (Big 4).

5. For Cincinnati and points beyond. Via C., I. & L. (Monon).

6. For Cincinnati and points beyond. Via P., C., C. & St. L. (Pan Handle).

Clarksville, Tenn.—*Third Morning Delivery*.—For Clarksville and points on and via Tennessee Central. Via I. C. to Hopkinsville and Tennessee Central beyond.

Columbia, S. C.—*Fourth Morning Delivery*.—For Columbia and points on Southern Ry. and A. C. L. beyond Columbia. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Columbia.

East St. Louis.—*First Day Delivery*.—1. For points on the Cott. Belt, M. & O., St. L., I. M. & S. Rys. Via C. & A.

2. For points on the M. & O. exclusively. Via C. & E. I.

3. For points on the Cott. Belt and M. & O. Rys. Via Wabash Ry.

Evansville, Ind.—1. For points on the L. & N. Ry. and L., H. & St. L., exclusively. Via I. C. Ry.

2. For points on the L. & N. and L., H. & St. L. exclusively. Via C. & E. I. Ry.

3. For points on and via I. C. R. R., exclusively. Via I. C. Ry.

Jackson, Miss.—*Third Morning Delivery*.—For Jackson and points on I. C. south of Jackson and all points on G. & S. I. Via I. C.

Jackson, Tenn.—*Second Morning Delivery*.—For Jackson and points on I. C. R.R. between Jackson, Tenn., and Water Valley, Miss. Via I. C. R.R.

Jacksonville, Fla.—*Fifth Morning Delivery*.—For Jacksonville and beyond. Via I. C. to Martin, N., C. & St. L. to Atlanta, Central of Georgia to Albany, A. C. L. to Jacksonville, Fla.

Knoxville, Tenn.—*Third Morning Delivery*.—1. Knoxville and points on and via L. & N. R.R. south of Knoxville. Via Big Four to Cincinnati, L. & N. to Knoxville.

2. For Knoxville and points on and via Southern Ry. in Tennessee. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Knoxville.

3. For Knoxville and points on and via Southern Ry. in Tennessee. Via P., C., C. & St. L. to Louisville. Southern Ry. to Knoxville.

Lexington, Ky.—*Second Morning Delivery*.—For Lexington and points on C., N. O. & T. P. and L. & E. Ry., south of Lexington. Via P., C., C. & St. L. to Cincinnati, C., N. O. & T. P. to Lexington, Ky.

Little Rock, Ark.—*Third Morning Delivery*.—1. For Little Rock and beyond for points on C., R. I. & P. in Arkansas and Louisiana. Via C. & E. I. to Memphis, C., R. I. & P. to Little Rock.

2. For Little Rock and beyond for points on C., R. I. & P. in Arkansas and Louisiana. Via I. C. to Memphis, C., R. I. & P. to Little Rock.

3. For Little Rock and points on St. L., I. M. & S. beyond Little Rock. Via Wabash to East St. Louis, St. L., I. M. & S. to Little Rock.

Louisville, Ky.—*Second Morning Delivery*.—1. For Louisville and points beyond. Via C., C., C. & St. L. (Big Four).

2. For Louisville and points beyond. Via C., I. & L. (Monon).

3. For Southern Ry. points, exclusively. Via C., I. & L. (Monon).

4. For L. & N. Ry. points exclusively. Via C., I. & L. (Monon).

5. For Louisville and points beyond Via P., C., C. & St. L. (Pan Handle).

Lynchburg, Va.—*Fourth Morning Delivery*.—For Lynchburg and points beyond. Via C., C., C. & St. L. (Big Four) to Cincinnati, C. & O. to Lynchburg.

Memphis, Tenn.—1. For Memphis and points on Frisco, Memphis to Birmingham. Via C. & E. I. R. R.

Third Morning Delivery.—2. For Memphis and points on the I., C. & Y. M. R. R. south to but not including Vicksburg and Jackson, Miss. Via I. C. R. R. Second Morning Delivery.

Mobile, Ala.—*Fourth Morning Delivery*.—For Mobile and points beyond. Via C., I. & S. (No. & So. Dispatch) to Cairo, M. & O. to Mobile.

Monette, Mo.—*Second Morning Delivery*.—For points on Frisco south of Monette. Via C. & E. I. and Frisco.

Montgomery, Ala.—*Third Morning Delivery*.—1. For points on and via A. C. L. exclusively. Via C. & E. I. to Evansville, L. & N. to Montgomery.

2. For Montgomery and points on and via L. & N. south of Montgomery. Via C. & E. I. to Evansville, L. & N. to Montgomery.

3. For Montgomery and points beyond. Via C., I. & S. (No. & So. Dispatch) to Cairo, M. & O. to Montgomery.

Mounds.—*Second Morning Delivery*.—For points on and via I. C. and N. C. & St. L., Hickman, Ky., to but not including Nashville, Tenn. Via I. C. R. R.

Nashville, Tenn.—*Second Morning Delivery*.—1. For Nashville and points on L. & N. south to but not including Birmingham. Via C. & E. I. to Evansville, L. & N. to Nashville.

2. *Second Morning Delivery*.—For points on and via N., C. & St. L., exclusively. Route C. & E. I. to Evansville, L. & N. to Nashville.

3. For Nashville, and points on N., C. & St. L., Nashville to Chattanooga. Via I. C. to Martin, N., C. & St. L. to Nashville. Second Morning Delivery.

4. For Nashville and points on L. & N. south to but not including Birmingham. Via P., C. C. & St. L. to Louisville, L. & N. to Nashville. Second Morning Delivery.

New Orleans, La.—*Fourth Morning Delivery*.—1. For New Orleans. Via C., I. & S. (No. & So. Dispatch) to Cairo, M. & O. to Meridian, N. O. & N. E. to New Orleans.

2. *Third Morning Delivery*.—For New Orleans. Via I. C. R.R.

3. For points on and via Southern Pacific in Louisiana, exclusively. Route I. C. to New Orleans.

Richmond, Va.—*Fourth Morning Delivery*.—1. For Richmond and points beyond. Via B. & O. to Washington, R., F. & P. to Richmond.

2. *Fifth Morning Delivery*.—For Richmond and points beyond. Via C., C., C. & St. L. (Big Four) to Cincinnati, C. & O. to Richmond.

Roanoke, Va.—*Fourth Morning Delivery*.—For Roanoke and points beyond. Via Erie to Columbus, N. & W. to Roanoke.

Paducah, Ky.—*Second Morning Delivery*.—For points on I. C. in Kentucky, and N., C. & St. L. Paducah to Memphis. Via I. C. R.R.

Salisbury, N. C.—*Fourth Morning Delivery*.—For Salisbury and points beyond. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Salisbury.

Texarkana, Ark.—*Fourth Morning Delivery*.—For Texarkana and points beyond on T. & P. R.R. in Louisiana. Via Wabash to East St. Louis, St. L., I. M. & S. to Texarkana.

Vicksburg, Miss.—*Fourth Morning Delivery*.—For Vicksburg and points on Y. M. V. R.R. south to but not including New Orleans. Via I. C. R.R.

LOCAL FREIGHT OFFICE EFFICIENCY, FROM THE VIEWPOINT OF THE GENERAL FREIGHT OFFICE.

BY CHARLES R. FRENCH.

The local freight office in the smaller towns and cities of this country is usually an isolated, desolate, uninviting building, with not more than half enough room and light for its occupants and their work, or the paraphernalia incident and necessary to their daily task; the idea apparently being that anything is good enough for the freight agent and his help. And yet you will usually find the occupants of these offices cheerful, keen, intelligent men, alive to all the needs of the business.

Through freight, express, mail and passenger business count for a great deal, in the yearly revenue received totals, but opposite to them the expense of maintaining them foots up to an amount equal or practically so, hence they must be considered the "trimmings," necessary, but not the bread-winners.

The local freight business is the mainstay, the bread-winner, the dividend payer, of any line and the local agent, in proportion to his alertness, ability and friendliness to the shipping public, is the best revenue producer of the railroad When a local movement for new industries starts, who is more welcome at the council of citizens called to consider the project than the popular local agent? And, indeed, who can better help than he? But, be he grumpy, unfriendly, unpopular, he cannot keep in touch with this local spirit and much of benefit to the town, the railway and himself is lost. Whatever makes for the benefit of the town itself reflects on the revenues of the station and to the credit of the agent.

By the use of a little diplomacy, shrewdness and common sense, an agent may become a leader, or at least a factor, in local enterprise, on whom the business people will rely; this may be accomplished by quietly exercising his influence for additional business enterprises, pointing out the advantages to capital and to the town, the increase of labor, with its attendant increase in population, need of more buildings, larger and better stores, larger bank accounts, higher prices for real estate, etc.; by consistently helping the business men of his community to new and larger markets, obtaining and giving them bits of information for their benefit; by striving to better the service he is able to offer them, both to and from his station; and last, but by no means least, by everlasting keeping before his superior officers the possibilities, probabilities and actualities of his station. He should not ask of his superiors impossible or unnecessary things, but only for what he knows his station needs to handle the business in sight, and he should keep after these things until he gets them.

Above all things, the local agent needs to keep his head and his temper, or, if he can, cut out the latter and send it to his worst enemy.

Just why the railways have so long neglected the local station, from which their best revenue is derived, is hard to understand; but it has been next to impossible to get proper accommodations, improvements, enlargments for sidings, platforms and warehouses, capable men in sufficient quantities, or enough pay to keep them when secured; anything seemed good enough for the local office; everything being sacrificed to the insatiable goddess Speed.

But one explanation presents itself for this condition and that is that the superintendent (under whose direct charge the agent is placed) is generally promoted from the Maintenance of Way Department, where naturally the radii of curves, strength of bridges, grades, condition of track and roadbed and kindred subjects were his daily diversion—in fact, he has been educated as a civil engineer and has practiced engineering in its application to railroading for years—and as that department is kept reasonably busy attending to its own work, he has not had the time nor the opportunity to familiarize himself with the work and needs of the freight department; consequently, when matters of importance to the proper development of the local station are brought to his attention he is apt to look at them from the standpoint of efficiency as it is regarded by the department in which he was educated, thereby missing the vital necessity for the improvement and turning it down.

To illustrate: The agent at a point in the middle west reported to his superintendent that a triangular tract of land adjoining the freight station property was to be vacated by a manufacturing concern and that the property had been offered the railroad. The agent recommended its purchase for a team track yard and freight warehouse. The facilities for handling the passenger and freight business were inadequate and would soon seriously cramp the space then occupied. Expansion was impossible, except in the direction indicated. The force of the suggestion was so obvious that the mere fact of calling it to the attention of the superintendent should have been sufficient, but he rejected it quite brusquely. The town had increased in population and business about 126 per cent. in ten years and was showing a vigorous growth at the time. Some months later, the general manager happened along and, being a man who saw things, noticed the vacant property and, appreciating its value and the need of better facilities at the station, asked why the attention of the proper officials had not been called to it. He was invited to look at certain correspondence on file in the agent's office, which resulted in his ordering the property secured at once. In the meantime two other parties were after the property, and the result was that it cost the railway over twice the original amount asked. You may say it was directly in line with the superintendent's supposed duty to know the conditions and requirements of this station. While in a broad interpretation of his duty this may be true, he could not fully appreciate the actual freight conditions as could a freight department man.

Do not understand from this that any criticism of the superintendent is meant. On the contrary, he is generally an efficient, painstaking man, but from the very nature of his training cannot understand or appreciate the working and need of the local office from the viewpoint of the freight department, which is the very heart of the whole organism of railroading; the maintenance of way department may point with pride to its magnificent roadbed, bridges, block signals, etc.; the passenger department may boast of its superb accommodations for the traveling public, or its "personally conducted tours," but the steady-going, hard-working freight department, with none of the red fire, blare of trumpets or press agents, quietly, but none the less surely, foots the bills, makes up the deficits created by the other departments and pays the dividends.

And what does this department, which is the chief revenue producer, do for the men upon whom it depends for the showing it must make in the annual report? Very, very little, the writer is sorry to say. Occasionally it sends him a tariff and quite frequently circulars of various kinds, but does it ever concern itself to find out whether these tariffs and circulars are understood by the recipient? Do the heads of this department know personally any of the agents? To both the above questions the answer is "No." Do the superintendents know the agents personally? Yes, every one. And so do the officers of the various other departments, but the agent is not in touch with his general freight office and, as far as that office is concerned, he (the agent) is left pretty much to his own initiative as to how he shall conduct his station. His general freight department corresponds with him, but that does not constitute supervision. It is merely asking for some bit of information or a criticism of something or other, with little or no effort to help him correct it. The agent has no personal acquaintance with the men of the general freight office with whom he corresponds, but has formed his own opinion of them from their correspondence, as they have of him from his, and both are probably very much wrong in their deductions. The

agent has, therefore, a very far from correct appreciation of his general freight office and is very likely misunderstood through their size-up of him, consequently there is a lack of sympathy or co-operation between them.

The general or division freight agent will tell you he has not the time to devote to the proper supervision of the agent, which is true—for he is a member of numberless associations and committees, which keep him pretty busy looking after the duties imposed by them, all of which are essential—yet neither has he the time to give the proper supervision to his office, but the work is done, and done well, because he has a competent man as his chief clerk to look after that for him in his absence. The general freight office should keep in close relationship with the agent, and the only way to do so is to have a personal representative who is acquainted with both.

The operating department has several assistant trainmasters, whose sole duties are to look after the men under the direction of their department, keeping in daily touch with them and bringing them into close relationship with the department.

The motive power department has road foremen in close touch with its engineers and firemen.

The maintenance of way department has its supervisors, who go over their divisions daily, advising, instructing, listening to suggestions from their sectionmen.

The division operator is required to make frequent trips over his division to thoroughly familiarize himself with the conditions along the line and to become acquainted with the operators under him.

Does it not seem that the freight department is making a grave error in not adopting a similar plan? A man, appointed by the general freight department and reporting to the general or division freight office, for each division, whose duty it would be to keep in touch with the agents and between them and the general freight office—who would spend enough time with each agent to become thoughly acquainted with him; who would be able to answer all questions asked, or, if he could not answer them, get the information on his next visit to the general office; whose sympathies were with the agent, who could understand him—would appear to be an invaluable addition to the staff of the general freight office. He should be a man educated in the freight service, preferably an agent, one who has been through the grind and able to enter into and appreciate the feelings of the agent.

In the course of the writer's experience he has visited many local offices and has had the opportunity of noting the ideas of many agents, resulting in the evolution of a system of administration which, subject to the necessary modifications to fit it to any particular station, may be of some assistance.

In the first place, the agent should inoculate his clerks with the idea that their own brains were made to use—that suggestions they may have for the improvement of the work will be carefully considered; invite their criticisms of existing methods; get their co-operation—and before he is aware of it there will have been a marked improvement in the way the work is turned out. Changes must come gradually, to avoid confusion—perhaps several methods will have to be tried before the best one is decided on. Aim to secure the simplest method consistent with thoroughness, so that any information desired may easily and quickly be found.

Perhaps at no other place is the parsimony of railways toward the local freight station so well shown as in its attention to track and warehouse facilities. This is in part due to the rapid growth of most stations beyond their facilities, but when improvements are made existing conditions only are considered and no provision made for future expansion; result—by the time the improvements are completed the business has outgrown them and the ingenuity of the agent taxed to the utmost to provide a semblance of accommodation for his patrons.

Little can be said of any benefit of the use of tracks in the yard. At each station the conditions differ and the agent and yardmen can, by a little study, devise a plan which will relieve pressure and give a maximum of utility. The hearty co-operation of every man under his command is essential to the success of any agent, and this can be easily secured if the clerks and other employees are made to understand that the good of the agency is their good, the success of the agent is their success.

The warehouse track or tracks should, as far as possible, be used for the loading and unloading of L.C.L. shipments. If possible, a track should be set aside for all cars containing shipments in excess of 10,000 pounds, so that consignees may go direct to the car and unload, without dragging such shipments through the warehouse.

The seal record of all cars received should be carefully taken and kept in a book provided for that purpose.

In checking out the contents of merchandise cars, check should be taken from the original waybill wherever possible, and any and all discrepancies noted thereon. The practice in some localities of "blind checking" is laborious, unnecessary and conducive of error. Why waste the time to check out the freight, entering the various items into a book and then checking the book entries against the waybill? For a permanent record? Will not the waybill afford such permanent record in much better shape? And can not the time wasted in this duplicate work be much better employed elsewhere?

Auditors of some railways require waybills to be sent to them when the agent has finished with them. The writer cannot conceive of any good reason for this practice, if the auditor has received, as he should, tissue copies of them. There are so many after-complications constantly arising, which make reference to the original waybill absolutely necessary, and as the waybills are part and parcel of the permanent records of the station, that in the writer's opinion an agent would be justified in refusing to part with them under any pretext whatever.

At one station all waybills, as soon as received, were placed in the hands of the car clerk and by him held until the receipt of the car, when they were stamped with a rubber stamp reading:

Car Received..
Train No. .... Time..........................
Placed ....
Contents checked by..................................
Seals ....
Entered F. R. Book P..................................
Extensions checked by ....

and date, train number and time noted by him. Time placed for unloading, check and seals were noted by check clerk, and freight received book page and check on extensions entered by freight received clerk.

At this station the night clerk made out expense bills for all waybills received during the night, attaching same to the waybills. This was done to gain time in the morning, when consignees came to receive their freight.

The car clerk, upon receipt of a car, after noting the time, date and train number as above, turned the waybills over to the check clerk, and the express bills to the cashier. Waybills received during the day, provided the cars were also received, went first to the cashier's department to have expense bills made, and then to the check clerk.

The practice in some localities of having the check clerk hold "over" and "short" reports for several days is a bad one and liable to lead to confusion and expense. All discrepancies should be promptly reported by the check clerk to the proper clerk in charge of "over," "short" and "damage" reports, that prompt action may be taken by him.

When freight has been checked out of car the next consideration is its proper disposition in the warehouse, where it will be easily found and easy of access. The writer has seen several systems of warehouse storage, and he believes that of these the two following will be found to be the best, his preference being for the first:

At station "A" the warehouse was divided into sections of

suitable size, marked "A," "B," "C," etc., each section being plainly marked with its space letter. An alphabetical list of consignees was made up and each consignee assigned to a space, the space assigned him being marked opposite his name on the list. All freight received for any particular consignee was placed in the space assigned him and he soon became accustomed to look in that place, and did not have to run all about the warehouse, picking up a box here, there and anywhere, as at some stations. Lists were posted in the warehouse for the use of stevedores, truckmen and others interested.

At station "B" the warehouse was divided into sections, the same as at "A," but instead of the sections being lettered each had the name or names of consignees to whom the space had been assigned prominently displayed above it. The method of stowing freight was the same in both cases.

So far as possible, the warehouse should be used only for inbound freight and the platform for outbound. When shipments are delivered from the warehouse a check should be taken, whether the shipment checked out of the car without exception, or not, to forestall any claim of consignees for alleged shortage or damage and to protect the railroad company against errors of delivery. Agents should not hesitate to note on the expense bill any discrepancy in the shipment (as is provided in their books of rules), and they should also make report of such discrepancies to their general office, making such explanatory remarks as may be necessary.

A great many errors are caused by careless or improper supervision of loading and by stevedores loading a part of a shipment in the wrong car. To overcome this and lessen the chance of making errors, a number of systems have been tried with more or less success. Of these perhaps the best is the "ballot system."

Under this system the cars are numbered "1," "2," "3," etc., beginning with the car first in or the car first out. Car No. 1 is always in the same place, day after day, so that the stevedores when told to take a shipment into car No. 1 know instantly where that car is located. The destination of the cars may be changed daily by the check clerk, but he alone concerns himself with the destination, the stevedores concerning themselves only with the number. A small, square block of wood, with a screw-eye on one end, will answer the purpose of marking. The block may be painted white, with the number in black, and may be hung on the car door during the time the cars are being loaded.

The check clerk, in making up his list of cars for the day, or half day, should take the numbers of the cars in the order in which he will number them, thus:

1. C., M. & St. P...	77773	Chicago, local.
2. C., B. & Q.	11006	Chicago, through
3. C. A. & C.	10163	Columbus
4. C., N. O. & T. P.	90640	Cincinnati
5. M. C..........	4030	Toledo

making his list on a card, which he can carry with him for reference. As he checks the shipments for the various cars he should note on the shipping order each stevedore's name and his load, as:

Dan. 2 boxes.
Jack. 1 bbl.

In each car is placed a small box—a cigar box will answer nicely—containing check or ballots of cardboard or other suitable material, bearing the number of the car as denoted by the block. In car No. 1 the box will contain ballots numbered "1," car No. 2 ballots numbered "2," etc. When the stevedore deposits his truckload into the car, as directed by the check clerk, he takes a ballot from the box, which he hands to the check clerk upon his return. If the ballot corresponds with the number of the car to which he was directed his load is checked off and he is given another load. If the ballot is not correct the check clerk immediately goes with the stevedore to the car into which he deposited the load and has it properly loaded, marking up an error against the stevedore. This method will not cause undue delay in loading, and if the records of each stevedore are posted once a month it will engender a close rivalry among them to keep their records clear.

Should the ballot system be found unsuited to a station, a more simple, but less effective, method is that of placing signboards on the car doors, these boards showing the points for which freight is being loaded into the cars bearing them.

(To be continued.)

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XVI.

If any electrification scheme be proceeded with, the railway department will have available a supply of electrical energy at a low price, and I certainly consider that it would pay to equip the Newport workshops and the North Melbourne workshops for electrical driving. I have prepared a complete scheme for this, which is submitted with this report.

The following is a summary of my recommendations:

1. That three-phase induction motors be used throughout.

2. That a voltage of 400 to 440 volts be adopted for power distribution purposes throughout the works.

3. That the energy be obtained from the Yarraville power station and transmitted to Newport by an overhead line at the generated pressure, to be transformed at Newport down to 440 volts, by means of two 750 kw. stationary transformers.

4. That if it be decided to proceed eventually with the electrification of the Williamstown branch, these transformers be situated in a sub-station close to the railway which will ultimately be used also for the purposes of the railway.

5. That the sizes of motors adopted throughout the workshops be standardized as to both horse power and speed.

6. That the North Melbourne workshops be converted to electrical driving on the same system, the energy in this case being obtained from stationary transformers installed in North Melbourne sub-station.

The whole installation involves some 980 b.h.p. in motors and the estimated capital cost is £9,550.

The cables and sub-station plant necessary for delivering this energy to the points required do not really form part of the railway scheme, and the accompanying table therefore gives separately my estimate of the cost of providing a supply in bulk to the Spencer Street lighting station, the St. Kilda Tramway, for general lighting purposes and for the Newport and North Melbourne workshops. It does not deal

Capital Cost of Cables and Sub-station Equipment for Power and Lighting Scheme.

	Sub-station equipment.	High-tension mains.	Est. cost including connections
Spencer St. Lighting Station.	2 500-kw. frequency converters in existing building.	12,000-volt cable connection at Spencer St. 2,000-volt cable to Richmond and No. Melbourne.	£10,254
St. Kilda Tramway Power Station.	*2 200-kw. rotary converters, one in Brighton Beach, and one in Balaclava sub-stations.	†None.	2,795
General Station Ltg. Scheme.	Supplied from conductor rail.	None	....
Newport Workshops.	2 750-kw. stationary transformers.	Overhead line from Yarraville.	5,661
No. Melbourne Workshops.	1 100-kw. stationary transformer in North Melbourne sub-station.	None	654
Total			£19,364

*These sets will each be capable of dealing with overloads up to 400-kw.

†An expenditure of approximately £7,273 for mains would be incurred if this work were put in hand before Stage I.

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

with the cost of the actual equipment of the Newport shops themselves or the wiring of the passenger stations, these matters being separately dealt with.

The next table shows the total consumption of electrical energy and the estimated maximum demand for power and lighting. In preparing this table, I assume that at Stage I practically all the work will be complete with the exception of that portion of the station lighting included only in Stages II and III, and that thereafter it will gradually increase, due to the extended use of electricity for power and lighting purposes by the railways.

In designing the power station at Yarraville, allowance has been made for this load, and in the estimates of power costs (*Railroad Age Gazette, January* 8.) I have allowed for the cost of generating this additional energy. It is desirable, however, in order that careful costs and records may be kept, that the amount of electrical energy so used be recorded separately, and I have allowed for meters being erected on the low tension side at the different points where current is required. As already mentioned, I suggest that the electric energy should be charged out at the supply meters at an average rate of ¾d. per unit (kilowatt-hour).* The table also shows the amount chargeable to power and lighting at the different stages on this assumption. In a later table, therefore, which will give my estimates of the cost of power debitable to traction, I assume that this will be done, and have deducted from the total generating costs given in the table of estimates of power costs, referred to above, the cost of the electrical energy used for power and lighting at ¾d. per unit.

Total Energy Consumption for Power and Lighting Scheme.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Output at power station*	3,922,400	5,070,450	6,440,110	7,793,490
Consumption at meters.*	3,137,920	3,929,600	4,830,080	5,845,120
Cost to power & lighting scheme.†	£9,806	£12,280	£15,094	£18,266
Maximum demand in kw.‡	1,449	1,636	2,081	2,585
Maximum demand in e. h. p.	1,943	2,193	2,790	3,466

*In units, per annum.
†At ¾*d*. per unit.
‡Allowing for diversity.

If we wish to make a fair comparison between electric traction and the alternative of continuing to operate the suburban system with steam traction, we must also include an estimate of the additional capital expenditure and operating expenses which would be necessary to enable steam traction to cope with the increased traffic in 1912. There will obviously be some addition to the present figures as regards both capital expenditure and operating expenses, as these are the figures for the present traffic and would not cover the increased traffic which we may look for in 1912. (See chart, *Railroad Age Gazette*, Nov. 20, 1908.)

This raises the question as to what traffic we are to base these steam figures on, for, of course, as one of the advantages claimed for electric traction is an increase of traffic, it would not be fair to debit steam traction with the cost of carrying the same traffic as we have assumed for electric traction unless we credit it with the same revenue. I therefore base the costs of steam traction on a traffic only 20 per cent. greater than the 1906 figures, as against 25 per cent., the increase assumed with electric traction. The service to be given is assumed to be the present service, strengthened where necessary to deal with the greater traffic, and no allowance has been made for any large increase in the number of trains throughout the day, as in the case of the electric service. The figures which I give are those prepared after our discussion in Melbourne on this subject with the general passenger and freight agent; these figures have already received approval.

*It would be a matter for departmental arrangement as to whether each section of the scheme should be charged this average price, or whether a graduated scale of charging should be adopted, based on the load factors of the various supplies given.

An accompanying table gives the capital expenditure necessary with steam traction to provide the additional rolling stock required to deal with a 20 per cent. increase of traffic.

Capital Expenditure on Rolling Stock Necessary with Steam Traction to Deal with a 20 Per cent. Increase of Suburban Traffic (Whole System.)

Lengthening and strengthening 344 45-ft. coaches and providing new axles and bogies	£127,423
Lengthening and strengthening 75 59-ft. coaches and providing new axles and bogies	19,500
Necessary alterations to provide desired proportion of first and second-class accommodation	5,709
Credit made to country service for 114 coaches taken into suburban working	67,830
10 BDbd coaches in course of construction, 1906	13,170
68 new second-class coaches	102,000
49 new first class coaches	78,400
12 new locomotives, E class	25,200
Total	£439,232
10 per cent. for contingencies	43,923
Total	£483,155
Credits for the release of fixed wheel base passenger stock, short bogie trucks and out-of-date wheels and axles	74,797
Total net cost	£408,358

Another table gives the total capital expenditure required to deal with this increased traffic under steam working, proportioned, on a train mile basis, to the different electrification stages which we have adopted throughout this report.

*Total Capital Expenditure at Each Stage Necessary with Steam Traction to Deal with a 20 Per Cent. Increase of Suburban Traffic.**

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Capital expenditure rolling stock†	£37,315	£141,019	£264,008	£408,358
Cost of bridge alterations.‡	4,415	8,926	10,688	17,232
Total	£41,730	£149,945	£274,696	£425,590

*This table includes nothing for any increase in the terminal capacity or number of roads which may be necessary to deal with the increased traffic by steam, but which will not be necessary with electric traction for some considerable time.
†Necessary with steam traction to deal with a 20 per cent. increase of suburban traffic allocated on a train-mile basis.
‡Necessary with steam traction.

A table gives in detail the corresponding increase in the operating expenses, also divided into stages. The operating expenses referred to in this and the following tables are those which would be varied by the introduction of electric traction. The items dealt with are, generally speaking, analogous to "locomotive and rolling stock expenses." I include, however, in the case of electric traction, the maintenance of the conductor rail which would be dealt with by the permanent way staff and which is, of course, an additional expense compared with steam traction. I also include, in the case of both electric and steam traction, the total amount of the guards' wages, because, on account of the increased service proposed with electric traction, this item is greater than it would be with steam. In the case of electric traction some addition may have to be made to the station staff to deal with the more frequent service and this has been allowed for.

Operating Expenses with Steam Traction to Deal with a 20 Per Cent. Increase of Suburban Traffic.

Operating expenses in 1906—	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Transportation	£1,429	£5,739	£10,596	£15,911
Rolling stock (excluding coal)	13,229	49,280	92,323	143,277
Rolling stock (coal only)*	3,581	13,358	25,140	38,829
Train lighting	1,034	3,264	5,409	7,854
Total	£19,273	£71,641	£133,468	£205,871
Addtl exp. of increase traffic	3,827	14,236	26,629	41,096
Total operating expenses†	£23,100	£85,877	£160,097	£246,967

*These figures allow for the estimated increase in the price of coal from 10*s*. 2*d*. per ton in 1906, to 14*s*. per ton in 1912.
†These figures only include the operating expenses referred to in the text.

(*To be continued.*)

General News Section.

The territorial legislature of Arizona is considering a bill to establish a railway commission of three members, and it is said that it is pretty sure to pass. It is proposed to have one of the members a lawyer and one of them familiar with the art of railroading. The salaries of all three are to be $2,500 a year each.

In the year 1908 the police department of the Baltimore & Ohio recorded more than 9,000 arrests, all made by the railway officers. These arrests resulted in conviction in about 80 per cent. of the cases. Thirty-nine sentences were for penitentiary offences, 3,700 for imprisonment in jails and workhouses, and 143 to reform schools and asylums; and in 2,400 cases fines were imposed.

The Cunard steamship "Mauretania" passed Daunt's Rock at 9.47 a.m., March 2, establishing a new record for the eastbound passage from New York of 4 days, 20 hours, and 2 minutes. Her average speed for the run was 25.28 nautical miles per hour. The "Mauretania" sailed from New York Feb. 25 and passed the Ambrose Channel Lightship at 8.45 a.m. The distance for the long eastbound course is 2,934 miles.

The Louisiana Railroad Commission announces that an order will be issued directing the New Orleans & Northeastern to install an approved block signal system from Slidell to New Orleans, 28 miles. The trains of the New Orleans Great Northern run over this part of the N. O. & N. E. to reach New Orleans, and it was here that a Great Northern train ran into one of the N. O. & N. E. last November, killing eight passengers. The commission gives the road 12 months within which to carry out the order—a task which no doubt could be accomplished in one month or less.

According to a press despatch from Washington, the Secretary of Commerce and Labor has held a conference with labor leaders concerning their recommendation that a bill be submitted to Congress providing for the inspection of locomotive boilers by the government; and the Secretary is quoted as saying that the work now being done by the government in the inspection of the boilers of steamboats should be extended to include locomotive boilers, with a view to preventing the appalling loss of life by railway accidents. The report says that the conference resulted in a decision to draft a bill, but this action was undoubtedly taken too late to have any influence on the 60th Congress.

In the Lower House of the Canadian Parliament, in a recent discussion on the Intercolonial Railway, a statement was read showing the number of permanent and temporary employees for each month of 1908, from which it appeared that the number of the permanent employees remained fairly constant during the year, standing at about 7,500, while the number of temporary employes fluctuated greatly, and the fluctuation was made the basis of charges of political manipulation and bribery. From January to April inclusive it was 700 to 800; and from that time on the figures were:

May	1,685	September	1,962
June	2,156	October	2,922
July	1,953	November	1,881
August	1,793		

Thus the number jumped by a thousand in the election month and dropped by over a thousand in the following month. The pay-roll was $499,000 in September, $538,000 in October, and $480,000 in November.

Daniel Willard, Second Vice-President of the Burlington, has issued a pamphlet urging employees of this road to oppose proposed legislation in the various states that would reduce the road's earnings or impose new burdens on it. In 1907 the Burlington appropriated $16,000,000 for betterments, extensions and new equipment. In 1908 the appropriation for these purposes was only $8,000,000, and in 1909 it is only $1,000,000. Mr. Willard makes it clear that these reductions in expenditures are due largely to anti-railway agitation and legislation. The road is being well maintained and operated but owing to the reduction in expenditures for additions and betterments, the number of employees was reduced from 53,000 in October, 1907, to 35,000 four months later, and the number is still much smaller than formerly. Mr. Willard says that he does not mean to assert that laws already made must be unmade or that wages must be reduced, but "we must be given time to work out the new problems that have been forced upon us; to see what it is going to cost to meet new requirements, and how much our revenues are going to be reduced. Perhaps by new methods growing out of the exigencies of the case we may still be able to earn a surplus sufficient to justify the resumption of extraordinary expenditures. If not, then either rates must be advanced or wages be reduced, or improvements must wait, or be carried on with borrowed money, and railways will be slow to increase their interest-bearing debt under such circumstances."

Sympathy and Discipline.

While the officials of the road and the members of the Grievance Committee will not disclose the result, it is learned that the poll of the conductors on the Atlantic system of the Southern Pacific, just concluded, favors a strike if Conductor Stockwell is not reinstated. Vice-President Fay has issued a circular setting forth that Stockwell was discharged for saying "To hell with bulletins"; and that he will not be reinstated.—*New Orleans Picayune.*

Undue Discrimination—Referred to I. C. C.

Eight San Francisco belles, the guests of the *Sunset Magazine*, published by the Southern Pacific Railroad, will arrive in New Orleans Sunday on their way to Washington and New York. The young ladies are the winners in a subscription contest given by the magazine, and all their expenses are being paid by the publication. They will go to Washington over the Louisville & Nashville. On the return trip they will visit Niagara Falls, Chicago and other points of interest.—*Picayune.*

New Railway Laws in Oregon.

The Oregon legislature at the session which has just closed passed several laws for the regulation of railways. The salient provisions of the new laws, of which there are seven, are as follows:

(1.) Railways are forbidden to make any contract or agreement, except by leave of the commission, to change their common law liability in the transportation of live stock. The commission shall prescribe a just and reasonable uniform live stock contract, which shall, within 30 days, be used by all railways. Penalty for violation $100. This act is the result of the refusal by the railways to eliminate certain provisions in their live stock contracts which were objected to.

(2.) The original Railroad Commission act was amended to meet the views of the Supreme Court of the United States, as expressed in the Minnesota rate case. The law as amended provides that when an injunction is issued to suspend an order of the commission respecting rates or transportation, the court shall require a bond from the roads applying for the injunction to answer for all damages caused by the delay in the enforcement of the order of the commission, and to compensate for sums paid in excess of the rates fixed by the commission. No appeal to the state supreme court shall stay the operation of any order of the commission unless the circuit or supreme court shall so direct, and unless the railway appealing shall give a bond.

(3.) The members of the commission and its employees may ride on any engine, car or train on payment of fare, but no railway shall therefore be deemed to become a common carrier of passengers except on passenger trains.

(4.) Railways are required, on application of any lateral or branch line, or of any shipper, to construct and operate on reasonable terms a track connection if it can be reasonably

done, and shall furnish cars for traffic offered in carloads; and live stock, perishable property and explosives shall have precedence over other traffic. If a railway refuses to provide a connection the commission is authorized to make a reasonable order. The cost of ties and grading shall be borne by the applicant.

(5.) The law requiring the railways to furnish the commission with lists of free passes is amended so as to provide that the commission, in its discretion, may exempt any carrier from furnishing a statement of trip passes issued to persons regularly and exclusively in its employ; but the carrier must keep a record of all such passes which shall be open to the inspection of the commission for two years.

(6.) Railways are prohibited from giving undue or unreasonable preference to any particular locality, but necessary preference may be given to live stock and perishable freight.

(7.) The act of October 24, 1874, and acts amendatory thereto, granting to the Willamette Valley & Coast, all the tide and marsh lands in Benton county, has been repealed. It does not appear that these lands have ever been surveyed by the state or the railway, and the company has never asserted title to or paid taxes upon them; and by the decision of the Supreme Court of the United States in Illinois Central v. Illinois, 146 U. S. 452, the title to tide lands belongs to the state, in trust for the people. The lands in question are now claimed by the Corvallis & Eastern, a Harriman line, which bought the property of the Willamette Valley & Coast.

The foregoing measures were framed or endorsed by the Railroad Commission. Through the efforts of the commission several measures were killed, including a 3-cent maximum fare bill, a 2½-cent maximum fare bill, a bill to penalize slow movement of or delays to live stock in transit, and a measure to require all rail transportation companies to provide all coaches with toilets and drinking water, and to punish the President, Vice-President and Directors for each violation by fine or imprisonment.

Electrical Engineering Fellowships at University of California.

The Recorder of the University of California announces the establishment, under the gift of Clarence W. Mackay and his mother, of two fellowships in electrical engineering, of an annual value of $600 each, open to all properly qualified university graduates. The object of these fellowships is to provide for post-graduate research work. Recipients will reside at the University of California.

Nickel-Chrome Rails.

The Bethlehem Steel Co., South Bethlehem, Pa., has, during the past year, sold several thousand tons of nickel-chrome rails. Most of the sales have been to steam railways for use on curves or at other points where rail wear is heaviest. The toughness of nickel steel rails has been recognized for some time, but they have not been hard enough to be of particular advantage. The addition of chrome gives the desired hardness. The Bethlehem company recommends three-quarters of 1 per cent. chrome and 1½ per cent. nickel. The price is about $51 a ton. As these rails have been in track for only a comparatively short time, it is not possible yet to give any reliable figures as to their service.

Division of the Santa Fe Into Two Operating Districts.

As announced in the *Railroad Age Gazette* last week, the Atchison, Topeka & Santa Fe proper, which includes the entire Atchison system except the Coast Lines and the Gulf lines, is to be divided into two operating districts. J. E. Hurley, now General Manager of all divisions, is to be General Manager of the "eastern lines," including the Illinois, Missouri, Kansas City, Eastern, Middle, Oklahoma and Southern Kansas divisions, with their branches, with headquarters at Topeka, Kan., and C. W. Kouns, now Assistant to the Second Vice-President, is to become General Manager of the "western lines," which will include the Western, Arkansas River, Colorado, New Mexico, Rio Grande and Pan Handle divisions, with their branches, with headquarters at Amarillo.

This division of territory has been necessitated by the growth both of traffic and of mileage. In 1900 the portion of the Atchison system now to be divided comprised 4,935 miles. Since then 1,185 miles have been added, making the total present mileage 6,120 miles. Besides, it has been found necessary to double-track between Chicago and Newton, Kan., 451 miles of second track having been already built, and the remainder is to be built as rapidly as practicable. On the lines to be divided the volume of business in the year ended June 30, 1900, was 6,941,011,408 ton miles; while in the year ended June 30, 1908, it was 11,333,122,916 ton miles, or an increase of 63 per cent. in gross weight handled. The train mileage in the fiscal year 1900 was 11,029,503 miles, while in the fiscal year 1908 it was 13,206,716 miles, being an increase of 20 per cent.

Grand Trunk Shops at Stratford, Ont.

The Grand Trunk shops at Stratford, Ont., were formally opened on February 18. The occasion was celebrated with a banquet given by the city to General Manager Hays and a number of other officers. This plant, which covers an area of about 21 acres, is said to be the best equipped shop in Canada. The buildings are of concrete and steel construction throughout and heated by hot air. The tools are operated by electric drive. There are five electric cranes, the largest being 120-ton capacity and the smallest 10 tons. The power plant, which has a concrete chimney 186 ft. high, is equipped with vertical water tube boilers with chain grates. The engine room contains one compressor, with a capacity of 2,150 cu. ft. of free air per minute and also two 400-k.w. and one 300-k.w. generators. There are about 1,000 men employed in this shop.

Concrete Water Tank in Mexico.

At Empalme, Mexico, where the Cananea, Yaqui River & Pacific makes connection with the old Sonora branch of the Southern Pacific, a water tank built entirely of concrete has just been erected by Carl Leonardt, a contractor of Los Angeles, Cal. It rests upon a concrete foundation and is 110 ft. high. Its inside diameter is 30 ft. and its capacity is 400,000 gallons. The erection of this tank was largely in the nature of an experiment, and since it was built it has been decided to erect tanks of this kind at other points on the road. Some of these other tanks will, it is said, be much larger than the one at Empalme.

New Bridges on the C. Y. R. & P.

Announcement has been made that the temporary bridges over several rivers crossed by the Cananea, Yaqui River & Pacific will be replaced by concrete structures. The largest of these, the one over the Yaqui river, will be 1,216 ft. long and will consist of 16 spans. The culverts on the new line are to be of concrete also. The Mountain division, between Tepic and Orendain, will necessitate a large amount of concrete construction, as many ravines and barrancas will be crossed.

Grand Crossing Track Elevation.

Grand Crossing, Chicago, seems at last to be in the way of being abolished. The question of elevating a part of the roads, which has been pending for about two years, because of the inability of the roads concerned to come to an agreement regarding plans and a division of the cost, will probably be settled shortly by arbitration. The roads involved, the Illinois Central, the Lake Shore, the Pennsylvania, and the New York, Chicago & St. Louis, have agreed to submit the questions in controversy to a board of five executive officers of disinterested railways, each of the four roads to select one, and these four to select the fifth. We understand that these selections have already been made, although the names have not yet been made public.

It will be recalled that at the point where this separation of grades is to be made the Pennsylvania and the Lake Shore cross the Illinois Central and the Nickel Plate almost at right angles. The cost to raise all these tracks to ordinance grade, within the territory affected by this particular ordi-

nance, was estimated at $4,000,000, there being six tracks for the Illinois Central, four each for the Lake Shore and Pennsylvania, and two for the Nickel Plate. But it was desirable, as well as necessary, that the grades of the intersecting railways also be separated, the north and south lines from the east and west. The plan which will be submitted to the arbitration board provides for raising all the tracks, but for running the Pennsylvania and Lake Shore above the Illinois Central and the Nickel Plate. The added cost will be about $1,500,000 as compared with leaving all tne tracks just high enough to clear the street traffic. It is regarding this plan, and an equitable division of the extra cost, that the arbitrators will be asked to decide.

Wireless Telegraph on the Lake Shore.

On Saturday last the Marconi wireless telegraph was tried between a moving train of the Lake Shore & Michigan Southern and the Marconi office at Cleveland. A sending apparatus was installed on westbound passenger train No. 35, second section, and messages were sent from a point 80 miles east of Cleveland, and also from Sandusky, 60 miles west of Cleveland; and while the train was moving between these places. Messages were sent while the train was running at the highest speed. There was no sending apparatus at Cleveland.

Standardization on the Rock Island-Frisco System.

The appointment of A. S. Greig, Assistant to the Chairman of the Executive Committee of the Rock Island-Frisco system, and Edward S. Moore, Second Assistant to the President of the Rock Island, as a Committee on Standardization, is a step toward the adoption of more uniform methods, materials and appliances on this system. Much equipment and many structures have been standardized already. But it is felt by the management that much greater uniformity, extending even to details, should be secured to promote both economy and efficiency. Committees containing representatives of the different roads in the system have been appointed heretofore to investigate and report on the desirability of uniformity in various matters, but the committees have lacked authority to enforce their recommendations, and in many cases their work has not been fruitful.

Chicago Harbor Commission Report.

The Harbor Commission appointed by Mayor F. A. Busse, of Chicago, to investigate and report on the harbor needs of Chicago has made its report. The Commission is composed of Charles H. Conover, Frederic A. Delano, J. M. Ewen, Alderman Charles L. Foell, Alderman Peter L. Hoffman, Isham Randolph, Charles H. Wacker and Alderman John P. Stewart. It favors the creation of a harbor which shall extend along the lake front from Waukegan, Ill., to Gary, Ind., and shall include the Chicago and the Calumet rivers. The commission makes numerous detail recommendations. These include the survey of the dock lines on the Chicago river and its branches, the lake front and the Calumet river, and the determination of all rights of ownership; the widening of the Chicago river above its branches to 250 ft.; the replacing of the center pier and narrow span bridges on the main river, and the South branch with bridges having a clear span of 200 ft. with straight bottom chords instead of arched chords; the illumination of the Chicago river by electricity; the straightening of the entire river at different points and the widening of both its branches; the widening of the Calumet river to a minimum of 300 ft. to where it forks; a technical engineering study as a basis for the progressive improvement of the North branch of the Chicago river; the reservation of the lake front between Chicago avenue and the mouth of the Chicago river for future harbor development, and the construction here of piers for the accommodation of passenger, package freight and fruit shipments; the reservation of the lake front from the mouth of the Chicago river to Randolph street for future harbor development; the securing of title to the right-of-way of the Illinois & Michigan canal for the benefit of the city of Chicago; the replacing of the present bridges in the Calumet river so that hereafter all bridges shall have two openings of 100 ft. or a single opening of 200 ft.; the reserving of the frontage of the Calumet river for the construction of public docks; the creation of an inland harbor on Lake Calumet; the creation of a harbor department in charge of a commission; the appointment of a competent engineer to have charge of surveys and prepare detailed plans, specifications and estimates of cost of the suggested improvements and of an advisory board of seven persons to co-operate with this engineer; the obtaining of a grant from the legislature of power for the city to construct and operate or lease wharves, docks, levees, etc.

New Power Plant in New Brunswick.

The contract for the construction work involved in the hydro electric development of the Grand Falls Power Co. on the St. John river at Grand Falls, New Brunswick, has been placed in the hands of Frank B. Gilbreth, New York. John B. McRae, Ottawa, Ont., is Chief Engineer and Ralph Mershon, New York, is Electrical Engineer. This plant will generate 100,000 h.p. in electric current, which will be furnished to various cities throughout New Brunswick and Maine. Grand Falls is on the Canadian Pacific, about 200 miles north of St. John, and about two miles east of the Maine state line.

The work involves, among other features, the construction of a number of shafts in rock excavation 130 ft. deep, a power chamber 30 ft. by 260 ft. and 130 ft. deep, a tail race tunnel 28 ft. in diameter and 2,400 ft. long and a power-house 350 ft. long and 260 ft. wide. The intake shafts will be nine in number, and 12 ft. in diameter, 130 ft. deep. The plant will be equipped for high potential and long distance transmission. Actual construction will be begun immediately and will be pushed through to completion at an early date. The falls and water power on the St. John river at this point are the largest in eastern Canada and this development will result in the establishment of a large number of manufacturing enterprises. The total head developed will be 135 ft. Numerous auxiliary works, substations and long-distance transmission lines will be erected. The total cost will be over $5,000,000.

American Society of Civil Engineers.

At a meeting held on March 3, two papers were presented for discussion, as follows: The Action of Frost on Cement and Cement Mortar, Together with Other Experiments on These Materials, by Ernest R. Matthews and James Watson, and The Bonding of New to Old Concrete, by E. P. Goodrich, M. Am. Soc. C. E. These papers were printed in Proceedings for January, 1909.

Engineering Society of Wisconsin.

The Engineering Society of Wisconsin was organized at the University of Wisconsin Feb. 26, some 150 city engineers, general managers of power and traction companies, contracting engineers, superintendents of water and light plants, mechanical and civil engineers and superintendents of highway construction becoming charter members. The officers elected were: President, Dean F. E. Turneaure, University of Wisconsin, College of Engineering; Vice-President, City Engineer M. Dodge, of Appleton; Trustees for two years, B. F. Lyons, Beloit Gas & Electric Co., and E. P. Worden, Prescott Steam Pump Co., Milwaukee, and Trustees for one year, E. Gonzenbach, of the Sheboygan Electric Light & Power Co., and City Engineer E. R. Banks, of Superior. These, as executive board, will elect the secretary later. At the opening session, Feb. 24, the highway work of the state geological survey, the use of tar, oils and emulsions on macadam and earth roads and pavements were discussed. Conservation of forests and water resources of Wisconsin was discussed by State Forester Griffith. Senator T. W. Brazeau, Senator E. E. Brown, Assemblyman J. R. Jones and Prof. D. W. Mead. Prof. W. D. Pence, engineer for the Wisconsin Railroad Commission, described the organization of the commission's engineering staff. The new problem of standards of gas and electric service was discussed. The electric interurban roads of Wisconsin were discussed by F. G. Simmons. The second night was given to a discussion of water powers by W. G. Kirchoffer and Prof. D. W. Mead.

Papers were read on the waterproofing of concrete by F. M. McCullogh; municipal engineering in the Orient and in Porto Rico, by J. T. Hurd and Edwin Wray; gas producers and small power stations, by V. E. McMullen and C. T. Atkinson, and the Madison concrete storm sewer system, by John F. Icke.

Railway Signal Association.

The March meeting of this association will be held at the Auditorium Hotel, Chicago, on Monday, the 15th, beginning at 10 a.m. In the forenoon E. E. F. Creighton, of the General Electric Co., will speak on lightning phenomena. In the afternoon, beginning at 2 o'clock, there will be a debate on the question:

"Resolved, That the scheme of signaling presented at the Washington meeting is the best scheme of signaling devised to date."

Two speakers will appear for the affirmative, and two for the negative, for a period of 20 minutes each, after which the discussion will become general. After the close of the general discussion, each side will be allowed 10 minutes in which to close the debate, after which a vote of all those present will be taken to reach a decision.

In the notice for this meeting the Executive Committee announces the adoption of all of the seven reports which were considered at the Washington meeting last October and were referred to letter ballot. The ballots were counted on February 2 and the votes by which the different propositions were adopted are given below, together with the numbers of the pages on which the subject is to be found in the Proceedings of last year (Volume XI., No. 4).

RESULTS OF LETTER BALLOT.

Pages.		For.	Agst.	Tot'l
251-276	Specifications for mechanical interlocking plants	508	34	542
200-232	Specifications for electric interlocking plants	514	29	543
420-435	Specifications for automatic block signal work	528	31	559
307-308	Automatic stops and cab signals. Requisites of installation	464	103	567
282-298	Rules for care of storage batteries	548	27	575
390-405	Specifications for rubber-covered wire	387	169	556

Standard Methods and Designs. Pages 345-386.

	For	Agst.	Tot'l
Specifications for:			
One-inch pipe and coupling	541	29	570
Gray iron castings	567	3	570
Malleable iron castings	569	1	570
Machinery steel	569	1	570
Wrought iron bars	569	1	570
Signal roundels, lenses and glass slides	567	3	570
Designs:			
1001, wire adjusting screw	567	2	569
1002, pipe adjusting screw	536	32	568
1003, obtuse angle compensator crank	567	2	569
1004, acute angle compensator crank	567	2	569
1005, three arm crank	568	1	569
1006, straight arm crank	568	1	569
1007, right angle crank	568	1	569
1008, one way crank stand	485	84	569
1009, two way crank stand	468	101	569
1010, one and two way crank pins	557	12	569
1011, one way crank stand complete	484	84	568
1012, two way crank stand complete	468	101	569
1013, one way compensator base	566	1	567
1014, pipe compensator	536	32	568
1015, one-inch pipe and coupling	518	51	569
1016, straight solid jaw (tang end)	522	48	570
1017, offset solid jaw (tang end)	521	48	569
1018, wide jaw (tang end)	538	31	569
1019, slotted jaw (tang end)	536	32	568
1020, screw jaw	569	1	570
1021, screw jaw (tang end)	539	30	569
1022, solid jaw (butt end)	568	1	569
1023, lug (tang end) for one-inch pipe	520	49	569
1024, straight adjustable link	565	1	566
1025, solid link	568	1	569
1026, standard ladder for pipe signal post	484	84	568
1027, top of ladders	483	85	568
1028, sides for ladder stays	501	67	568
1029, front and back clamps for ladder stays	512	56	568
1030, standard pipe signal post	548	19	567
1031, standard pipe signal post	548	19	567
1032, standard pipe signal post	548	19	567
1033, jaw pins	537	32	569
1034, base for six-inch signal post	508	60	568

Engineers' Society of Western Pennsylvania.

At a meeting of the Structural Section on March 2, a paper on Observations on Structural Shop Management was presented by Samuel E. Duff. The subject was taken up under the following subdivisions: Complete Information in Shop; Arrangement of Drawing Room; Ordering Material; Regarding Material Ordered; Receiving and Inspecting Material; Handling and Storing Material; Placing Material in Shop; Wood Templates v. Steel Templates; Laying Out; Punching, Automatic Spacing, Shearing; Fitting Up, Riveting, Finishing; Shipping.

Civil Engineers' Society of St. Paul.

The officers for 1909 are as follows: President, H. J. Bernier, Assistant Chief Engineer of the Minneapolis, St. Paul & Sault Ste. Marie; Vice-President, J. D. Du Shane, Assistant United States Engineer; Secretary, D. F. Jurgensen, 116 Winter street, St. Paul, Minn. The regular meetings of the society are held in the club room in the City Hall on the second Monday of each month, except June, July and August.

Central Railway Club.

At the meeting on March 12, John McE. Ames, M. E., American Car & Foundry Co., New York, will present a paper on The Use of Steel in Passenger Car Construction. The standing Committee on Rules of Interchange will present its annual report, which will include consideration of the abuse of the M. C. B. repair card.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The trunk lines have postponed until April 30 the date when agents will refuse to sign bills of lading made out on the old forms.

The Mallory and Morgan steamship lines have made a reduction of five cents per 100 lbs. on cotton from Galveston to New York, a result of the competition introduced by the Texas City Steamship Co. The rate is now ten cents. It is not yet certain that the cut will have much effect on the volume of shipments.

The Pacific Mail Steamship Company has announced a reduction of about 25 per cent. in eastbound freight rates between San Francisco and New York. It is reported that a plan of San Francisco parties to establish a line of steamships from San Francisco to La Boca, Panama, connecting with the Panama Railroad, caused the reduction.

The Southern Railway has announced that its new standard bill of lading will be put in use April 1. The form has been modified somewhat from that prescribed by the Interstate Com merce Commission. The freight traffic manager has issued a circular intimating to shippers that forms printed on cheap paper in very small type are objectionable.

At a meeting of the Atlantic import committee of the Trunk Line Association at New York last Tuesday, it was decided to take action on the Boston & Maine's rate cutting. The first cut of one cent in the commodity rate on import freight from Boston to western points was made by the Boston & Maine in January, and was promptly met by the Baltimore & Ohio, Chesapeake & Ohio, Pennsylvania, Reading and Boston & Albany. This action of the other lines practically nullified the advantage which the Boston & Maine had hoped to gain, and a few weeks later it announced another similar cut. It was thought that the other roads would retaliate. The action this week leaves the situation unchanged.

The New Jersey State Agricultural College and the Pennsylvania Railroad are to co-operate in running a farmers' educational train through southern New Jersey on March 8, 9 and 10. Nineteen stops will be made, and at each of the stations lectures will be given on soil fertility, potato and strawberry production, alfalfa, corn and dairy products. Large posters are to be displayed in prominent places in the section through which the train is to run. The State College authorities will send the farmers personal letters. On the train from the State Agricultural College will be Dr. Edward B. Voorhees, Edward Van Alstyne, K. C. Davis and M. A. Blake. Division Freight Agents W. W. Wimer, Jr., and Wm. Coffin will represent the railway.

Calvert's Monthly, a commercial journal published at Chicago, gives in its February number the results of an investigation to ascertain whether the railways were justified in raising freight rates. Its editors believed that the advances were not justified. It employed as investigators newspaper men at Chicago, New York, Philadelphia, Boston, St. Louis, Kansas City, St. Paul, Omaha, San Francisco and Portland, and instructed them not to seek the views or opinions of railway officers or shippers, but only facts, figures and actual conditions. The article giving the results of the investigation is quite long and the conclusion reached is "that the roads were actually forced to take some action for their preservation. The increase in rates was necessary if the prices of the commodities used by the companies and of the labor employed were not reduced."

Howard Elliott, president of the Northern Pacific, in a letter to the business men of Portland, concerning his refusal to open the Portland gateway to the Union Pacific, says:

"The Union Pacific desires to get the benefit of the business the Northern Pacific has developed for the last thirty-five years at Puget Sound, and to obtain that benefit, not by making an investment of money, but by a demand that the Northern Pacific turn over the use of its property to the Union. The Northern Pacific has offered to rent its physical property on very reasonable terms, the Union Pacific then to share in the risks of operation and management, but this offer was declined. The Northern Pacific has spent a great many millions of dollars at Portland, in doing which it was obstructed by the Union Pacific in many ways. If the commission decides to put our property at the use of the Union Pacific, we should, in self-defence, have to bave the matter tried out in the courts."

The railways belonging to the Transcontinental Freight Bureau have decided to modify a number of the advances in rates that they put into effect on January 1. They gave a hearing to shippers at Chicago lasting from January 28 until February 26, and were convinced by the arguments of shippers that some of the advances made were too great. Among the commodities upon which the westbound rates will be reduced from 3 per cent. to 25 per cent. are oil, wagons and vehicles, agricultural implements, beer, cotton-seed oil, wire fencing, pig iron and linseed oil. Among the commodities on which the eastbound rates will be reduced are cocoanut oil, deciduous fruits, leather and tin scrap. Reductions are made not only in rates to and from the Pacific coast, but also in some cases to and from points intermediate between Chicago and the coast. The changes are so numerous and affect such a wide variety of commodities that it would be impossible adequately to summarize them here.

The railroad committee of the Iowa Senate has reported favorably a bill to amend the long and short haul clause of the existing Iowa railway law. The proposed legislation would authorize railways to base rates between competing points on the short line mileage, but would prohibit any road from making any rate to a given point that was higher than a rate to a point beyond. As the Iowa law has been applied in the past, a road having the long line between two points could not meet the rate by the short line without reducing all intermediate rates so that they would be as low in proportion to mileage as the rate to the competitive point. The result has been that at many points the roads have refrained from meeting one another's competition because they would be compelled in consequence to sacrifice more than they would gain. The avowed purpose of the proposed legislation is to give shippers at competitive points a chance to ship by either of the competing lines at the same rate. The distance tariff in the past has probably been more rigorously enforced in Iowa than in any other state, and the fact that the legislature seems disposed to modify the law and that it is being urged to do so by shippers, shows that the people of the state are beginning to appreciate the fact that this phase of their railway policy has hurt their interests more than it has benefited them.

It appears that the appeal of the Grand Trunk Railway against the order of the Canadian Railway Commissioners requiring it to run a third-class train between Montreal and Toronto (noted last week, page 427) was taken up to the Privy Council of Great Britain, which considered the matter on February 15 and 17 in London. It was dismissed, however. The Commissioners' order was based on an old section of the Grand Trunk Act of 1852, which had been treated by the company and everyone else as obsolete. The chief question involved in the appeal was whether the provisions of the 1852 Act in reference to tolls and third-class carriages, which have in fact never been acted on, were impliedly repealed by the general railway act of 1906. It was contended by the company that the 1906 Act, by vesting in the Commissioners the power and authority to regulate the rates and tolls of every railway in Canada, was inconsistent with and repugnant to the 1852 Act. The Privy Council, however, holds that the old Act is still in force. The railway between Toronto and Montreal was constructed and operated under powers granted to an entirely new Grand Trunk Company by the Amalgamation Act of 1854; Section 3 of the 1852 Act was never acted on during the railway's existence; by the Acts of 1854 and 1859 the directors of the new undertaking were empowered to vary all tolls; and by Acts of 1859, 1868 and 1879 the Governor in Council—and subsequently by Acts of 1903 and 1906, the Commissioners—had full power to alter tolls on all Canadian railways, but the argument based on these facts was, however, rejected.

INTERSTATE COMMERCE COMMISSION.

Rates on Grain and Flour from Missouri River to Chicago.

August J. Bulte Milling Co. et al. v. Chicago & Alton et al. No. 1123 and No. 1129. Opinion by Commissioner Harlan.

Complainants concede the reasonableness of the proportional rates applicable east of Chicago and the Mississippi river in making up the through rates on flour from the Missouri river to the seaboard, but condemn the proportional rates applied between the rivers and to Chicago as unreasonable in themselves and unduly discriminatory when compared with the proportional rates from Minneapolis to Chicago.

The circumstances and conditions surrounding the transportation of flour through Chicago from Minneapolis to the seaboard for export or domestic consumption are substantially dissimilar to the circumstances and conditions surrounding the traffic through Chicago from Missouri river points, in that the lower proportional rates from Minneapolis to Chicago are the direct result of the competition of lake and rail routes. Where a well sustained water competition exists that takes a substantial portion of the tonnage and could readily prepare to take it all, if left in undisturbed control of the traffic, the rail line, without necessarily subjecting itself to charges of discriminating against other localities, may adjust its rates so as to fight for the whole tonnage the moment it really feels the effect and influence of its competitor's rates; it need not wait, as complainants contend, until the water line is prepared to take half the tonnage.

While a division of a through rate long accepted by a carrier may often be pertinent evidence, it is not a sound final test of the reasonableness of the through rate itself. Nor is the rate per ton per mile the generally accepted basis in this country for making up interstate rates.

The manufactured product commonly takes a higher rate than the raw material from which it is made. But the maintenance of a parity of rates on wheat and flour between the Missouri river and the Atlantic seaboard tends to equalize conditions at all points at which flour-milling enterprises exist, and seems on many grounds to be a sound rate policy in that territory. Complainants' suggestion that the flour-milling industry of this country can be fostered by an order requiring carriers to the Atlantic seaboard to maintain a lower rate on flour than on wheat involves a matter of national policy beyond the authority of the commission to adopt until the Congress, by adequate legislation, has made that a rule of transportation.

The Spokane Case.

City of Spokane, Wash., v. Northern Pacific et al. Opinion by Commissioner Prouty.

The complaint was based on two grounds:

1. That rates from eastern destinations to Spokane were higher than those to Seattle, a more distant point.

2. That the rates to Spokane were inherently unreasonable.

On the first point the defendants claimed that water competition compelled them to charge the rates in effect at Seattle and that therefore they might charge a higher rate to Spokane without violating the long and short haul provision, or without discriminating under the third section. The commission sustains the claim of the defendants. It shows that rates to Pacific coast terminals are controlled by water competition and that higher rates to interior points like Spokane are not of necessity unlawful.

On the second point the commission sustains the claim of the petitioner and holds that rates from eastern destinations to Spokane charged at the present time are unjust and unreasonable. It reduces class rates from St. Paul to Spokane 16⅔ per cent. and makes substantially the same reduction from Chicago to Spokane. Rates east of Chicago are not dealt with.

Nearly all commodities to the cost move under commodity rates, and these were the principal subject of complaint on the part of Spokane. Rates from all points on the Missouri river and east to Seattle are the same, while rates from the same points to Spokane are usually considerably higher than to Seattle, and increase as the point of origin lies further east.

The complainants referred, as illustrative, to 32 articles. The commission holds that it can only fix rates on the articles enumerated. The complainants insisted that the rates on these commodities to Seattle ought not to be exceeded at Spokane. The commission holds, with respect to 27 of these articles, that the rate from St. Paul to Spokane should not be higher than the rate from St. Paul to Seattle; with respect to five slightly higher rates to Spokane are permitted. Rates from Chicago to Spokane are made about 16⅔ per cent. higher than from St. Paul to Spokane.

Below is given a table showing the present rate on these articles, the rate established, and the reduction.

Commodity.	Rate Present.	Rate New.	Reduction.
Tin boxes and lard pails, NOS; Boxed, crated or jacketed; Nested in boxes, barrels or crates	190	100	90
Carpets, NOS	270	185	85
Plow points	164	110	54
Shovels, etc.	164	135	29
Fruit jars and glasses	190	100	90
Canned corn, etc.	125	90	35
Belting, cotton or rubber	205	120	85
Bicycles, boxed or crated	335	250	85
Blank books and tablets	170	125	45
Books, NOS, boxed	225	140	85
Drugs and medicines	200	150	50
Cotton duck, etc.	185	150	35
Glass, etc.	138	90	48
Glass, all sizes, NOS	150	90	60
Paint, dry, etc.; Paint, in oil, etc.; White or red lead, dry or in oil, etc.	115	90	25
Paper bags, etc.	120	100	20
Rubber boots, and shoes	235	175	65
Saws, circular, etc.	228	150	78
Water heaters, etc.	230	170	60
Stoves and ranges (cast iron), etc.	155	130	25
Stoves (sheet iron)	220	150	70
Glassware, NOS	190	120	70
Rope and cordage, etc.	167	125	42
Wheelbarrows, KD, flat.	141	90	51
Windmills, KD	155	135	20
Wire, copper	188	110	78
Wire, fencing, in rolls	150	80	70
Woodenware, in packages	174	125	49

In the hearing, the cost of reproducing the properties of the Great Northern and Northern Pacific, their financial history, their present capitalization, and their earnings in recent years, were all fully gone into, and are discussed in the report. The headnotes, in addition to those previously mentioned, are as follows:

1. The system of transcontinental rates now in force applies lower transportation charges from points of origin on the Missouri river and east to Pacific coast cities than are applied to intermediate interior points. This scheme of rate making has been forced by water competition between the Atlantic and the Pacific coasts, and the maintenance of the lower rate to the more distant coast point is not of necessity a violation of the third or the fourth sections, since water competition creates a dissimilarity of circumstance and condition between the interior and the coast.

2. Water competition may justify a difference in carload minimums and in the right of combining different commodities at the carload rate, as well as in the rate itself; but carriers should be prepared to justify such preference.

3. In determining what are reasonable rates between two poinst neither that railway which can afford to handle traffic at the lowest rate nor that whose necessities might justify the highest rate should be exclusively considered. Rates must be established with reference to the whole situation.

4. Certificates issued against the ore lands formerly owned by the Great Northern cannot be properly considered in determining what are reasonable earnings for that company at the present day.

5. The Great Northern has in the past distributed its stock issues among its stockholders at par from time to time, although the market value of the stock was often much above par. Without expressing any opinion on the legality or propriety of this practice, it is held that this fact, at this time, can have no bearing on the earnings to which that company is entitled.

6. Neither can the capital stock of the Great Northern be reduced for the purpose of determining what its fair earnings should be by the amount of that stock which was originally issued without consideration.

7. In determining what will be reasonable rates for the future the commission may properly consider that under the rates in effect a large surplus has been accumulated in the past, but it should not make rates for the purpose of distributing that surplus to the public.

8. The importance of the question whether a railway shall

be allowed to earn a return on the unearned increment represented in the value of its right of way is illustrated by the facts in this case, but is not discussed or decided.

9. On an examination of the history of these properties, the cost of reproducing them at the present time, the original cost of construction, the present capitalization, and the manner in which that capitalization has been made, it is held that the earnings of both the Great Northern and the Northern Pacific in recent years have been excessive.

The order in this case will be made effective on May 1 next. If the commission is satisfied that the carriers will require additional time to check in rates on other commodities and to other points, the effective date will, on application, be extended.

Limitations on Commission's Assessment of Damages.

S. R. Washer Grain Co. v. Missouri Pacific. Opinion by Commissioner Cockrell.

Complaint alleged unjust discrimination arising from the practice of defendant of allowing free commercial elevation at certain places and refusing the same, or a money compensation therefor, at Atchison. Based on this allegation indirect damages to a large amount were claimed as well as an attorney's fee. The evidence was that the complainant actually elevated a certain amount of grain, moving in interstate commerce over the defendant's lines. The Commission has condemned commercial elevation as practiced by the carriers, or money compensation therefor; at the time of the alleged discrimination, however, seven and one-half mills per 100 lbs. was considered a proper allowance in lieu of such elevation.

The Commission has jurisdiction, without regard to the amount in controversy, to award damages whenever they arise under the act, excepting in those cases where the act itself names another forum.

While the Abilene case, 204 U. S., 426, settles the primary jurisdiction of this Commission to determine the reasonableness or unreasonableness of an established rate and to award reparation predicated upon the unreasonableness of an established rate, the Commission's jurisdiction is primary also in matters of unjust discrimination, undue or unreasonable preference or advantage, undue or unreasonable prejudice or disadvantage, and, generally, whenever the Commission may order the carrier to cease and desist from violations of the act.

The Commission, in passing upon the reasonableness or unreasonableness of a rate, acts as an administrative body having quasi judicial functions; when it determines what the rate should have been and shall be in the future it exercises certain legislative functions; when it computes the damages or reparation due the shipper by reason of the enforcement and collection of a rate unreasonable to the extent that it exceeds a rate which is declared to be reasonable, there is a mere mathematical determination of the damages the shipper should receive. Reparation or damages, therefore, in all matters which concern rates, are reduced, after the Commission has determined what the reasonable rate should have been, to the simplicity of a mathematical calculation; elements of conjecture, speculation, and inference are entirely eliminated. In matters of discrimination, however, of undue preference, prejudice or disadvantage, a different field is entered, where the services of a jury may be necessary, not only by reason of the seventh amendment to the Constitution, but by the very nature of the subject-matter itself. It may be proper, and the Commission has so considered in many instances, to award money damages in cases of the kind just described, and such awards have been complied with by the carriers, but the proofs to support such awards should be very clear and exact; they should be free from surmise and conjecture.

Reparation, based upon the amount of grain actually elevated, allowed in this case because it is found that the free commercial elevation afforded shippers elsewhere discriminated against Atchison and affected the rates paid by the complainant to the exact extent of seven and one-half mills per 100 lbs. The Commission does not assess costs; nor does it allow attorney's fees; nor does its order for the payment of money have the effect of an order, decree, or judgment of a court; nor are such orders enforceable by process; nor do they become liens upon the property of a defendant.

STATE COMMISSIONS.

The Railway Commission of California in case No. 101 says that it is not governed by strict rules of evidence such as are observed by courts of law, its object being to arrive at the facts, and in so doing it follows the practice adopted by the Interstate Commerce Commission.

COURT NEWS.

The Supreme Court of Pennsylvania has decided that the state law stipulating the length of time goods may be kept in storage is invalid as far as it applies to goods in cars that are engaged in interstate commerce.

Judge Carland in the United States Court at Sioux Falls, S. Dak., March 2, granted a temporary injunction in the case involving the 2-cent passenger fare law, recently enacted by the state legislature. The injunction restrains the railway commissioners, the attorney-general and the state's attorneys of the various counties through which the lines run, from attempting to compel the railway companies to comply with the law. All passengers are enjoined from instituting actions against the companies for violating the law and from demanding that they be carried at a 2-cent rate.

In the Louisiana supreme court on February 24 the St. Louis & San Francisco consented to a judgment nullifying the contract by which the Frisco's trains were to enter New Orleans over the tracks of the Yazoo & Mississippi Valley. It is reported that a representative of the Frisco later announced that its trains would be running into New Orleans by June 1. It now reaches a point between New Orleans and Baton Rouge over the Colorado Southern and the New Orleans & Pacific. Seemingly the only other available entrance is over the tracks of the Louisiana Railway & Navigation Co.

The Illinois Terminal Association, operating a railway between Alton, Ill., and Edwardsville, and the Illinois Glass Company, which is said to own the Terminal Association, charged with paying illegal rebates, entered pleas of guilty in the federal court at Springfield, Ill., on February 24. The Illinois Terminal Association also pleaded guilty to failure to post and file freight rates. The Terminal Association was fined \$4,000 and costs and the Illinois Glass Company \$12,000 and costs, which were paid. It was alleged that through the common ownership of these concerns the glass company was enabled to ship glassware from Alton to California at a rate of \$20 a car less than that paid by its competitors.

The full bench of the Supreme Court of Massachusetts has affirmed a decree of a single justice requiring the New York, New Haven & Hartford to part with all its holdings in the Worcester & Southbridge, Worcester & Blackstone Valley, Worcester & Webster, Webster & Dudley, the Berkshire and the Springfield Street Railway companies before July 1, 1909. The proceeding against the road was brought in 1906 by the Attorney-General of the state. The road said that it had doubt as to the meaning of the decree and wanted the court to set out more clearly and unmistakably what it could do and could not do. The full bench can find no reason for any doubt on the part of the road as to the meaning and intent of the order. A New Haven despatch says that the road expected the decision, and it is not regarded as changing in any material aspect the situation. The question now is whether or not during the legal proceedings the controlling interest in the electric lines has been legally disposed of. Since the stockholders' meeting last October the controlling common stock has been, with a single exception, sold to persons entirely disconnected with the company, either officially or in any other relationship whatever. The only official connection remaining, it is asserted, is in the fact that President Mellen remains one of the trustees of the Investment & Security Company. The New England Navigation Company holds as a creditor certain notes of the Investment & Security Company.

Judge Anderson, of the federal court, who is presiding in the second trial of the case of the government against the Standard Oil Company of Indiana for the alleged acceptance of rebates from the Chicago & Alton, indicated informally on

February 25 that on the evidence introduced at the previous trial he would rule that the defendant could not be convicted of more than 36 offenses, this being the total number of settlements made on the basis of the alleged illegal rates. Judge Anderson hinted that if the question were a new one which had not before been passed on he would give very serious consideration to the contention of counsel for the Standard Oil Company that there had been but one offense, which continued throughout the entire time that the alleged illegal rates were in effect; but that he understood from the decision of the Circuit Court of Appeals in the case that it considered the number of offenses to be the number of settlements that were made. Counsel for the Standard Oil Company previously attacked the venire called from which to select a jury, on the ground that it was composed almost entirely of farmers. Judge Anderson held that the point was well taken and ordered a new venire to be drawn. If Judge Anderson's formal ruling shall be the same as his informal ruling regarding the number of offenses, the maximum aggregate fine that can be imposed, if the Standard Oil Company shall be found guilty, will be $720,000, instead of $29,240,000, the aggregate fine imposed by Judge Landis at the former trial.

Hearing in Southwestern Rate Case.

The taking of testimony in the Southwestern rate case was finished by Commissioners Harlan and Clark of the Interstate Commerce Commission at St. Louis on February 25.

W. G. Van Vleck, Second Vice-President of the Galveston, Harrisburg & San Antonio and the Texas & New Orleans, stated that since the Texas Commission had valued these two roads at $18,000 a mile there had been an increase of over 100 per cent. in their value by reason of betterments and seasoning. He estimated the present value of the properties at $45,000 a mile. He said that it cost the two roads $35,000 to comply with the Texas law requiring electric headlights; that the state full crew law cost $25,000 a year; that the 8-hour law cost $10,000 a year and the 16-hour law $5,000 a year.

T. J. Freeman, Receiver and General Manager of the International & Great Northern, said that the train loads on this line had been reduced and the speed of freight trains increased. This had increased operating expenses but had also resulted in better service to shippers. It enables the Texas jobber to reduce the stock he carries because he knows that in 3½ days he can get a shipment from St. Louis. The increase in rates would result in the railways adopting a more liberal policy and in installing industrial tracks which would also benefit shippers.

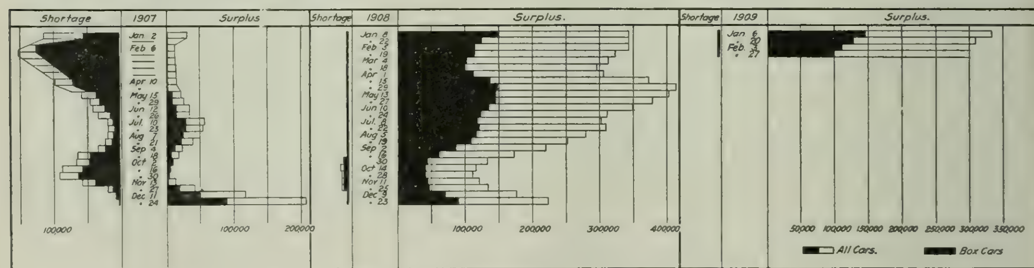
A. W. Houston, Counsel for the San Antonio & Arkansas Pass, submitted statistical tables showing that the increase in rates if applied to the tonnage carried in 1908, would increase the revenue of his road less than $27,000.

L. J. Storey, a member of the Texas Railroad Commission, was examined regarding the method used by the Texas Commission in making its valuation of railways. He said that the "unearned increment" in the real estate of Texas railways was not considered in the valuation. He admitted that "if the present estimated value of the real estate used for right-of-way and terminals were considered in making the valuation of the railway properties not a single railway in Texas would be earning a return on its valuation." He defended the method of valuation used on the ground that the influx of population caused the increase in the value of railway real estate, and that therefore the public should benefit by it through low rates, not the railways through high rates.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 41 A, giving a summary of car surpluses and shortages by groups from December 24, 1907, to February 17, 1909, says:

"The surplus taken as a whole is practically unchanged since the last report, the total for this period being 301,441, a decrease of 130 cars. The figures by classes, however, show considerable change. There is a decrease of 12,120 in the number of surplus box and an increase of 12,497 in coal and gondola cars. Flat cars are evidently more in demand, as there is a decrease of 2,197 in the surplus of this class. Group 2 (Eastern) and 3 (Middle), comprising the principal coal roads, show the greatest increases, while group 6 (Northwestern) shows the largest decrease in box and total cars."



Car Surpluses and Shortages in 1907, 1908 and 1909.

CAR SURPLUSES AND SHORTAGES, FROM DECEMBER 24, 1907, TO FEBRUARY 17, 1909, INCLUSIVE.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724

REPORTS OF REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$91,802	$35,193	$137,629	$23,083	$25,147	$3,538	$45,198	$5,245	$102,211	$35,418	.....	$4,800	$30,618	$4,890
Bangor & Aroostook	515	196,625	35,322	243,955	41,544	29,828	3,798	77,981	11,344	164,495	79,460	.....	1,500	77,960	55,038
Buffalo, Rochester & Pittsburg	568	428,367	60,993	501,785	38,278	131,661	8,310	174,421	13,685	366,355	135,430	$141	15,000	120,571	30,528
Central of New England	294	151,277	21,531	185,375	23,044	23,504	1,666	83,921	4,415	136,550	48,825	.....	5,600	43,225	42,893
Chicago & Northwestern	7,635	3,047,297	1,151,077	4,656,739	466,759	575,159	103,746	2,098,330	95,888	3,339,882	1,316,857	7,836*	230,000	1,079,021	‡159,463
Chicago, Burlington & Quincy	9,023	3,866,164	1,391,673	5,807,989	459,821	1,151,998	121,650	2,105,690	168,131	4,007,290	1,800,699	13,120*	212,600	1,574,979	15,997
Chicago, Lake Shore & Eastern	630	259,208	....	286,509	23,827	77,267	1,079	109,654	5,172	217,000	69,509	.....	3,000	66,509	8,870
Chicago, St. Paul, Minn. & Omaha	1,739	702,398	311,399	1,088,819	73,264	123,858	22,534	437,673	35,830	693,159	395,660	143*	53,008	342,509	11,537
Cleveland, Akron & Columbus	210	98,031	33,498	148,380	15,125	34,205	2,549	55,325	3,464	110,668	37,712	.....	5,000	32,712	6,918
Cumberland Valley	162	152,037	39,778	202,217	20,020	22,763	3,841	65,959	4,705	117,288	84,929	605	3,713	81,821	11,915
Delaware, Lackawanna & Western	893	1,965,267	465,216	2,609,880	146,800	390,386	44,368	802,301	57,518	1,441,373	1,168,507	20,553	98,400	1,090,660	185,523
Elgin, Joliet & Eastern	239	179,550	31	184,431	18,093	25,021	2,793	73,201	7,218	126,326	58,105	.....	9,500	48,605	162
Florida East Coast	584	125,236	128,039	298,551	32,926	38,409	5,622	112,956	8,912	198,825	99,726	.....	11,000	88,726	5,056
Grand Rapids & Indiana	592	227,126	93,102	343,046	45,661	59,174	10,092	156,024	14,329	285,280	57,766	446*	20,749	36,571	21,411
Gulf & Ship Island	307	128,378	28,285	168,544	35,597	25,001	1,729	55,157	7,795	125,279	43,265	.....	5,850	37,415	13,487
Kansas City Southern	827	505,701	102,962	672,029	70,523	83,985	23,943	232,396	28,524	439,371	232,658	.....	25,581	207,077	38,482
Lehigh Valley	1,446	2,195,353	248,425	2,540,278	295,803	465,035	71,017	824,260	53,350	1,709,465	830,813	15,971*	94,600	720,242	65,332
Louisiana Western	198	114,145	48,896	172,252	17,504	20,580	5,908	44,978	7,488	96,458	75,794	866	5,000	71,660	‡4,248
Louisville & Nashville	4,388	2,699,532	807,853	3,754,769	375,330	710,609	85,055	1,256,426	83,824	2,511,244	1,243,525	23,866*	112,700	1,106,959	621,069
Maine Central	931	394,554	152,643	590,754	65,346	97,080	5,989	263,594	23,080	455,089	135,665	268	31,962	103,971	‡884
Morgan's La. & Tex. R.R. & S.S. Co.	351	251,417	93,584	376,525	86,238	41,530	10,366	139,303	13,643	291,080	85,445	1,725	16,000	71,170	‡88,089
New Orleans & North Eastern	196	221,540	46,996	287,668	25,081	43,958	7,507	96,373	12,306	185,225	102,443	.....	8,000	94,443	47,637
New York, New Haven & Hartford	2,000	1,991,696	1,687,333	4,055,890	480,072	485,041	19,732	1,962,416	100,101	3,047,362	1,008,528	59,371	295,000	772,899	644,534
New York, Philadelphia & Norfolk	112	169,653	27,315	213,763	25,606	41,738	3,004	84,563	8,665	163,576	50,187	.....	6,250	43,937	20,412
Norfolk & Southern	582	137,401	46,008	195,890	13,729	17,768	4,226	61,135	12,469	109,327	86,563	753*	5,200	80,610	51,833
Northern Central	462	660,133	144,229	865,660	131,899	216,412	11,193	440,327	18,540	818,371	47,289	320	19,514	28,095	‡86,520
Northern Pacific	5,674	2,835,667	1,026,490	4,147,390	464,006	651,185	62,360	1,677,255	122,309	2,977,115	1,170,275	16,338	157,601	1,029,012	‡499,164
Pennsylvania Co.	1,416	2,059,721	515,770	2,889,374	418,702	529,114	67,184	1,217,414	71,491	2,303,905	585,469	3,595*	147,460	434,414	129,218
Pennsylvania R.R.	4,048	7,917,382	2,140,058	10,891,952	1,377,907	2,400,157	144,389	4,126,776	279,961	8,329,190	2,562,762	32,553*	174,339	2,355,870	283,008
Phila., Baltimore & Washington	716	559,601	525,771	1,260,829	200,093	272,998	19,658	577,696	27,500	1,097,944	162,885	.....	31,142	131,743	‡3,658
Pittsburgh, Cin., Chicago & St. Louis	1,472	1,682,302	528,534	2,533,810	346,951	462,974	65,718	995,583	53,080	1,924,306	609,504	633*	114,160	494,711	69,689
Vandalia	829	423,782	164,974	668,559	78,530	121,060	21,556	299,844	17,242	538,232	130,327	.....	24,365	105,962	‡11,463
Vicksburg, Shreveport & Pacific	171	75,008	38,681	122,535	27,626	21,791	3,582	38,904	4,308	96,211	26,324	.....	6,000	20,324	7,755
Virginia & South Western	184	89,386	11,042	103,401	9,023	23,245	886	36,654	4,305	74,113	29,288	.....	3,850	25,438	15,380
West Jersey & Seashore	363	102,069	145,501	273,240	73,192	70,843	6,719	158,602	7,857	317,213	43,973*	1,528	17,112	59,557†	‡36,380
Wisconsin Central	1,131	416,439	97,978	550,976	47,778	90,251	25,610	243,734	20,429	427,802	123,174	94*	29,768	93,312	8,433

SEVEN MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$593,143	$276,777	$935,888	$148,417	$192,099	$22,945	$303,821	$34,744	$702,026	$233,862	.....	$28,720	$205,142	‡$1,474
Bangor & Aroostook	515	1,209,598	350,061	1,640,338	307,598	193,605	20,629	495,911	73,227	1,090,970	549,368	.....	10,500	538,868	248,147
Buffalo, Rochester & Pittsburg	568	3,508,844	547,535	4,234,084	557,826	991,506	58,344	1,266,795	97,495	2,971,966	1,262,118	$404	105,000	1,157,522	‡206,354
Central of New England	294	1,156,239	205,323	1,445,056	246,155	147,507	11,699	501,389	20,857	927,907	517,149	.....	39,200	477,949	275,066
Chicago & Northwestern	7,635	26,275,061	10,579,750	39,989,868	4,773,934	4,391,852	659,229	14,585,159	644,073	25,054,247	14,935,621	19,002	1,610,000	13,344,623	1,194,001
Chicago, Burlington & Quincy	9,023	31,313,039	12,155,101	47,410,584	6,830,464	7,678,200	892,901	14,549,716	1,161,715	31,112,996	16,297,588	84,791*	1,488,200	14,724,597	142,933
Chicago, Lake Shore & Eastern	630	2,139,485	....	2,335,559	194,535	529,830	7,729	748,785	44,091	1,524,970	810,589	.....	21,000	789,589	‡91,095
Chicago, St. Paul, Minn. & Omaha	1,739	5,156,369	2,526,669	8,226,558	979,028	850,231	151,619	2,925,481	210,165	5,116,524	3,110,034	3,887	370,825	2,743,096	345,200
Cleveland, Akron & Columbus	210	795,288	271,905	1,163,108	134,725	205,174	16,485	379,629	21,191	757,204	405,904	.....	45,222	360,682	40,105
Cumberland Valley	162	1,061,272	347,340	1,479,753	140,324	134,526	26,940	460,153	38,850	800,793	678,960	4,232	25,991	657,201	‡24,338
Delaware, Lackawanna & Western	893	14,555,018	4,046,113	19,836,179	1,971,773	2,571,381	331,049	5,473,731	387,967	10,735,901	9,100,278	155,890	602,400	8,653,768	297,947
Elgin, Joliet & Eastern	239	1,373,851	300	1,422,045	152,811	226,369	17,931	464,558	55,272	916,941	505,104	.....	66,500	438,604	‡84,200
Florida East Coast	584	690,551	465,764	1,356,697	291,584	277,811	34,433	592,010	60,283	1,256,122	100,575	.....	77,000	23,575	59,461
Grand Rapids & Indiana	592	1,560,626	996,176	2,754,951	299,873	380,296	72,703	1,061,690	94,853	1,909,415	845,536	412	147,387	698,561	85,306
Gulf & Ship Island	307	822,305	217,278	1,108,497	233,511	174,450	10,117	365,790	51,245	835,113	273,384	.....	27,959	245,425	‡36,616
Kansas City Southern	827	3,840,908	790,556	5,084,586	555,141	599,455	152,487	1,620,502	185,383	3,112,968	1,971,618	.....	195,561	1,776,057	‡7,091
Lehigh Valley	1,446	16,525,239	2,394,431	19,562,007	2,065,288	3,648,183	455,586	5,904,560	372,117	12,445,734	7,116,273	26,868*	626,200	6,463,205	‡1,157,040
Louisiana Western	198	768,476	312,055	1,139,295	107,968	139,056	32,697	313,649	46,540	639,910	499,385	3,362	35,727	467,020	9,180
Louisville & Nashville	4,388	19,430,136	6,103,777	27,204,395	3,008,211	4,722,464	575,576	8,650,981	549,830	17,507,061	9,697,333	90,076*	786,725	8,820,532	2,982,721
Maine Central	931	2,815,413	1,183,889	4,927,573	777,882	673,785	51,703	1,759,734	161,864	3,424,968	1,502,605	18,315	217,186	1,303,734	‡296,444
Morgan's La. & Tex. R.R. & S.S. Co.	351	2,082,979	604,444	2,868,780	510,063	298,285	58,353	1,038,650	86,947	1,992,298	876,482	9,585	113,115	772,952	159,603
New Orleans & North Eastern	196	1,350,314	325,113	1,791,773	172,295	329,643	51,301	595,763	73,697	1,222,699	569,074	.....	52,000	517,074	54,697
New York, New Haven & Hartford	2,000	15,192,334	13,698,232	31,706,686	3,953,440	3,737,307	167,458	13,285,621	645,343	21,789,169	9,917,517	740,276	2,012,000	8,645,793	120,991
New York, Philadelphia & Norfolk	112	1,292,978	229,835	1,635,585	137,413	293,005	21,899	598,989	76,520	1,127,826	507,759	.....	43,540	464,219	‡74,364
Norfolk & Southern	582	855,320	382,315	1,336,408	193,384	145,396	29,744	435,217	104,630	908,371	428,037	155*	44,400	383,482	160,788
Northern Central	462	5,142,224	1,200,977	6,741,083	490,907	1,464,753	86,877	3,007,995	135,593	5,186,125	1,554,958	5,047	136,602	1,423,403	‡302,232
Northern Pacific	5,674	29,031,023	10,418,983	41,792,565	4,482,526	4,753,453	482,886	11,900,548	640,333	22,259,746	19,532,819	329,889	1,760,048	18,102,760	‡663,511
Pennsylvania Co.	1,416	18,352,391	4,085,756	24,564,718	2,256,126	3,842,146	430,722	8,247,288	502,498	15,278,780	9,285,938	16,152*	1,065,898	8,203,888	70,753
Pennsylvania R.R.	4,048	58,140,749	17,222,513	81,159,171	8,777,537	15,663,694	1,060,248	28,614,961	1,978,742	56,095,182	25,063,989	155,657	1,220,375	23,999,271	‡2,007,458
Phila., Baltimore & Washington	716	4,588,394	4,012,583	9,667,103	1,173,603	1,688,626	146,667	3,988,120	199,916	7,196,932	2,470,171	.....	217,992	2,252,179	‡116,386
Pittsburgh, Cin., Chicago & St. Louis	1,472	12,796,192	4,187,725	19,196,212	2,067,603	3,297,840	426,466	6,668,550	393,280	12,853,739	6,342,473	4,359*	849,755	5,488,359	154,498
Vandalia	829	3,341,695	1,335,612	5,261,220	783,426	847,662	146,713	2,001,929	117,228	3,896,958	1,364,262	.....	178,557	1,185,705	‡59,397
Vicksburg, Shreveport & Pacific	171	478,616	294,661	834,050	141,453	168,766	23,486	252,899	29,398	616,002	218,048	.....	42,453	175,595	50,366
Virginia & South Western	184	625,187	88,593	738,372	79,552	127,583	6,230	219,787	26,746	459,898	278,474	.....	29,293	249,181	81,035
West Jersey & Seashore	363	872,972	2,031,027	3,064,885	441,380	402,027	76,699	1,255,280	54,453	2,229,839	835,046	52,608	119,787	767,867	‡170,622
Wisconsin Central	1,131	3,178,108	965,337	4,427,573	482,219	544,881	171,338	1,580,589	141,746	2,920,773	1,506,800	3,424	205,950	1,304,274	‡33,370

*Deficit. †Loss. ‡Decrease.

Western Transit and Rutland Transit United.

The Western Transit Line and the Rutland Transit Line, controlled by the Rutland Railroad, have been consolidated, and the joint headquarters will be at Buffalo. The new arrangement eliminates Cleveland as a stopping point and the office there will be closed. Hereafter westbound boats will load 14 ft. at Ogdensburg, going to Buffalo for the balance of their cargo. The eastbound vessels will load 16 ft. at Chicago for Buffalo, lightering there to 14 ft. for the trip through the Welland canal and the river to Ogdensburg. Both lines have long been controlled by the New York Central.

Traffic Club of Chicago.

The Traffic Club of Chicago on February 25 increased its initiation fee for all members to $10, the annual dues for resident members to $25 and the annual dues for non-resident members to $12.50. The committee appointed to seek permanent club rooms stated that rooms probably would be secured by April 1. The annual meeting of the club and election of officers will be held on March 30. The nominating committee has nominated for President, W. M. Hopkins; for First Vice-President, Fred Zimmerman; Second Vice-President, J. Charles Maddison; Third Vice-President, W. H. Johnson; Secretary, John T. Stockton; Treasurer, John H. Grace; Directors for two years, Frank T. Bentley, D. W. Cooke and F. B. Montgomery.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

E. C. Noble has been appointed the General Claim Agent of the Texas & New Orleans.

James Steuart Mackie, Secretary of the Colorado & Southern, has been elected the Secretary of the Chesapeake & Ohio, with office at New York.

John S. Rockwell, Real Estate and Tax Agent in the state of New York of the Buffalo, Rochester & Pittsburgh, has been appointed the General Agent, with office at Rochester, N. Y., and he will have charge of tax assessments, real estate and personal injury claims.

The following officers of the La Fayette Railroad were elected at a meeting of the Board on February 23: President, H. T. Kincaid, Dayton, Ohio; First Vice-President and General Manager, J. A. Kauffman, La Fayette, Ga.; Secretary and Treasurer, Col. T. J. Kauffman, Dayton, Ohio; Second Vice-President and General Counsel, R. M. W. Glenn, La Fayette, Ga.; W. D. Morrison, Assistant Secretary, and S. A. Hunt, Jr., Assistant Treasurer.

The Dakota, Kansas & Gulf has elected the following officers: President, W. H. Mitchell, Beloit, Kan.; First Vice-President, N. R. Holmes, Troy, N. Y.; Second Vice-President, W. H. Roe, Kearney, Neb.; Third Vice-President, C. B. Winegar, Lebanon, Kan.; Fourth Vice-President, J. B. Holmes, Troy, N. Y.; Secretary, George N. Nay, Sandy Hill, N. Y.; Assistant Secretary, W. W. Dilworth, Beloit; Second Assistant Secretary, C. W. Kibler, Kearney; Treasurer, F. T. Locke, New York; Assistant Treasurer, A. T. Rodgers, Beloit; Second Assistant Treasurer, A. U. Dann, Kearney; General Attorney, F. T. Burnham, Kansas City, Mo.

Operating Officers.

W. E. Becker has been appointed the Superintendent of the Southern Indiana and the Chicago Southern, with office at Terre Haute, Ind., succeeding M. E. Sebree, resigned.

A. W. McLimont, Electrical Engineer of the New York Public Service Commission, First district, has been appointed the General Manager of the Chicago & Milwaukee Electric.

W. R. Beauprie, Superintendent of the Montgomery district of the Atlantic Coast Line, has been appointed the General Manager of the Atlanta & St. Andrews Bay, with office at Dothan, Ala.

S. E. Dillon has been appointed the Superintendent and Local Treasurer of the Little Rock & Hot Springs Western, with office at Little Rock, Ark., succeeding H. E. Martin, resigned to engage in other business.

W. C. McKeown, Assistant Superintendent of the Wyoming division of the Union Pacific, has been appointed a Superintendent, with office at Cheyenne, Wyo., succeeding H. L. Anderson, resigned on account of ill health.

T. F. Brennan, Superintendent of Transportation of the Buffalo, Rochester & Pittsburgh, has been appointed the General Superintendent, with office at Rochester, N. Y., and his former office has been abolished. J. E. Burnes has been appointed the Superintendent of Car Service, with office at Rochester.

John C. Dailey has been appointed the General Superintendent of the Denver & Rio Grande, with office at Salt Lake City, Utah, as previously announced in these columns. He was born on January 12, 1864, at Lebanon, Ohio, and began railway work in 1884 as an agent of the Illinois Central. In 1887 he was appointed Train Despatcher, and in 1892 Chief Train Despatcher. In 1893 he was appointed Trainmaster, and in 1898 was made Superintendent. On February 15, 1908, he was appointed the General Superintendent of the International & Great Northern, which position he held until his appointment as the General Superintendent of the Denver & Rio Grande, on February 1, 1909.

Hugh M. Taylor, who has been appointed Assistant General Manager of the National Railways of Mexico, was born in 1870 at Montgomery, Ala. After graduating from the Alabama Technical Institute, he began railway work in 1889 on the Birmingham Mineral, now part of the Louisville & Nashville, as masonry inspector. He later became draftsman, then Assistant Engineer, and still later Resident Engineer. His work with the Louisville & Nashville included the erection of the Coasa river bridge between Sylacauga, Ala., and Calera in 1890 and 1891. In September, 1891, he became Supervisor of the Mexican National, and was successively brakeman, Assistant Engineer, yardmaster, conductor, Trainmaster and Superintendent. He was then appointed Superintendent of Construction in charge of building the line from Huchuetoca to Gonzalez, about 161 miles. After this line was completed Mr. Taylor was appointed General Manager of the Interoceanic of Mexico, and on May 20, 1907, was appointed Assistant General Manager of the National Lines of Mexico, in charge of engineering and maintenance, which position he held until his authority was extended over the lines of the National Railways of Mexico.

Traffic Officers.

George S. Bassett, Jr., has been appointed Traveling Freight Agent of the Michigan Central at Pittsburgh, Pa.

O'Donnell Iselin has been appointed a Traveling Passenger Agent of the Buffalo, Rochester & Pittsburgh, with office at Rochester, N. Y.

A. C. Baker has been appointed a Passenger Agent of the Chicago Great Western, with office at Chicago, succeeding R. H. McCurdy, resigned.

L. L. Korn has been appointed a Freight Traffic Agent of the Atchison, Topeka & Santa Fe, with office at Indianapolis, Ind., succeeding R. M. Jenks, resigned to go with another road.

J. T. Crutchfield, Commercial Agent of the Atlanta, Birmingham & Atlantic, has been appointed the General Western Agent of the Texas City Steamship Co., with office in the American Trust building, Chicago.

Edwin F. Adams, chief clerk in the passenger department of the Gulf, Colorado & Santa Fe, has been appointed the Assistant General Passenger Agent, with office at Galveston, Tex. This is a new position.

Charles E. Perkins, Assistant General Freight Agent of the Kansas City Southern, has been appointed an Assistant General Freight Agent of the St. Louis, Iron Mountain & Southern, with office at St. Louis, Mo.

Osgood Packard has been appointed a Traveling Passenger Agent of the Boston & Albany, with office at Boston, Mass., succeeding C. E. Colony, who has been appointed a City Passenger and Ticket Agent, with office at Boston.

A. S. Haines, District Passenger Agent of the Illinois Central, at Nashville, Tenn., has been appointed District Passenger Agent at Jackson, Miss., and James P. Brown, Traveling Passenger Agent at Jackson, has been transferred to Nashville.

Frank W. Teasdale has been appointed a Commercial Agent in charge of freight traffic in the city of Minneapolis, Minn., and suburban points, of the Chicago, St. Paul, Minneapolis & Omaha, with office at Minneapolis, succeeding W. Wade Wilcox, resigned to engage in other business.

Stanley H. Johnson, whose appointment as the Assistant Freight Traffic Manager of the Chicago, Rock Island & Pacific has previously been announced in these columns, was born on February 22, 1872, at Bunker Hill, Ill. After a High School education at St. Louis, Mo., he became connected with the Southern Interstate Association, at St. Louis. Later he was employed as stenographer in the Freight Traffic department of the Missouri Pacific at St. Louis, and from here he went for a time to the East Tennessee, Virginia & Georgia, now a part of the Southern, at Knoxville, Tenn. He next was associated with the Chesapeake, Ohio & South-western, now a part of the Illinois Central, at Louisville, Ky. Early in 1894 he went with the Southwestern Freight Bureau, at St. Louis, remaining with that organization about eight years and occupying various positions up to that of bureau secretary. In 1902 he was appointed chief clerk to the Third Vice-President and Traffic Manager of the Chicago, Rock Island & Pacific, and in 1904 he was made General Freight Agent at Little Rock, Ark. In 1906 he was appointed an Assistant General Freight Agent, which position he held until his recent appointment.

Engineering and Rolling Stock Officers.

C. B. Smyth, Assistant Mechanical Engineer of the Union Pacific, has resigned and has been appointed the Superintendent of the McKeen Motor Car Co., Omaha, Neb.

C. A. Christofferson, Signal Engineer of the Chicago Great Western, has been appointed the Signal Engineer of the Northern Pacific, with office at St. Paul, Minn.

T. A. Lawes has been appointed the Master Mechanic of the Southern Indiana and the Chicago Southern, with office at Bedford, Ind., succeeding G. A. Gallagher, resigned.

A. M. Kinsman, Engineer of Construction of the Baltimore & Ohio, has been appointed the Chief Engineer, with office at Baltimore, Md., succeeding D. D. Carothers, deceased.

W. I. Bell has been appointed an Assistant Supervisor of Signals of the Eastern Pennsylvania division of the Pennsylvania, succeeding George E. McFarland, promoted.

H. R. Klepinger has been appointed the Chief Engineer of the La Fayette Railroad, with office at Dayton, Ohio. W. T. Sherman has been appointed the Assistant Chief Engineer.

G. E. Johnson has been appointed the Master Mechanic of the Wymore division of the Chicago, Burlington & Quincy, with office at Wymore, Neb., succeeding A. B. Pirie, assigned to other duties.

W. B. Embury has been appointed the Master Mechanic of the Oklahoma & Pan Handle divisions of the Chicago, Rock Island & Pacific, with office at Chickasha, Okla., succeeding W. J. Monroe, resigned.

A. S. Greig, Assistant to the Chairman of the Executive Committee of the Chicago, Rock Island & Pacific, St. Louis & San Francisco, Chicago & Eastern Illinois and the Evansville & Terre Haute, and Edward S. Moore, Second Assistant to the President of the Rock Island Lines, will hereafter in addition to their present duties, act as a Committee on Standardization of all these lines, with office at Chicago. Mr. Greig will be Chairman of the Committee.

Purchasing Officers.

Roy S. Parker has been appointed the General Storekeeper of the Kansas City, Mexico & Orient, with temporary office at Fairview, Okla.

OBITUARY.

J. V. Key, Superintendent of Construction of the Eastern of New Mexico, died from heart failure at Albuquerque, N. Mex., on February 26. He had had charge of the work on the Belen cut-off of the Atchison, Topeka & Santa Fe and had been with the Santa Fe for 18 years.

George R. Hough, a veteran conductor of the Wabash, died at his home at Clayton, Ill., Feb. 18, at the age of 74. Mr. Hough had been in continuous service on the Wabash for 52 years and was the oldest man in length of service on the entire system. He served as passenger conductor for 32 years between Keokuk and Bluffs.

W. H. Whalen, Purchasing Agent of the General Rubber Co., New York, died on March 2 at his home in New York after an illness of about a year. He was 58, and at one time was Assistant Purchasing Agent of the Chicago, Rock Island & Pacific, and became Purchasing Agent of the Delaware, Lackawanna & Western in 1899, and six years later became Purchasing Agent of the General Rubber Co.

Henry C. Hope, Superintendent of Telegraph and Signals of the Chicago, St. Paul, Minneapolis & Omaha, died from apoplexy on February 26, at St. Paul, Minn. He was born June 19, 1850, at Rockford, Ill. He began railway work in 1873 as operator and despatcher of the Chicago, Milwaukee & St. Paul, at Milwaukee, Wis. He was appointed to the position he held at the time of his death, on November 1, 1880.

W. H. Tilford, Vice-President of the Standard Oil Co., died in New York on March 2. Mr. Tilford was 59 years old. He began work in the oil business, the firm of which he became a partner being later merged into the Standard Oil Co. In 1878 he went to the Pacific coast, organizing subsidiaries of the company and, particularly, organizing the Standard Oil's transportation lines along the Pacific coast and across the Pacific. After returning to New York, most of his time was taken up in arranging similar transportation matters for the parent company. He was later made Treasurer and, finally, a Vice-President.

Clement Rolla Glass, formerly in the engineering departments of the Southern Pacific and the Union Pacific, and at the time of his death General Manager of the Andes Tin Co., La Paz, Bolivia, S. A., accidentally shot himself in Buenos Ayres on January 2, and died almost instantly. He was born in Martinez, Cal., and received his education at the University of California and at the San Jose University. He was for a time Deputy United States Surveyor of Nevada and was also in the Geological Service. After spending some time in Alaska with various mining companies he went to South America and was appointed Chief Engineer of the Consolidated Copper Mines of Corocoro. Later he was made Manager of the Inca Rubber Co. of Peru, where he remained until his connection with the Andes Tin Co. His exceptional ability as a mining engineer did much toward placing the mining work of Bolivia on a systematic basis. He was 41 years of age.

H. A. Schwanecke, Vice-President of the Pittsburgh, Binghamton & Eastern, died at his home in Marshall, Ill., on February 21 from a complication of asthma and other diseases. Mr. Schwanecke was born at Hanover, Germany, in November, 1846. He graduated from Göttingen University with high honors in 1866, and came to America shortly after graduation. He began railway work as draftsman on the Philadelphia & Reading, and was later appointed Assistant Engineer of the Reading & Columbia, now part of the Philadelphia & Reading. Later he became Principal Construction Engineer of the Perkiomen Railway, and later became Principal Assistant Engineer in charge of location and construction of the Vandalia. Among other positions held by Mr. Schwanecke were the following: Principal Assistant Engineer of the Ashtabula, Youngstown & Pittsburgh; Chief Engineer of the Springfield & St. Louis; Chief Engineer of the Lake Erie & Western;

Chief Engineer and Superintendent of Construction of the Pittsburgh Junction Railway; Chief Engineer of the Foxburg Bridge Co. He also had a large private practice as consulting engineer, and had served on many important commissions in addition to his railway work.

Edwin Reynolds, who was President of the American Society of Mechanical Engineers in 1902, died at Milwaukee, Wis., on February 19. Mr. Reynolds was born in 1831 in Connecticut. After a public school education he went into a machinist's shop and served his apprenticeship. After working in different shops, he went to Aurora, Ind., becoming Superintendent of the shops of Stedman & Co. He returned to the East when the civil war crippled this business, and in 1867 went to the Corliss Steam Engine Co., Providence, R. I. He was made General Superintendent of these works in 1871. Six years later he went to Milwaukee as General Superintendent of the Reliance works of Edward P. Allis & Co. Soon after his connection with this concern he designed the Reynolds-Corliss engine and later introduced the first triple-expansion pumping engine, the cross compound hoisting engine for mining purposes and a number of other original designs in steam engine development that placed him high in the field of mechanical engineering. He was later instrumental in bringing about the organization of the Allis-Chalmers Co., which took in the Allis works and several others, becoming Second Vice-President and a Director of the new company. Mr. Reynolds was also President of the German-American Bank of Milwaukee, President of the West Allis Malleable Iron & Chain Belt Co., and was the first President of the National Metal Trades Association. He was also a member of many technical societies and clubs, and in 1885 was given the honorary degree of LL.D. by the University of Wisconsin.

Railroad Construction.

New Incorporations, Surveys, Etc.

Acme, Red River & Northern.—The name of this company has been changed to Quanah, Acme & Pacific Railway.

Asheville & East Tennessee.—This company is said to have started work on a line to be built from Asheville, N. C., north thence northeast via Weaverville, Mars Hill and Burnsville to Huntdale, on the Carolina, Clinchfield & Ohio, about 45 miles. Track laid from Asheville on about eight miles. R. S. Howland, General Manager, Asheville.

Billings & Cooke City (Electric).—According to press reports this company is building an electric line from Billings, Mont., southwest to Cooke, near the Yellowstone National Park, about 85 miles. George H. Savage, Secretary and Chief Engineer.

Brockville, Westport & Northwestern.—Application is being made to the Canadian parliament to extend the time for building this company's previously authorized lines.

Canadian Roads.—Application has been made by W. R. Clarke, of Kansas City, Mo., and associates, to the Alberta legislature for a charter to build a line from Edmonton, Alb., north via Lac la Biche to Fort McMurray, on the upper Athabasca river, about 250 miles.

Cleveland, Southwestern & Columbus (Electric).—This company has finished work on the connecting line from the main line at Seville, Ohio, southwest via Ashland to Mansfield, 42 miles, where connection is made with its western lines.

Coal & Coke.—An officer writes, regarding the reports that this company will shortly let contract for building a branch from Gassaway, W. Va., south to the mouth of Wolf creek, that no definite action has yet been taken for the construction of this branch, and it is undecided when anything will be done.

Crow's Nest & Northern.—According to press reports this company will begin work this summer on a line for which surveys have been filed with the British Columbia government, from Crow's Nest, B. C., to coal fields at Crown, 12 miles. J. A. Williams, President, and C. O. Diffenderfer, Chief Engineer, Spokane, Wash. (Dec. 4, p. 1500.)

Denver, Northwestern & Pacific.—The extension from Yampa, Colo., north to Steamboat Springs, 29 miles, has been opened for operation. (Jan. 1, p. 36.)

Des Quinze & Blanche River.—This company is asking for an extension of time for building its authorized lines from Dyment, Ont., on the Temiskaming & Northern Ontario, to the mouth of the Des Quinze river, Quebec, thence to Des Quinze lake. The Bronson Company, Ottawa, who are chiefly interested in this railway, have contracts for construction.

Franklin & Clearfield.—See Lake Shore & Michigan Southern.

Grand Trunk Pacific.—Application is being made to the Canadian Parliament for an act empowering the company to build additional lines of railway as follows:

From a point on the main line west of Pembina Crossing, Alb., in a southwesterly direction to a point near the Embarras river, thence in a southerly direction toward the headwaters of the Little Pembina river, about 100 miles.

From a point on the main line along the Embarras river in a southwesterly direction towards the McLeod river, about 25 miles.

From a point on the authorized line between Calgary, Alb., and Coutts, in a southwesterly direction to McLeod, thence through the Pincher creek vicinity to the western boundary of Alberta, about 100 miles.

Authority is also being sought to issue bonds to the extent of $30,000 per mile.

The Railway Committee has reserved decision on the application of this company for an extension of time until June, 1911, to build 85 miles of the Kitimat branch in British Columbia. The right to build this branch was secured from the Pacific Northern & Ominica Railway, which was granted a charter in 1902 and carries a subsidy of $5,000 a mile.

Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co.—This company has applied for a grant of land under the waters of Cayuga lake, on which to construct an embankment to carry its proposed extension to be built across the northern end of the lake east to Geneva, N. Y. The embankment is to be about a mile long and cost between $180,000 and $200,000.

International & Great Northern.—Surveys are being made by this company at Taylor, Tex., for new switching yards and tracks adjoining the grounds for the site of the new roundhouse and machine shops in southwest Taylor.

Kansas City, Olathe, Ottawa & Iola.—Projected from Kansas City, southwest via Olathe and Ottawa, to Iola. An officer writes that during the past four years three complete surveys have been made for this line. The final location provides that no grade will be above 1 per cent. and no curve greater than 1 deg. Financial arrangements were made last October and the company is now ready to give the first division of 50 miles, between Iola and Ottawa, to the contractors.

Knoxville, Sevierville & Eastern.—Work is said to be under way on the first eight miles of this line projected from Knoxville, Tenn., southeast to Sevierville, 29 miles. Contract reported let to the Revilo Construction Co., of Knoxville. It is expected to have the entire line finished this year. W. A. Seymour, Chief Engineer, Knoxville. (July 17, p. 554.)

Kootenay & Crow's Nest.—This company is seeking a charter from the Alberta government for a line from Crowley, Alb., southeast to a point on the International boundary near Coutts.

La Fayette Railroad.—Surveys made for a line to connect La Fayette, Ga., with the Chattanooga Southern, about four miles. The company wants quotations on a 50,000-gal. water tank, complete with spout; an upright boiler and pump; 375 tons of 60-lb. rails and 90 tons of 56-lb. rails, with angle bars, bolts and spikes, and a 200 or 300 light electric plant complete. J. A. Kauffman, General Manager, La Fayette, Ga.

Lake Shore & Michigan Southern.—An officer writes that track on the Franklin & Clearfield is laid from Brookville, Pa., to Welch Run, about 10 miles, and the Welch Run bridge is about 50 per cent. completed. Track will reach Brookville about July next.

LONDON & NORTH WESTERN.—Application made to incorporate this company to build from London, Ont., west to Sarnia, passing through the townships of Lobo, East Williams, Adelaide, Warwick, Plympton and Sarnia; also from London to a point on Lake Huron, passing through the townships of East Williams, West Williams, McGillivray, Stephen, Hay, Stanley and Goderich, and with power to build branch lines not longer than 15 miles, and not to extend beyond the limits of the counties of Middlesex, Lambton or Huron. Authority is also being sought to build and operate telegraph and telephone lines, etc., such work to be declared for the general advantage of Canada. Ivey & Dromgole, London, Ont., solicitors.

MARSHALL & EAST TEXAS.—Press reports from Marshall, Tex., indicate that negotiations with the city have been satisfactorily completed, and the building of the line to the south is now assured; also that contract was given to Scott & Sons, contractors, St. Louis, Mo., for 12 miles. (Feb. 19, p. 380.)

MISSOURI & NORTH ARKANSAS.—An officer writes that the main line has been completed from Neosho, Mo., to Helena, Ark., and the bridge over White river, consisting of a 300-ft. draw span and two 125-ft. spans with girder and trestle approach, has been completed. Connection will be made with the St. L., I. M. & S., the Y. & M. V. and the I. C. at Helena. Sixty miles of the new line are in the Ozark mountains. Regular train schedule went into effect on March 1.

MISSOURI, OKLAHOMA & GULF.—Work on the line from Lamar, Okla., south to Calvin, 17.1 miles, has been completed and the line opened for operation. (July 3, p. 457.)

MORGANTOWN & DUNKARD VALLEY (ELECTRIC).—At a recent meeting of the stockholders of this company steps were taken to issue at once $300,000 of bonds to cover the cost of construction on 30 miles of line from Morgantown, W. Va., west to Wadestown, six miles north of Mannington. About four miles of the line has been graded. J. A. Miller, Chief Engineer, Morgantown.

NEW CASTLE & NEW WILMINGTON (ELECTRIC).—The Mercer Construction Co., Mercer, Pa., has purchased the charter of this company, including the franchise in New Castle, Pa., and 11 miles of right of way between New Castle and New Wilmington. The line is projected north to Conneaut Lake via Greenville. The main line will be 44 miles long. F. P. Filer, President, Mercer; S. D. Downs, Vice-President, Greenville; L. W. Orr, Secretary and Treasurer, Mercer.

NORFOLK & WESTERN.—Directors of this company recently authorized the construction of seven miles of double track in West Virginia west of Iaeger, and 31 miles between the Ohio river and Columbus, Ohio, at congested points. This work, which is to be begun at once, will include considerable revision of lines and grades. The cost of the improvements will be about $1,225,000.

OCEAN SHORE.—An officer writes that the main line from San Francisco, Cal., south to Santa Cruz, which is to be 78 miles long, is now in operation from San Francisco south to Long Bridge, 38 miles, and from Santa Cruz, north to Scott creek, 14 miles, leaving a gap of about 26 miles on which grading is under way. This work is under contract to Lilly & Heins, and the Humboldt Contracting Co., of Santa Cruz; Graham-Nicholson Contracting & Engineering Co., of San Francisco, and the Ransome-Crummey Co., of Oakland. About eight miles is heavy bluff work, running about 200,000 cu. yds. a mile, and the balance is across open country where work will average about 20,000 cu. yds. a mile. The company has in operation 2½ miles of branch line and 6½ miles of commercial sidings. Nothing further has been done since surveys were made for the proposed branch to be built under the name of the Ocean Shore & Eastern from Santa Cruz, southeast to Watsonville, 19 miles, and from that place under the name of the San Juan Pacific to Hollister, 25 miles. Part of the latter is in operation. Surveys were also made for an additional 200 miles to be built under the name of the San Joaquin Valley from Hollister to Coalinga. (Dec. 4, p. 1501.)

OCEAN SHORE & EASTERN.—See Ocean Shore.

PITTSBURGH, MORGANTOWN & GRAFTON.—Surveys are soon to be started by this company for an electric line to be built from the Pittsburgh, Pa., district, west to points in West Virginia. W. E. Hildebrand, the principal promoter, is quoted as saying that application will shortly be made for a charter, and that the first construction work will be carried out from Washington, Pa., to Marianna, where the mines of the Pittsburgh-Buffalo Coal Co. are located. James Bryan, of the Pittsburgh, Harmony, Butler & New Castle Railway will be the engineer in charge.

QUANAH, ACME & PACIFIC.—See Acme, Red River & Northern.

SAN JOAQUIN VALLEY.—See Ocean Shore.

SAN JUAN PACIFIC.—See Ocean Shore.

SAPULPA & INTERURBAN.—This company is said to have been organized in Oklahoma to build a line from Sapulpa, Okla., southeast via Kiefer to Glenpool, on the Midland Valley Railroad, 10 miles. Five miles additional are to be built at and near Sapulpa, also a line north to new oil fields at Taneha. Contracts are to be let for grading and bridging. The company will erect the overhead work with its own forces. H. E. Clark, President, Glen Campbell, Pa., and D. W. Patton, Chief Engineer, Sapulpa.

SIOUX CITY & SPIRIT LAKE (ELECTRIC).—An officer writes that franchises have been granted by the towns of Le Mars, Paullina, Primghar, Hartley and Spirit Lake. It is expected to begin work early this spring and finish the entire line this year. The projected route is from Sioux City, Iowa, northeast to Spirit Lake, 108 miles. The maximum grade will be less than 1 per cent., with 3 degs. curvature outside of the towns. Contract let to the Westinghouse, Church, Kerr & Co., New York, to build the line. F. Patch, President, and L. F. Wakefield, Chief Engineer, 209 American block, Sioux City. (Oct. 16, p. 1177.)

SOUTHERN PACIFIC.—An officer of the Texas & New Orleans writes that grading is about finished on the extension from Gallatin, Tex., south to Rusk, nine miles. Track laid on two miles. The Suderman-Dolson Co., Galveston, Tex., are the contractors. (Sept. 18, p. 982.)

Building second track between Rockland, Cal., and Colfax, about 30 miles. This second track is on new center line with a maximum grade of 1.5 per cent. compensated.

The San Ramon branch has been extended from San Ramon, Cal., south to Radum, 11 miles.

TENNESSEE COAL, IRON & TIMBER COMPANY.—According to press reports this company, incorporated in Maine with $1,500,000 capital, owns over 50,000 acres of mineral and timber lands in Cumberland and Morgan counties, Tenn. Plans made to build a short railway to connect with the Southern Railway and the Cincinnati, New Orleans & Texas Pacific. The directors include former Governor Curtis Guild, Jr., G. Bolster and W. Whitcomb, all of Boston, Mass.; W. A. Henderson, of Washington, D. C.; S. W. McCall, of Winchester, Mass., and S. Dixon, of Macdonald, W. Va.

TEXAS & NEW ORLEANS.—See Southern Pacific.

TEXAS ROADS.—A charter has been granted in Texas to the company organized by L. E. Walker, J. Lake and others, of Marshall, Tex., to build a line from Marshall south to Port Arthur, about 200 miles. (Oct. 30, p. 1276.)

TUXPAN & FURBERO.—An officer writes that this company is building a line from the Port of Tuxpan, in the state of Vera Cruz, Mex., to Furbero, in the same state, 54 miles. Track has been laid from Tuxpan to Cazones, 20 miles. The work includes one 150-ft. steel bridge. About 1,500 men are now at work and it is expected the line will be finished by June. The company is also putting in a 6-in. pipe line, two pumping stations, also tanks to be finished by July, and expects to begin delivering oil at the Port of Tuxpan in August. Percy N. Furfer, President of the Oil Fields of Mexico Company, and A. C. Payne, General Manager, Mexico City.

VALDEZ & YUKON.—Press reports indicate that a contract has been let for the first 34 miles of this road from Valdez to the Copper river and that construction work will be started not later than May 1.

WASHINGTON, POTOMAC & CHESAPEAKE.—Press reports say that plans are being made for an extension from the present southern terminus at Mechanicsville, Md., southeast to Esperanza, on the St. Mary's side of Drum Point Harbor, 20 miles.

Railroad Financial News.

Baltimore & Ohio.—Principal and interest of the $6,000,000 one-year 5 per cent. notes due March 1, and the $3,660,000 one-year 5 per cent. notes due March 2, were paid.

See Cincinnati, Hamilton & Dayton.

Canadian Northern.—See Duluth, Rainy Lake & Winnipeg.

Canadian Pacific.—The company has sold $3,984,000 common stock, making the total amount outstanding $150,000,000.

President Shaughnessy is quoted as saying that the company has bought "$5,000,000 worth" of Canadian government 3½ per cent. debentures.

Chesapeake & Ohio.—Frank Trumbull has become chairman of the board of directors, and James H. Dooley has been elected a director, succeeding H. T. Wickham. Edwin Hawley, Frank A. Vanderlip, John W. Castles, Frank Trumbull and President George W. Stevens have been appointed an executive committee.

Chicago, Milwaukee & Puget Sound.—See Union Pacific.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, have bought $3,486,000 first and refunding mortgage bonds maturing April 1, 1934.

Chicago Southern.—The security holders' protective committee, consisting of C. D. Smithers, A. G. Hodenpyl, M. B. Johnson, E. K. Boisot and J. E. Blunt, Jr., with Silas W. Howland, Secretary, 24 Broad street, New York, ask the deposit, prior to March 15, of outstanding first mortgage bonds, collateral bonds and syndicate subscription certificates.

Cincinnati, Hamilton & Dayton.—The following is the financial plan of the Cincinnati, Hamilton & Dayton:

The 4 per cent. notes maturing 1913 will be guaranteed principal and interest by the Baltimore & Ohio, and $11,000,000 Pere Marquette common stock, which is held as collateral, will be relinquished.

Holders of the 4½ per cent. notes maturing 1909 will be asked to waive three and one-half years' interest in default.

They will receive in exchange either (1) Baltimore & Ohio 4 per cent. bonds, with coupons detached up to 1915, or (2) an offer of $60 in cash, or (3) some equivalent of this amount maturing in two years' time.

J. P. Morgan & Co. give the Baltimore & Ohio the option to purchase their $8,000,000 Cincinnati, Hamilton & Dayton common stock at 160 in five years. This was the original price J. P. Morgan & Co. paid for the stock. If the B. & O. fails to exercise this option, it will buy the stock in any case after an appraisal at the end of the five-year period.

J. P. Morgan & Co. will retain the $11,000,000 Pere Marquette common under terms of the deal with the 4 per cent. note holders.

Duluth, Rainy Lake & Winnipeg.—The Canadian Northern, it is said, owns the entire capital stock of the Duluth, Rainy Lake & Winnipeg, but has not assumed or guaranteed the bonds.

Erie.—The New York Public Service Commission, Second district, has granted some minor modifications of the order giving the Erie permission to issue $30,000,000 bonds, but it has refused to grant the request that the issue be allowed on the consent of 60 per cent. instead of 90 per cent. of the bondholders.

The time limit for the sale of bonds heretofore authorized is changed from August 1, 1909, to October 1, or such latter date as the commission may prescribe. (Feb. 19, page 346.)

Intercolonial Railway.—On apparently good authority, negotiations are reported pending between Sir Wilfrid Laurier, the Canadian Premier, and the Canadian Northern Railway for a lease of the Intercolonial Railway to the Canadian Northern, on a basis of approximately 2 per cent. on the outstanding Intercolonial securities, the rental to be increased in proportion to increases in earnings of the leased road.

New York, New Haven & Hartford.—See an item in regard to this company under Court News.

New York-Philadelphia Co. (Electric).—A majority of the company's securities has been deposited under the agreement of the protective committee, consisting of John A. Young, W. E. Scarritt and H. W. Whipple, with G. D. Bruce, 2 Rector street, New York, as Secretary. (R. G., March 6, 1908, p. 330.)

Southern Railway.—J. P. Morgan & Co., the First National Bank and the National City Bank, all of New York, are offering $21,333,000 Southern Railway development and general mortgage 4 per cent. (series A) bonds due 1956 at 79. The bankers will accept up to April 1, 1909, at 102½, in payment for the bonds, Southern Railway five-year 5 per cent. collateral bonds maturing April 1, 1909, and carrying the coupon due April 1, 1909. Including the present issue, the total amount of development and general mortgage bonds outstanding is $62,000,000. The mortgage securing the bonds will be, after April 1, a first lien on the following: 765 miles of line; on lease holds or trackage rights on line aggregating 1,085 miles; on the majority of stock of railways aggregating 475 miles; on stocks insuring perpetual right to use freight and passenger terminal properties in 16 cities in the South, and on all future acquisitions of lines built or paid for free from lien with the proceeds of the new bonds.

Stephensville North & South Texas.—A half interest has been sold to St. Louis interests, it is said. The road runs from Stephensville, Tex., to Hamilton, 43 miles.

Union Pacific.—This company has bought a half interest in the Chicago, Milwaukee & Puget Sound's new line from Black River Junction, Wash., to where it crosses the Puyallup river, three miles from Tacoma, 26 miles.

Equipment and Supplies.

CAR BUILDING

The Erie is asking prices on 30 steel underframe express cars.

The Labelle Iron Works is asking prices on 50 seventy-five-ton freight cars.

The Long Island is asking prices on 114 fifty-ton box and 20 fifty-ton gondola cars.

The Atlantic Coast Line is asking prices on two 60-ft. combination mail and express cars.

The Duluth, South Shore & Atlantic has given a contract to the American Car & Foundry Co. for repairing 400 freight cars.

The Canadian Pacific is said to have ordered 500 steel cars from the Dominion Car & Foundry Co. This item is not confirmed.

The Atchison, Topeka & Santa Fe has ordered two 55-ft., all-steel, 200-h.p. gasolene motor cars from the McKeen Motor Car Co.

The Indiana Steel Co., which recently asked prices on 20 fifty-ton slag cars, has decided to postpone indefinitely the purchase of this equipment.

The City Commissioners of Calgary, Alberta, Canada, have given a contract for eight pay-as-you-enter cars to the Ottawa Car Co. and for four of a similar type to the Preston Car & Coach Co.

The Minneapolis & St. Louis, reported in the *Railroad Age Gazette* of February 5 as being in the market for 100 freight cars, has ordered 500 thirty-ton box and 100 forty-ton gondola cars from the Mt. Vernon Car Manufacturing Co.

The Louisiana & Arkansas, reported in the *Railroad Age Gazette* of December 4 as being in the market for car equipment, has ordered two coaches and one combination mail and baggage car from the Barney & Smith Car Co.

The Seattle Electric Company has ordered 30 single-end, combination type cars with end and side doors, through the Stone & Webster Engineering Corporation. These cars will be 47 ft. 8 in. long over the buffers and will have a seating capacity of 55 passengers. The bodies are to be built by the St. Louis Car Co. and will be mounted on type C-50 double trucks made by the Standard Motor Truck Co. The cars will have General Electric No. 80 four-motor equipment and K-28 J type control. National Brake & Electric Co. air brakes will be supplied.

IRON AND STEEL.

The Bettendorf Axle Co., Davenport, Iowa, reported in the *Railroad Age Gazette* of January 22 as being in the market for 1,300 tons of structural steel for a new foundry, has ordered 1,600 tons from George W. Jackson, Inc., Chicago.

The Pittsburgh & Lake Erie, reported in the *Railroad Age Gazette* of January 22 as being in the market for 9,000 tons of rails, has given the contract for these rails, 100-lb. section, to the Carnegie Steel Company. There is no truth in the report that the price was shaded to $25 per ton.

The La Fayette Railroad, J. A. Kauffman, General Manager, La Fayette, Ga., is in the market for 375 tons of 60-lb. rails and 90 tons of 56-lb. rails, with angle bars, bolts and spikes; also a 50,000-gal. water tank complete with spout, an upright boiler and pump, and an electric light plant, complete.

General Conditions in Steel.—All reports indicate that there is to be no variation from the existing price of rails, $28 per ton. There seems to be a general feeling that the railways are holding back orders for finished steel products with the idea that this action will cause a break in rail prices, although manufacturers maintain that there will be no break. It is also supposed that the tariff movement will result in a reduction of import duties and the home market may have to consider this. If railways withhold orders for rails until after a new tariff is fixed, a foreign market will probably have very much to do with the price of rails, especially if the duty is reduced. Requests for cuts in rail prices are said to have been met with similar requests regarding freight rates and both sides maintain that the margin of profit will not permit reduction.

One consequence of the cut in prices of finished steel products has been the announcement by the Lackawanna Steel Co., of a reduction in wages, as follows: "The Lackawanna Steel Co. put into effect on March 1 a reduced scale of wages at its Buffalo works. Common labor was reduced from 14 cents per hour to 12 cents, and other rates were reduced on an average of 10 per cent., with the exception of tonnage men; the latter, owing to the small volume of operations, are already working under substantial reduction."

RAILROAD STRUCTURES.

Fort Wayne, Ind.—According to press reports officials of the Wabash are locating the site of a new freight house to be built here.

Kansas City, Mo.—The Chicago & Alton, Missouri Pacific and Metropolitan Street Railway have submitted plans to James L. Darnell, City Engineer, for the proposed viaduct on Lydia avenue, to cost about $77,000.

Matamoras, Mex.—According to press reports, contract between the National of Mexico, the Mexican Government and the St. Louis, Brownsville & Mexico Railroad for the building of an international bridge across the Rio Grande to connect the two systems of railway, has been formally signed. The plans were approved some time ago by all the interests concerned, and it is said that the material for the bridge has been ordered. The long delay in beginning work on this bridge was due to differences that arose as to its location. The present Matamoras terminus of the National of Mexico is about five miles from the proposed bridge crossing. It is estimated that the bridge will cost more than $500,000.

New York.—The first suspended girder of the new Manhattan bridge over the East river was swung into place this week. It is the intention to have the structure completed and open by December 15, 1909.

St. Louis, Mo.—Press reports indicate that the Missouri, Kansas & Texas has acquired terminal property to be used for storage tracks and a large freight depot.

Taylor, Tex.—See International & Great Northern under Railroad Construction.

Worcester, Mass.—The Boston & Albany has given a contract to Woodbury & Leighton, of 166 Devonshire street, Boston, to put up a new passenger station, to cost about $500,000. The architects are Watson & Huckel, of Philadelphia, Pa., and New York.

SIGNALING.

The Northern Pacific is in the market for automatic block signals for 45 miles of double-track between Tacoma and Seattle. Three-position semaphores giving indications in the upper right-hand quadrant will be used.

French Patents Bill.

The French government has introduced a bill to amend the patent law of the country to insure the adequate working of foreign patents in France. Under the present law, patents may be canceled if not worked at all in France. The principal provision of the new bill is quoted as providing that patent rights shall be held to lapse in the event of failure on the part of the holder either to exercise his right in France or in the French colonies for a period of three years after applying for his certificate, or to resume exercise of after a similar interval; or, secondly, in the event of only partial exercise of the patent in French territory. In the second event, the patent courts will be invested with discretionary power to call upon the holder of the patent to show cause why he should not exercise his rights in French territory "in an adequate degree."

Supply Trade News.

The American Car & Equipment Co., Chicago, has moved its offices from the Monadnock block to 730 Colony building.

The newly organized Duntley Manufacturing Co., Chicago, has taken the whole of the fourth floor of the Plymouth building for its general offices.

The Northwestern Railway Supply Co., 8 South Canal street, Chicago, the incorporation of which was reported in the *Railroad Age Gazette* of January 22, has increased its capital stock from $500 to $25,000.

C. B. Smyth, Assistant Mechanical Engineer of the Union Pacific, has been appointed Superintendent of the McKeen Motor Car Co., Omaha, Neb., and will hereafter devote his entire time to the interests of that company.

The Indianapolis Railway Mail Equipment Co., Indianapolis, Ind., has been incorporated to manufacture and sell railway mail equipment. Capital stock, $100,000. The incorporators are William A. Zumpfe, Ernest L. Killen and George B. Mabin.

Charles W. Waughop, Jr., has been appointed Sales Agent of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., with headquarters at St. Louis. Mr. Waughop will act as the coupler expert of the company in introducing the Excel coupler.

T. Harbert Taylor, 419 Empire building, Atlanta, Ga., has about completed the organization of a railway and mill supply company, to be located in Atlanta, and would like to hear from concerns manufacturing articles handled by railway and mill supply houses.

The H. W. Johns-Manville Co., New York, will rebuild its warehouse and factory recently destroyed by fire at Milwaukee, Wis. H. J. Esser, Architect, Milwaukee, is designing a six-story fireproof structure, to be 50 ft. x 150 ft., and a separate office building.

M. N. Demiejian, 43 White street, New York, wants catalogues of machine tools and miscellaneous railway supplies. He has been in the United States for some months and expects to return to Turkey in a few weeks, where he will act as sales agent for locomotives and other railway equipment and materials.

E. E. Hudson, formerly Manager of Sales of the Battery Supplies Co., Newark, N. J., has been made Manager of Sales of the Primary Battery Department of the Edison Manufacturing Co., Orange, N. J. The Edison company's sales office at 10 Fifth avenue, New York, has been discontinued, and hereafter all communications should be addressed to the main office at Orange.

The Crocker-Wheeler Company, Ampere, N. J., recently booked orders for two 400-k.w., 575-volt, engine-driven railway generators for the city of Edmonton, Canada. An order for eight form W rolling mill motors aggregating 170 h.p. has been placed by the Alliance Machine Co., Alliance, Ohio. A 125-h.p., 230-volt motor to operate a friction saw has just been ordered by Pettibone, Mulliken & Co., Chicago.

The following telegram has been received from the McKeen Motor Car Co., Omaha, Neb.: "An equipment company in Middle West discovered endeavoring to sell two steam motor cars by representing them to be McKeen cars, which is misrepresentation of facts. We do not want our cars misrepresented to the public and will be pleased if you will make mention of this matter in your news columns."

Joel S. Coffin, Vice-President of the American Brake Shoe & Foundry Co., Mahwah, N. J., received, on Saturday last, a tribute from his friends and former associates in the Galena-Signal Oil Co., Franklin, Pa. Galena men from all parts of the country assembled in Mr. Coffin's office, presenting him with a loving cup engraved with their facsimile signatures, also a mahogany office desk and a handsome specially designed ink stand.

Fred A. Poor, who has been in Europe for the past 20 months in charge of the foreign business of the Rail Joint Co., New York, has been placed in charge of the Chicago office of that company, commencing March 1. Prior to going to Europe, Mr. Poor was for several years Western Representative of the Weber Railway Joint Manufacturing Co., a subsidiary company, and before that time was in the engineering department of the Illinois Central.

The February issue of the *T. P. A. Bulletin*, published by the Technical Publicity Association, New York, gives, as usual, an account of the previous monthly meeting, quoting from remarks on advertising by several of those present. The bulletin also announces that a committee has been appointed to make a uniform style of advertising rate card, to be recommended for the use of trade papers. A list is published, showing the technical and trade journals which have submitted to the association reports on their circulation.

E. H. Symington, of the T. H. Symington Co., Baltimore, Md., who last fall completed a second trip around the world for his health, had another break-down in Europe resulting from the serious skull fracture he sustained in Chicago nearly two years ago. John F. Symington, manager of Eastern Sales, who is traveling in Europe on his wedding trip, reports from Berlin that his brother is soon to leave a hospital there in which he has undergone treatment for several months. It may be several more months before Mr. Symington can return to his work in the Railway Exchange building, Chicago.

R. B. Clark, Jr., who has been for the past year in the Chicago office of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., in the capacity of Sales Agent, has been transferred to the New York office in a like capacity, where he will be associated with F. C. Norton at No. 1 Wall street. H. H. Waldron, for a number of years Secretary to W. H. Newman when he was President of the New York Central Lines, and later Secretary to W. J. Wilgus, at that time Vice-President of the New York Central Lines, succeeds Mr. Clark, and will co-operate with F. W. Graves in the Chicago office in the Fisher building.

The Nilson, Miller Co., Hoboken, N. J., has been incorporated with $25,000 capital. The plant is at 1300 Hudson street, in the shop formerly occupied by W. D. Forbes & Co. The company will conduct an engineering and general machine shop business, making a specialty of designing and building, to order, electrical apparatus, gasolene engines, etc., for commercial vehicle, marine and stationary use; also experimental work and special machinery. L. G. Nilson, Chief Engineer of the Strang Gas-Electric Car Co., New York, is President of the new company; he will continue as Consulting Engineer for the Strang company. J. E. Miller is Secretary and Treasurer.

The Ralston Car Works, Ralston, Neb., the incorporation of which was reported in the *Railroad Age Gazette* of February 26, has secured 30 acres of land at Ralston, about six miles from Omaha, and will begin about April 1 the erection of buildings, laying of tracks, etc., for a freight car repairing plant with a capacity of at least 400 cars a month. The plant will be equipped with machinery to make heavy repairs on both wood and steel cars. The general offices of the company will probably be at Omaha until such time as the plant at Ralston is completed. The incorporators are: M. S. Dean, W. J. Lacey, James E. Simons, Harley Parker and C. A. Ralston, all of Chicago; George T. Ross, St. Louis, Mo.; William Hassman, Peoria, Ill., and L. Howard and H. H. Baldrege, of Omaha. The officers of the company have not yet been elected.

William O. Duntley, Vice-President of the Chicago Pneumatic Tool Co., Chicago, has been elected President, succeeding his brother, J. W. Duntley, resigned to become President of the Duntley Manufacturing Co., Chicago. Charles Booth has been elected Vice-President, succeeding Mr. Duntley, and W. A. Mitchell has been elected Assistant Secretary. John R. McGinley, of Pittsburgh, Pa., succeeds Charles M. Schwab as Chairman of the Board. William O. Duntley, whose photograph is reproduced herewith, was born July 21, 1867, at Wyandotte, Mich. In 1884 he began his business career with an electrical company at Detroit, Mich. He went to Chicago in 1887 and has since been identified with different establishments in that city. For a number of years he was engaged in electrical work for Baggot & Co., and in 1895 was appointed Traveling Salesman for the Chicago Pneumatic Tool Co. In 1899 he was elected Vice-President, General Manager and a Director of the tool company. The new officials were elected at a meeting held on February 15.

W. O. Duntley.

TRADE PUBLICATIONS.

Pay-as-you-enter Cars.—The J. G. Brill Co., Philadelphia, Pa., is mailing a 9-in. x 16-in. engraving of a new type pay-as-you-enter car, mounted on Brill No. 27-F2 trucks, 300 of which cars were recently built for the Chicago City Railway Company.

Freight Shipment.—Oelrichs & Co., general agents of the North German Lloyd Steamship Co., 5 Broadway, New York, send a 72-page book entitled "Aid to Shippers," which contains a quantity of information of value to those engaged in the export or import trade. The book includes a table of foreign moneys with United States equivalents; foreign weights, measures, tariffs, custom requirements, etc.

Air Compressors.—Catalogue EE-36, issued by the Ingersoll-

Rand Co., New York, illustrates and describes small power driven air and gas compressors of four types; Class EE-1; Imperial Type XI; Imperial Junior and Imperial Baby. This catalogue is profusely illustrated, printed on heavy paper and contains general information and data which is instructive and valuable to those interested in or operating compressors.

Chloride Accumulators.—The Electric Storage Battery Co., Philadelphia, Pa., has just issued Bulletin No. 112, which contains an interesting and instructive article entitled "The Chloride Accumulator in Iron and Steel Mills." Bulletin No. 110 describes the operation of chloride accumulators in connection with remote control oil switches. These bulletins are 8 in. x 10½ in., printed on heavy paper and design for filing in a loose leaf cover.

Gisholt Turret Lathes for Bar and Chuck Work.

The capacity of the turret lathe has been greatly enlarged in recent years, not only as measured by the amount of metal removed, but in the size of the pieces which it can handle. The Gisholt lathes, here illustrated, are particularly adapted to heavy locomotive work. Fig. 1 shows a 24-in. lathe with 6¼-in. hole in the spindle. This tool is in use at the Chicago shops of the Chicago & North Western. The Rock Island has at its Moline shops a lathe with the same size spindle, but 28-in. swing. The majority of these big bore lathes swing 24 in. and have either a 6¼-in. or a 5-in. hole through the spindle. The illustration shows a large crosshead pin as finished from the solid steel bar. A pin, 11½ in. long, 5½ in. in diameter at the large end and 5 in. rod bearing, has been finished in 45 minutes. This lathe can be used also for finishing the ends of piston rods and other similar large bar work. The drawings in Fig. 2 show some of the various locomotive pins which are finished in this lathe.

By the use of the big bore lathes on circular bars, the cost of forging is elminated, the pieces do not have to be centered, considerable handling of stock is done away with, and calipering is reduced to a minimum. In finishing a large crosshead pin, the steel bar is held in a three-jawed scroll chuck, and three chuck blocks with set screws. The first tool post is used for truing up the end of the bar, and next the roughing box tool on the main turret. The rod bearing and the body for the thread are then finished to exact size by cutters on turret, and the two taper fits into crosshead are finished by another pair of turret cutters. The die head is then used for the thread and the pin is cut off by a cutter in the tool post. The pins may be finished complete or, if desired, the taper portions may be left with sufficient stock so that when wanted for repair purposes they may be finished to the exact size then required. The pins are often made up in this way for store stock.

Fig. 3 shows a 34-in. Gisholt lathe in the Altoona shops of the Pennsylvania Railroad; the tool equipment specially adapted for the finishing of the pieces is shown at the left in the foreground of the engraving. The cost of finishing these pieces on the Gisholt lathe was materially reduced as compared with the work on an ordinary lathe. The finished details here shown include piston centers and bull rings, double eccentrics and crosshead centers.

Fig. 4 illustrates some of the locomotive details which are finished by chuck work on this machine. Concave piston centers are finished in two operations. First, the concave surface is roughed off by cutter

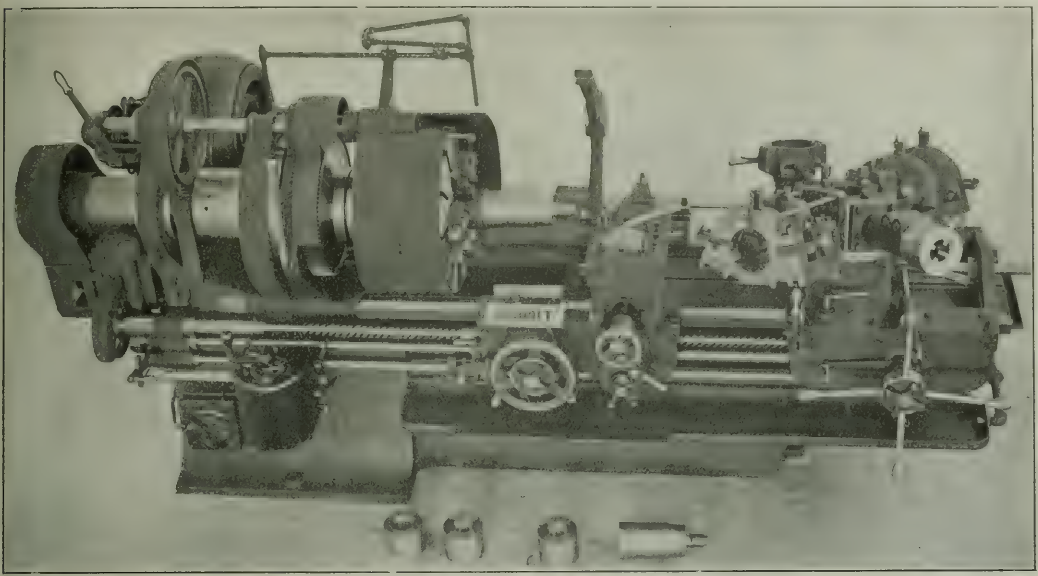


Fig. 1—Gisholt 24-in. Lathe with 6¼ in. Hole.

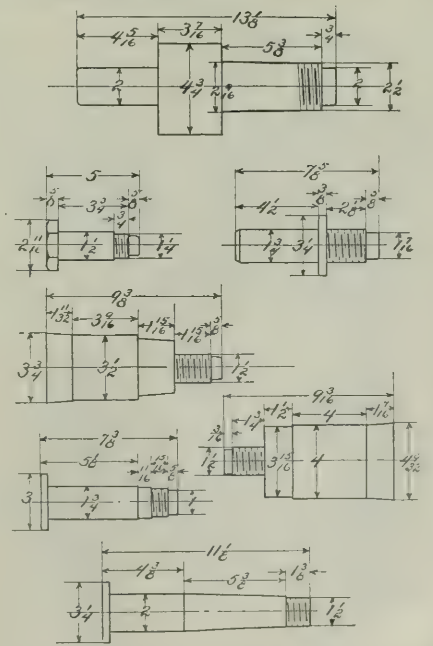


Fig. 2—Bar Work Finished on Gisholt Lathe.

in tool post; the hole is bored rough by one tool and finished by a taper reamer on the turret head. In the second operation, the convex portion of the center is outside in the chuck, but before chucking a taper bushing with a cylindrical hole is inserted so that a spindle can enter it and steady the outside cutters. The outside surface is then roughed by cutter in tool post as before and the exact finish obtained by cutters on the turret. Mechanical officers and foremen have been quick to grasp the advantages of these machines, and they are now found in nearly all the progressive locomotive shops of the country.

The Gisholt Machine Company, Madison, Wis., manufactures also motor-driven horizontal drilling and boring machines, vertical boring mills and universal tool grinders.

Pittsburg Pneumatic Hammers.

The accompanying illustration shows a hammer for chipping, flue beading, calking, etc. This hammer is of the valveless type, with but one moving part which performs the dual function of valve and striking piston. The hammer is designed to be durable and reliable, having substantial dimensions of parts and ample area of direct air passages. As shown in the illustration, the construction is simple and the cycle of operations may be easily followed. Compressed air enters through the port A and maintains a constant pressure against shoulder B on the piston, forcing it backwards until ports C come into communication with the feed port A, when pressure enters the cylinder E

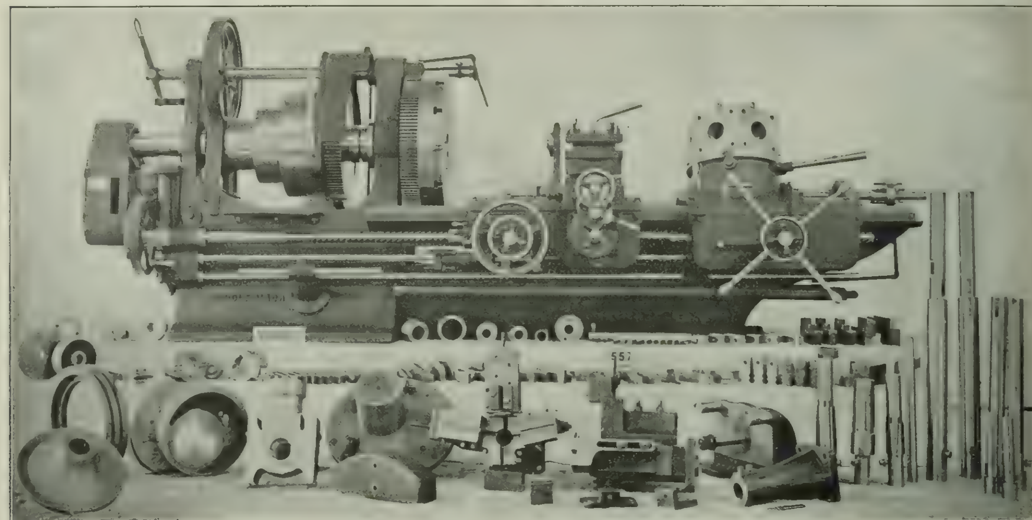


Fig. 3—Gisholt 34-in. Turret Lathe.

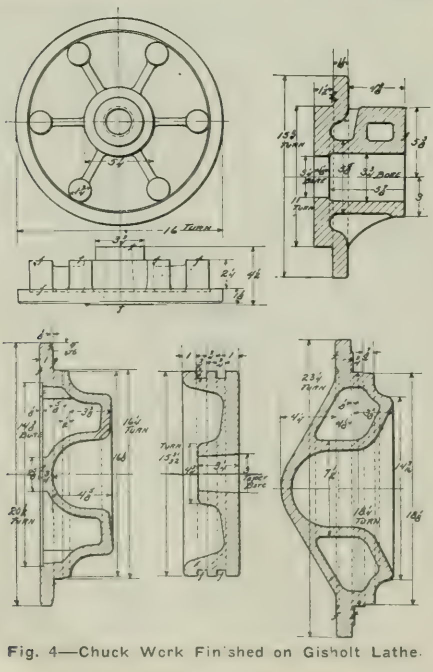
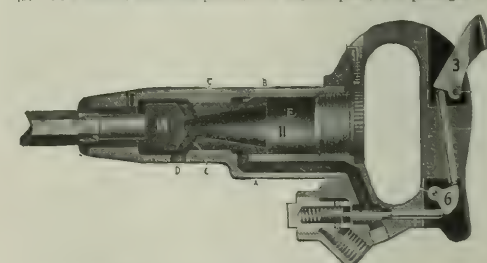


Fig. 4—Chuck Work Finished on Gisholt Lathe.

through the hollow portion of the piston. Acting against the full area of the piston it overcomes the constant pressure on the small shoulder B and drives the piston forward to strike the blow. The piston ports C, coming into communication with the exhaust chamber D in the cylinder, permit the pressure back of the piston to escape to the atmosphere, when the constant pressure on the piston shoulder again moves the piston backward as before. The blows are thus repeated in rapid succession. The piston is returned against an air cushion formed by the pressure admitted through the hollow portion of the piston and vibration is said to be reduced to a minimum.

It will be noted from the position of the air ports and passages that



Pittsburg Pneumatic Hammer.

the hammer takes air behind the piston only during the first quarter of its forward stroke, thus using the air expansively and economically. Similarly to an automatic cut-off engine, it requires ample volume of pressure during the short period of intermittent admission. To insure this requisite volume, larger hose connections are provided than are required for hammers taking air during the entire forward and backward strokes. This hammer can be taken apart and reassembled in a very short time, and no particular skill is required to maintain it in working order.

These hammers are made by the Pittsburg Pneumatic Co., Canton, Ohio.

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CONTENTS

THE DISTRIBUTION OF RAILWAY SHARES.

Now and then in our experience with the rules of political economy, including finance, there develop statistics which seem to invert those rules. They reverse, indeed, not merely the rules but, seemingly, the most ordinary motives of human policy and action. President Harrison—he was afterward President—in the hot political campaign of 1888 made a hit when on the stump he referred to the "men of maxims, not of markets." He went too wide and flung the net of his epigram too far. A maxim is, in truth, but a principle crystallized into brevity. A theory, if sound, is but a maxim enlarged, a principle deduced from facts. Yet now and then we meet with an apparent exception which has to be pretty closely analyzed to prove the rule.

Such an exception that almost reaches the size and quality of a paradox is suggested by the distribution of railway shares during the year 1908. Returns compiled not long ago for 25 prominent railway companies showed an actual increase of the total stock outstanding of only from $2,890,158,997 to $3,000,248,157, or a little less than 4 per cent. During the same period the number of stockholders increased from 211,069 to 252,083, or somewhat more than 19 per cent.—about five times the increase of outstanding stock measured in ratios. The figures, we presume, at least for the most part, cover the fiscal year for the railways that ended June 30, 1908. But even so they covered not only nine months of a panic and depressed twelve-month but a period of civic onslaught on the railways, federal and state. Such an attack reaching all over the country coupled with reduced earnings was the reverse of favorable to railway investment. It is true that it, from one viewpoint, should have induced selling and, in that sense was favorable to distribution. But selling implies buying and to buying the condition was, on its face, distinctly unfavorable—more so indeed than to selling for, in the psychology of investment, the owner has the "hold on" impulse while the buyer is apt to be conservative and timid. Again, during a time of depression, if new stock is issued the shareholder is likely to take up his stock rather than sell his "rights" low and thus depression, to a degree, resists distribution. The only real distributive force has been the exchange of convertible bonds for stock. But that force has been minor and modified by the fact that the stockholder and convertible bondholder have often been one.

Let us take a concrete case to illustrate the situation. The New York, New Haven & Hartford company during the calendar year 1908 has had no bonds convertible within that time. It has suffered like other roads from the industrial stagnation, in fact more than most of them as tapping intensified factory territory. It has been the object of attack by the federal authorities and of both legislative and judicial attack in Massachusetts—an attack reaching at times a most violent character. Yet during the calendar year 1908 its stockholders have increased, as we are informed authoritatively, about 2,000, or some 14 per cent.; and in Massachusetts, alone, where a majority of its stockholders live and where a plurality of its shares, as compared with other states, is held, the number of stockholders has increased about 900, or more than 12 per cent. And no one will contend for a moment that such a road as the New Haven with its relatively paltry sales in the market is in any degree affected by speculative distribution of shares.

In seeking the causes of distribution of conservative railway ownership against conditions so adverse one is forced back to underlying and fundamental facts which, fully appraised, are the most cheering sign and symptom of the general railway situation. Time—by which we mean past time—and experience have been on the side of the railways. The railways have assumed in the mind of the investor an institutional character. As an investment class they have paid him well in spite of incidental evils of "high" finance. Indeed, in not a few cases, he has been a beneficiary of that high finance which he may not, himself, as a fiscal moralist, approve. He has seen also that the railways have been subject to no such hydraulics as have poured their floods into the industrials and the street railways. As an outcome of all these elements combined the railways acquired a kind of investment momentum that held confidence through adversity. When railway stocks fell the old railway investor naturally bought them first and advised his friends to do so. The contrast is shown by comparison with the industrials which, as a whole, have been much less under civic attack than the railways. While 25 railways, as stated, increased their stockholders 19 per cent., 41 industrials, some of them conservative, increased their stockholders only from 296,292 to 322,277, or less than 9 per cent. Railway stock distribution in ratio was more than double that of the industrials and, of course, among a much more conservative and retentive class.

Besides its suggestion of momentum and confidence through hard times the wide distribution of railway shares has a deeper and a public meaning. The shareholder, if he happens to belong to the right gender votes and influences other votes. His increase and expansion, anatomically speaking, denotes in the body politic a set of fiscal nerves at once more ramified and more sensitive. He creates fresh local "interests" which

must be reckoned with by legislatures collectively and the politician individually. The stockholder was heard from in a national election last autumn. There were elections before that and there will be more.

IMPROVED STEELS.

The steel trade journals report recent improvements in the methods of steel manufacture which result in products so superior to the regular grades that they have peculiar interest to railways which are large consumers of steel. The electric furnace is rapidly coming into use as an important factor in steel manufacture, and where water power is abundant and fuel is scarce it is extending the boundaries which have for a long time confined the iron and steel districts. Experience with the electric furnace in foreign countries has shown that it will purify the metal to a larger extent than the gas furnace or the Bessemer converter, and it is proposed to use it as an adjunct to the ordinary processes of steel manufacture for the purpose of reducing the amount of phosphorus and sulphur and to deoxidize the bath. After a careful investigation by its metallurgists, the United States Steel Corporation has decided to use a 15-ton Heroult electric furnace at the South Chicago works. Three-phase alternating current will be used, and it is proposed to refine the blown metal from the Bessemer converter in the Heroult furnace, reducing the percentage of phosphorus and sulphur, and to use the product for high grade steel rails. The capacity of one furnace is sufficient for the production of 500 tons of steel in 24 hours. By this method it may be found possible to produce low phosphorus rails at the Bessemer works without resorting to the very expensive measure of substituting the open hearth furnace. This experiment will be made at the South Chicago works during the coming summer.

The Heroult steel refining furnace is of the crucible type with a tilting rack. The heating is initially affected by means of the electric arc which forms between the surface of the slagging materials which float on the metal bath and the two massive carbon electrodes which are suspended above it. The impurities of the steel are removed by renewing the slag. The refining operation thus becomes a "washing out" one. Heroult claims that with this furnace iron or steel of any degree of impurity can be refined, and from the purified metal a steel of any desired composition can be produced by the addition of the necessary amount of carburite and other ferro-alloys.

Another interesting item relates to the developments which are rapidly taking place in the manufacture of high speed steel. The Sheffield, England, steel makers were not satisfied to pay tribute to the Taylor-White Company, and they have been experimenting with various alloys and heat treatments and have succeeded in producing a tool steel which in some qualities surpasses those previously made. While the extravagant reports in regard to the cutting power of this new steel may not be found to be entirely correct, yet it is well attested that English manufacturers have succeeded in making a high speed tool steel which has a longer endurance when cutting hard material with the cutting edge at red heat, and it will not crack when plunged into water. Tool steel makers in this country are also improving their product, and there is a prospect of such active competition on both sides of the Atlantic that the railways may soon be able to buy high speed steel at lower prices.

Vanadium steel is used in large quantities by the automobile manufacturers on account of its superior strength, which allows lighter sections to be used. This quality should recommend it for the machinery of locomotives, especially the reciprocating parts, which are often heavier than is necessary, even when made of ordinary carbon steel. If these parts were designed so that the working stresses had the same factor of safety with relation to the elastic limit of vanadium steel, as for the steel generally used, their weight could be materially reduced. Nickel steel for railway purposes has been a disappointment, both for rails and for machinery, and there appears to be a better prospect for vanadium steel. These high grade steels cost more money per pound, but there are places in railway structures where the parts are subject to constant vibration, to alternating stresses or to violent shocks, where they may be substituted for carbon steel and in the end not prove so expensive.

The increase in elastic limit obtained by the use of expensive alloys in spring steel is of little advantage except that it prolongs the life of the spring, for with such material under the same load the ratio of fiber stress to elastic limit is materially less. In the tests made at the Baldwin Locomotive Works on the effect of different methods of tempering the results showed that while the elastic limit was materially increased it had little effect on the modulus of elasticity. As the deflection under a given load bears a direct relation to the modulus of elasticity it is evident that the deflection under a given load cannot be changed by hard or soft tempering. It is also clear that alloy steels which tend to increase the elastic limit cannot result in a reduction in the number of plates or the weight of the spring. Though the elastic limit may be 50 or 100 per cent. greater than that of ordinary spring steel, duplicate springs will act alike under equal loads. The advantage of the improved alloy spring steel must, therefore, be in prolonged life and not in any reduction in weight.

THE SPOKANE RATE CASE.

The decision of the Interstate Commerce Commission in the Spokane rate case raises directly the vitally important questions, what constitutes a reasonable rate; what profit railways are economically and legally entitled to earn on interstate traffic; and what is the basis on which that profit should be computed.

The city of Spokane complained against the rates of the Northern Pacific, the Great Northern and the Union Pacific for two distinct reasons: (1) It was alleged that the rates from the East were unjustly discriminatory against Spokane because they were higher than the rates of the same roads to the Pacific coast terminal point, Seattle. (2) It was also alleged that the rates to Spokane were inherently unreasonable. The commission held that water competition, under the decisions of the United States Supreme Court, entitled Seattle to lower rates than Spokane. But it ordered the rates to Spokane reduced for the second cause alleged, viz., that these rates were inherently unreasonable in that they enabled the carriers to earn profits which were expressly held to be excessive.

Since a comparatively small portion of the profits of the roads are derived from traffic to Spokane, it must follow, if the rates to Spokane are unreasonable *per se*, that the rates to other inland points, such as Denver and Salt Lake City, which are on much the same basis, also are inherently unreasonable and should also be reduced; and the commission as good as says that this is its opinion. But, as the commission concedes, water competition is controlling at coast terminal points, and would be pretty sure to force reductions to the coast corresponding to any made to intermediate points. So the probable effect of the order, if upheld and enforced, would be to leave the relations between rates to different localities practically as they are now, but to reduce in proportion to the reductions to Spokane rates to all coast terminal points, and to all points that directly or indirectly base on coast terminals. The shippers at intermediate points would continue to be at the same relative disadvantage as now in competing with jobbers at the coast; but all would gain something at the expense of the railways. The result would be a greater curtailment of revenues than any group of roads has ever suffered in consequence of the act of any public authority. The reduction in

net revenues would be almost exactly the same as the reduction in gross earnings, which would amount to many millions of dollars; for there would be no resulting reduction in operating expenses, and the articles that would be affected are such that lower rates would cause no perceptible increase in the volume of traffic.

The opinion, which was written by Commissioner Prouty, shows that the commission spared no pains to render a decision that would be in harmony with the views that have been expressed by the Supreme Court of the United States upholding the legal right of railways to discriminate between localities where the circumstances and conditions are substantially dissimilar. It seems rather doubtful if the opinion and order can be successfully attacked solely on the ground that compliance would compel the roads to so discriminate against any locality as to deprive it of any fair advantage that geographical and commercial conditions and the law give to it. As the decision turns on the alleged inherent unreasonableness of the rates made by the railways and the alleged excessiveness of their profits, so, it would seem, must any successful resistance to it be based mainly on the proposition that the rates and profits of the railways in the past have been inherently reasonable and that compliance with the commission's order would so reduce them as to make them unreasonably low *per se*.

The decision is open to attack from the economic standpoint on the ground that the commission takes a wrong view as to what constitutes a reasonable rate. Railway traffic managers in this country, and many of the leaders of thought on railway economics, have contended that rates should be adjusted to what the traffic will bear—on the value of the service. On this basis the transcontinental rate system is easily defensible. All kinds of traffic move freely long distances on the rates fixed by the railways. Far from being a hindrance to the development of the West, the transcontinental rate system has been one of the most potent forces in furthering its wonderful progress and fostering its great prosperity. The railways in that section suffered much adversity up to 10 years ago. During the past decade Great Northern, the Northern Pacific, the Union Pacific, the Southern Pacific, the Santa Fe, have prospered with the rest of the part of the country through which they run. But it cannot be said that their change from adversity to prosperity has been due to high rates. Their rates are not as high as ten years ago. The increase in the gross earnings of the roads is due to the increase in the density of their traffic—in other words, to the increase in the amount of the service that they render to the public. The increase in their net earnings has been largely due to the enterprise and skill with which they have been managed. Each of the roads mentioned has taken many millions of dollars of its earnings and spent them on additions and permanent improvements, so that to-day they not only render more service to the public than ever before, but render better service, both passenger and freight, at the same or less cost to the shipper and the traveler.

Now, can rates be properly held to be inherently unreasonable on which the traffic moves easily; which are low as compared with other rates for similar service throughout the world, and for which much better service is rendered than ever before? If rates are to be held inherently unreasonable because the roads making them are earning large profits, will not a damper be put on enterprise and skill in railway management? What incentive will the management of a road have to seek to build up a large traffic by skilful adjustment of rates; to attract travel by giving the best and safest service; to reduce operating expenses by constantly experimenting with and adopting new and improved appliances, if all profits above a certain maximum—say 4 or 6 per cent.—are to be appropriated by the public by reductions in rates? Such a policy would put a premium on stagnant, imbecile railway management. The Supreme Court of the United States said, in the case of Covington, etc., Turnpike Co. *vs.* Sandford: "If a corporation cannot maintain such a highway and earn dividends for stockholders, it is a misfortune for it and them which the Constitution does not require to be remedied by imposing unjust burdens upon the public." But if a public service corporation can be restrained from exacting exorbitant charges from the public, even if without making such charges it cannot earn a profit, does it not seem that it should follow, that so long as it does not impose unjust burdens by making exorbitant charges, public authorities should be restrained from attacking its rates on the ground that they regard its profits as too large?

Whether, in view of some of its past decisions and contemporary tendencies in the regulation of public utility corporations, the Supreme Court of the United States could be induced to take the view here expressed of what constitutes reasonableness in rates, is open to serious doubt. If it shall be finally held that the true criterion of the reasonableness of rates is the amount of profit that the railways charging them earn, the questions of what percentage of profit a railway is entitled to, and on what basis that profit must be calculated, will have to be definitely fought out, and in some ways the Spokane case would be a good one in which to fight these issues out to a definite conclusion. It is clear that the Interstate commission, in common with most of the state commissions, believes that railways should be restricted to a rather small percentage of return on the value of their properties. In the Spokane case the Great Northern and Northern Pacific introduced a large amount of testimony to show that on the basis of the bare estimated present cost of reproducing their physical properties their earnings are not excessive. The commission conceded that the estimates submitted probably were not far wrong. Nevertheless, it practically ignored them in its decision. It explicitly refused to say whether it regarded the present estimated cost of reproduction of the properties as the proper basis of valuation, but at the same time it broadly intimated that it did not believe that the roads are entitled to earn a return on the present value of real estate which cost them much less than its present value, or perhaps nothing at all. Every state commission that has tried to make a valuation has found that the original cost of construction of the older and larger roads is unascertainable. If, then, the appraisal of the physical property is not to be taken as the basis of valuation of the physical properties, what basis is to be taken? Does the Interstate commission favor the Texas policy of so reducing rates as to confiscate the so-called "unearned increment" and intangible values of railways, and then taxing the roads on what has been confiscated?

It is quite true, as the commission intimates, that if rates are to be based on the rapidly increasing value of the physical properties, rather than on the value of the service, rates in course of time may become much higher than they are now. That, unquestionably is one of the drawbacks of the theory of valuation—which, by the way, is being advocated by the commission, not by the railways. But the proposition to deny to the railways the right to earn a profit on the 'unearned increment" of tneir real estate is simply a proposition to apply the single tax theory of Henry George to the transportation industry alone. It is a proposition to confiscate as much of the value of the real property of the railways as the public may be unwilling to let them retain while letting other owners of real estate enjoy the full benefit of its increase in value. Can this be done under a Constitution that frowns on class legislation and expressly prohibits the taking of private property without just compensation? If the courts finally hold that the reasonableness of rates is to be measured by the profits of the railways, it is hard to see how they can fail to hold also that the proper basis of valuation is the estimated present cost of reproducing the physical properties for railway purposes, with reasonable additions for skill in management and density of traffic; and that the proper percentage

of profit to be allowed is the average percentage of profit earned in other large businesses against which the roads have to compete in the money market for new capital.

If only the reductions in rates specifically required by the commission should be made an unfair discrimination would result in favor of Spokane as against other cities. If all the reductions should be made that the commission clearly foresaw its order probably would compel, even the strongest roads in transcontinental territory would be hard hit, and their weaker competitors would suffer severely. The commission suggests to the carriers that if they can offer any other scheme of readjustment than that indicated in the decision the commission will be glad to give it consideration. No doubt the carriers will submit some plan. The decision is so sweeping in its probable effects, and the principles involved are so important that if some basis of agreement is not reached the courts probably will be appealed to. The resulting litigation probably would exert a profound influence on future regulation of railways.

DELAWARE, LACKAWANNA & WESTERN.

The policy of the Delaware, Lackawanna & Western in accumulating a considerable surplus of anthracite coal during 1908 is in line with that of other coal companies, and should form one of the strongest arguments against a strike by the anthracite mine workers. The total tons of coal sold by the Lackawanna during 1908 was less by 700,000 tons than during the previous year, and as the production was about the same as in 1907, the increase in stocks of coal on hand is about represented by the decrease in tons sold, so that as President Truesdale points out in his annual report, "should there be such suspension [as in 1906] of mining operations, it will be readily seen that the accumulated stocks of coal will be required to amply protect consumers pending the resumption of work;" and as will also be seen, a suspension of work by miners would be in a sense a gain for the coal companies.

The fact that the Delaware, Lackawanna & Western is so large a carrier of anthracite coal, and such a large part of its earnings come either from the transportation or the mining and sale of coal, prevents its showing, in the full year of business depression, 1908, from forecasting the showing to be made by other companies. Total operating revenue amounted to $32,898,495 last year, as compared with $37,264,473 in the previous year, and of this revenue, $14,558,703 was from transportation of coal in 1908 and $14,361,416 in 1907, the earnings from the coal department amounting to $4,166,793 in 1908 and $4,224,921 in the previous year, so that the total income from coal operations was to $18,725,496 in 1908, and $18,586,337 in 1907. These figures do not exactly show the effect of the business depression, as President Truesdale says: "The increase in revenue derived from the transportation of coal was not due to the total tonnage of coal moved during the year being larger than in 1907—in fact, it was slightly less—but in part to the change in the accounting methods previously referred to and to the further fact that a larger proportion of the total tonnage was moved to terminal points west and north, where the haul was longer and the earnings per ton larger. The shipments to tidewater were smaller than during the previous year. The coal moving to tidewater markets earns about 25 per cent. less per ton than that moving to western and northern markets."

The unique position of the Lackawanna as a railway company, without bonds, and with but $26,000,000 capital stock, and a surplus after paying 20 per cent. dividends of $5,457,125 in a year of great business depression, made it possible for the management to pursue an almost diametrical opposite course from that taken by the majority of the managers of other railways.

Construction on the second tunnel through Bergen hill just west of Hoboken, N. J., was carried on without the least interruption from financial causes, and the Lackawanna Railroad Company of New Jersey was incorporated and began building the new cut-off line between Slateford, Pa., and Port Morris, N. J. This cut-off, which saves about 11 miles and materially reduces grades and eliminates curves, was described in the review of the annual report of the Lackawanna published in the *Railroad Gazette*, April 24, 1908. It is estimated that the cut-off will cost between $8,000,000 and $9,000,000, and will require about three years to build, the funds being advanced from the surplus of the D. L. & W., and no plan for permanent financing having as yet been decided on.

Another evidence of the strength of the company is shown in the expenditures for maintenance. The total expenses in 1908 were $18,623,655, as compared with $21,539,739 in 1907, and the expenditure for maintenance of way and structures was $3,343,396, or about $1,641,000 less than the sum shown under the same general heading for the year 1907. The change in accounting methods, however, just about accounts for this decrease, since under the practice of several years, $1,172,121 charged last year to additions and betterments would have been charged to maintenance of way and structures. Maintenance of equipment cost $4,747,700 last year, an increase of $1,016,619 over 1907, but part of this increase is explained by the requirement of the Interstate Commerce Commission of a depre-

Delaware, Lackawanna & Western.

ciation charge. The following table shows the unit costs of maintenance, the mileage operated includes all first, second, third, etc., track and one-half switches and sidings:

	1908.
Maintenance of way per mile, owned and operated. .	1,711
Average cost of repairs per locomotive	1,703
Average cost of repairs per passenger-train car.	603
Average cost of repairs per freight-train car.	54

These figures cannot be properly compared with figures given for 1907. The sums spent for repairs are low as compared with other roads operating in the same territory, not because the Lackawanna neglects proper maintenance of equipment, but because its rolling stock is in splendid condition, and therefore needs comparatively few repairs. Forty-nine locomotives, 26 passenger cars, 10 milk cars, 100 refrigerator cars and 300 steel hopper cars were bought or built at a cost of $1,266,549. This cost was charged to replacement account, and left a credit balance at the close of the year of $91,772 to this account.

The reduction in transportation expenses is largely explained by changes in accounting methods.

The principal additions and betterments expenditures were for the new passenger station at Scranton, $601,781 being charged to this account last year, and for the new locomotive shops and machinery at Scranton, $641,986 being charged to this account. There was also $286,708 spent for new piers at Jersey City. The building of these piers consists largely of iron and concrete work, and covers a portion of an extensive system of diagonal docks and warehouses, located on and served by a broad ship canal, and when com-

pleted will give the company valuable terminal facilities for transhipment of freight in connection with both harbor and ocean water carriers.

Traffic statistics show that the average distance a ton of coal was carried was 190 miles, an increase of 10 miles over the already extraordinarily long haul of 180 miles in the previous year. The average distance carried for merchandise freight remained nearly the same as in 1907, being 169 miles last year. The average rate on coal per ton per mile was 0.861 cents last year as against 0.848 cents in the previous year, while the average rate on merchandise freight per ton per mile was 0.708 cents as against 0.682. This higher rate for coal than for merchandise freight is a noticeable exception to the rates on most other roads in this country. The average train load of 484 tons last year and 490 tons in 1907 is low as compared with soft coalers. The Chesapeake & Ohio, for instance, has an average train load of 621 tons.

The tonnage of nearly all commodities was less in 1908 than in 1907, with two rather surprising exceptions. There were 1,018,872 tons of bituminous coal carried last year as compared to 948,146 tons in the previous year, and there were 739,682 tons of cement, brick and lime carried in 1908 as against 592,817 tons in the previous year. These two commodities ordinarily show very quickly any falling off in manufactures and business, and it is rather hard to explain why the tonnage carried by the Lackawanna should increase in a year of business depression, unless it is, that last year the Lackawanna was able to get a comparatively larger proportion of this tonnage than its competitors.

In predicting better times ahead for the Lackawanna, President Truesdale says: "There is little doubt but what the great drop in railway traffic and earnings has proven an object lesson to the large and influential element in our national and state politics which for some years has been vigorously engaged in promoting their political ambitions by extreme railway agitation and legislation, the effect of which has been to undermine the standing and credit of the railways of the country. A sudden and decided halt appears to have been called in the anti-railway crusade which has so actively been carried on during the past three years, and many recent indications point to the fact that this strange and unaccountable craze has at last run its course for the time being at least."

The following table shows the results of operation for the year ended December 31, 1908, as compared with 1907. The figures for 1907 have not been rearranged to correspond to the form of accounts prescribed by the Interstate Commerce Commission and used in 1908:

	1908.	1907.
Average mileage operated....	957	957
Coal transportation revenue	$14,558,703	$14,361,416
Mdse. freight revenue	9,850,008	12,235,808
Passenger revenue	6,449,032	6,757,596
Total operating revenue	32,898,495	37,264,473
Maint. way and structures.	3,343,396	4,974,888
Maint. of equipment	4,747,700	3,731,082
Traffic*	569,398	....
Transportation	9,312,645	12,254,278
Total operating expenses	18,623,655	21,539,739
Net rev., outside operations†.	155,899	....
Taxes	1,180,800	1,349,700
Net revenue	13,249,939	14,375,034
Gross income	18,930,191	19,540,189
Net income	13,478,728	13,909,415
Renewals and betterments....	2,781,603	3,820,088
Dividends	5,240,000	5,240,000
Surplus	5,457,125	4,849,327

*Included in transportation expenses in 1907.
†Not shown separately in 1907.

NEW PUBLICATIONS.

Social Engineering. A record of things done by American Industrialists, employing upwards of a million and a half people. By William H. Tolman, Ph.D., Social Engineer, with an introduction by Andrew Carnegie. 384 pages; 6 in. x 9¼ in. Published by the McGraw Publishing Co., New York; 1909. Price, $2.

Dr. Tolman, who is the director of the American Museum of Safety, the secretary of the American Section of the International Congress of Improved Dwellings, a corresponding member of the Imperial Technological Museum of Vienna, etc., has made a profound and far-reaching study of social life in industrial establishments, and the book at hand, covering the results of his researches, is an extremely interesting work. The book is written from the standpoint of promoting industrial efficiency by keeping in good working condition the human machines, and the chapters cover such topics as: The Opportunity for Specialized Education; Educational Trips; Factory Councils; Club Houses; Night Schools; Hygiene; Safety and Security; Benefit Associations; Pensions; Co-operative Committees; Savings and Loan Associations; Housing; Recreations, and the broader topic of communal or social betterment. But these topics give a very inadequate idea of the scope of the work covered. A better idea can be given by mentioning the fact that something like 1,700 suggestions, ideas and incidents of actual industrial welfare-practice are clearly and carefully indexed in the back of the book. The author has perhaps a wider acquaintance than anyone living with the general subject of the promotion of industrial efficiency through all kinds of things that come under the scope of welfare work; and his book at no time gives the impression of being the work of a dreamer or of an impractical man, because it is confined to these concise statements of actual practice, well illustrated and with the minimum of extraneous comment. We are inclined to think that there are very few large employers who could not get ideas with a definite money value from this book.

Letters to the Editor.

THE SPOKANE CASE.

New York, March 8, 1909.

To the Editor of the Railroad Age Gazette:

The Supreme Court of the United States settled finally, in the so-called Social Circle cases, that if competition exists at the more distant point which controls the rate at that point, the long and short haul clause of the Act to regulate commerce is not violated by charging a higher rate at an intermediate point. In the Spokane case, the Interstate Commerce Commission has shown a wholesome fear of going contrary to this ruling, but nevertheless gets around it. The Supreme Court held that a lower rate might apply to the more distant point, but threw the burden of proof, as to how much lower that rate should be, on the railway company.

The Interstate Commerce Commission now says in effect to the Northern Pacific: "A lower rate to Spokane than to Seattle is reasonable, but your lower rate is unreasonable, in that it affords more than a fair return on the investment." In this argument there are two things to be determined. What is a fair return on the investment, and what is the investment? The Interstate Commerce Commission discusses original investment and cost of reproduction in a manner intended to convince the reader that the Northern Pacific and the Great Northern are heavily overcapitalized, but it does not decide whether the investment should include the unearned increment resulting from the present location of the Northern Pacific, and its value as a going concern. It, however, assumes in a general, casual sort of way, for purposes of fixing a rate, that it will take the two roads at their own valuation. Surely it is fully as important to know what the investment is on which a fair return must be earned, as to settle the fairness of a given rate of return.

The vague and rather cryptic way in which the commission disclaims any intention of disbursing to the public the surplus of the Northern Pacific suggests the logical conclusion that the Northern Pacific has a right to earn a fair return on this surplus as invested, regardless of whether the surplus was originally earned from fair rates or unfair rates. This seems the just attitude toward the question. It makes no difference how the company originally obtained the funds

which it has invested in its property. The investment as it now stands should earn a fair amount.

The Public, spelled with a capital P, may have paid what the Interstate Commerce Commission now thinks is too high a rate in the past. The excess earnings of the company were invested in the property, and all the public of to-day has got a right to demand is that rates shall not be so high as to return an excessive rate on the whole investment. It is none of the public's business, so far as fixing rates is concerned, as to where the money for the investment came from. There has been no moral wrong committed against the public of to-day by the railway company of to-day, even if the railway company of the past exacted excessive fares from the public of the past. The property of the railway company, and the rights of shippers have both passed to innocent third parties, and the company, by accumulating a surplus and investing it in the property, is not in any sense stealing from the shipper of to-day. It simply in the past directed the use of funds to which at that time it had undisputed right, and those funds have an inherent right to a fair return.

As to the capitalization of the unearned increment, it has been capitalized in every other form of public and private business. It would appear a vast injustice that it should not be capitalized in the railway business. In the Consolidated Gas case recently decided by the Supreme Court of the United States, the court held that the gas company's property could be properly capitalized *as it stood*. It did not attempt to take away the unearned increment accruing to the company from its situation in New York city, nor should the Interstate Commerce Commission take away the unearned increment accruing to the Northern Pacific through the growth of the country which it serves. It is the height of injustice to render valueless the foresight and genius that has gone into the location and building up of the Northern Pacific.

TRAFFIC MAN.

LOCAL FREIGHT OFFICE EFFICIENCY AND THE DEPRESSING INFLUENCE OF THE CIVIL ENGINEER.

To the Editor of the Railroad Age Gazette:

In your grand paper of last week, Charles R. French was bold enough to open up a subject that I have been 20 years waiting for, and that is the numbing effect of an engineer's education which makes him a defective superintendent. He believes that twice two is four, because he can prove it; that excellence of design, material and workmanship in track structures and rolling stock gets safety, economy and efficiency. He can prove this on the drawing board and by statistics. But dealing solely with material things and mathematical niceties is apt to make him bigoted. With men of initiative and imagination he gets cross; calls them promoters, or inventors.

As a railway superintendent he works out this way: He can see that a brick yard, or a shingle mill, can be established on his division and make money if he will make a rate that will move its product 50 miles. To him, "it's the rate that moves the freight" seems to be a sound mathematical proposition. But when he is asked by the local freight agent to consider a change in the freight service that will give a manufacturer a larger zone for his sales; or teaming facilities to save his customers' time and money; he is like the man from Missouri: "You've got to show me," said the man from Missouri, "and you can't." The engineer superintendent is not generally the man to learn that it is the quality of service, rather than the rate, that moves the freight.

The engineer is a great man. The industrial success, the wonderful prosperity of this, the richest country in the world, is largely due to him. I am mentioning his one small defect: he is bigoted: He can look at structural propositions in the large, but the equation of human wants, weaknesses and tastes has variables and unknown quantities that he can't comfortably and exactly fill in from his table of natural sines, so they do not interest him. This defect shows itself when we try to find a civil engineer who has become President, Senator, Congressman, Governor, Assemblyman, or Mayor. Perhaps there are such, but I do not know of them.

I am mentioning to you the one quality in the engineer-superintendent that I don't like, and I thank Mr. French for opening the subject.

LOCAL FREIGHT AGENT.

HOW MANY ENGINEERS BECOME SUPERINTENDENTS?

To the Editor of the Railroad Age Gazette:

Referring to the article written by Charles R. French for your publication of March 5, on page 465:

I gather from his statements that he blames the shortcomings at local freight stations largely to the alleged fact that superintendents are promoted from the Maintenance of Way Department and are consequently only informed upon mathematical, engineering and kindred subjects. Without debating the merits of superintendents having such a foundation for official training and duties, it would be interesting to uncover the extent to which this was really true; in other words, to see what proportion of the superintendents on the railways in the United States actually did meet the specifications.

ENGINEER.

[This could be ascertained as to general, but not divisional, superintendents by study of the "Biographical Dictionary of Railway Officials," which we publish and consent to sell to all comers. But it is not necessary. Mr. French was in error except as to practice on the Pennsylvania Lines. Nine out of thirteen of the Pennsylvania general superintendents, and more than half of their division superintendents, have had engineering education and experience. On other lines it is quite generally true that superintendents earn their promotion entirely in the operating department. This does not necessarily mean that the Pennsylvania "leans" to the civil engineer. Their system is the admirable one of encouraging educated young men to come in the service and be watched. When a young man shows ability in any department he is given a chance to change and learn thoroughly. It is not an unnatural result that in the working out of this system a large percentage of efficient officers should be found among those whose preliminary education was in the most precise and accurate of all the professions.—Editor.]

Contributed Papers.

LOCAL FREIGHT OFFICE EFFICIENCY, FROM THE VIEWPOINT OF THE GENERAL FREIGHT OFFICE.

BY CHARLES R. FRENCH.

II.

As the present law requires that a bill of lading be issued for every shipment, and when bills of lading are issued and out of the hands of railways they are negotiable documents, good for the value of the articles specified on their face, all bills of lading should be carefully checked with the goods before they are signed. Bill of lading clerks should refuse to sign any bills of lading not having the "O. K." of the check clerk. Too much care cannot be taken in this regard.

To facilitate loading and prevent mixing up the loading gangs, it is well, if possible, to load freight for only one direction in the forenoon and the opposite direction in the afternoon. This will have to be governed largely by the leaving time of the trains which pick up the warehouse cars. Shippers will be glad to co-operate with the agent if the proposition is properly put to them.

In loading local or way cars from which freight will be "peddled" to various stations, care should be taken to so load

the freight that shipments for stations may be taken out of the cars practically in station order, first out nearest the door and last out in the ends of the cars. This will save much time and annoyance and not a few "over" and "short" reports, as the train crews will not waste any time looking for packages buried beneath freight for other stations. Such loading is not the easiest, but by the exercise of a little care it can be accomplished and the results will show that it is time well expended.

Particular attention should be given to the loading of fragile and light pieces or packages, so that heavy freight will not fall on them or be skidded against such articles and crush them. Do not stack packages up to the car roof and be surprised if they fall over in transit and break or damage themselves and other freight in the car. Rather spread such packages out one, two or three tiers high and, if their nature will permit it, load other and lighter freight on top of them.

Every railway has issued circulars regarding the practice of loading hides, oil, fertilizer and similar articles in cars other than the ones provided for that traffic, and it is comparatively a rare thing that such loading is encountered. But a word here will not be amiss. When this class of freight is loaded into a new car the odor will remain for months, and the car is not fit for any other class of freight. Such shipments should be held until a proper car is provided for them.

In many of the freight offices no effort at all is made to file tariffs and in others the filing is done in a half-hearted way, so that no good results from the time devoted to it, and when rates are wanted the division freight office is asked for the rate by wire. This burdens the telegraph wires with unnecessary business, takes up the time of the division freight office, delays the billing of the shipment on which the rate is wanted, and unless memorandum billing is issued or the shipment held causes an "over" report to issue.

A simple, comprehensive tariff filing system would obviate all this and make the hunt for rates a pleasure. Such a system, uniform in every local freight office of a railway, could be easily installed.

Heretofore tariffs have been of all sizes, shapes and kinds and their filing in anything approximating order has been a difficult thing. The Interstate Commerce Commission has partly lessened this difficulty by decreeing that all tariffs should be after a pattern adopted by that body. All new tariffs must conform to their requirements, so that in a short time all tariffs will be uniform.

In considering a filing system three things are necessary—a comprehensive index, adaptability to any line of tariffs, quickness in locating the desired rate. Considering these points, a card index appears to most nearly cover the requirements, being easily accessible, easily kept, and having the added value of carrying no "dead" matter in it. When a tariff is canceled, the cards referring to it may be taken out and destroyed or filed in a "dead" file.

These cards should show the tariff number, date effective, commodity on which the tariff applies and the territory to and from which the tariff applies. The index should show, first, the tariff by numbers; second, by commodities, and, third, by territories, so that having any one item, number, commodity, or territory, the proper tariff may at once be located.

If a file of canceled tariffs is kept, when a tariff is canceled, note on the card corresponding to it the date of cancelation, by what authority, and if superseded by another tariff, the number of the superseding tariff, filing the card in the "dead" file.

The tariffs may be kept in a cabinet having a number of compartments of suitable size and labeled numerically, or in such manner as in the opinion of the agent will render reference to them most easy.

Another method of filing tariff sheets and pamphlets, but which will not lend itself to the larger book tariffs, is that of pasting them into a large invoice book and cross-indexing, as above, in the index provided in the book. Either system will render reference to the tariffs an easy matter, provided the file is kept up-to-date. This can be done with very little work if it is done at the time the tariff is received, but if they are allowed to accumulate it becomes burdensome. Be on the job.

The writer recently, while traffic manager for a manufacturing concern, used a system of cards, alphabetically arranged and divided by states, on which he compiled the rates to practically every important city in the United States, Canada and Mexico, basing on Philadelphia. The original work was very tedious, but after it was completed caused very little work to keep it up-to-date. This file was used entirely as a basis for quotation of prices, yet it might easily be made to serve as a labor-saving device in a local office.

Unless a tariff is carefully perused, properly understood and accurately handled, many and costly errors are likely to be made. If careful inspection of a tariff does not make it clear, it should not be used until it has been interpreted and is fully intelligible. When once understood, care is the only thing necessary to use with it.

The bill clerk will find it a great help and saver of time if he will note the percentage divisions of through rates in the spaces usually left in the tariff between the name of the town and the state:

				Basis— Boston.	New York.	Delivering line.
ADRIAN,	P. R.R. 40%		*Mich.*	15	12	Wabash.
	P. CO. 45%			15	12	D., T. & I.
	D., T. & I. 15%			15	12	L.S. & M.S.
AKRON	P. R.R. 40%	P. R.R. 35%	*Ohio*	10	8	B. & O.
	P. CO. 40%	P. CO. 45%		10	8	C., A. & C.
	C., T. & V., 20%	C., A. & C. 20%		10	8	C., T. & V.
				10	..	Erie.

thus making reference to the percentage sheets for every shipment unnecessary.

The agent at a station which the writer frequently visited has prepared a complete table of percentage divisions of rates applying from his station in book form, showing the division of each rate under each percentage for the six classes and also on all existing commodity rates. This is the only station at which the writer has seen such a thing attempted, and it was of considerable interest to him.

Instead of having to stop to figure out each percentage division of a rate every time it is used, all that is necessary at this station is to turn to the page indicated by the percentage division and the base number, then to the class or commodity on which division of rate is desired, and copy the figures. It is such an ingenious idea and such a great labor saver that the writer wonders it has not been copied broadcast. In addition to the saving of time, the chance of making errors in figuring divisions of rates is eliminated entirely, and it certainly will increase the efficiency of the billing force. An idea of the arrangement of the book follows:

Base No. 75.	1.	2.	3.	4.	5.	6.
3.3 per cent.....	.066	.0561	.0462	.0363	.033	.0264
4.5 per cent......	.090	.0765	.0610	.0495	.045	.0362

With the tariffs fixed, showing the percentages, as above described, and the percentage divisions of rates figured out and made up in book form, the bill clerk should be in excellent shape for high-pressure work.

A system successfully used in the billing room at one station frequented by the writer was as follows:

Of three bill clerks, one was appointed chief; all shipping memos came to him from the check clerk; each memo was routed, rated and the billing point entered by him, together with the divisions of through rates where necessary. For this purpose he used a rubber stamp reading:

BILL TO...
VIA........................ at...................

Memos were then turned over to the bill clerks for billing, the chief helping also with the billing when he had finished routing and rating all memos.

In the morning the first duty of the chief bill clerk was to go over the press copies of the previous day's billing, check

up each waybill with the memo. and order corrections made for all errors detected, keeping a list of the errors made by each man, which record was posted each month in the office. He then prepared a classified tonnage report for the agent, showing carload and less carload business separately, total tonnage and total revenue outbound for the day.

The writer was informed that the number of errors charged against his station in the billing room had been cut down over 75 per cent. since the adoption of this system.

In billing, the easiest way is always the best. Do not crowd and scheme to get a large number of items on a small sheet; think of the man who has to check from that bill; make your billing plain; use room enough to make it easily read; make your figures plain; abbreviate only such words as lend themselves to easy translation and use the accepted abbreviations only. The writer has frequently seen billing where the letter "b" was used promiscuously for box, barrel, bag and bundle. Every agent has received waybills that were absolutely unintelligible and knows how he felt about the fellow who made them; do not let such waybills go out of your office. Should a shipping memo. be illegible, do not guess at it, but take time to find out what the memo. calls for.

The errors charged against each station by the auditor, superintendent or general freight agent and the sarcasm expended in calling attention to them, is a thing no agent particularly enjoys, especially as he has not made them himself. He has to take the blame for them, however, and concerns himself with plans for reducing their number the following month or the employment of drastic measures if they are not reduced.

The most practical means for reducing the number of errors seems to be a system of counter checking, charging the errors made (only those which get beyond the office and on which it is necessary to issue corrections) against the party making them, and the publication of the record each month showing the number of errors made by each employee, compared with his record of the preceding month, and, if possible, the same month of the previous year. Comment is not necessary, as each man's performance is its own commendation or condemnation; if it be good, he is justly proud of it, and resolves that it shall stay that way; if it be poor, he is ashamed of it, and makes up his mind to "show somebody something next month," which he generally does by cutting down his total.

Such a system puts every man on his mettle; every man knows the record of every other man and his pride makes him want that record to be good. Errors can not be avoided entirely, but the carelessness existing in many offices is responsible for numberless mistakes which are unnecessary and which it has been proven can, with ordinary precaution, be prevented.

There is not a freight station in the country at which the agent will admit having sufficient help. And in many cases the help allowed is insufficient. The writer has noticed, however, that little or no effort is made by the agent to economize his force and to so arrange his work that the best results may be obtained. Many stations now rushed to death could, with no additional help, handle much more work than they are now handling, by simply rearranging the work. Where a more economical adjustment of the office work will not solve the problem and relieve an office, additional help should be asked for and insisted upon. If, as should be the case, the business of the station shows an increase, the superintendent's attention should be called to the fact, as should that of the division or general freight office, together with any other good arguments that present themselves. Do not present a request for more help with poor reasons or insufficient cause, the superintendent must be shown that it is needed, as he must show officials higher up. So many good positions are open to experienced railway men outside the railway service that if the railways are to keep their best men the old practice of working them eighteen hours a day can not be continued.

In many offices telegraph operators are stationed whose spare time is unemployed, and who could be utilized to good advantage, having the effect of adding one more clerk. This should be presented to the superintendent, with information showing the need of additional help and the extent of idle time which the operator has, and no difficulty should be experienced in obtaining the use of the operator's time.

In other offices the yardmaster, or some department other than the freight department, may be usurping the time and attention of one or more of the freight office force; an appeal to the superintendent will speedily remedy such usurpation. Many an agent stands for such proceedings, being too timid to object. A certain college student paraphrased a well-known Latin passage into—"All gall is divided into three parts, Nerve, Brass and Sand." An agent needs all three in his business, and if he is too timid to stand up for his rights he has no business in the service.

The station records should include daily tonnage, revenue and classified carload reports, both inbound and outbound, and these records should be totaled once a month at least, and compared with the same period of the previous year and the increase and decrease shown. If the superintendent does not require such a detailed report it is a good thing to have on file, for it makes a good weapon to use for improvements, additional help, etc.; besides, one never knows when such information may be requested, and it is always good policy to be prepared.

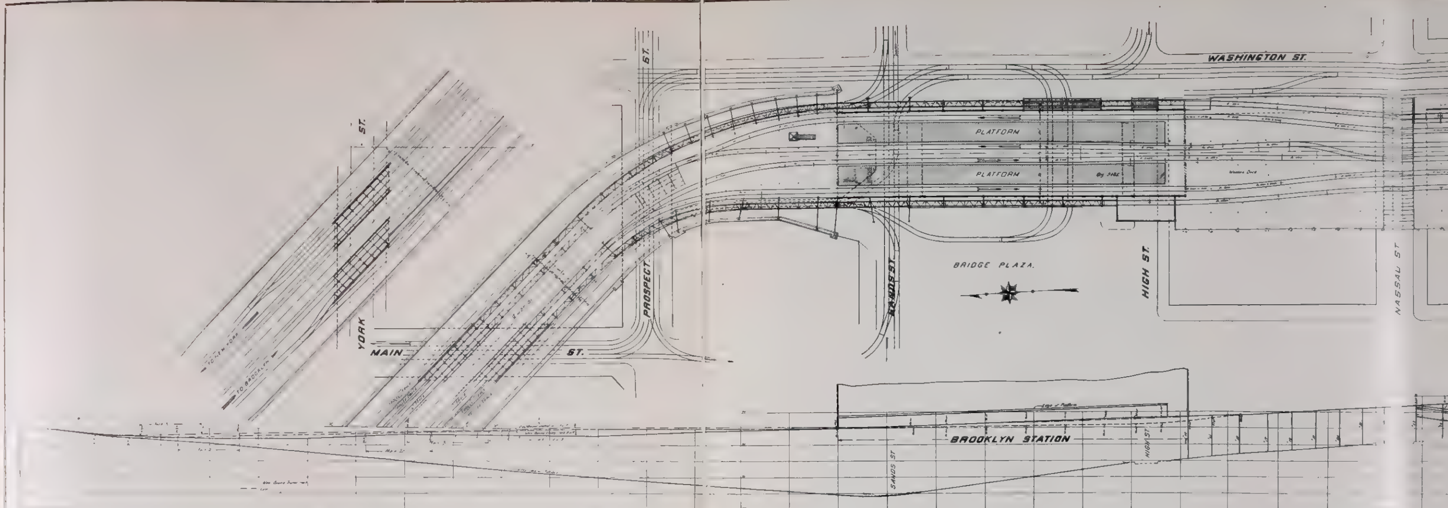
A very convenient thing, both for use in the local office and for the information of the general office, is a list of shippers and consignees, showing track accommodations, switching charges, approximate amount of business per year, most convenient delivery, etc. A few of the larger stations have issued such lists, but smaller stations have not done so, perhaps from a mistaken idea that such information is not wanted. Anything that makes for the benefit or improvement of the service is wanted.

In meeting and doing business with the representatives of foreign lines and the traffic managers of industrial concerns, they should be treated with all the courtesy possible, but they have no authority over the agent and have not the right to interfere with him in the discharge of his duties, nor to give him orders. Agents at smaller stations are apt to feel that these men have this right, and will allow themselves to be led into doing things which the representatives have no right to ask. Such representatives bear about the same relation to an agent as a shipper or consignee and are entitled to the same consideration and no more.

When a customer does not understand the working of a proceeding you are forced to take time, stop and explain it to him and try to satisfy him that it is correct. Railroading is not a thing that can be picked up over night, but requires years of careful training. Therefore, do not be surprised or show disgust if your customer does not grasp the gist of your explanation at once—remember how you worked and sweated in an effort to understand a much simpler matter when you first took up railroading; remember also how many years you have been trying to understand these things yourself and how little you really know about them even now.

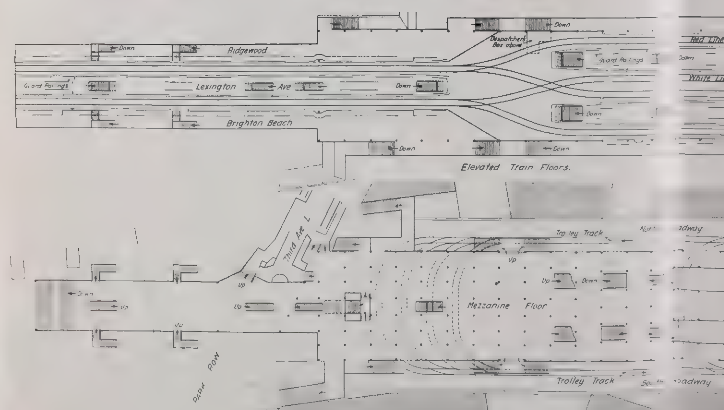
Had the officers and agents of railways taken a little more care to see that the public was enlightened as to the everyday working of railway matters and had not rebuffed almost every effort for information, it is doubtful if they would be to-day facing a situation full of distrust, suspicion, resentment and adverse legislation.

The switching engines on the Danish State railway, with few exceptions, have no fireman, the engineman doing the firing. These engines are small and their boilers are low, making it comparatively easy to keep a look-out.

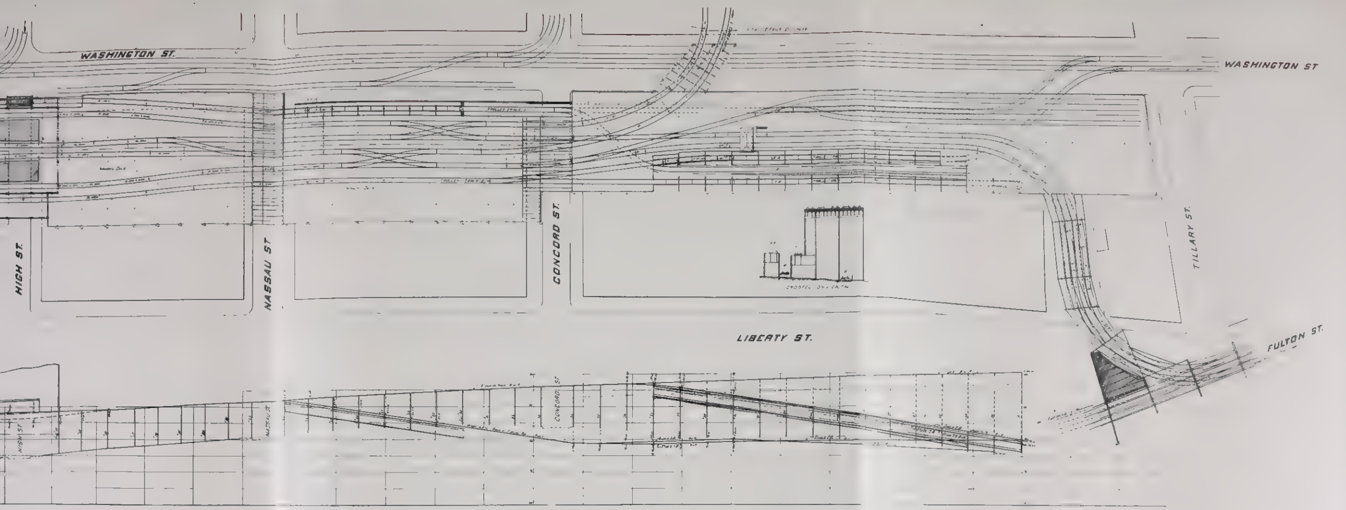


Brooklyn Yard and Station.

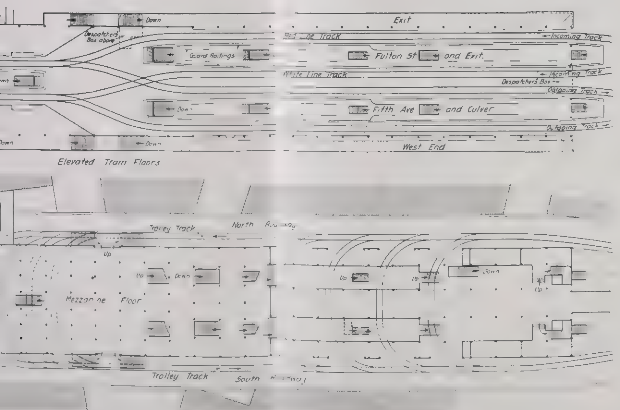
Track Model in Despatcher's Box in the Manhattan Terminal.



Manhattan Terminal; Brooklyn Bridge.



Brooklyn Yard and Station.



Ground and Mezzanine Floors.

Manhattan Terminal; Brooklyn Bridge.

Brooklyn Yard and Station; Looking West from Despatcher's Tower.

Manhattan Bridge, now under construction, is seen in the distance.

TRAFFIC ON THE BROOKLYN BRIDGE, NEW YORK CITY.

BY F. VAN Z. LANE, C.E.
Assistant Engineer in Charge of Traffic, Department of Bridges, City of New York.

[WITH AN INSET.]

The Bridge Department of the City of New York and the Brooklyn Rapid Transit Company have completed the transit improvements which were begun on January 27, 1908, when through elevated train service replaced the shuttle service over the Brooklyn bridge. As a result of these improvements, the present operation of elevated trains and surface cars over the bridge is probably as good an example of high class railway operation as can be found anywhere when traffic density, capacity, safety, comfort, speed and uniform operation are considered together.

From a traffic standpoint, the Manhattan terminal, the Brooklyn bridge and the Brooklyn yard must be considered as parts of a span, for each depends upon the other in considering the fundamental traffic problem. All three were worked up to, and must now be maintained at, their respective maximum capacities to have a maximum elevated train and surface car movement between Manhattan and Brooklyn. As the evening rush hour, from 5 to 6 p.m., presents the greatest problem, this period will be considered in emphasizing some of the features that make this capacity traffic movement possible. The elevated train and surface car operations present two distinct and independent kinds of service and they will be treated separately.

ELEVATED TRAIN SERVICE.

The elevated train service over the Brooklyn bridge during the hour from 5 to 6 p.m. consists of 6-car multiple control trains, operated from nine different points in Brooklyn, entering the Brooklyn yard over two tracks, where they are routed and despatched to Manhattan over the single westbound track on the bridge. On entering the Manhattan terminal, all trains are run on one of two tracks, served by two unloading platforms. After unloading, the trains are switched to one of six loading platforms, from which they are despatched to Brooklyn over the single eastbound track on the bridge to the Brooklyn yard, where they are separated and despatched to their various destinations over two eastbound tracks. It will be readily seen, therefore, that the Brooklyn yard, the bridge and the Manhattan terminal each plays an important part in the transportation problem and that a small delay within the limits of any one of these three will have a serious effect on the others. During the rush period, the schedule maintains a continual line of trains under one-minute headway. The trains entering the Brooklyn yard are brought in from nine different points and despatched so as to operate over a single track across the bridge.

The capacity of the Brooklyn bridge determines the capacity of the terminal. The railway is at present operating 61 trains per hour in each direction over the bridge, and the entire traffic problem is based upon this figure. The block signal system, which was installed under the direction of the New York Department of Bridges by the Union Switch and Signal Co., Swissvale, Pa., was described in the *Railroad Age Gazette* of August 28, 1908. The word capacity in this connection bears a direct relation to the other mentioned fundamental features; those of safety, comfort, speed and consistency. Of these, safety must be given first consideration, and it is this that has determined the bridge capacity. At present the terminal and yard are consistently up to the bridge capacity.

The Manhattan terminal, shown on the accompanying inset, consists of three floors. The ground floor, or surface car level, is 580 ft. long x 135 ft. wide; the second, or mezzanine, is 515 ft. long x 91 ft. wide on an average; the third, or elevated train floor, is 780 ft. long x 91 ft. wide on an average. Within the limits of this terminal, some 61 six-car elevated trains from nine different lines and over 300 surface cars from 16 lines, carry about 50,000 people during the rush hour from 5 to 6 p.m., 42,000 of which are going in one direction. The first, or surface level, is devoted entirely to surface cars. The mezzanine floor acts as a distributor to the elevated train platforms on the floor above. Tickets are purchased on this mezzanine floor and also deposited in one of the several chopping boxes which control the entrances to the several platform stairways. By this arrangement, all passengers who have reached the elevated train floor are not further concerned regarding their tickets. The train floor consists of a gauntlet track layout, with six loading platforms and one purely unloading platform, while one of the loading platforms is also used for unloading trains. Three of the loading platforms are of the island design.

The problem of bringing this elevated train terminal up to the capacity of the bridge during the rush hour period did not necessitate the providing of more tracks, but rather merely the altering of them, so as to have a freer movement of trains as well as to provide for a quick unloading, loading and starting of the train. This latter consideration is probably the secret of the maximum train operation obtained. Since the despatcher at all times knows the position of the trains on the road, he can obtain the maximum efficiency in train movement if conditions permit his moving the train at the proper time. As the platforms of the Manhattan terminal are always crowded during the rush period, in order to have a train leave on the despatcher's signal, provision must be made for closing the train gates a few seconds previous to the time of starting the train. This is accomplished through a system of guard railings, seen on the accompanying plan of this floor, which make narrow passageways along which passengers must move. These also permit closing the train gates when the cars are filled. Through the system of the despatcher's signals to the guards, these gates are closed a few seconds before the time of starting the train. This provides time for the conductor's bell signal, indicating that train gates are closed, to be passed from the rear of the train to the motorman by the time the despatcher is ready for the train to start.

On account of variations in stairway and roof column locations in arranging the guard railings on the loading platforms, each opening had to be treated independently, and often each presented a different problem. Generally, however, a double row of railings was installed, the second row overlapping the openings of the first, which prevent a possible crowding from the rear. The space between these railings is about four feet and the passengers form in double column as they advance toward the entrance of the cars. This arrangement assists very materially in the loading of trains in a minimum time, which is necessary in order to maintain the schedule of 61 trains per hour.

It is not always possible to place the trains of a given line on the same side of an island platform and in order to avoid confusion, an electric announcer is installed on all island platforms. This signal is controlled by the despatcher, who signals to the platform guards and the passengers are thus permitted to arrange themselves in case of trains being placed other than their accustomed position. All trains are announced by hand operated semaphore arms, which indicate both the name of the line and the track on which the train will be placed for loading. The racks which house these arms are located in the center of the platforms, and an announcer is connected to the despatcher's office. In addition to these train indicators, illuminated glass signs on the respective platform display markers corresponding with those carried on the leading car of a train. The switches and semaphores in the Manhattan terminal are electro-pneumatically controlled from two different towers, the locations of which are shown in the accompanying plan. The incoming and out-

going switches are thrown by the despatcher in the tower at the entrance of the terminal who decides upon the location of every train. The switches which control the tracks into the pockets in the west end of the terminal are controlled from the small tower near the crossover. These switches as well as all others in connection with the bridge operation are equipped with electric detector locking instead of mechanical detector bars.

Illuminated track models showing the two tracks across the bridge are placed in the despatcher's towers in the Manhattan terminal and also in the Brooklyn station. The fronts of the models are of glass and divided into sections, each representing one track section on the bridge. Each model contains 78 sections, each of which is lighted by a one-c.p. 55-volt incandescent lamp. Each section indicates, when lighted, that the corresponding track section is not occupied. When, however, any section remains dark, it indicates to the towerman that the corresponding track section on the bridge is occupied by a train. Signals corresponding to those on the bridge are painted on the model in their proper positions, the whole arrangement presenting to the towerman the entire layout in miniature. These models were designed and installed by the Union Switch & Signal Co., in conjunction with the block signal installation. By this arrangement, the despatchers know at all times the exact position of those trains which are not in the terminal or in sight of the towers. In addition to controlling the movement of all outgoing and incoming switches, the despatcher in the Manhattan terminal sounds all signals for the movement of trains in the terminal. This despatcher has two assistants, one who operates the blue platform lights and the train announcer, and the other who is in telegraphic and telephonic communication with the rest of the line in Brooklyn. This man also records the arriving and leaving time of all trains.

The trains are operated on a schedule which must be maintained, since only a small delay will cause a number of passengers to gather on the loading platforms, making it necessary to close the iron gates which control the entrances to the platforms. The solution has been the supplying of a large number of trains and keeping them moving as fast as the passengers arrive.

In case of a breakdown on any line, a so-called gap train is sent to the Manhattan terminal to replace the disabled train, as it is necessary to provide immediate accommodation for the passengers who have gathered on any one platform. There are three of these gap trains held in readiness in the Brooklyn yard, and are put into service by the Brooklyn despatcher.

All ticket booths in the Manhattan terminal are equipped with signals which may be used to announce the necessary cessation of ticket selling, when it becomes advisable to temporarily stop the entrance to the loading platforms, resulting from the delay of any train. In case of a prolonged delay, the passengers who have gotten to the loading platform may be transferred to the surface lines on the ground floor. This same plan is also used in the Brooklyn station in case of a block on the westbound track over the bridge.

With the old arrangement of gauntlet tracks over the bridge, the destination in the Manhattan terminal of all trains, was decided upon by the despatcher in the Brooklyn yard, and this at a disadvantage, as he could not quickly learn of the exact position of the trains in the Manhattan terminal. In the present arrangement of single tracks over the bridge provision is made for the final destination of trains in the Manhattan terminal by the despatcher located there, so that the jurisdiction of the despatcher in the Brooklyn yard terminates after he has successfully sent all trains through the Brooklyn station.

The present plan of operation permits 61 six-car trains per hour to cross the Brooklyn bridge in each direction, or 122 trains per hour through the Brooklyn yard, which schedule must be maintained during the rush hours in the morning and evening.

SURFACE CAR SERVICE.

The surface cars of 16 different lines converge at the bridge and are operated over a single westbound track on the north roadway of the bridge to the ground floor of the Manhattan terminal. On the first level of this terminal, as shown in the accompanying plan, are eight loops where the surface cars discharge and receive their passengers. The cars are then returned to Brooklyn over a single eastbound track on the south roadway of the bridge.

The Manhattan terminal and the Brooklyn exit and entrance must be considered, as well as the bridge itself, in attaining and maintaining capacity service over the surface lines. The loops in the terminal and the tracks on the bridge can be maintained at their capacity only by a construction which prohibits a congestion of cars, such as formerly resulted on the Brooklyn side. This congestion was caused by vehicles which use the same thoroughfares to and from Brooklyn as the car lines. During the rush hour periods, more than 300 cars, and nearly as many vehicles entered and left each roadway of the bridge at Sands street, where there were several tracks crossing each other. This new arrangement was put in operation on September 28, 1908, and not only relieves the congestion at the entrance of the bridge, but has resulted in cutting down the running time of cars while on the bridge about 33⅓ per cent. At present these cars run from the Manhattan terminal to Tillary street, Brooklyn, in the same time that it formerly required to make a trip from the Manhattan terminal to Sands street and they make the round trip from Tillary street to Manhattan terminal in 18 minutes.

Reference to the plan and elevation of the Brooklyn yard and station shows the arrangement of tracks. Formerly all surface cars entered and left the bridge at Sands street. This brought them into contact with the cars and vehicles approaching and leaving the bridge resulting in a slow movement in both directions, which affected the entire system. To overcome this, additions were made to the yard structures, which provided additional tracks from a point near the Brooklyn anchorage to continue part of the surface cars on the yard structure, over Sands street, through the yard to a point beyond Concord street before returning them to the surface. In like manner some of the cars are delivered to the bridge at the Brooklyn anchorage from Concord street.

The Coney Island & Brooklyn Railroad, which operates 16 per cent. of the cars over the bridge, was formerly responsible for about 50 per cent. of the delays. These delays were due mainly to poor equipment, but at the present time this equipment is in first class repair and the percentage of delays caused by the cars of this company does not exceed the percentage of its cars operated over the bridge, which condition should be maintained by all lines.

The remedying of these two defects, that of relieving congestion of surface lines by running part of the cars over the yard structure and that of keeping equipment in first class repair, together with a regulation prohibiting heavily laden vehicles from crossing the bridge during rush hours has done most toward bringing the surface car service on the bridge up to capacity. The average number of cars operated during the rush hour increased from 221 in February, 1907, to 319 during the same period in 1909. The delays due to defective equipment have been reduced from 456 minutes in February, 1907, to 136 minutes in February, 1909. There were 93,437 surface cars operated over the bridge in February, 1907, which makes 44 seconds per 100 cars, while there were 112,078 cars operated in February, 1909, which makes but 7¼ seconds per 100 cars. This is considered a remarkable showing. It is now possible to operate over 300 surface cars per hour through the Manhattan terminal by running at a fairly high rate of speed, but if this speed is exceeded, collision with

other cars or with vehicles is possible. As many as 357 cars have been operated over the bridge per hour.

The locating of several inspectors and police on the terminal and roadways has also had much to do with the smooth operation of these cars. These inspectors keep the vehicles in the roadway, as well as seeing to it that motormen maintain their cars at the best possible speed. Boxes containing wrecking tools, fuses, etc., are located at the end of the bridge at the towers and anchorages and push cars are distributed at frequent intervals to be used in case of breakdown. Provision is also made for promptly removing disabled or dead horses from the bridge. Telephones installed in each tower permit immediate communication with the despatching boxes in case of trouble. The track on the north roadway has been continued some 30 ft. beyond the last loop and disabled westbound cars may be laid up on this track while awaiting the arrival of a wrecker or for a quieter period during which to move them to the shops. Former practice in this regard was to use the last loop for this purpose, but this proved poor practice, since it resulted in taking that loop out of the service and causing a great deal of confusion among the passengers, with consequent delay to cars.

The surface car terminal on the ground level in the Manhattan, consists of eight loops between the north and south roadway. The loops are sufficiently long to accommodate two cars, one on each side, leaving a passageway along the center line of the bridge for the use of pedestrains on their way to the promenade. The four lower loops are close together and the loading and unloading is carried out simultaneously on account of the limited space between them. The upper loops are further apart, which permits the north side to be used for unloading, and the south side for loading. The main problem of operation on this level is to keep the loops free so that a car will not block the main line. In order to accomplish this, the starter is located so that he can see all incoming trains and he notifies by signal the inspector on each loop when a car is approaching. The inspector then sees to it that any cars which may be standing there are sent out. Through this arrangement, these loops will accommodate about 58 cars per hour. The first one of the upper loops is used for the bridge local, a surface car which makes a round trip between the Brooklyn and Manhattan terminals. Entrance to the cars on this line is controlled by an enclosure and all tickets are purchased before entering.

The difficulties in the transportation problem here involved can be best understood from these figures. Of the 300,000 passengers carried over the bridge every 24 hours, 50,000 of them go during the rush hour from 5 to 6 p.m., moving in one direction. To meet this demand an average of 61 six-car elevated trains, and an average of 305 surface cars leave the Manhattan terminal during the rush hour from 5 to 6 p.m., or a total of 671 cars per hour. The excellent results shown were obtained by the co-operation of the Brooklyn Heights Railroad Company and the Department of Bridges of which James W. Stevenson is the commissioner and C. M. Ingersoll was chief engineer.

HANDLING COMPLETE BRIDGE SPANS.

The Lehigh & New England has just rebuilt its single-track bridge over the Delaware river at Portland, Pa., the work being now finished, except for some painting. The bridge consists of six 150-ft. riveted deck trusses, Cooper specification E50, replacing that number of old pin-connected trusses. The new spans are assembled nearly complete some distance from the bridge site. If they were erected under traffic on the bridge piers, it would require continuous false work, which would be expensive and also dangerous. The work being done in winter, the false work might at any time be carried away by ice, the new span under erection be lost, and traffic tied up for want of a bridge. As a matter of fact, the ice did go out of the river recently, but no damage was done, the only false work being the towers at the piers, and these, being on the down-stream side, were fully protected.

Fig. 1—New Span on the Way to Position.

The first plan considered for doing the work without continuous false work was to put transverse girders through the old truss, fastening them to angles riveted to the end posts, and on the projecting ends of these cantilevers erect the new truss. When complete, the old and new spans could both at once be moved transversely on skids, the new truss taking the position of the old one. This plan was not followed, as the old trusses were not strong enough. The plan adopted was to assemble the new span off the bridge, bring it into position over the old truss and hang it from gallows frames. The old truss was then moved out sidewise and the new truss lowered into position.

Each new truss was erected in a yard about a quarter of a mile from the bridge site. The ties were laid on it and the other assembling was complete, except for the rails, the shoes and the sway bracing at the end panel points. The weight of a single span is about 150 tons, while the ties weigh about 15 tons more. It was hauled to the bridge site on a pair of special trucks, as shown in Fig. 1. Double A-frames were mounted on the trucks, and the end floor beams of the truss rested on swing bolsters at the tops of these frames. Between the yard and the bridge there is a curve with a 3½ in. superelevation. This superelevation had to be reduced to 2½ in. because of the height of the center of gravity of the truss when mounted on the trucks. The new

Fig. 2—New Span Hoisted Clear of Trucks; Old Span Still in Place.

Looking east; equalizer in foreground.

Fig. 3—Old Span Moved Out and New Span Ready to be Lowered.

Looking east; equalizer at extreme right.

Fig. 4—New Span in Place.

span was brought into position under the gallows frames over the old span, made fast to four sets of 6-sheave blocks, and hoisted clear of the tracks. The blocks were made fast to the bridge by pin-connected knuckles. The upper portion of the knuckle was integral with the block and the lower portion was bolted to the end post of the bridge during erection in the yard. This made the attaching of the blocks to the bridge span quick and simple, the blocks being simply lowered to position and the pins inserted. After the span was hoisted clear, the shoes were pinned on and the sway bracing at each end put in place. The rails on the old bridge had previously been cut at the ends of each span and angle bars put in. When the new truss was in position over the old truss, these angle bars were removed. The old truss was then slid out sidewise on transverse beams and rails resting on the false work alongside each pier. The old trusses were so light that no rollers were needed.

The four lines from the sheave blocks were all carried to one of the gallows frames, then down to idler pulleys at track level, and thence along the bridge to an equalizer, mounted on a four-wheel truck. Another set of 6-sheave blocks connected the truck carrying the equalizer to a fixed block bolted to the floor system, the fall lines from these blocks running directly to the hoisting engine. When the new truss was first raised from the trucks on which it was carried from the yard, the equalizer was about 50 ft. from the fixed block. As the truss was lowered, the equalizer moved towards it, its total

Fig. 5—New Span Lowered Part Way.

travel being about 300 ft. By this system, the four sets of blocks from which the truss was suspended were lowered evenly. The equalizer and fixed block are shown in the foreground in Fig. 2. This arrangement required three or four hundred feet of tangent track. As the east approach to the bridge is on a curve, the hoisting engine and tackle had to be used first from one side and then from the other, accordingly as the truss being handled was near the curved approach or not. In Fig. 3, which shows the placing of a truss near the west end of the bridge, the hoisting engine and tackle are on the east end, the equalizer being visible in the distance. In Fig. 2, where work is under way on a truss in the middle of the river, this arrangement is reversed. When the new truss was in final position, the same rails which had been used on the old span were put in place. In one case, a new truss was put in position two hours after leaving the yard, and was ready for traffic as soon after as the rails could be relayed and the derrick car and other apparatus got out of the way. In this case it took 30 minutes only from the time the moving out of the old span was started to the time the new one was down in place. On the average, it took eight days to erect one truss and put it in place.

To take care of the old truss, outriggers were made fast to the new truss at each panel point and the old truss suspended

Fig. 6—Placing Approach Girder Span.
Rails and ties partly removed from old span.

from them. The old truss was then wrecked, one panel at a time, and the members handled by a derrick car and loaded into cars. The gallows frames were moved to position for handling the next truss as follows: Transverse 12-in. x 16-in. x 20-ft. timbers were placed on the derrick car under the blocks bolted to the posts of the gallows frame. One of these blocks can be seen in Fig. 5 near the lower right-hand sheave block. The derrick car boom was then made fast to the upper part of the gallows to steady it, and the whole frame raised by jacks under the transverse beam. The car then moved forward and placed the frame in its new position on the pier ahead.

The work of rebuilding the bridge included the replacement of a trestle approach on the east end consisting of 30 30-ft. deck plate girders and two 50-ft. deck plate girders on steel bents, which were handled in the usual manner by derrick car. The west approach span over the Delaware, Lackawanna & Western tracks, however, was handled by the gallows frames. Fig. 6 shows this 105-ft. deck girder span, fully assembled, about to be put in place. The ties, rails and sway bracing were removed from the old span, and the new span was then dropped between the two old trusses. The old trusses were then taken out with two derrick cars and dismantled in the yard.

The Pennsylvania Steel Company, Steelton, Pa., had the contract for fabricating, erecting and installing the new bridge It is interesting to note that the vertical posts of the gallows frames had previously been used in the erection of the Blackwell's Island bridge at New York. H. Denburger, Supervisor of Bridges and Buildings of the Lehigh & New England, who was in general charge of the work, under J. A. Zehner, General Superintendent, is responsible for the scheme adopted for putting the new trusses in place, the actual plans for which were drawn by M. G. Hilpert, Assistant Engineer of Erection for the Pennsylvania Steel Company. J. A. Johnson was General Foreman in the field for the steel company. We are indebted to Mr. Denburger for the foregoing description and photographs.

LOCOMOTIVE SPRINGS.*

BY J. A. KINKEAD.

Until recently each spring maker has been a law unto himself. All springs were furnished to a given load and length under a more or less severe guarantee; in most cases even the kind of steel was not specified. With this arrangement the manufacturer used such number, width, thickness of plate, as well as pitch, as seemed best to him. Had all spring makers been working with the same constants, fairly uniform results would have obtained. As, however, the several spring makers used F. S. varying from 70,000 to 90,000, and modulus of 28 to 32,000,000, a replace spring ordered to the same length and load might be entirely different from the original spring in the three vital points, number, width and thickness of leaves, if supplied by a different maker, and might vary as widely as their action in service. This irregularity caused so much confusion and annoyance that many users of springs now calculate their own springs, and specify not only the length and capacity, but also the number, width, thickness of leaves, and height of their springs. In this connection the American Locomotive Company has issued a table derived partly from G. R. Henderson's tables, but differing from them in deflection of full elliptic springs. These tables are given herewith.

AMERICAN LOCOMOTIVE CARD.

"Spring tables for semi-elliptic springs give the capacity of one plate 1 in. wide and different thicknesses.

"To obtain the required number of plates, multiply the figure given in 'Load' column by the width of spring in inches and divide the required capacity by the result. The quotient gives the number of plates required.

"*Note.*—Where quotient gives decimal more than 3 add one plate to the whole number.

"The number of full length plates must be 25 per cent. of the whole number required; other plates must be regularly shortened.

"The deflection given in table is the difference between free and loaded height, irrespective of width or number of plates; for full elliptics number of plates and deflection given is for each half of spring."

SPRING TABLES.—*Semi-Elliptic Springs.*
One plate 1-in. wide.

Length between cent'rs.	1/4-in. plate Load.	Deflection.	5/16-in. plate Load.	Deflection.	3/8-in. plate Load.	Deflection.	7/16-in. plate Load.	Deflection.	1/2-in. plate Load.	Deflection.
20	167	0.98	260	0.78	...	....	...	....	...	....
22	152	1.19	235	.95	341	0.79	...	....	...	....
24	139	1.41	217	1.13	312	.94	...	....	...	....
26	128	1.66	200	1.32	288	1.10	393	.95	...	....
28	119	1.92	186	1.53	268	1.28	365	1.10	...	....
30	111	2.20	173	1.76	250	1.47	341	1.26	...	....
32	...	....	163	2.00	234	1.67	319	1.43	...	....
34	...	....	153	2.26	220	1.88	301	1.62	...	....
36	...	....	144	2.53	208	2.12	284	1.81	372	1.53
38	...	....	...	....	197	2.35	269	2.03	350	1.76
40	Formulas used in....				187	2.60	255	2.24	333	1.95
42	Computing table.....				178	2.87	243	2.47	317	2.16
44	$P = \frac{53,333\ H^2}{L}$				170	3.15	232	2.71	303	2.37
46					163	3.45	222	2.96	290	2.58
48	$F = .000611\ \frac{L^2}{H}$....				156	3.75	213	3.22	277	2.82
50	...	....	...	....	...	....	204	3.49	266	3.06
52	P = net static load..				...	....	197	3.78	256	3.30
54	F = deflection.				...	..	189	4.08	247	3.57
56	H = thickness plate..				...	....	...	....	238	3.83
58	L = length bet. cen..				...	....	...	....	230	4.12

With American Locomotive Company's tables the deflection for full elliptic springs is considered as double that of semi-elliptic springs, whereas Henderson made allowance for one-quarter of the leaves in semi-elliptic springs being full length. Henderson's tables thus show deflection for full elliptic springs about 10 per cent. greater than double the deflection for semi-elliptic springs.

Another subject open to discussion has been the effect of the band. Some engineers in their calculations consider the total length the distance between supports less the width of the band; *i.e.*, the metal under the band is considered inactive and hence neglected in the calculation. This is equivalent to using a higher f. s. and a greater modulus. In order to determine the effect of the band I tested a spring made of plates tempered perfectly straight in order to eliminate such variables as camber and "truck" or greater curvature of the shorter plates. This spring when tested first without, then with band, gave the same deflection for 80,000 f. s. but slightly less deflection without the band at 160,000 f. s., indicating that the width of the band may be neglected in calculations.

Fiber Stress.—The f. s. is eliminated in two ways: First—elastic limit, which is again subject to two variables, kind of materials and heat treatment; second—conditions of service, as overload on the springs. Tests recently made on the B. & M. show that overload is often 40 per cent., and sometimes as much as 60 per cent. The recognized standard spring steel, P. R. R. analysis, with .90 to 1.10 as tempered commercially, has an elastic line of about 160,000 lbs. per sq. in. With conditions as noted above on B. & M., a F. S. of about 80,000—*i.e.*, one-half the elastic limit should be satisfactory.

Modulus.—The modulus is without doubt the same for all wrought iron and steel, irrespective of heat treatment or alloys used. The variations shown in diagram No. 2, which was plotted by T. D. Lynch, of Westinghouse Electric & Mfg. Company, from results obtained with Ewing Extensometer reading to .000064 per inch of length, was plotted in that way merely for convenience, as the actual readings were the same for all materials, viz., 1A, O H steel as rolled; 1B, O H steel, oil tempered and annealed; 1C, O H steel, oil tempered, etc.

The variations in results of tests recently made at Baldwin Locomotive Works, which are given below, are due more to very slight irregularities in the readings rather than to actual differences in the modulus.

Report, June 24.

		Elastic limit.	Modulus.
17	Annealed in lead at 1400 deg. F............	78,500	27,550,000
	Hardened in oil at 1450 deg. F.:		
11	Drawn to 560 deg. F....................	137,500	28,700,000
14	" " 500 "	160,400	27,150,000
19	" " 400 "	177,600	29,080,000
12	Not drawn	187,400	28,610,000
	Hardened in water at 1425 deg. F:		
16	Drawn to 1050 deg. F..................	180,700	28,070,000
13	" " 900 "	233,900	28,860,000
15	" " 750 "	240,800	29,220,000 Broke
20	" " 600 "	219,800	30,420,000 Broke
18	Not drawn	212,000	29,960,000 Broke

The same might be said of result obtained by Fairbairn (in manufacture of iron) as follows:

Strength of Steel to Resist Transverse Strain (Jeans).

Manufacture.	Modulus of elasticity.
Naylor, Bicker & Co.........................	30,278,000
S. Osborn & Co.	27,482,000
C. Sanderson Bros.	29,973,000
T. Turton & Sons.	30,294,000
J. Brown & Co..............................	30,370,000
C. Cammell & Co.	29,166,000
H. Bessemer & Co.	29,810,000
Titanic Steel & Iron Co.	31,901,000
Haematite Steel & Iron Co..................	28,754,000
Heaton Steel & Iron Co.....................	28,605,000
Mean	29,663,000

For all practical purposes it should be found satisfactory to use a modulus of 30,000,000, as unavoidable variations in width and thickness of leaves, not to mention length and camber of leaves, would entirely nullify a change of modulus, which change would also render practically useless the work done by Henderson and others.

Reference was made above to the effect of difference of camber. Although differences of camber in two springs do not affect the maximum working load or deflection of the springs, yet differences of camber in leaves of the same spring may make a very material difference in the life of the spring.

The usual method of making a semi-elliptic spring in railway shops is as follows: Heat and bend the main plate to

*Abstract of paper read before Canadian Railway Club, Montreal, Can., February, 1909.

a little less than the specified height of the finished spring, and after tempering, use the main plate as a templet for the next. The second plate is given more curvature than the main, and is then used as a templet for the third, each plate being fitted to the preceding one by hand or rolls. It is customary with most spring makers, and even specified by some users, to give each successive leaf a little more curvature, so that when piled for banding they will all separate at the center. With some, considerable difference is made in the first few plates, the others made to fit as closely as possible. When the band is applied, and the plates all brought together, an additional camber, or negative load is given to the main plate and an equal strain put on the short plates. Again, the main plate will not carry its share of the load until returned to its original camber. It is readily seen that the final result is a negative load on the main plate and a positive load or strain on the short plate varying with the total amount of set taken up in banding. In this way a strain of from 10 to 40 per cent. of their working load may exist in the short plate caused by the band alone. When such a spring goes into service, the overload the spring is always subject to results in early failure of the short plates. The relative failures of short and long plate was found by one road to be about 5 to 1, while another road replaced broken short leaves with untempered leaves on account of excessive breakage. Where there is an average difference of 3/8 in. between each plate, it is readily seen the strain that would be put on the short plates. It is undoubtedly much better practice to have the plate fit, then the band performs only its natural function of keeping the plates in line.

Material.—The steel used for springs in the earlier days was graded by fracture only, and made by the cementation or crucible process. The grade used for springs would show possibly .50 per cent. carbon. Steel of this character is used for springs in England and Europe to-day, as indicated by recent analyses of Krupp and Steel, Peach, Tozer spring steel given below:

	Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
Krupp	.54	.35	.068	.059	.573
Steel, Peach, Tozer..	.68	.19	.063	.050	1.112

The steel used most largely in this country has come to be known as "Pennsylvania Analysis," and was introduced by Dr. Chas. B. Dudley. This requires carbon .90 to 1.10, manganese not over .25, and copper, phosphorus and sulphur not over .05.

With these two widely varying kinds of steel, the Pennsylvania and Steel, Peach, Tozer, it is possible, by different heat treatments, to get approximately the same elastic limit, but for the same heat treatment the former will, of course, give much the higher results. Under usual conditions, the low carbon steel is hardened in water, while the high carbon steel is hardened in oil. This difference in treatment should give practically the same elastic limit to both steels, in which case it would be interesting to learn which would give the best service. I know of two roads using both kinds of steel, but unfortunately the careful record of spring service necessary to make satisfactory comparison is lacking. From tests made on single plate with steel showing about .60 carbon, it was found that when the elastic limit was as high as is usually obtained with the higher carbon, the plate would break at slightly above the elastic limit. The higher carbon steel with the same elastic limit will bend to 45 deg. at least without breaking.

A growing interest is being taken in alloy steels. A number of the French roads use Wolfram or Tungston steel in their driving and truck springs; the automobile builders are using various alloys such as silicon, chrome-vanadium, chrome-nickel and others. In connection with alloy steels, I would like to call your attention to a comparative test of vanadium steel showing carbon .35 and vanadium .17, with Pennsylvania steel, carbon, 1.13. The springs were P. R. R., class E 100, 16 plates, 5 in. x 1/2 in., centers 36 in., and calculated load 29,160 lbs. The vanadium spring was given a load of 92,000 lbs., and took 1/2-in. set. It was then given 94,000 lbs. three times without taking any additional set. The elastic limit is seen to be about 85,000 lbs.

The P. R. R. spring was given a load of 89,000 lbs., taking a set of 1 1/8 in., then 85,000 lbs., taking 1/4 in. more set, then at the application of 89,000 lbs. eight plates broke. This spring shows an elastic limit of 65,000 lbs. There is no question as to the relative merits of these two springs, but the results are incomplete in that check tests have not been made to verify the original tests.

Flexibility.—Flexibility is the all important point in spring design, and has received the least attention from spring makers and users. Springs are used in construction on account of their flexibility, and within reasonable limits their value varies directly as their flexibility. Great care is taken to see that springs are the right width, or length, or strength, or height, and little or no attention paid to their prime function, flexibility. It seems unreasonable to say that many spring failures are due to excess strength, but this is the case. The original springs applied to a class of engines were 28-in. center, nine plates 6 x 7/16 in., with calculated capacity of 19,700 lbs. Identical springs except having 10 plates instead of nine, were applied to engines of a similar design. In each case the springs were entirely unsatisfactory, and were replaced by springs having 16 plates 4 x 3/8 in., and 17 plates 6 x 5/16 in. respectively. These springs gave satisfactory service, although 3,000 lbs. lower in calculated capacity; or, in other words, 3,000 lbs. weaker. In comparing the springs it is seen that the length was unchanged, and the width unchanged in that 6-in. plates were used in the second replace springs. The one marked difference is the flexibility. By substituting thinner leaves the factor, load per inch deflection, was lowered 30 per cent. Expressing the flexibility in terms of load necessary to produce 1 in. deflection, the 7/16-in. plate gave 18,000 and 19,000 lbs., the 3/8-in., 13,000 lbs., and the 5/16-in., 12,000 lbs. per inch deflection.

On the showing of these four springs, I do not hesitate to recommend that the flexibility be checked up in all cases of excessive spring failure, and where the calculated load divided by deflection exceeds 15,000 lbs. substitute longer springs or thinner plates.

Similar instances have been brought to my attention which bear out the above assumption. In one instance four leaves were added to a spring, one at a time, thinking failures were due to weakness. With each additional leaf the failure increased.

Testing.—The last point in the treatment of this subject is testing. It is generally conceded that seeing is believing, but in the usual testing of semi-elliptic springs this is not the case. Theoretically a spring will show uniform deflection under proportionate loads within the elastic limit of the material, irrespective of whether the load is applied or released. In practice the friction between the leaves results in a deflection less than calculated for applied loads and greater than calculated for released loads. Furthermore, a spring under a given load may stand at any height between the heights of applied and released loads or for any given height balance at any load within the curve for their height. For this reason a spring may seem to carry a given load at a given height in the testing machine when by slight changes in local conditions the spring will carry the same load at a height varying 3/8 in. either way.

With driving springs the variation in height under working load due to friction alone will be 3/8 in. to 5/8 in. Two springs are designed to carry 25,000 lbs. at 1 in. height. If no mention is made of manner of testing, both springs would be within the 3/16 in. allowance usually given, one on released load and the other on applied load. but the first would be a half-inch or more too high in service, and the second would be as much too low. With any change in load the friction

present is absorbed before there is any apparent motion of the spring. This friction under ordinary conditions will be from 2,000 to 4,000 lbs. If the plates are oiled, or covered with paint or other lubricant, it may be only one-quarter that amount. This action of semi-elliptic springs is the reason of their easy riding, the friction acting as a dampener to prevent excessive vibrating. The friction between the leaves is overcome by slight blows or vibration of any kind causing a change in the applied and released lines. In this way by blow of fist an apparent change of 300 to 500 lbs. can be made in the spring.

With semi-elliptic springs it is satisfactory to order to the height under applied load allowing ⅜ in. variation over, or to height under release load allowing ⅜ in. under required heights. To my mind the latter is to be preferred, as it is more constant and more easily taken.

Failures.—I attribute spring failure to the following:

First.—Bad fitting, resulting in failure of short plate.

Second.—Overloading, due to incorrect weights, high speed on improperly banked curves, low joints, bad switch points or crossings, and improper brake application. A majority of failures are due to abuse of the springs in this way. One serious lot of failures seemed mysterious until it was discovered that trouble was due to drop engines took in running on and off the turntable at the roundhouse.

Third.—Lack of flexibility.

Fourth.—Bad tempering.

Fifth.—Lopping, or letting down under load.

In conclusion, I should like to suggest:

First.—Increase in flexibility, particularly in cases of excessive failure where load per inch deflection is high.

Second.—Work to either applied or release loads in testing, and not leave this point open, as is usually done.

Third.—Fair criticism of failures, so that responsibility is not put on designer or maker when trouble is due directly to bad roadbed or miscalculated loads.

Fourth.—Careful record, mileage or time, of service of spring, in order to locate the cause of failures and be in position to apply proper remedy.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.

BY W. F. M. GOSS,

Dean of the College of Engineering, University of Illinois.

V.

VIII. CONCLUSIONS CONCERNING BOILER-PRESSURE VS. BOILER CAPACITY AS A MEANS OF INCREASING THE EFFICIENCY OF A SINGLE-EXPANSION LOCOMOTIVE.

26. *In the preceding chapters an analysis has been given showing the saving* which may result in locomotive service, first, by increasing the pressure, the boiler capacity remaining unchanged, and second, by increasing the heating-surface, the pressure remaining unchanged. A summary of the conclusions of these chapters is presented in Figs. 16 to 21 in which the full line represents the gain through increase of boiler-pressure and the dotted line the corresponding gain through increase of boiler capacity. The values for these diagrams are taken directly from Tables 5 and 7. It will be seen that starting with pressures which are comparatively low, the most pronounced results are those to be derived from increments of pressure. With each rise in pressure, however, the chance for gain through further increase diminishes. With a starting-point as high as 180 lbs., the saving through increased pressure is but slightly greater than that which may result through increased boiler capacity.

The fact should be emphasized that the conclusions above described are based upon data which lead back to the question of coal consumption. The gains which are referred to are measured in terms of coal which may be saved in the development of a given amount of power. It will be remembered that conditions which permit a saving in coal will, by the sacrifice of such saving, open the way for the development of greater power, but the question as defined is one concerning economy in the use of fuel. It is this question only with which the diagrams (Figs. 16 to 21) deal.

There are other measures which may be applied to the performance of a locomotive which, if employed in the present case, would show some difference in the real values of the two curves (Figs. 16 to 21). The indefinite character of these measures prevents their being directly applied as corrections to the results already deduced, but their effect may be pointed out. Thus, the extent to which an increase of pressure will improve performance has been defined, but the definition assumes freedom from leakage. If, therefore, leakage is allowed to exist, the result defined is not secured. Moreover, an increase of pressure increases the chance of loss through leakage, so that to secure the advantage which has been defined, there must be some increase in the amount of attention bestowed, and this, in whatever form it may appear, means expense, the effect of which is to reduce the net gain which it is possible to derive through increase of pressure. Again, in parts of the country where the water-supply is bad, any increase of pressure will involve increased expense in the more careful and more extensive treatment of feed-water, or in the increased cost of boiler repairs, or in detentions arising from failure of injector, or from all these sources combined. The effect of such expense is to reduce the net gain which it is possible to derive through increase of pressure. These statements call attention to the fact that the gains which have been defined as resulting from increase of pressure (Figs. 16 to 21) are to be regarded as the maximum gross; as maximum because they are based upon results derived from a locomotive which was at all times maintained in the highest possible condition, and as gross because on the road, conditions are likely to be introduced which will necessitate deductions therefrom.

The relation which has been established showing the gain to be derived through increased boiler capacity is subject to but few qualifying conditions. It rests upon the fact that for the development of a given power a large boiler will work at a lower rate of evaporation per unit area of heating-surface than a smaller one. The saving which results from diminishing the rate of evaporation is sure; whether the boiler is clean or foul, tight or leaky, or whether the feed-water is good or bad, the reduced rate of evaporation will bring its sure return in the form of increased efficiency. An increase in the size of a boiler will involve some increase in the cost of maintenance, but such increase is slight and of a sort which has not been regarded in the discussion involving boilers designed for higher pressures.

Keeping in mind the fact that as applied to conditions of service the line *A* is likely to be less stable in its position than *B*, the facts set forth by Figs. 16 to 21 may be briefly reviewed.

Basing comparisons upon an initial pressure of 120 lbs., (Fig. 16), a 5 per cent. increase in weight, when utilized in securing a stronger boiler, will improve the efficiency 8.5 per cent., while if utilized in securing a larger boiler, the improvement will be a trifle less than 3 per cent. Arguing from this base, the advantage to be derived from an increase of pressure is great. If, however, the increase in weight exceeds 10 per cent., the curve *A* ceases to diverge from *B* and if both curves are sufficiently extended, they will meet, all of which is proof of the fact that the rate of gain is greatest for relatively small increments of weight.

Basing comparisons upon an initial pressure of 140 lbs. (Fig. 17), the relative advantage of increasing the pressure diminishes, though on the basis of a 5 per cent. increase in weight it is still double that to be obtained by increasing the capacity.

Basing comparisons upon an initial pressure of 160 lbs. (Fig. 18), the advantage to be gained by increasing the pres-

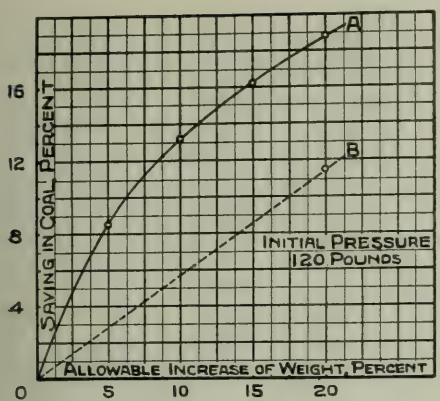


Fig. 16.

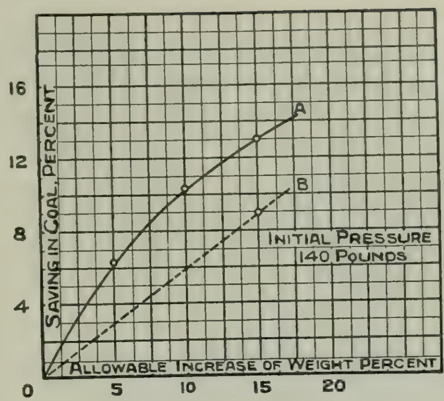


Fig. 17.

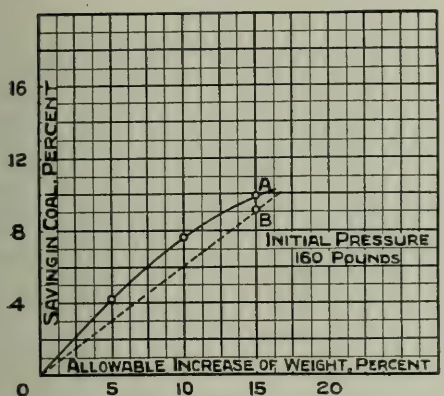


Fig. 18.

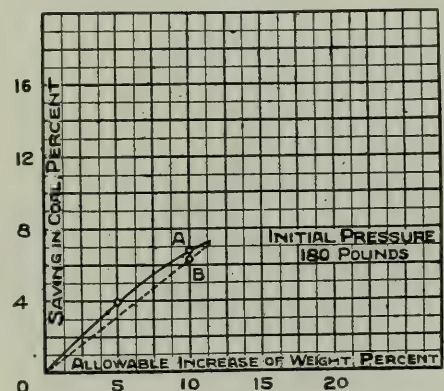


Fig. 19.

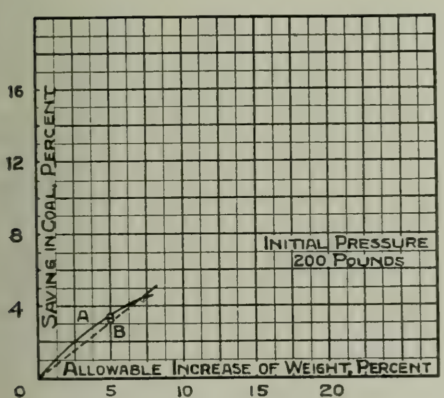


Fig. 20.

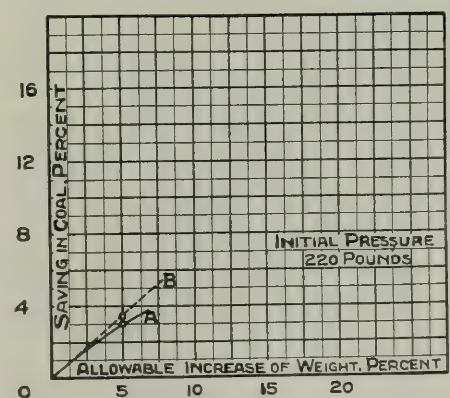


Fig. 21.

The Lines A Represent the Saving in Fuel When an Allowable Increase in Weight Is Utilized in Making a Stronger Boiler to Permit a Higher Pressure.

The Lines B Represent the Saving in Fuel When an Allowable Increase in Weight Is Utilized in Making a Larger Boiler to Give Increased Capacity.

sure over that which may be had by increasing the capacity is very small, so small in fact that a slight droop in the curve of increased pressure (A) would cause it to disappear. As the curve B may be regarded as fixed, while A, through imperfect maintenance of boiler or engine, may fall, the argument is not strong in favor of increasing pressure beyond the limit of 160 lbs.

Basing comparisons upon an initial pressure of 180 lbs., (Fig. 19), the advantage under ideal conditions of increasing the pressure, as compared with that resulting from increasing the capacity, has a maximum value of approximately one-half of 1 per cent. In view of the incidental losses upon the road the practical value of the advantage is nil. The curves A and B (Fig. 12), constitute, therefore, no argument in favor of increasing pressure beyond the limit of 180 lbs.

Basing comparisons upon an initial pressure of 200 lbs., (Fig. 20), it appears that under ideal conditions either the pressure or the capacity may be increased with equal advantage, this being in effect a strong argument in favor of increased capacity rather than of higher pressure.

Basing comparisons upon a pressure of 220 lbs., (Fig. 21), it appears that even under ideal conditions of maintenance the gain in efficiency resulting from an increase of pressure is less than that resulting from an increase of capacity. In view of this fact, no possible excuse can be found for increasing pressure above the limit of 220 lbs.

THE USE OF STEEL IN PASSENGER CAR CONSTRUCTION.*

BY JOHN McE. AMES.

Mechanical Engineer, American Car & Foundry Co.

The primary cause of the introduction of steel in passenger construction, I take to be the idea of safeguarding the passenger against fire and accidental injury from telescoping and other causes. Nearly every wreck of wooden coaches carries with it a harrowing tale of suffering from fire, and many legislators have agitated the question of compelling the railways by law to provide the traveler with non-combustible conveyances. The advent of electricity as motive power increased materially the danger from fire and in order to avoid conditions such as existed in the Paris underground accident, the question of non-combustible coaches was brought forcibly before those railways intending to enter New York by sub-river tunnels. Here the danger from smoke would be nearly as great as from fire itself.

Before the death of that far-sighted executive of the Pennsylvania system, the late Mr. Cassatt, he decided that with the completion of the tunnel system into New York, none but steel coaches should be used in tunnel service and preparation according to his policy is being rapidly brought to completion. These sub-river tunnels have, therefore, been factors in the introduction of steel in coach construction, but the primary idea is nevertheless the safeguarding of the passenger. The growing scarcity of long timber for sills and the reduction in cost of maintenance of steel over wooden cars may both be considered as minor causes in the introduction of steel.

We know then why steel should be used, but the question occurs to many as to *where* steel should be employed and where it is unnecessary. Opinions differ regarding interior finish, roof, doors, headlining, floors, windows, etc. To attain the safeguarding of passengers there is no question but that steel should be used for underframe, posts, carlines, etc., or that steel or metal exterior should be used in order to avoid fire from outside causes. But is it necessary to make the interior of similar material even if it can be and is being done? The statement is often heard among railway men, "If we are going to build of steel, let us build a coach entirely of steel without even a splinter of wood." This expresses the sentiment prevalent to-day, but I do not believe the result obtained by the elimination of *all* wood, compensates for the increased cost and loss of insulating qualities, nor it is necessary for the safeguarding of the passenger. In order to apply steel both inside the coach and out, every piece of metal must be either bolted or riveted in place, requiring much ingenuity to so design that rivets may be driven. The alternative is to rivet the outside plates to the frame and then attach the interior plates by means of machine screws tapped into posts and carlines. This generally proves an easy but sad solution, for vibration and unequal expansion soon loosen the tap screws and out they come like tacks driven into plaster. A few wooden furrings bolted to posts, belt rails or carlines, entirely covered on the outside by the steel construction, on the inside by the finish and head lining, which may be well fastened thereto by wood screws, offers a much cheaper, neater and unobjectionable method of construction except for the sentimentalist who wishes to eliminate the last splinter of wood. Aluminum or a slow burning artificial board certainly should be permitted to replace steel for headlining, partitions and interior pier covers. I should not advocate the use of steel for window sills or arm rests on seat ends. These parts soon loose their paint, due to constant elbowing, thus presenting an untidy appearance and should be made of wood. The use of steel for roofs adds to the weight of the coach as at least ⅛-in. material is required when roofs are to be walked on while icing and filling tanks. The greatest care must be taken with joints of the roof sheets to avoid leakage. Good results are obtained by lap joints, both edges of which are welded to the adjacent plate by oxy-hydrogen or other process. This is all expensive work and there is doubt whether the result is enough better than canvas covered artificial board to warrant the additional expense. If, however, we are to safeguard the passenger, steel must be used for roofing in order to protect him from external fire in cases where a coach is overturned. Steel should not be used for roofs where power is taken from overhead wires, as it would prove too dangerous to employees. If steel is used in a case of this kind, it should be provided with a substantial insulating covering which will, of course, again add weight to the car. Floors are another difficult proposition in a steel coach. Passengers should not be asked to walk on a slippery steel plate, even if carpet covered and, therefore, some other surface must be provided. Magnesium cement has been largely used, but could be substituted by interlocking rubber or cork tiles, both of which are insulating and slow burning. Steel alone should not be used for floors, but should be used on the lower surface especially with electrically-driven trucks. The use of steel or brass for window frames seems like a waste of metal in view of the fact that heat from without, if severe enough, may break the glass, and even though the wood should ignite, there is not enough of this material in the frame to produce any serious result. The same may be said of doors if fitted with glass, otherwise steel should be used for doors as a protection against fire in adjoining coaches. From the builders' standpoint, the chief reason why wooden window frames should be used is that each frame may be fitted to place and a tight joint obtained in spite of unequal window openings due to camber, uneven metal work, etc. Steel for moldings is to-day the accepted practice and a good product is obtainable in cold-drawn metal, but here again must be provided wood furrings to which the moldings may be attached by wood screws or else the undesirable tap screw, or similar device is required. Steel is good, but not essential for partitions and seat frames. I believe the evolution of the steel coach will produce a more composite interior than required by present demands.

The subject of paint on steel naturally comes to mind. After building a coach entirely of steel at great expense so as to safeguard the passenger against fire, the builder is often required to paint and varnish the exterior and grain the interior

*From a paper presented at the Central Railroad Club, March 12, 1909.

to resemble wood, using highly inflammable material. This is, of course, an inheritance from the wooden coach, a habit which is hard to change. Steel can be given an excellent dull paint finish which could be easily kept clean and we await some Lochinvar to lead us away from the highly-polished and inflammable finish now in vogue. Incidently the subject of noise due to the use of steel was a mooted question before any coaches were built, but anyone who has ridden in a steel coach will concede that, except for a slight drumming sound over the trucks, there is, if anything, less noise in a steel than in a wooden coach.

Having discussed *why* steel should be used in passenger construction, and *where* it should be or need not be used for safeguarding the passenger, we come to a collateral subject which must be considered along with the use of steel, namely: its insulation against heat and cold. What have we gained if, while endeavoring to safeguard our passenger from fire and wreck, we freeze him in winter and roast him in summer? I am free to confess that there is very little information obtainable on this subject of insulation. We know that steel absorbs a large amount of heat from the sun's rays, but believe that with open windows and electric fans, steel coaches will be as agreeable as the present wooden coach in summer. Winter, however, presents a different problem. A steel coach in our northern countries could be subject to an exterior temperature of 40 deg. to 50 deg. below zero and an interior temperature of 90 deg. (providing someone does not interfere with the porter) or in all a difference of 140 deg. The outside steel is tending to contract, the inside steel to expand, and both to equalize the temperature without and within the coach. This is the condition which ruins tap screw fastenings, tends to loosen rivets and destroy connections, thus warranting the use of wooden furrings, artificial board or other lining material not subject to expansion and contraction. In winter steel feels colder and in summer hotter than wood, and this is another reason why window sills and arm rests should not be made of steel. Air-tight joints are difficult to make with steel against steel and although an air space may be provided between the sheathing and lining, it is in no sense a dead air space such as is required for good insulation. Double floors should keep out the cold from below and there is little trouble with roof insulation, but the side and end framing, cut up by window and door openings, is a problem still somewhat unsolved. An attempt at insulation has been made by backing the steel lining with asbestos cloth, but joints cannot be covered as in a wooden coach and air gets through the smallest opening, thus reducing the efficiency of the asbestos backing. I do not wish to convey the idea that steel coaches cannot be heated satisfactorily, for slightly increased radiating surface over that required in wooden coaches produces the desired result, but still it is evident that the better the insulation, the less the required amount of heat, and it is along these lines that the problem should be taken up.

In guarding against leakage from rain or snow, joints must necessarily be made as tight as possible. This is done in the roof by welding or soldering the overlapping joints and in the outside of the frame by so constructing that plates and pier covers overlap so as to provide against leakage. The least opening which permits water to run down back of a plate produces a streak of rust and ruins the painters' best efforts. This can be and is overcome by proper design and workmanship and is not to be compared to the difficulty of insulating against cold.

When a railway officer makes up his mind that the safety of his passengers warrants the use of steel in his coaches, he usually asks the car building company these two leading questions:

"How much more will a steel coach cost than my standard wooden coach?"

"How much more will it weigh?"

The answers to these questions depend upon many conditions and to some extent the price is governed by the weight. The only fair way to approach these questions is to compare the weight and cost per passenger according to seating capacity. All available information in regard to steel coach weights is tabulated on page 322 of M. C. B. Proceedings, Vol. 42, and to this the officer is respectfully referred. It happens that the length of many standard wooden coaches is 60 ft. or under, the exact length having been largely governed by the longest stick available in one piece for sills. Now to substitute steel for wood in a 50 or 60-ft. coach, whose weight has been minimized by years of development, does not produce the result desired. To illustrate, reference to the table mentioned gives the weight of a 53-ft. 5¾-ft. Penna. steel coach, seating 64 passengers as 95,400 lbs., or 1,490 lbs. per passenger. Table No. 2 on page 319 of the same volume gives weight of Penna. wooden 53 ft. 9 in. coach, seating 62 passengers, as 85,000 lbs. or 1,373 lbs. each, a difference of 117 lbs. per passenger in favor of the wooden coach. On the other hand, the same table gives the weight of the Pennsylvania 70-ft. steel coach, seating 88 passengers, as 116,100 lbs. or 1,319 lbs. each and the weight of Penna. 70-ft. wooden coach, seating 80 passengers, as 106,000 lbs. or 1,325 lbs. each. Both the steel weights given include storage batteries not included in the wooden car weights. These figures illustrate the fact that when changing from wood to steel, in order to obtain true economy, the length best adopted to steel construction should be considered and a comparison then made on a basis of weight per seating capacity. An important factor which governs the cost, is the number of coaches in a given order. Designs, die work, formers, patterns, jigs, templates—all absolutely essential for steel work where wood could be cut and tried—cost as much for one coach as for 50, and unless duplicates of some standard coach already built, an order for a few steel coaches is necessarily a costly proposition. As the number in the given order increases, to some extent, the price per coach decreases, since overhead charges may then be distributed proportionately, but at best, the cost of steel is greater than wood in coaches, unless a comparison is made per passenger carried. However, the steel coach should last longer and cost of maintenance should be largely reduced.

Having determined that the use of steel will safeguard the passenger and that the price of steel compares favorably with wood, if considered on a basis of cost per passenger carried, let us not forget that the stockholder is also interested in new rolling-stock. What effect has the use of steel in passenger construction upon the railway stockholder and his dividends? We can safely say that he benefits by the use of steel, due to decrease in cost of maintenance, and longer life of coach at small increased initial expense. But how about cost of repairs in case of wreck? A wrecked steel coach presents a bad condition and repairs of this kind are much more costly than for wooden coaches. If badly wrecked, the wood coach may also burn and leave no salvage other than the metal parts. If, on the other hand, a steel coach, by not burning or telescoping, has saved the life of one or more passengers, it has served the purpose for which it was constructed and the stockholder benefits by fewer damage judgments. The railway company may well afford to scrap such a coach, obtain the salvage and purchase a new one with money saved from litigation.

To conclude, the use of steel in passenger construction is not an experiment but a matter of daily use. It lends itself readily to the skill of the artisan and reduces risk of serious accident to the passengers. It is more available than wood, produces a plainer effect, is easy to clean and weighs no more than a wooden coach if economically designed. The initial cost per passenger carried is about the same as for wooden coaches, its maintenance considerably less. The life of a coach is greatly increased by the use of steel, and damage suits as well as suffering in case of accident greatly reduced. The use of steel in coach construction is increasing daily and is here to stay.

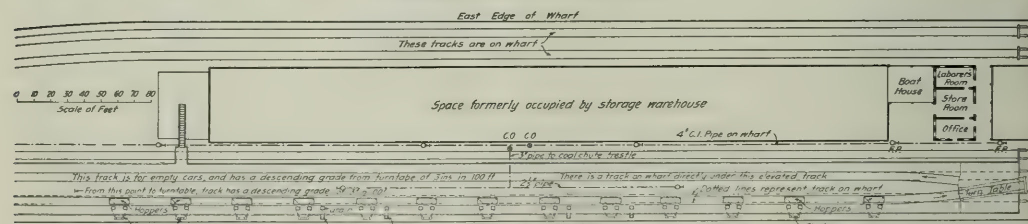
LOUISVILLE & NASHVILLE TERMINALS AT PENSACOLA

Pensacola bay is landlocked by Santa Rosa island, which is about 38 miles long, lying parallel to the main land and about two miles from it. The western end of the island is about 1½ miles from a peninsula of the mainland and the entrance to Pensacola bay is through this gap. The channel at this point is wide and from 30 to 45 ft. deep. Inside the bay, for a distance of 9 or 10 miles, the area of deep water broadens out so that there is extensive anchorage space in 30 ft. water. The city of Pensacola is about eight miles from the entrance.

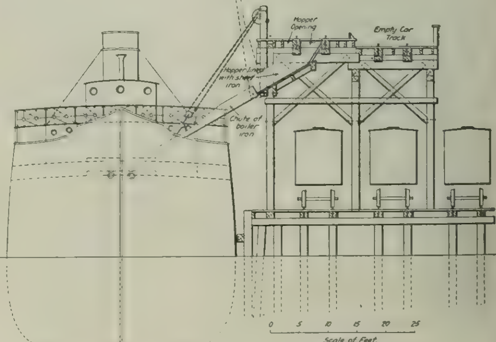
The Louisville & Nashville wharves, which are in the city, were built several years ago. They are: The Muscogee wharf and coal dock, the Tarragona street wharf and the Commandancia street wharf. These wharves are reached by 28-ft. channels, 100 to 125 ft. wide, running to the deep water in the center of the harbor. Vessels drawing 28 ft. can load on both sides of the wharves. The Muscogee wharf is used mostly for coal, phosphate rock and lumber. It is 2,440 ft. long, 120 ft. wide at the sea end and 46 ft. wide at the shore end. On the lower level are five tracks and on the coal trestle above are two tracks. The trestle has 13 coal chutes and four grain chutes. These are hinged so that they may be drawn up out of the way when not in use. They have extension aprons so as to accommodate the hatches of vessels of any size. Coal cars are run out on the outer of the two elevated tracks, unloaded through the chutes and then moved to a transfer table at the end of the trestle, going back on the inner track to the railroad yards north of the wharf. Phosphate rock is loaded in the same way. Vessels may be loaded from cars on the upper and lower tracks at the same time, taking on bunker coal while loading cargo, or taking coal or phosphate rock through the chutes and miscellaneous freight from other cars on the lower tracks. Lumber is also loaded direct from the cars. Timber is usually unloaded into the water from skids near the shore end of the wharf and held in booms until needed.

The Tarragona street wharf and the Commandancia street wharf are about a mile west of Muscogee dock. They are parallel to each other, with a slip about 160 ft. wide between them. Tarragona wharf is 1,950 ft. long and from 130 water and the rest in 15 ft. water. At the shore end is a grain elevator of 500,000 bushels capacity. A belt conveyor runs from the elevator to the outer end of the wharf through a conveyor gallery. There are two belts, each designed to deliver 10,000 bushels of grain an hour. Along the west side of the wharf are 27 grain spouts, through which grain is delivered to the holds of vessels. Grain can thus be loaded from both belts to one hold or separate holds of the same

Muscogee Wharf and Coal Dock.



Plan of Muscogee Wharf and Coal Dock.



Section of Muscogee Wharf and Coal Dock.

or different steamer. There are two warehouses on this wharf, the outer one is 50 ft. wide and 404 ft. long, divided into 11 compartments. This is used for storing import freight shipped in bulk, such as salt and fertilizers. It is served by a Hunt elevated automatic railway for handling freight to or from the different compartments. The other warehouse is 50 ft. wide and 140 ft. long. This is for miscellaneous export freight. On the western side of the wharf are two tracks. Opposite the export warehouse these tracks are on different levels, so that cars may discharge to or load from vessels from both tracks at the same time. These tracks are protected from the weather by a shed 25 ft. wide. This wharf is used for all freight except coal and phosphate rock.

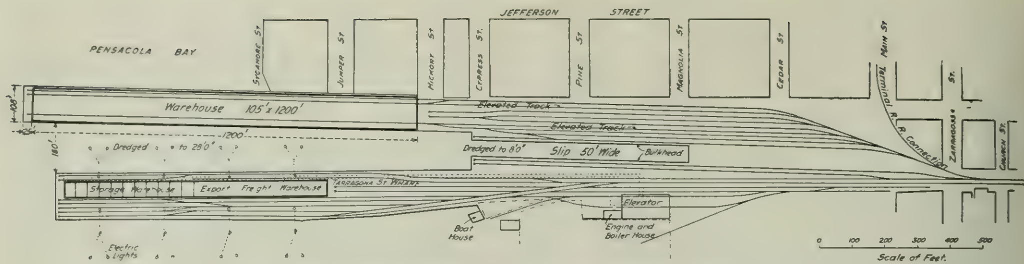
The Commandancia street wharf is the newest of the three structures. It is 2,075 ft. long and about 110 ft. wide. The warehouse is a two-story building, 1,200 ft. long and 50 ft. wide. Alongside of it on the upper story there are two railroad tracks, one on each side, and on the lower story there are three. These tracks, as well as storage space on the eastern side, are protected from the weather by sheds. As at the Tarragona street wharf, vessels can be loaded from either the upper or lower floors or from both at once, and at the same time take on bunker coal. Both floors of the warehouse are designed to carry 600 lbs. per sq. ft. The warehouse has 400 doors, each 8 ft. wide, opening vertically.

All the wharves have tracks for the temporary storage, classification, etc., of cars. In addition, there is a 1,000-car storage yard. All the wharves are built on creosoted pine piles from 60 to 75 ft. long. They are lighted by electricity and wires are arranged for extensions so that electric lights can be carried down into the holds of vessels. On each wharf there is a system of piping for fire protection and for supplying vessels with water. The fire plugs are about 150 ft. apart. There are also chemical fire extinguishers, hand grenades, fire hose, etc., and city fire alarm boxes are near at hand. The switch engines used on the wharves are supplied with fire pumps and the company's employees have regular fire drills.

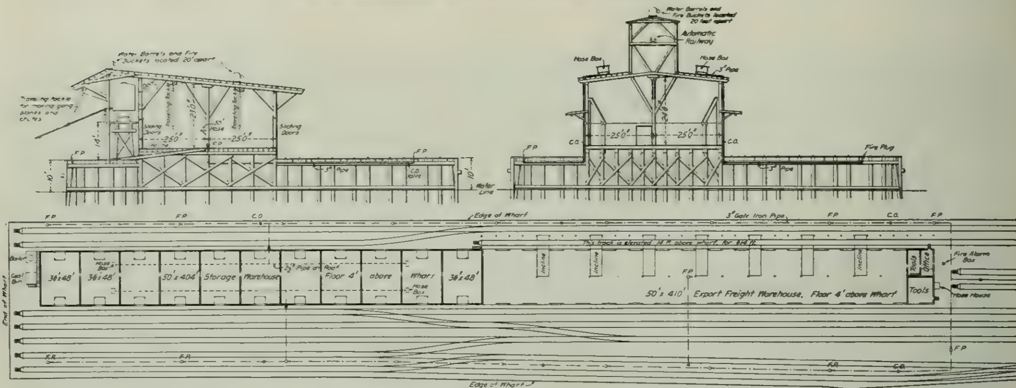
Before the Louisville & Nashville improvements were made, the only export business of Pensacola was that originating in nearby territory, being mostly lumber and naval stores. Nearly all of it was handled in sailing vessels. The result of the improved facilities is shown in the following table of exports from the city during the calendar year 1907. The L. & N. brings to Pensacola cotton from five states, coal and iron from Alabama and Tennessee, phosphate rock from Tennessee, yellow pine from Florida and Alabama, and grain and packing house products from connecting railroads in the Middle West. Since no attempt has been made to serve other than southern territory with imports, the principal

Commandancia and Tarragona Wharfs, Looking North.

Wharf Office and Grain Elevator.



Plan of Commandancia and Tarragona Street Wharfs.



Plan and Sections Through Export Freight Warehouse and Storage Warehouse.

Commandancia Street Wharf, and Outer End of Tarragona Wharf.

Part of Plant of Atlantic Compress Company.

movement has been in raw materials. It is expected that the port will do a large business in mahogany logs from Central America and Africa, and arrangements have been made to handle a number of steamer loads of this timber. The export business of the city should in future be favored by the fact that Pensacola bay is nearer the Panama canal than is either Mobile or New Orleans, and the city itself is much nearer open water than are the other two cities.

The exports from Pensacola during the calendar year 1907 included the following:

Coal, gross tons	68,713
Cotton, square bales	195,533
Resin, barrels	339,773
Sawn and hewn timber, superficial feet	119,285,544
Lumber, superficial feet	163,024,000
Cottonseed products, tons	4,576
Phosphate rock, tons	95,548
Turpentine, gallons	903,160
Staves, pieces	106,514
Tobacco, pounds	4,865,153
Value of the exports	$19,891,792.00

This tonnage was carried in 88 sailing vessels of 94,466 tons net register, and in 187 steamers of 421,100 tons net register; total vessels, 275; total tons, net register, 515,566. The bulk of the cargo was consigned to ports in Europe and in the United Kingdom, with some for South American, Central American, Cuban and North African points.

The import cargoes, consisting mainly of raw materials, aggregated 87,292 tons, valued at $650,643.

Both the export and import cargoes from and to European countries originated at or had consignment to the territory south of the Ohio river and east of the Mississippi river, principally in Florida, Alabama, Georgia, Mississippi and Tennessee.

The regular steamship service is as follows:

Destination.	Line.	Sailings.
Liverpool, England	Serra Steamship Line.	Bi-monthly.
Bremen, Germany	Teutonic Line.	Bi-monthly.
Antwerp, Belgium	Flemish Line.	Monthly.
Havre, France.	Pensacola-Havre Line.	Monthly.
Genoa and Venice, Italy; Trieste, Austria.	Austra-Americano Line.	Bi-monthly.

There are, in addition, special sailings to London and Manchester, England; Dunkirk, Nantes, Marseilles and Cette, France; Barcelona, Spain; Leghorn, Italy; Hamburg, Germany, and Rotterdam, Holland.

MR. ARNOLD'S SEVENTH SUBWAY REPORT.

"The Return on the Investment in the New York City Subway" is the title of a seventh report which has been made to the State Public Service Commission by B. J. Arnold. This may be called a summary, or review, of the six other reports dealing with different questions relating to the operation of the subway, which have been noticed in these columns. Mr. Arnold believes that the express stations should have a sufficient number of tracks to accommodate as many trains at one time as may be necessary in order that trains when stopping shall never delay trains behind them; that storage room should be provided at the south end of Manhattan so that cars would not have to be hauled back northward empty in the morning and then again southward in the afternoon; that every car should have a motor so as to afford the utmost facility in increasing or decreasing the length of the trains at any point; that trains should be run short trips wherever possible, so as to avoid the expense of empty car mileage, which is a considerable burden under the present system, where trains are emptied long before they reach the terminus of the road; and that the couplings between cars (and also the air-pipe couplings and the electric couplings) should be so improved that cars can be attached or detached at any station without loss of time. After discussing these and other points, he reaches the following—

CONCLUSIONS.

First—Raise *all* the money for the construction and equipment of such portions of future subways as can be shown to be profitable upon the city's credit and at the lowest possible rate of interest.

Second—For such portions of the system as are clearly unprofitable, let the territory, the value of which is enhanced by the construction of the subways, bear the burden of the initial cost.

Third—Eliminate taxes as is now done with the present subway.

Fourth—Extend the refunding period for the retirement of the cost of subways over as long a period as practicable.

Fifth—Design the express stations of the main stems of such subways upon the reservoir principle so as to secure maximum capacity with minimum investment.

Sixth—Lay out a comprehensive system of transportation and begin the construction of subways at the center of the congested district and extend outward in order to get the benefit of the short haul profits before assuming too much of the long haul burden, and in connection with the short haul business investigate carefully the possibilities of moving platforms for the local tracks.

Seventh—Take advantage of specific cases where railway companies desiring to secure terminals, the indirect value of which to them is great, may be willing to contribute largely to the cost of building portions of a comprehensive subway system.

Eighth—Lease the operating privileges, under proper public supervision, to an operating company upon the basis of an agreed compensation per car-mile—the number of car-miles to be operated, which is the measure of service, to be determined by dividing the income from the traffic by the total cost of operating a car-mile, the income to be sufficient to provide for operating expenses, including maintenance, fixed charges and depreciation, and leave sufficient margin to sufficiently compensate the operating company so as to secure the highest class of skill and efficiency in operation.

Mr. Arnold says that there is a large amount of short-haul passenger business available in the lower part of Manhattan, which is not accommodated either by the surface or the elevated roads. This can be developed by subways so that the business district can be economically extended northward to Fifty-ninth street. This conclusion, however, seems quite evidently to be based on the hope of providing ample local-station facilities; as, for example, with a moving sidewalk. He calls attention to the fact that the money invested in the subway now draws interest varying from 3½ per cent. to 6 per cent., some of it having been borrowed by the city at the lower rate, and some by the operating company (for equipment) at a higher rate. No depreciating reserve fund has been provided by the present management—a fault which should be corrected. For the last fiscal year (ending June 30, 1908) the expenses per car-mile for maintenance of way were 1.8 cents; maintenance of equipment, 1.87 cents; maintenance of power plant, 0.35 cents. Wages of trainmen amounted to 1.79 cents per car-mile, and the cost of power supply was 2.38 cents. Discussing the storage of empty cars, Mr. Arnold says that a subway with two tracks could better afford to provide storage space under Battery Park than to build a single additional track to accommodate the rush southward in the morning and northward in the evening. At present at least one million useless miles are run by cars each year because of lack of storage room, and two millions because trains have to be run through to the end of the line, even when a large share of the passengers have been left at stations near the middle of the line. Mr. Arnold says that coupling and uncoupling cars by hand requires from one to two minutes at each station where cars are taken or left, and this time he would propose to save; but how to save time in testing the air-brakes after the hand operations are finished, he does not explain. He believes that 10 per cent. of the total number of car-miles could be saved, which he estimates would amount to $320,000 a year.

Mr. Arnold estimates that in New York City an ordinary trolley road costs, per mile of track, from $32,000 to $50,000 a mile; a surface road, with underground conduit, from $80,000 to $120,000; an elevated road from $200,000 to $300,000; a subway from $600,000 to $900,000, and a tunnel under water from $1,200,000 to $1,800,000. The foregoing figures do not include electrical conductors, power plants or cars. In general, a subway should not be built unless there is business enough for three elevated lines. Although these estimates are made on a basis of miles of track, they contemplate roads of at least two tracks in all cases, no doubt.

Fully 30 per cent. of the investment in the present subway was for branch lines, which are run at a loss. For such costs as these the property benefited should be assessed.

RECAPITULATION OF POSSIBLE SAVINGS.

Reviewing the entire problem of making a sub-surface sys-

tem of transportation pay a fair return on the investment even with the fare limited to the uniform amount of five cents a passenger, Mr. Arnold gives the following recapitulation. The cost of operating the present subway is shown in column A (year ending June 30, 1908). The extreme theoretical reduction in cost that can reasonably be expected is shown in column B, and in column C, the lowest probable practical limit of cost that can be attained in the operation of future subways under the most favorable conditions. All figures are given in cents per car mile.

Comparative Operating Expenses.

	Cost, cts. per car mile.		
	A.	B.	C.
Maintenance of way. The reduction is due to the possibility of operating more cars than is done at present over each track.	1.18	.18	1.00
Maintenance of equipment. The saving shown may be accomplished by providing the most economical repair shop equipment.	1.87	.27	1.60
Maintenance of power plant. Very little saving is to be expected except that due to running more cars or providing slightly less reserve machinery than has been thought best with the present subway.	.35	.10	.25
Wages of trainmen. The only reduction that can be expected in this item will be due to efficiency in the management of the men and trains, and not in the reduction of the cost of labor. Every car mile operated will require its quota of trainmen.	1.79	.04	1.75
Wages of station men. All station expenses per car mile will become less as the volume of traffic increases.	.84	.34	.50
Other transportation expenses. This item also *diminishes* as the number of car miles increases, although the reduction cannot be expected in the same proportion as the increase in car miles.	.95	.40	.55
Power expenses. Every car moved one mile will require approximately the same amount of power, unless the average speed is reduced. Some slight economy may be expected with increase in load.	2.38	.20	2.18
General expenses. This item will become smaller as the car miles increase, as the total expenses are divided among a larger number of car miles.	.69	.25	.44
Total operating expenses. As the fullest limit of economy cannot be expected with every item in any one case, it is probable that 9 cents per car mile represents the lowest practicable operating cost, in the present state of the art.	10.05	1.78	8.27

*Comparative Fixed Charges—Column A Estimated.**

	Cost, cts. per car mile.		
	A.	B.	C.
Interest on permanent way. This item can be limited by keeping down the investment and by operating the tracks up to their fullest limit of capacity during rush hours.	4	2	2
Sinking fund for permanent way. This item can be reduced in the same proportion as the previous one. The 1 per cent. determined upon as the rate for sinking fund with the present subway is not any too large.	1	0.5	0.5
Interest on equipment. By reducing the rate of interest from 6 to 4 per cent., a considerable saving can be effected. If the policy of providing funds for the equipment by means of the city credit could be followed the saving in interest per car mile would go far toward providing an adequate depreciation reserve for the replacement of this equipment.	3	1	2
Total for fixed charges. It will be seen that the possibilities for saving are nearly twice as great with the fixed charge accounts as with the operating expense items.	8	3.5	4.5
Total cost, including both operating expenses and fixed charges. The sum total of all the possible economies amounts to 5.28 cents per car mile, or 30 per cent. of the total average cost of operating each car mile in a subway similar to the present subway. As the lowest limit can only be secured by strict economy in investment and in operation, which in some cases might reduce the quality of the service supplied, it will be better to assume a medium figure of between 14 and 15 cents per car mile as the low practicable limit which can eventually be expected with future subways. With the present subway it will be difficult to introduce sufficient economies to reduce the total cost per car mile to less than 17.5 cents.	18.05	5.28	12.77

* The first column shows the results that can be obtained by operating 50,000,000 car miles in a subway in which the permanent way cost $50,000,000 and the equipment $25,000,000, which is approximately the ratio with the present subway.

Recapitulation of Estimates for Future Operations.

	Subway similar to present subway.	future subway.
	Cost per car mile	
Income per car mile—	Cts.	Cts.
From passenger operation only	23	18
From advertising, sale of power, etc.	1	1
Total gross income per car mile	24	19
Operating expenses	10	9
Net earnings	14	10
Fixed charges	7.5	5.5
Surplus to be applied to dividends and depreciation	6.5	4.5
Depreciation at the rate of 3 per cent. per year on actual investment in equipment	—	1.5
Surplus for profit	6.5	3

From the foregoing analysis it will be seen that in order to pay a profit of 6.5 cents per car mile from the operation of a subway similar to the present subway, *it is necessary to crowd the passengers in the cars* so that the average income *from passenger revenue* amounts to 23 cents per car mile. Furthermore, in order to maintain this profit of 6.5 cents per car mile, which in the case of the present subway is now all disbursed as dividends, the item of depreciation on the equipment must be entirely neglected.

The second column shows that if changes are made in the methods of financing, constructing and operating subways it is possible to design and build future subways that will furnish adequate service for a five-cent fare and at the same time take care of depreciation and interest on the investment. That the service can be adequate is indicated by the fact that the *income per car mile from passenger revenue only* need not be more than 18 cents, instead of 23 cents as required under present conditions.

In order to produce this result the following economies must be secured:

	Saving per car mile. Cts.
1. Reduce the investment required for permanent way by raising by special assessment on the property benefited the first cost of all branch lines. The saving per car mile would approximate	1
2. Increase the earning capacity of each dollar invested in permanent way by designing the stations on the main line on the reservoir principle, so that 60 trains an hour can run over each main line track. Practicable saving per car mile.	1
3. Effect economies in operation and maintenance and reduce relative importance of general expenses by operating more cars with same organization charges. Saving per car mile.	1
4. Raise the money for the first cost of the equipment on a basis of 4 per cent. instead of 6 per cent., either by using the city's credit or otherwise. Saving per car mile	1
5. If all the investment for both the permanent way and the equipment could be secured solely upon the city's credit, the "profit" made by the operators over and above interest charges could be justly reduced, as the operators would then assume no financial risk. With the present subway, which pays nominal taxes amounting to about $60,000 per year, about 1⅓ cents of every 5-cent fare goes toward "profit." If the city furnished the money for the equipment as well as for the permanent way, then this profit could be reduced from the present rate of about 6.5 cents per car mile to not more than 3 cents. At this rate the profit to the operators would amount to $1,500,000 per year on the basis of 50,000,000 car miles. Thus the saving per car mile to the subway system by this arrangement would amount to at least	3.5

The sum of all these savings amounts to 7.5 cents per car mile, but as it may not be practicable to secure the full measure of economy indicated as possible in each case, the total saving may be taken as 6.5 cents per car mile.

It is feasible to construct, operate and maintain subways in certain localities within the congested districts of New York and operate them upon a five-cent fare, but * * * these short-haul subways cannot be divorced from the long-haul feature and consequently with the return upon the investment now required by private capital there is now no field in New York City for the construction of a comprehensive system of subways entirely with private capital unless the fare for the long-haul passenger is something more than the present five-cent fare.

The working expenses of the Prussian State Railways, which in 1896 were 54 per cent. of the gross earnings, in 1908 were about 72 per cent. Better service, and especially higher wages and higher prices of supplies, have done it.

CHAMBER OF COMMERCE ON NEW YORK RAPID TRANSIT.

A committee of the New York Chamber of Commerce, appointed Nov. 4 has reported on the rapid transit problems of New York City. The committee consisting of E. H. Outerbridge, chairman; Paul M. Warburg, Howard C. Smith, Clarence H. Kelsey and J. Edgar Leaycraft, declares itself strongly inclined to private construction, equipment, and operation of subways hereafter to be built, and advocates legislation granting more favorable conditions to private capital. The municipal construction of further subways is out of the question, as the city has not the borrowing power to undertake such projects. Subways should be built, equipped and operated by private capial, with the option to the city to purchase, operation to be conducted upon specific terms of profit-sharing with the city in lieu of taxes or payment for franchise rights. This principle has accomplished the settlement of the aggravated conditions formerly existing between the surface railways in the City of Chicago and the city. Under the agreements arrived at, the corporations have been enabled to obtain large amounts of new capital for reconstruction and extension, and the city has received in the first year of operation about $1,600,000 as its share of the profits without having incurred any obligations. The committee believes that it may be found necessary, in view of the cost of long-haul traffic in the present Subway, to increase the rate of fare on the express trains, while leaving the local fares at 5 cents. Thus persons who could use the slow trains would have the choice of the cheaper rate. A ten-cent fare would mean an additional expense of $31 per annum, but this would be offset by the savings in rent in suburban districts and by healthy living conditions. * * * At present the financial problem is beset with so many uncertainties that private capital cannot look upon the undertaking as safe. The community can dictate the operation and the routes, service, and fare may not be settled by considerations of financial return, but by the question of what may be best for the city at large; therefore, the city should make good any deficiency in operating. Where capital has to subordinate its own interest to that of the public to such an extent that on the legitimate share capital not even 3 or 4 per cent. could be earned, the community at large certainly would have received so much in service that no reasonable objection could be raised to making good the deficiency out of the annual tax budget. * * * Structures built by private capital would become the property of the city for a nominal consideration. * * * If private capital is to be attracted, it will be necessary to make legal provisions by which the security of the investment and a stated degree of return thereon cannot be jeopardized by changes to be made on the simple order of any commissioners who may then happen to be in office.

To this end the committee advocates a board of arbitration consisting of three engineers, one chosen by the city, one by the companies, and the third by these two, which shall pass upon the reasonableness of orders of the Public Service Commission before they are promulgated.

The proposal to have the cost of subway construction assessed on the abutting property owners might be useful in outlying districts, if the assessment bonds could be issued, so that they cannot become a lien on the general credit of the city.

As a matter of immediate relief the committee favors the extension of the present Subway south from Forty-second street on the west side and north from Forty-second street on the east side, and favors the construction of a third track on the Second and Third avenue elevated roads. The Steinway Tunnel either ought to be acquired by the city "on favorable terms," or else a franchise should be granted to allow its being put into operation.

The Elsberg law is criticized. It has been as obstructive "as though it had been designed for the purpose of preventing construction of rapid transit lines." As the laws now stand, additional subway lines if built by the city would have to be operated by it; for contractors could not be found to lease them.

The report indorses the Public Service Commission law, declaring it has made impossible many abuses, but "the extent to which regulation should go is a debatable question. The Public Service Commission can practically assume the usual prerogatives of operating officials, and can issue orders for operation and equipment after preliminary hearings, which, if enforced, can only be contested in the courts on the ground of confiscation. The law does not specify that the commissioners shall be experts in this field, nor do they incur any financial responsibility by reason of their acts and orders. They are under continuous pressure from associations of citizens and the public generally, and, presumably, cannot altogether escape from political influences."

" * * * Great deal of deliberation, education, and negotiation will be necessary to work out a wise solution. * * *"

MISSOURI RATE LAW UNCONSTITUTIONAL.

A decision in favor of the railways was handed down on March 8 by Judge McPherson of the United States District Court in the two-cent fare and maximum freight rate cases, involving 18 Missouri lines. The railways contended that the rates fixed by the statutes of the state were not remunerative, but confiscatory, and asked that the enforcement of the statutes be enjoined. The state brought proceedings to have them enforced.

The maximum freight law involved reductions ranging from 2 per cent. to 40 per cent. on freight in carload lots. The railways secured a court order temporarily restraining the state officials from putting this act into effect, and on June 11, 1907, Frank Hagerman, representing the various railways, petitioned the court to make this order permanent. By mutual agreement and at the suggestion of Judge McPherson, who desired to have a practical test, the two-cent passenger rate law was put into effect on June 11, 1907, to run three months. At the end of that period both sides agreed to continue the rate in effect, as the results obtained had not been considered sufficient and the law is still being enforced.

After many delays, the cases were finally brought to trial before Judge McPherson. The final arguments were presented on January 20 last. At that time Governor Hadley, who, as attorney-general, had begun the cases, spoke for the state. Mr. Hagerman made the principal argument for the railways.

"The question," said Judge McPherson in his decision, "is whether the traffic wholly within the state of Missouri generally referred to in the evidence as local traffic, can be carried under the freight-rate statute of 1907, and the passenger-fare statute of 1907, at such profit as will give a reasonable return after paying expenses upon the investment, or whether such traffic is carried at a loss, or less than such reasonable profit. * * * The court has reached the conclusion that upon this question the statutory rates fixed by either and both statutes are not remunerative."

In giving the reasons for such conclusions, the decision says:

"The unquestioned and undoubted rule is that there is a presumption both of fact and of law in favor of the validity of every legislative enactment. The railway companies have the burden of removing this presumption and showing clearly, or, as some experts say, palpably, and others say, beyond a reasonable doubt, that the statute is invalid. In these cases the court has recognized this rule. The authorities on this question form a long and unbroken line, with the single exception of the majority opinion in the Pennsylvania case decided a year ago. (68 Atl. Rep., 676). And that one authority is not persuasive.

"All testimony and argument bearing upon the question as to what consideration the legislature of Missouri gave to these enactments is utterly immaterial. Much was said in argument as to the message of Governor Hughes of New York, two years ago, in declining to approve the two-cent fare statute of that state. Governor Hughes had the moral courage to veto a measure of popular favor because, as he believed, the question had not been fully considered. But the relations of a governor to proposed legislation and those of a court to legislation consummated are entirely different.

"Most laymen and many lawyers believe that the question is whether the railway company as a system is earning sufficient revenue on the value of the property of the system. They believe that if the Burlington, Santa Fe, Wabash, or any other railway system is earning such money as will pay all charges and expenses, including taxes and interest, with reasonable dividends to the stockholders, state rates for state business must stand. Of course, no one believes this who has given the slightest attention to the question. That precise question was decided by Justice Brewer, and affirmed by the supreme court in the Nebraska case of Smyth vs. Ames. The only question is as to Missouri rates, less expenses properly charged against the same. And if this balance does not leave sufficient to pay a reasonable return, the law is invalid. And if the railway system of any company is earning more than a reasonable return by reason of interstate rates, which affect the people many times more than local rates, and if such interstate rates are too high, Congress, either acting alone or through a commission, must make the corrections.

"The Supreme Court, during the present year, in the case of the City of New York v. Consolidated Gas Company of New York, decided that 6 per cent. was fair and right to be given to the owners on the true valuation. My opinion is, that while a gas plant is in some respects different from a railway, that a railway property, properly built and properly managed, should, over and above expenses, make a return of 6 per cent. per annum. And considering all the evidence, it is fairly shown that all of these roads were properly and economically built and are being properly and economically managed, and that, after paying the expenses for maintenance and operation, there is less than 6 per cent. returns, and not more than 3 per cent. on any of them, and as to some of them a deficit, taking the property as above stated within the state of Missouri at its fair valuation. And this is so without reference to bonds, because in no case do these bonds bear 6 per cent. interest. But taking the bonds into consideration, there is still not to exceed 3 per cent. returns, and in many cases a deficit after considering all debits and credits, on the true valuation for the state business. There is no evidence that any of the existing bonds were improperly issued, either as to amounts or rates of interest. In fixing the value the court has considered the evidence of witnesses as to the stocks and bonds outstanding, and the state board for taxing purposes has valued these properties. Of course, those findings are not binding nor conclusive, but they are persuasive.

"The valuation of the roads has been fixed by the court as shown by the findings of fact. The entire state and interstate earnings of each of the roads within the state are known and fixed to a certainty. The expenses are known and fixed. To apportion these expenses must be done according to one of the two theories, and the correct theory is that according to revenue. One theory or other must be applied to both freight and passenger expenses, and the court should not adopt the one theory as to part, and the other theory as to another. The one theory is helpful to the one side, and the other theory helpful to the other side—the one theory to the one side in freight, and the other theory to the other side in passenger. But an arbitrary splitting of theories is illogical and unfair and cannot be recognized. The court has adopted the revenue theory because a great number of the best railway experts of the country, against a very limited number to the contrary, have so testified. Every court that has ever had this question before it in so far as I am advised by the briefs of counsel and my own independent investigation has so held. * * *

"The passenger earnings under the two-cent fare law of 1907, allowing nothing for extra cost over interstate business, give no return whatever to the Rock Island, St. Louis and Hannibal, Kansas City, Clinton and Springfield, and the Great Western. The other companies will have the following: The St. Louis & San Francisco, between 3 and 4 per cent.; the Santa Fe, between 4 and 5 per cent.; the Kansas City Southern, a small fraction over 2 per cent.; the Missouri, Kansas & Texas, between 2 and 3 per cent.; the Burlington, between 3 and 4 per cent. But all this is arrived at by allowing no extra cost of service. But if there be added the extra cost for freight and passenger, there are no earnings over expenses. This is confiscation under the constitution.

"It being a legislative act, and not a judicial one, this court cannot fix rates. If it could, 2½-cent passenger rates would be fixed for the stronger roads, and three for the others. But that is for the legislature, acting itself with experts such as the state employed in these cases, or through a commission with like assistance.

"When the statutes in question were enacted, it was believed by many that by reducing the fare there would be much more travel. For a month or so this proved to be true. But with the novelty gone, the testimony shows that the increase has been less than 3 per cent. and more nearly 1 per cent."

The judge says, as to the abolition of passes, that the evidence shows the passenger revenue is increased by reason thereof less than 1 per cent.

Frank Hagerman, representing the railways, made the following statement:

"The maximum freight laws have never been enforced because the temporary injunctions were granted when they became effective. Therefore the situation as to them will in the future be the same as it has been in the past. The two-cent fare law, howver, has been enforced. From the decision of the court, the state may appeal to the Supreme Court of the United States. Pending that appeal, the railways will not be bound by the law, and may at any time adopt and put in force the old rate by publishing new schedules as required by law. The state law requires 10 days' notice of an advance in the state rate; the interstate commerce law requires 30 days' notice of any change in the interstate rate. What rate the railway will adopt and when it will be put in force, must, of course, be determined by the traffic officials after they have carefully considered the text of the decision.

"The two-cent rate is the subject of pending litigation in Minnesota, South Dakota, Nebraska and Kansas. It is not conceivable that, if the rate is confiscatory in Missouri, it can be compensatory in any of such states. What, if anything, will be done in other states has not been determined. In view of the thorough investigations and the decisions in the Pennsylvania and the Missouri cases, it is doubtful whether any state will longer attempt to keep in force a two-cent fare law. Oklahoma makes provision therefor in its constitution, which may be difficult to change.

"Judge McPherson proceeded with unusual care and caution, and at great personal sacrifice to himself heard the testimony orally. He has laid down in simple words certain rules, by the use of which any legislature seeking to pass a rate law, or any railway desiring to contest one, can readily determine whither it is confiscatory: These rules are: Ascertain the value of the entire railway property in the state; of such value, assign to the traffic to which the rate in question applies such proportion as the revenue from such traffic bears to the entire state revenue; on this assignable value there must be an annual return of a least 6 per cent. Expenses as between state and interstate business must be divided on a revenue basis, and have added thereto the extra cost of doing state business over interstate business."

Governor Hadley is quoted as saying that the decision does not end the fight. While the decision is simply the opinion of one judge, it must be accepted as the law until the case is submitted to the Supreme Court of the United States. That he thinks the decision is wrong, goes without saying. The theory of the railway experts, that the expenses common to state and interstate traffic should be divided in proportion to the revenue produced by the two classes of traffic with an added increase of cost for doing state business, seems to him manifestly absurd, and its logical result would be that the higher the rates and the greater the revenue produced by the state traffic, the larger would be the amount of expenses assigned to that traffic.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XVII.

One of the tables gives for the different stages of the work a summary of the previous estimates of capital expeditures necessary for the introduction of electric traction.

Summary of Capital Expenditure Involved by Electric Traction and Resultant Increased Interest Charges.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
1. Power station, high-tension feeders and sub-stations*	£221,333	£386,357	£580,430	£846,689
2. Track equipment.†	53,330	170,328	311,035	568,139
3. New rolling stock.‡	67,674	221,657	426,044	754,881
4. Inspection pits and Flinders St. car-sheds.	14,392	23,538	45,179	57,341
5. Total cost, electric scheme	£356,729	£801,880	£1,362,688	£2,227,050
6. Less expenditures to deal with traffic by stm. trac.	41,730	149,945	274,696	425,590
7. Net adtl cost, electric scheme.	£314,999	£651,935	£1,087,992	£1,801,460
8. Interest at 4 per cent per an.	12,600	26,077	43,520	72,058

*Including spares for power department.
†Including low-tension cables and alterations to permanent way, and spares.
‡(Less credits), alterations to existing stock, and electrical equipments, including spares.

The operating expenses with electric traction are comparable with the operating expenses with steam traction. The table giving the former shows that although a much more frequent service and a greater schedule speed would be given with electric traction than with steam traction, the operating expenses of the former would be slightly lower. If the two systems be compared on the basis of the operating expenses per train-mile, electric traction shows up still more favorably, steam traction costing from 45 per cent. to 72 per cent. more according to the stage taken.

Operating Expenses with Electric Traction.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Power Department:				
Cost of power	£7,719	£24,809	£46,267	£70,591
Rolling Stock Department:				
Motormen's wages and stores.	2,693	10,052	19,027	29,079
Inspection and maintenance of rolling stock & equipment..	4,692	25,714	49,570	76,911
Transportation Department:				
Additional staff at stations..	510	1,968	3,640	6,840
Guards' wages and stores....	2,229	7,728	15,158	23,479
Way and Works Department:				
Maint. of elec. track equip...	720	3,300	6,700	12,800
Electric traction—				
Operating costs—total.*	£18.563	£73,571	£140,362	£219,700
Do. per train-mile.	13.34*d.*	12.10*d.*	11.52*d.*	11.03*d.*
Steam traction—				
Operating costs—total*	23,100	85,877	160,097	246,967
Do., per train-mile.†	19.38*d.*	19.06*d.*	18.98*d.*	18.93*d.*
Difference in favor of electric traction—total	£4,537	£12,306	£19,735	£27,267
Do., per train-mile.	6.04*d.*	6.96*d.*	7.46*d.*	7.90*d.*

*See second note in table of operating expenses with steam traction.
†Train-miles 12 per cent. increase on 1906 returns.

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

A comparison between the cost of steam and of electric traction if interest on the capital cost of the electrification scheme be taken at 4 per cent. per annum and debited to the cost of electric traction is given in one of the tables. This table also compares these results, for each stage, with the increase in revenue resulting from the improved facilities for travel rendered practicable by electric traction. If the comparison as to financial results from steam and electric traction be based solely on the figures shown in this table, a slightly larger increase in traffic than the 5 per cent. suggested is necessary to justify the substitution of electric traction for steam. It will be seen, however, that the amount required in order to restore the financial balance in favor of electricity is comparatively small at all stages except that for the Port Melbourne and St. Kilda branches.

Comparison of Increased Cost of Electric Service with Increased Revenue Due to Improved Facilities.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
1. Interest charges, 4 per cent., on capital cost elec. scheme...	£12,600	£26,077	£43,520	£72,058
2. Saving in operating expenses with electric traction......	4,537	12,306	19,735	27,267
3. Extra cost of electric traction including interest charges..	£8,063	£13,771	£23,785	£44,791
4. Additional increase in revenue on basis of 5 per cent. greater traffic with elec. traction	2,500	11,073	20,520	28,632
5.* Do., on basis of 10 per cent. greater traffic	5,000	22,145	41,040	57,265
6.* Do., on basis of 15 per cent. greater traffic	7,500	33,218	61,560	85,897
7. Actual percentage increase.†	16.1%	6.2%	5.8%	7.8%

*The estimates assume a difference of 5 per cent. only in additional revenue, but for convenience corresponding figures are also given for increases of 10 per cent. and 15 per cent.
†Of revenue above the assumed normal growth of 20 per cent. necessary for the revenue at the different stages to balance the additional capital charges, less the saving in operating expenses.

The factors affecting the growth of a large system like this are so numerous as to make it impossible to speak positively as to the increase in traffic following on the introduction of electric traction, but after a very careful comparison of your conditions with those of other suburban systems before and after their conversion to electrical working, I am of the opinion that 10 per cent. is a conservative estimate of the additional revenue which will result within a comparatively short time from the improved service proposed.

I have now compared the results obtainable by electrical working with those to be expected if steam working be continued. Another, and somewhat different, way of looking at the matter is to take electric traction by itself and consider whether, in view of its many advantages, the fact that it can be installed and worked so as to yield a steadily increasing profit justifies its adoption. The final table compares the estimated profits from the suburban railways in 1912 with electrical operation (assuming the normal increase of traffic—20 per cent.—plus the minimum of 5 per cent. due to improved service—with the actual profits for the year 1906 with steam traction.

Profit from Suburban Business in 1906 (Steam) and 1912 (Electric).

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Operating expenses, 1912, electric.	£18,563	£73,571	£140,362	£219,700
Operating expenses, 1906, steam..	19.273	71,641	133.468	205.871
Increase, operating expenses....	£710*	£1,930	£6,894	£13,829
Increase in revenue	12,500	55,363	102,600	143,162
Increase in gross profit.	£13.210	£53,433	£95,706	£129.333

*Decrease.

It will be seen that if tne Port Melbourne and St. Kilda lines only are proceeded with there will hardly be sufficient profit to pay the interest charges on the new capital expenditure. This arises largely because, in this case, the amount

of electrical energy required is really not sufficient to bring the cost of generation down to a reasonably low figure. But if in addition to the Port Melbourne and St. Kilda lines we include the Brighton and Essendon lines, Stage I., the scheme becomes one of sufficient size to secure real economy of generation, and the financial results from the suburban system in the year 1912 would be considerably better than they were for the year 1906*; the additional surplus is, in fact, £21,358 after paying interest on the new capital expenditure. For the complete scheme this figure rises to £40,251.

SUMMARY OF CONCLUSIONS.

The report deals with two main questions:—

I. Is the substitution of electric traction for steam traction on the Melbourne Suburban system financially justified?

II.—If so, how can electric working be best applied?

After referring to the special importance of the suburban business, the experience of other cities and the advantages offered by electric traction, both to the public and to the management, technical considerations are dealt with and financial results determined.

The main conclusion is that on account of the great advantages to the public and the improvement in financial results to be expected from so doing, the application of electrical operation to the suburban railways is justifiable.

The more important conclusions and recommendations are here given in order of convenience rather than in their actual sequence in the report itself.

Capital Outlay.

(1). The total capital outlay for the conversion of the whole suburban system will be £2,227,050. It is recommended that a portion only of the system be converted at present (see No. 19, below).

(2). In considering these figures the expenditure necessary if steam traction be retained must also be taken into account. This expenditure on rolling stock only amounts to £408,358.

Cost of Electric Working.

(3). The expenses per train-mile with electric traction would be 11.0d. as against 18.9d. with steam. With the former, however, there would be a greater train-mileage.

(4). The total operating expenses with electric traction for the whole suburban service would be £27,267 per annum less than with steam (see No. 9).

Financial Result.

(5). The total annual expenditure for the whole service, including 4 per cent. on the new capital outlay, would be £44,791 more than with steam; against this must be put the additional revenue due to the improved service.

(6). The surplus, after paying interest on new capital for the complete scheme, would with electric traction be £40,251 greater than was obtained in 1906 with steam.

Improved Service.

(7). If electric traction be adopted, an improved schedule speed and frequency of service becomes possible with the existing tracks and termini.

(8). An increase of 20 per cent. over the present schedule speed and an increase of 71 per cent. in the train-mileage, are financially justifiable, and are covered by the expenses referred to above.

Rolling Stock.

(9). The adoption, instead of locomotives, of the "multiple-unit" system of train operation is recommended, giving this increase of 71 per cent. in the train-mileage with an increase of only 23 per cent. in the ton mileage.

(10). Cross-compartment coaches should be adopted, the existing bogie stock being altered and used for the electric service.

(11). The total stock required would be 496 coaches with electric working, as compared with 546 coaches and 110 locomotives with steam, the reduction in the number of coaches being due to the higher schedule speed.

Electrical System.

(12). A direct-current 800-volt system would be the cheapest and best system for this particular case.

(13). The direct current should be distributed to the trains from sub-stations by means of a protected conductor rail.

(14). The sub-stations should be supplied with three-phase high-tension current from the power station by means of underground cables in the central areas, and by overhead lines in the less populous districts.

Power Station.

(15). The energy required should be generated in a central power station situated at Yarraville, designed to handle the load of 35,000 electrical horse-power.

(16). This power station should be designed to burn either black or brown coal, and the power plant should consist of water-tube boilers and steam turbines.

(17). The Spencer street and Elsternwick stations should be shut down, and the St. Kilda Tramway and the existing lighting system supplied in bulk from Yarraville.

(18). The Yarraville power station should be also used for the lighting of the railway stations and the driving of the Newport and North Melbourne workshops.

Initial Scheme.

(19). If electric traction be decided on, the scheme proceeded with in the first instance should consist of the Port Melbourne and St. Kilda and the Brighton and Essendon Branches, involving, with power plant, an initial expenditure of £801,880.

(20). After paying interest on this sum the surplus from these lines would, with electric traction, be £21,358 greater than was obtained in 1906 with steam traction.

(21). If steam be retained on these lines, £141,019 will have to be spent on rolling stock for them alone.

(22). The conversion of these lines should be so arranged that the electric zone might be extended to the other suburban lines at a future date with a minimum of alteration and expense

Other Operating Changes.

(23). Such questions as systems of train despatching, automatic signaling, new block sections, special provisions for race traffic, etc., would be best deferred until part, at least, of the system is being worked electrically.

*The estimated operating costs in the final table assume at all stages that the power and lighting scheme would be proceeded with and that the amount of electrical energy required for this purpose would reduce the cost of power to the traction scheme. If this allowance were not made, the financial result of converting the Port Melbourne and St. Kilda branches only would be even worse, as at this stage the effect on our estimated operating costs of the power and lighting scheme is considerable, owing to the relatively large amount of electrical energy it would require.

GERMAN FREIGHT CAR UNIONS.

Stringent requirements have been in effect in Germany requiring the return home of borrowed equipment, and a tariff for the rental of cars when conveying freight over lines other than those belonging to the state, is rigidly enforced. Practically the same rules control the movements of freight cars between the different German states as between various European countries. The system involves an enormous amount of bookkeeping and adds to the work of stationmen. During 1907 $4,600,000 was paid between German railway lines for car hire, and the transport of empty freight cars to home territory exceeded 125 million car miles.

To do away with the loss and expense involved in existing conditions, the directors of the various state railways have organized a general freight car union. The head office of this organization will be at Berlin, and it will be responsible for over 500,000 freight cars. Territorial lines will be abolished in the scheme of organization, and the railway network of the empire will be divided up into natural districts, each of which will be assigned its quota of cars. The distribution within a district will be controlled by the local traffic manager. To meet the varying demands of individual sections according to the season of the year, or in response to unusual local industrial conditions, the effective distribution of rolling stock between districts will be directed from the Berlin office. Repairs to cars will be made at once in whatever district they may be found necessary. Future additions to the stock of cars will be made from funds supplied by the constituent members of the Union, and standard types will be adopted.

There will be a single annual adjustment of accounts by the constituent lines to balance up the inequalities between cars furnished and cars used by each line. This item of accounting will be of the simplest character, being based upon the year's traffic returns, and will involve only a few day's work by an expert. Arrangements are being made to bring the new plan into operation on April 1, 1909.

The French railway in Abyssinia from the coast by way of Harrar to Adis Abeba, the seat of government, which has had more than one struggle to get itself built, is reported to be in danger again on account of the competition of camels. Trains of loaded camels come up from the coast, while the railway trains are nearly empty. The camel traffic is in the hands of men who own nothing but camels, and who cut rates till they get the freight. The camel drivers are said to make disrespectful gestures to the trainmen as they pass with an empty train.

General News Section.

The amount of creosote imported into New York during the past year is estimated at 25,000,000 gallons. In 1904 only 3,500,000 gallons were imported.

At the meeting on March 12 the Central Railway Club's committee on the revision of Master Car Builders' Rules of Interchange will submit its report.

The Brotherhood of Locomotive Engineers is to put up a large office building at Cleveland. The building will require 2,400 tons of steel, and the King Bridge Co. has the contract.

The Commercial Cable Co. is to cut one of its cables 300 miles east of Newfoundland and divide it at St. Johns. By thus making two sections of the cable the speed of transmission can be increased 35 per cent.

The Boston & Maine is to install telephones for train despatching between Boston and Fitchburg, 50 miles. A metallic circuit will be put up, to be composed of copper wire weighing 210 lbs. to the mile, and Gill selectors will be used for calling.

During the year 1908 the Pennsylvania Railroad kept special records of 369,315 trains, and it was found that 88 per cent. of them came into their terminals on time. The through trains included in these figures averaged 87 per cent. on time, and one-quarter of these trains which came in on time had been detained on the road and had made up a part of the time that had been lost. During the 12 months of 1908 the 18-hour train arrived in Chicago on time 315 days, and in New York 314 days.

In the United States District Court at Lynchburg, Va., March 9, a plea of guilty was entered by counsel for A. A. Luck, E. T. Edmunds, Samuel Butler, Robert Branthan and Walter Wildman, sub-contractors on the Virginian Railway, in April, 1907, to the charge of holding laborers in peonage. Luck was fined $1,000, Branthan $500, Edmunds $150 and the others $100 each. These contractors through labor agents got a number of Italians to work on the railway. Many of the laborers desired from time to time to leave the work, but were prevented by the gang bosses, who used threats, and in some instances did actual violence to the men.

The annual report of the Pennsylvania Railroad Voluntary Relief department for the last calendar year closes 23 years of successful operation, during which time the total payments for benefits and expenses have been a little over 22 million dollars. The railway companies—the Pennsylvania and its three principal subsidiaries east of Pittsburgh—have paid nearly one-fourth of this sum, having borne all of the operating expenses and having paid over a million dollars for relief to sick members who had exhausted their title to benefits and for deficiencies in the treasury in the years when the assessments did not equal the payments. The membership at the end of 1908 was 91,777, which is about 8,000 less than at the beginning of the year. Over 25,000 new members joined, but there were 32,000 who left the service of the company. The death rate during the last year was equal to 9.7 per thousand members, and the average number of members constantly disabled was equal to 41 per thousand.

General Manager Atterbury, of the Pennsylvania, has sent a telegram to General Superintendent Brooks, of the Philadelphia, Baltimore & Washington, and to General Superintendent Myers, of the Northern Central, congratulating them on the success with which they coped with the unusual snow and sleet storm of March 3. He says:

"With the very extraordinary conditions existing, and in the absence of any means of communication to direct the very heavy passenger train movement in connection with the inauguration, it is very gratifying to know that the same was accomplished without accident or loss of life, and I wish to extend to your trainmen and all others concerned my appreciation of the care and good judgment exercised by them in this emergency." In the height of the extra travel to the inauguration of President Taft a severe storm of snow, rain and wind destroyed the telegraph lines between Philadelphia and Washington for 30 miles or more, and many of the poles fell across the tracks.

Brakemen Not to Go on Car Roofs.

The New York State Public Service Commission, Second district, has issued to-day an order directing the New York Central to put into effect on March 30 rules forbidding any employee going on the top of moving trains or locomotive tenders, freight or passenger, on any portion of its lines within the electric zone (New York to Croton and to North White Plains), or in making up trains, switching or other train movement at or about any station yard or siding within the electric zone when such movement passes under or within 300 ft. of any bridge or other overhead construction having a clearance above the track of less than 21 ft.

Fifteen Billion Tons of Traffic "In Sight."

A press despatch from Salt Lake City, March 3, announcing the running of the first passenger train over the Western Pacific from Salt Lake City to Wendover and back, incidentally reminds a waiting world that for some miles the new road runs over a bed of salt, which contains 483,000,000 carloads of that substance. With so much freight which is absolutely sure to go out by this line the selling of stock in the road ought to be as easy as selling tickets in the New York Subway. To properly mystify the public the prospectus should call attention to the fact that these salt beds will provide an average of exactly ten tons for each inhabitant of the earth. Estimating 3 lbs. as the average annual consumption of salt by each human being, and making proper allowance for the slack demand in countries like India where salt is not so freely eaten, we thus see that the Western Pacific is sure of a good income for seven thousand years.

Mr. Wilgus' Rapid Transit Proposal.

Application was made this week to the New York State Public Service Commission for a franchise for an "inter-terminal belt line" in New York City, entirely within the Borough of Manhattan, a modification of a more extensive system of freight subways submitted to the Commission some months since by W. J. Wilgus, formerly vice-president of the New York Central and now president of the Amsterdam Corporation, of 165 Broadway (*Railroad Age Gazette*, October 16, 1908). In the present enterprise Mr. Wilgus gives as his associates Gustav H. Schwab, C. D. Halsey & Co., J. G. White & Co., P. A. S. Franklin, Hodenpyl, Walbridge & Co. and C. C. Cuyler.

The proposed system consists of a four-track water front belt line, elevated in some places and underground in others, with a crosstown line at 59th street and lines connecting with the Grand Central and Pennsylvania passenger terminals. Mr. Wilgus states that he is aware the franchise cannot be granted until certain changes are made in the rapid transit laws.

It is proposed to carry passengers at 5 cents each and the builders would not ask the city for either money or credit. In his application Mr. Wilgus said:

"The need for rapid transit along the water front, where an elevated structure would be unobjectionable; the benefit that the public would reap from some convenient means of interchange between the termini of the great trunk line railways and steamship lines; the relief that would follow a through train service from the suburban regions on the north to the Battery; the partial solution of the West Side freight problem; the stimulating effect upon the city's growth of opening the great East Side district to commercial development; and, above all, the prompt relief that would be afforded to the entire transit situation in Manhattan—all these are reasons

why the plan for an interterminal belt line for passengers appears to have merit, from the standpoint of the investor, the municipality and the general public."

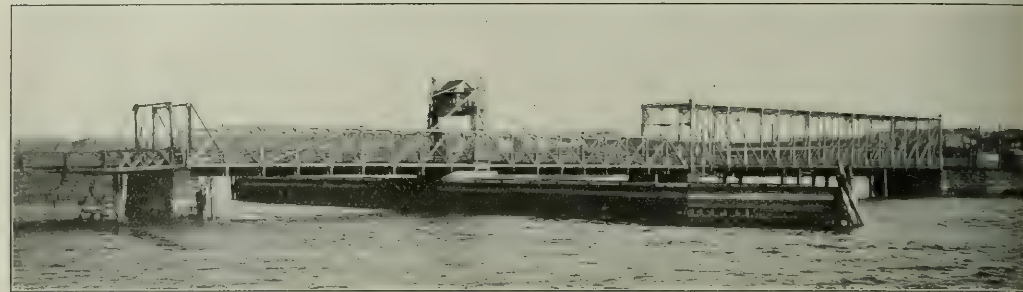
With a view to preparing an amendment to the existing rapid transit acts which would allow of the building of such a system as Mr. Wilgus asks for, the Public Service Commission will hold public hearings and order conferences between the engineers of the board and the engineers of the Amsterdam Corporation.

At a hearing before the Public Service Commission in New York this week to consider the application of the Hudson-Manhattan Tunnel Company for permission to extend its Sixth avenue tunnel to the Grand Central Station T. P. Shonts said that the Interborough company was prepared to build elaborate extensions of the present subway with its own money to the extent of $49,000,000, demanding of the city only $1,000,000, this municipal contribution being technically obligatory, it is understood, under the present laws governing subway building. Mr. Shonts proposes the extension of the present subway from 44th street southward under Seventh avenue and Greenwich street to the Battery, and northerly from the Grand Central Station under Lexington avenue to the Harlem river. This would give two trunk lines, one on each side of the city.

E. H. Harriman Outside His Tent at San Antonio.

A Railway Bridge with a History.

The accompanying illustration shows two sections of a railway bridge with a somewhat striking and checkered record. Some 35 years ago at the time when the New York, New Haven & Hartford was replacing its wooden bridges with iron structures the old wooden truss bridge over the Housatonic river between Bridgeport and New Haven was replaced. It was noted at the time that it seemed structurally slender but its grace of design and beauty of truss and chord made it the theme alike of popular and official eulogy. For months after it was finished and when, under the old Connecticut statute, every train had to stop at a drawbridge, it was "heads out" for the passengers in admiration of the new structure.



Adaptation of Old N. Y., N. H. & H. Bridge for Highway and Trolley Traffic. Length of Draw Span and Annexed Span About 400 ft. In Use Since 1885.

All went well until a few years later when a young student of the Yale Scientific School took the bridge as the subject of his graduating thesis. He visited the bridge, took his measurements, applied to them the formulas for strength of shape and material, and demonstrated that the bridge was structurally weak and very dangerous for traffic.

The thesis was submitted to the authorities of the school who kept it a deep secret but confirmed its figures and conclusions. They in turn submitted the thesis to the President and engineering experts of the New Haven Company. The experts, to the President's amazement, confirmed the *dicta* of the thesis. The almost new bridge came down right away, to be superseded by a structure less ornate but more stalwart. A crisis which had cost the President much anxiety was disguised in his next annual report by his emphasis on heavier traffic, larger train loads, dispraise of old cast-iron designs and praise of the new bridge "over which trains run as freely as they do over terra firma." Within a few years that bridge itself has had to be displaced by a much heavier one to sustain increased train load.

A little later a part of the old "poetic" cast-iron bridge was bought of the railway company to be used as sections of the ancient Tomlinson's drawbridge between the city of New Haven and the East Haven shore, where for 24 years it has served well for general highway and trolley car traffic and for those purposes is apparently in as good condition as ever though, in parts, it has had to be strengthened. The draw-span is that of the original bridge and, with the annexed span, also a part of the original structure, covers a distance of about 400 feet.

Pennsylvania Track Prizes.

The prizes awarded by the Pennsylvania Railroad for excellence in track maintenance during 1908 amount to $10,860. The premiums awarded by the General Manager went in pairs to the supervisor and his assistant, as follows: C. M. Wisman, 800, and J. D. Lovell, 400, for best line and surface on the main line during entire year; G. C. Koons, 700, and H. H. Garrigues, 300, greatest improvement in line and surface on main line during entire year; H. L. Thomas, 600, and M. W. Clement, 200, best line and surface on Philadelphia division during entire year; J. A. Burchenal and T. E. Lightfoot,

best line and surface on Middle division; C. I. Leiper and W. W. Hubley, best line and surface on Pittsburgh division; G. Goldie, Jr., and H. A. John, Jr., best line and surface on Maryland division.

The foregoing premiums are based on inspections made about every six weeks throughout the year between Jersey City, Pittsburgh, Philadelphia and Washington, by a committee consisting of the Chief Engineer of Maintenance of Way, the Engineer of Maintenance of Way, and three branch line division Superintendents, who make the trips in a special car attached to one of the fast trains in each direction, and a careful observation is made by means of instruments specially constructed to indicate imperfect line and surface.

Premiums are awarded by the General Superintendents to those among the 1,500 track foremen who achieve the best results for the year. Those over $25 went to the following, each being $50 except as noted:

E. J. McGuire (60), James Coote, T. Prindaville, J. M. Cahill, John Cooke, J. McDaid, C. Calter, R. L. Baird (100), G. Althouse (60), John Small, J. Johnston, J. K. Weaver, G. A. Kohler, A. Rodman, C. W. Urban, H. Murray, E. B. John (100), B. F. Garver (60), M. Klinedinst, G. F. Wagner, D. Hawk, S. P. Lightner, J. H. Martin, A. Treese, G. Ehrenfeld (100), G. J. Stahley, William Johns, H. H. Mumma, J. G. Blair, J. E. Bishop, A. A. Raffensperger, B. F. Mount, F. L. Yeager, Henry Aul, J. B. Elmer (60), Michael Lay, Harry Boyd, J. E. Rollins, C. J. Dinsey, W. K. Mangum, P. Hayden, J. F. Thomas, S. F. Miller, W. T. Lego, J. Welch, T. Woomer, J. Yannutz, A. Cosei, F. J. Wills, J. A. Toy, D. W. Phillips, T. H. Duncan, P. Dempsey, J. A. Granato, J. L. Nolan, B. T. Rust (60), D. I. Allen, J. Coverdale, G. Walker, A. F. Slade, A. Johnson, J. F. Burgie, J. Murphy, J. E. Winters, C. Mancus, J. Lynch, J. Mostacato, Wm. Hartman, J. W. Freeman, J. Sheehan, C. H. Wyant, G. L. Welch, Wm. E. Brown, A. W. McClellan, E. J. Ayars, E. S. Hippey, J. Bergen. Nineteen foremen received $25 each.

On the Long Island Railroad awards were made as follows: C. F. Dunbar (100), C. King (50), A. E. Weinberger (50), Frank Ferrulla (25). Dominick Panullo and Mike Geraldo were tied for first place and each received $37.50. Wm. Meilke and J. Reuger, were also tied and received $37.50 each. Martin Conway received 50 and F. E. Turner, 25.

Prizes on the Cumberland Valley amounting to $305 were awarded to C. A. Gribble (80), John C. Wagner (60), H. R. Meredith (40), Urge Shoap, (25), S. N. Rook (30), A. F. Kohler (20), John Gray (25), A. J. Dehart, (25).

For the coming year the Cumberland Valley will increase its prizes from 25 to 60 per cent.

London Electric Railways.

For the present, the London & North Western Railway, which was going to relieve its lines out from Euston terminus by an electric railway partly tube and partly surface out as far as Watford, is still obliged to defer the carrying out of the underground section, but it has during the past year done work in connection with the surface track. The matter had to be deferred originally owing to the state of the money market, a reason which has held back many other important enterprises which English engineers would have liked to get to work upon. The Central London Railway is applying for parliamentary powers enabling it to extend its line from the Bank (City) station to and under the Liverpool street station of the Great Eastern Railway, where it will also have connection with another railway serving north and northeast London suburbs. This new section is one that has often been thought about, and it will undoubtedly afford a greatly needed connection. At the present time the passenger leaving the tube trains at the Bank has to proceed either by omnibus or for ten minutes on foot through very crowded city streets, before he reaches the Liverpool street terminus. It is to be hoped that the Central London will succeed in getting its bill through. For this and other improvements, capital and borrowing powers for $2,200,000 are sought. Last year the Central London benefited greatly from the traffic to the Shepherd's Bush (Franco-British) exhibition, for which it laid a short additional length of line. For the last half of the year the average receipt per passenger was 4.06 cents as compared with 4.02 cents in 1907, while the cost per passenger was only 2.04 cents as compared with 2.56 cents in 1907—the increase of 5,350,003 passengers being responsible for these improved results. The Central London directors have not got to the end of their fare troubles, for they say that it may yet be necessary to make further alterations in the scale in order to meet surface competition on more equal terms, such competition having been specially felt since the closing of the exhibition. As the Shepherd's Bush site is to be used again this year for another great show (Imperial Exhibition), the C. L. will again reap benefit, but probably not to the same extent.

It is announced that the City & South London, which has from the beginning proceeded so very cautiously with the construction of short sections outward to the north and to the south of London, is about to undertake one more step. Its last completed section was the connection of Islington to Euston for tapping the great incoming traffic from suburban areas served by the London & North Western. The scheme now reported to be in preparation for Parliament to consider relates to the other end of the tube which it is proposed to carry on from the present terminus at Clapham to Balham and Tooting.

It is intended to start running the electric trains on the London, Brighton & South Coast single-phase alternating section between London bridge and certain stations near it very shortly. The line between Battersea Park and Peckham is the first to be completed, and experimental working is in progress.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.: May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month: New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago: June 16-18, 1909; Atlantic City.

American Society of Civil Engineers. C. W. Hunt, 220 W. 57th St.; N. Y.: 1st and 3d Wed., except July and August: New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.: 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.: irregular, usually weekly: Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association. Harry D. Vought, 95 Liberty St., N. Y.: April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association. -D. B. Sebastian, La Salle St. Station, Chicago: June 21-23, 1909: Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday, in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August: Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Altanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909: Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month except June, July and August; Chicago

Western Society of Engineers. J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

St. Louis Railway Club.

At the regular monthly meeting on March 12 a paper will be presented by D. T. Taylor, General Foreman Car Department, St. Louis & Santa Fe, Monett, Mo., entitled "The Piece or Premium System of Organization; Development and Economy; Day-Work Fallacy Exposed."

Illinois Fuel Conference.

The program for the Illinois Fuel Conference at the University of Illinois, March 11, 12 and 13, consists principally of addresses on mining subjects, including mine explosions, first aid, smoke suppression, coal analysis, work of the United States Geological Survey, the Illinois State Geological Survey and the University of Illinois engineering experiment station.

Canadian Society of Civil Engineers.

At a meeting of the General Section held on March 11, a paper on Foundations of the Manhattan Life building, New York, by T. Kennard Thomson, was read by the author and illustrated with lantern slides.

Traffic News.

The committee on common carriers of the Texas House has reported adversely on the 2-cent fare bill.

The lines in Western Classification territory have extended indefinitely the time during which old shipping tickets may be used with the statement stamped upon them that shipments are received subject to the uniform bill of lading.

The Interstate Commerce Commission announces that the Canadian Pacific Railway and the Quaker Oats Co. have been indicted in Vermont on charges connected with the transportation of grain products from Richford, Vt., to Boston, free of charge.

Representatives of the Pennsylvania Lines, the Erie, the Southern, the Norfolk & Western, the Baltimore & Ohio, the Chesapeake & Ohio and the Cumberland Gap Despatch, at a recent meeting in Cincinnati, decided to make the same rates on grain on the opening of lake navigation as were made last season.

The Chicago & Eastern Illinois has established a new package and refrigerator car service between Chicago and southern points. Three cars will hereafter leave Chicago at 6:45 p.m. with through shipments for Atlanta, New Orleans, Mobile and Jacksonville and points beyond. The schedule calls for a running time to Atlanta of 54 hours.

A press despatch from Topeka, March 9, says that the upper house of the Kansas legislature has rejected the 2-cent fare bill which was passed by the lower house. This ends the 2-cent fare legislation in Kansas at this session. The Senate, however, passed the maximum freight rate bill, reducing the rates in the state 5 to 15 per cent. The bill already had been passed by the House.

The National Wholesale Lumber Dealers' Association has adopted resolutions setting forth that the lumber dealers of the country depend largely for their prosperity on the prosperity of the railways and that it is important that the earnings of railways should enable them to maintain normal operation and proper facilities. The association, therefore, urges Congress and the state legislatures to be moderate in the regulation of railways.

At a conference held in New York City last week the roads interested are said to have agreed on an advance of five cents per 100 lbs. in the rates for carrying bituminous coal from West Virginia to Lake Erie and other points in the West. Where the rate has been 97 cents per 100 lbs., it will be $1.02. The main object of the conference, it is said, was to settle controversies concerning the relation of these rates to the rates on coal from mines in western Pennsylvania and Ohio; but the subject had to be continued for further discussion this week.

The Wabash and the Union Pacific have made an arrangement for new joint through daily passenger service between St. Louis and Denver via Kansas City. The new train will be put on April 4. Westbound, it will leave St. Louis at 2.30 p.m. and arrive at Kansas City at 9.55 p.m.; leave Kansas City at 11.15 p.m. and arrive at Denver at 5.20 p.m. Eastbound, the train will leave Denver at 12 o'clock, noon, and arrive at Kansas City at 8.05 a.m.; leave Kansas City at 9.15 a.m. and arrive at St. Louis at 5.45 p.m. The train will connect with through trains of the Union Pacific for the Pacific coast, and through cars to the coast may later be put on. The train will have an observation 10-section sleeper, a 12-section and drawing-room sleeper and a chair car, all to be electric lighted.

P. W. Coyle, Commissioner of the Freight Bureau of the Business Men's League of St. Louis, has received from Hon. E. E. Clark, of the Interstate Commerce Commission, a letter to the effect that the duty of a carrier to take all necessary steps to collect the full tariff rate—that is, to recover under charges—is not so rigidly limited as might appear from the Commission's Bulletin No. 1. The law does not place upon the carrier a greater obligation to collect under charges from the consignee than from the consignor. There are numerous instances in which the consignor is the party who is responsible for the freight charges. It was therefore an erroneous statement in the Bulletin to add the words "from the consignee."

The Freight Bureau of the Business Men's League of St. Louis, of which P. W. Coyle is Commissioner and A. F. Versen, Secretary, has issued a circular to its members, calling attention to the excessive number of complaints filed with the Interstate Commerce Commission. One railway, with headquarters in St. Louis, receives on an average four formal complaints a day which it must defend before the commission. The Freight Bureau suggests that many of these proceedings before the commission could be avoided if the members of the bureau who have apparent ground for complaint would submit the facts to the bureau for consideration. This, it is believed, would result in better co-operation and less friction between the shippers and the carriers.

The decision of the United States Circuit Court in the Missouri 2-cent fare case, reported elsewhere, is taken to indicate that no 2-cent fare law can be successfully defended in the federal courts in any state west of the Mississippi river. It is regarded, therefore, as probable that it will not be long before passenger rates in territory west of the Mississippi river will have been put on a basis of 2½ cents or 3 cents a mile. Passenger traffic officers of Missouri lines express the opinion that they will be able to raise all Missouri rates, both state and interstate. As Judge McPherson, in his decision holding the 2-cent fare law invalid, intimated that he believed that 2½ cents for the stronger lines and 3 cents for the weaker lines would be a fair and reasonable rate, it is not improbable that these rates will be adopted. However, owing to Missouri's central location, a readjustment of rates in that state will involve a very extensive readjustment of interstate rates, and there will probably be greater delays in raising the rates in Missouri than there were in raising them in Arkansas, where the number of lines is much smaller and the conditions less complex. The Attorney-General of Missouri says that he will immediately appeal the rate cases to the Supreme Court of the United States. A press despatch from Detroit says that Michigan railways intend to fight the state railway law unless the state authorities either reduce the valuations put on railways or repeal the 2-cent fare law, so that the roads can earn 6 per cent. on the valuation placed on them by the tax commission.

COURT NEWS.

The Arkansas Supreme Court returned a decision on March 1 sustaining the constitutionality of the so-called Barker demurrage law, which was passed by the state legislature in 1907, in so far as it applies merely to intrastate business. Judge Trieber, of the Federal court, has held this law unconstitutional so far as it applies to interstate business.

Judge Trieber, of the United States Circuit Court, has refused to grant the petition of the Arkansas Railroad Commission, asking for the dissolution of the injunction granted by Judge Vandeventer restraining the enforcement of the 2-cent pasenger fare law and the orders of the commission

reducing freight rates in Arkansas. The request of the commission that the railways be required to modify the rates that they have put in since the injunction was issued will be taken up for consideration on March 29.

Ralph M. Shaw, of counsel for the Chicago & Alton, paid into the United States District Court at Chicago on March 1 $60,000, being the total amount of fines imposed upon the Alton, its former Vice-President, J. N. Faithorn, and its former General Freight Agent, F. A. Wann, for the payment of rebates to the Schwarzschild & Sulzberger Co., at Kansas City.

The Supreme Court of the state of Washington on March 1 rendered three decisions sustaining the right of the State Railroad Commission to fix rates. One of the cases grew out of an appeal by the Great Northern from an order by the commission requiring certain specified joint rates on wheat. The Great Northern contended that under the state constitution no public authority except the legislature could exercise the power of fixing rates. The Supreme Court held that after the legislature had provided that rates must be fair, just, reasonable and adequate, it might delegate the administrative duty of fixing them to the commission. This finding conflicts with a decision rendered last summer by Judge Hanford of the Federal Court at Seattle. The State Supreme Court held that while the constitution recognizes a division of the powers of the state into legislative, executive and judicial, they need not be kept wholly distinct. In a case appealed by the Oregon Railroad & Navigation Co. the court upheld the power of the commission to require reasonable physical track connections. This grew out of orders of the commission requiring the Northern Pacific, the Spokane & Inland Empire and the O. R. & N. to make connections at Oaksdale and Garfield; the Northern Pacific and O. R. & N. at Connell, Pullman and Farmington; the O. R. & N. and the Spokane & Inland at Waverly, Thornton and Colfax, and the Northern Pacific and Spokane & Inland at Rosalia and Palouse. The court in its third decision upheld an order of the commission establishing joint rates on potatoes.

Questions asked and remarks made by Judge Anderson, who is trying in the Federal court at Chicago the case of the government against the Standard Oil Company of Indiana for the alleged acceptance of rebates from the Chicago & Alton, indicate a possibility that the entire proceeding may be dismissed because of the government's inability to prove that the 18-cent and 19½-cent rates, which it declares were the legal rates for the transportation of oil from Whiting, Ind., to East St. Louis, Ill., and from Chappell, Ill., to St. Louis, were actually ever legally in effect, as applied to interstate traffic. The rate of 18 cents was the intrastate rate from Chappell, Ill., to East St. Louis. Similarly, the 19½-cent was the rate from Chappell to East St. Louis, with the charge of the Wiggins Ferry from East St. Louis to St. Louis, added. The government sought to show the legality of the 18-cent rate from Whiting to East St. Louis by introducing in evidence Interstate Commerce Commission application sheet No. 1,203, by which the Chicago Terminal Transfer Railroad, the originating road, purported to apply the Chappell rate from Whiting. Counsel for the Standard Oil Company contended that this was not a legal publication and filing of this rate for interstate business, because the Alton had never concurred in it. Consequently the 18-cent rate could not legally be applied upon an interstate shipment from Whiting to East St. Louis, and therefore the allegation in the indictment that the 18-cent rate was the only legal rate was untrue. The 19½-cent rate to St. Louis was attacked similarly upon the ground that the Alton had never concurred in the Wiggins Ferry's application sheet. The rates actually collected, it will be recalled, were 6 cents from Whiting to East St. Louis and 7½ cents from Chappell to St. Louis. Judge Anderson remarked that he had grave doubts whether the evidence that the government had introduced was sufficient to show the legality of the higher rates; for the government must, in order to prove that an illegal concession had been made, show that there was a legal standard—that is, a legal rate—and that this standard had been violated. He said that there was no evidence as yet of the existence of any such legal standard. As we go to press it is understood that the government has abandoned the suit.

INTERSTATE COMMERCE COMMISSION.

Stoppage-in-Transit for Structural Iron.

Indianapolis Freight Bureau v. Cleveland, Cincinnati, Chicago & St. Louis et al. No. 1045. Opinion by Commissioner Clements.

Defendants' rule governing the loading of long ladders in Official Classification territory should be modified so as to provide for the shipment of one dozen ladders at actual weight by fixing the minimum at 1,800 pounds.

Since the hearing several defendants have issued tariffs allowing stoppage in transit at Indianapolis for fabrication of structural iron and reshipment at the through rate from point of origin to final destination, provided Indianapolis is intermediate, a charge of 1½ cents per 100 lbs. to be made for the incidental service. In view of this development, the complaint as to this feature is dismissed without prejudice.

Reparation Not a Matter of Course.

Morse Produce Co. v. Chicago, Milwaukee & St. Paul. No. 1490. Opinion by Commissioner Cockrell.

Complainant, in a petition which did not claim reparation, had heretofore alleged that certain rates were unjust, unreasonable and discriminatory; and the commission, after full hearing, condemned said rates as unjust, and prescribed maximum rates to apply thereafter. The carrier complied with the order of the commission. Thereafter the complainant filed the present petition, based on the shipments and facts set forth in his former complaint, and asked for reparation in an amount equal to the difference between the aggregate sum actually collected by the carrier under the old rates and the sum it should have collected if the rate which the commission had declared reasonable had been in effect. The petition should have stated the whole case, including any reparation claimed, and it does not necessarily follow that reparation will be awarded in all cases on the basis of a rate prescribed to be observed thereafter. On the facts in this case reparation is denied.

Loss of Weight in Elevation.

Baltimore Chamber of Commerce v. the Pennsylvania et al. No. 1821. Opinion by Commissioner Harlan.

The defendants issue certificates for the actual weight of grain shipments going into their elevators at Baltimore, and on that weight assess their transportation and elevator charges; but each certificate shows on its face the "scaleage deduction" that will be made, on the basis of published tariff estimates, when the grain is delivered out of the elevator to the certificate holder. The complaint alleges that these deductions are arbitrary and constitute an illegal appropriation of the property of the complainant's members and others who ship grain to Baltimore, Md.

The defendants by this practice are not exacting from grain shippers either a rate, in the form of grain, or an addition to a rate, and therefore the question presented is not one of rates. Neither is the practice one affecting rates, as the tariff rules are simply notice that while the shipment weighed so much when taken into the elevator, the grain will weigh so much less when it goes out, because of the weight of dirt, dust, chaff and moisture, which, in the process of elevation, will disappear and cannot therefore be delivered to the holder of the elevator certificate when the grain is ordered out. So long as the deductions are based on reasonable estimates of the weight of foreign matter that is unavoidably eliminated and lost in the process of elevation the practice is not one that affects rates or has any real relation to rates.

The practice of one defendant herein of supplying at its New York elevators enough grain to make up the weight of dirt, chaff and moisture lost in the process of elevation is a practice affecting rates, in that it is an advantage or benefit that the shipper gets under the published rate; but the charge that the making of deductions at Baltimore and not at New York is unduly prejudicial to Baltimore is not now considered, the record not having been made with a view to the disposition of the complaint on that ground.

REPORTS OF REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.
(See also issue of March 5.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance — Way and structures.	Maintenance — Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,458	$3,959,059	$1,584,760	$6,063,475	$790,218	$827,601	$156,256	$1,786,026	$147,337	$3,707,438	$2,356,037	....	$231,472	$2,124,565	$492,989
Atlantic Coast Line	4,109	1,542,039	531,308	2,266,315	298,700	290,145	40,662	732,110	66,785	1,428,702	837,613	....	90,000	747,613	402,819
Baltimore & Ohio	3,992	4,090,408	928,804	5,363,454	636,321	940,145	128,243	2,124,003	125,669	3,954,381	1,409,073	$63,317†	180,084	1,165,672	341,471
Boston & Maine	2,242	1,794,481	876,830	2,919,249	242,730	382,700	36,897	1,146,607	77,745	2,186,679	732,570	8,494	157,971	583,093	301,123
Central of Georgia	1,916	618,888	209,864	914,556	120,056	176,594	26,838	297,202	35,854	656,544	258,012	4,950	38,782	224,180	56,143
Central of New Jersey	668	1,319,152	306,084	1,726,952	151,396	307,230	22,115	509,993	37,045	1,027,779	699,173	43,591†	83,754	571,828	36,202
Chesapeake & Ohio	1,896	1,705,735	317,618	2,109,652	208,528	444,803	36,897	672,801	44,360	1,407,389	702,263	5,527†	67,100	629,636	205,206
Chicago & Eastern Illinois	966	675,530	134,989	863,235	91,262	160,666	13,867	343,346	33,651	642,792	220,443	2,544†	26,500	191,399	‡51,056
Chicago, Milwaukee & St. Paul	7,516	3,077,007	835,647	4,308,998	351,797	631,561	109,519	1,831,611	104,796	3,029,284	1,279,714	6,941†	206,645	1,066,128	‡104,397
Chicago, Rock Island & Pacific	7,414	2,939,790	1,250,168	4,475,497	618,019	619,447	116,113	1,868,794	133,819	3,356,192	1,119,305	15,240†	179,925	924,140	‡7,574
Cleveland, Cincinnati, Chicago & St. L.	1,982	1,319,601	517,190	2,024,965	159,049	402,895	69,142	895,015	47,186	1,573,287	451,678	7,120†	74,000	370,558	118,949
Colorado & Southern	1,218	589,081	100,984	729,619	73,019	145,295	12,800	235,742	25,797	492,653	236,966	158†	21,225	215,583	‡22,313
Delaware & Hudson	845	1,182,369	159,946	1,464,686	102,594	184,987	17,885	603,229	35,600	944,295	520,391	422†	35,000	484,969	4,185
Denver & Rio Grande	2,516	1,210,075	289,354	1,569,168	149,676	328,273	32,413	643,194	57,609	1,211,165	358,303	2,068†	65,000	291,235	96,597
Erie	1,902	2,211,626	557,905	3,069,350	223,035	649,495	86,280	1,248,196	77,541	2,284,547	784,803	20,555†	106,084	658,164	372,319
Galveston, Harrisburg & San Antonio	1,339	564,177	191,155	800,977	133,450	110,176	21,845	321,894	27,186	614,551	186,426	826†	28,179	157,421	124,330
Great Northern	6,899	1,808,191	673,349	2,729,995	537,429	574,710	58,280	1,190,272	89,237	2,449,958	280,037	7,694	251,490	36,241	‡327,760
Gulf, Colorado & Santa Fe	1,518	771,650	233,835	1,058,597	152,559	137,439	21,111	421,197	30,308	762,614	295,983	.....	31,864	264,119	145,297
Illinois Central	4,519	3,087,405	849,016	4,519,965	405,543	864,814	92,965	1,647,918	92,925	3,104,165	1,415,800	3,093†	186,328	1,226,379	280,531
Lake Erie & Western	724	252,037	48,033	319,859	34,571	90,738	10,594	142,678	11,997	290,578	29,281	.....	17,000	12,281	‡23,154
Lake Shore & Michigan Southern	1,511	2,152,602	733,562	3,316,725	230,143	534,577	83,966	1,188,581	52,196	2,089,463	1,227,262	2,419†	125,000	1,099,843	372,647
Michigan Central	1,746	1,288,500	447,904	1,907,660	168,803	309,034	55,030	830,701	36,499	1,400,071	507,589	3,917†	94,000	409,672	74,618
Missouri, Kansas & Texas	3,072	1,297,280	581,423	2,005,218	295,032	307,038	48,605	846,599	73,367	1,570,641	434,577	1,145†	69,175	364,257	‡81,191
Mobile & Ohio	926	596,832	98,262	810,177	78,204	128,338	30,202	290,825	29,373	556,642	253,535	2,626†	20,000	230,909	61,998
Nashville, Chattanooga & St. Louis	1,230	687,962	202,169	959,959	137,816	181,661	35,572	339,643	22,951	717,643	242,316	4	20,000	222,320	93,631
New York Central & Hudson River	3,587	3,910,501	1,899,824	6,549,606	573,200	1,307,654	175,236	2,847,734	209,742	5,113,566	1,436,040	2,571	353,435	1,085,176	307,483
Norfolk & Western	1,921	1,953,730	276,479	2,310,699	251,968	399,372	42,711	690,579	52,145	1,436,775	873,924	208†	82,300	791,416	266,360
Oregon Short Line	1,156	894,216	274,399	1,250,066	72,321	148,129	21,208	291,497	32,068	565,223	684,843	738†	50,000	634,105	276,537
St. Louis Southwestern	773	419,853	100,251	545,889	93,484	95,569	21,807	151,060	19,852	381,772	164,117	527†	14,992	148,598	4,050
St. Louis Southwestern of Texas	697	202,252	66,061	289,012	90,257	68,002	11,316	140,799	16,100	326,474	37,462*	389†	4,448	42,299†	18,044
Southern	7,016	2,703,453	1,033,324	4,035,975	459,459	656,734	101,545	1,564,737	148,392	2,930,867	1,105,108	9,234	155,656	958,686	525,774
Texas & New Orleans	450	187,840	69,680	279,506	73,022	42,598	5,745	161,322	8,109	290,796	11,290*	628†	11,600	23,518†	‡58,901
Texas & Pacific	1,885	884,508	294,737	1,246,809	151,576	201,913	17,151	500,459	34,168	905,267	341,542	2,136†	38,000	301,406	55,509
Union Pacific	3,340	2,221,701	736,182	3,284,415	208,006	451,412	79,625	947,229	103,912	1,790,184	1,494,231	5,585†	111,783	1,376,863	371,516
Wabash	2,515	1,354,721	445,295	1,986,148	197,229	334,010	71,184	875,433	102,648	1,580,504	405,644	2,293†	68,216	335,135	‡53,987
Yazoo & Mississippi Valley	1,371	674,801	186,549	914,182	152,275	138,146	14,792	338,875	21,715	665,803	248,379	2,022	30,835	219,566	‡4,366

SEVEN MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,458	29,739,004	10,782,257	43,991,036	5,578,038	7,125,004	909,470	11,870,720	934,376	26,417,608	17,573,428	.....	1,395,734	16,177,694	2,557,602
Atlantic Coast Line	4,109	10,162,594	3,265,974	14,491,924	2,053,456	2,100,206	243,277	4,847,191	418,787	9,662,917	4,829,007	.....	630,000	4,199,007	1,088,573
Baltimore & Ohio	3,992	32,091,922	7,785,362	42,328,336	5,008,457	6,235,155	914,384	14,574,389	846,062	27,578,447	14,749,889	319,352†	1,199,569	13,230,968	587,519
Boston & Maine	2,242	13,259,773	8,351,784	23,391,753	2,792,426	2,579,968	278,832	10,403,642	535,108	16,589,976	6,801,777	75,705	1,017,748	5,859,734	130,048
Central of Georgia	1,916	4,575,435	1,723,978	6,893,362	930,702	1,253,842	184,263	2,112,795	255,767	4,746,369	2,146,993	36,085	268,960	1,914,118	217,798
Central of New Jersey	668	9,550,666	2,562,517	12,819,401	1,270,499	2,152,289	181,169	3,469,638	259,400	7,332,995	5,486,409	250,105	617,743	5,118,771	‡582,942
Chesapeake & Ohio	1,896	12,172,153	2,701,770	15,512,574	1,762,015	2,927,173	253,813	4,262,672	297,896	9,503,569	6,009,005	9,179†	466,100	5,533,726	262,507
Chicago & Eastern Illinois	966	4,830,009	1,036,097	6,221,185	705,083	1,156,563	110,430	2,186,585	243,984	4,402,645	1,818,540	11,107†	141,615	1,665,818	‡176,844
Chicago, Milwaukee & St. Paul	7,516	25,961,064	7,998,198	36,816,798	4,457,901	4,396,340	766,592	12,813,319	633,659	23,067,811	13,748,987	157,842	1,395,500	12,511,329	150,890
Chicago, Rock Island & Pacific	7,414	22,012,138	10,420,879	34,192,005	5,328,323	4,447,773	776,773	12,637,956	889,624	24,080,449	10,411,556	76,665†	1,285,639	9,049,252	154,655
Cleveland, Cincinnati, Chicago & St. L.	1,982	9,759,125	4,240,345	15,466,873	1,703,347	2,718,058	489,731	6,094,285	307,782	11,313,203	4,153,670	21,119†	485,348	3,647,203	224,080
Colorado & Southern	1,248	4,037,959	966,541	5,276,917	652,721	899,818	97,865	1,607,393	183,501	3,441,298	1,835,619	2,049	146,746	1,690,922	‡23,476
Delaware & Hudson	845	8,945,417	1,784,980	11,075,263	775,309	1,155,473	132,349	3,835,346	246,778	6,145,255	4,930,008	15†	241,748	4,688,245	‡521,822
Denver & Rio Grande	2,516	8,928,837	3,034,955	12,528,224	1,396,031	2,040,820	267,604	4,260,610	370,663	8,335,728	4,192,496	35,807	454,750	3,773,553	‡666,504
Erie	1,902	18,654,156	4,921,798	25,363,631	2,628,928	5,150,722	544,563	8,683,932	536,816	17,544,961	7,818,670	241,797	694,694	7,365,773	1,855,754
Galveston, Harrisburg & San Antonio	1,339	4,575,125	1,255,769	6,132,181	762,902	732,144	148,193	2,398,112	185,917	4,227,268	1,904,913	16,146†	120,865	1,767,902	691,266
Great Northern	6,899	24,984,083	6,671,044	33,535,541	5,850,097	3,931,715	411,560	8,871,680	596,686	19,661,738	13,873,803	154,115	1,499,877	12,528,341	‡694,373
Gulf, Colorado & Santa Fe	1,518	5,894,997	1,808,902	8,071,582	1,172,798	1,287,412	140,378	2,728,911	228,807	5,558,306	2,513,276	.....	182,326	2,330,950	1,258,772
Illinois Central	4,519	21,532,173	6,603,375	32,087,968	3,809,317	7,173,223	679,148	10,910,920	672,580	23,245,188	8,842,780	20,853†	1,319,085	7,502,842	28,142
Lake Erie & Western	724	1,969,508	491,234	2,599,356	363,081	500,214	76,588	1,006,986	72,944	2,019,813	579,543	.....	119,760	459,783	‡74,600
Lake Shore & Michigan Southern	1,511	15,699,834	5,825,845	24,557,076	2,914,916	3,456,753	592,867	7,713,920	393,299	15,071,755	9,485,321	14,118†	898,647	8,572,556	353,551
Michigan Central	1,746	9,620,243	3,876,579	14,798,891	1,789,430	2,019,925	421,550	5,654,414	245,851	10,131,170	4,667,721	23,773†	659,694	3,984,254	‡647,099
Missouri, Kansas & Texas	3,072	10,689,034	4,285,034	15,797,587	2,031,583	2,401,130	333,939	5,637,351	470,102	10,874,105	4,923,482	7,381†	736,725	4,179,376	‡697,844
Mobile & Ohio	926	4,199,512	733,963	5,735,299	645,296	917,872	193,845	1,960,668	203,334	3,921,015	1,814,284	13,727†	116,500	1,684,056	66,957
Nashville, Chattanooga & St. Louis	1,230	4,519,885	1,541,728	6,504,226	928,424	1,200,909	238,696	2,324,847	159,534	4,852,410	1,651,816	6,649†	140,000	1,505,167	5,009
New York Central & Hudson River	3,587	29,817,569	16,612,205	51,746,260	6,231,899	8,926,028	1,265,124	18,939,945	1,155,629	36,518,625	15,227,635	141,742	2,711,111	12,658,266	405,797
Norfolk & Western	1,921	14,313,657	2,127,849	17,011,275	1,854,512	2,832,620	273,928	4,899,802	369,071	10,229,933	6,781,342	1,154†	597,300	6,182,588	367,865
Oregon Short Line	1,456	7,511,092	2,402,564	10,530,133	960,124	946,720	131,114	1,995,836	207,844	4,241,638	6,288,495	1,442	348,048	5,941,889	1,054,360
St. Louis Southwestern	773	3,152,787	722,265	4,044,840	538,598	657,770	148,534	995,176	138,730	2,478,808	1,566,032	3,890†	105,142	1,457,000	‡36,996
St. Louis Southwestern of Texas	697	1,602,790	564,576	2,320,876	579,749	463,689	61,341	976,082	108,280	2,189,141	131,735	1,703†	54,332	75,700	104,593
Southern	7,016	20,336,233	8,321,730	31,141,627	3,696,716	4,748,365	702,099	10,853,983	1,012,340	21,013,503	10,128,124	89,319	1,115,221	9,102,222	2,434,312
Texas & New Orleans	450	1,496,158	483,986	2,115,130	373,668	304,271	38,983	900,349	57,220	1,674,491	440,639	6,260†	61,445	372,934	‡28,139
Texas & Pacific	1,885	6,239,745	2,286,791	9,166,564	983,331	1,295,457	106,167	3,369,173	231,343	5,985,471	3,181,093	19,515†	420,740	2,740,838	258,047
Union Pacific	3,340	20,488,397	5,993,871	28,768,363	2,738,196	2,843,726	574,463	6,575,553	709,243	13,441,181	15,327,182	7,653†	762,503	14,557,026	3,865,951
Wabash	2,515	10,123,507	3,971,245	15,345,331	1,674,190	2,269,659	468,805	5,857,315	485,399	10,755,368	4,589,963	8,530†	476,001	4,105,432	‡417,298
Yazoo & Mississippi Valley	1,371	1,376,703	1,312,656	6,051,488	1,188,896	1,058,368	110,908	2,287,234	164,540	1,809,946	1,241,542	20,830	238,375	1,024,003	‡16,815

*Deficit. †Loss. ‡Decrease.

Minimum Carload Weights.

General Chemical Co. v. Norfolk & Western et al. No. 1903. Opinion by Commissioner Harlan.

A tariff naming a rate per ton on a commodity and providing that the minimum carload weight shall be the marked capacity of the car gives the shipper the right to demand any car of recognized standard dimensions suitable for the carriage of that commodity. If on reasonable demand the carrier cannot supply a car of the particular size ordered, it is its duty nevertheless to accept the shipment and move it in any available car or cars, applying the rate on the basis of the marked capacity of the car ordered.

STATE COMMISSIONS.

Louisiana. Rates on Petroleum and Its Products.

The National Petroleum Association and the Marine Oil Company, Limited, v. The Arkansas Southeastern et al. Order 976.

Louisiana has, in recent years, developed extensive oil fields, and the establishment of refineries at several points in the state has developed an industry which the commission holds should be encouraged. Railways operating in Louisiana assess various rates, which are far from being uniform, and in some cases are excessive. Some of the railways have established commodity rates on petroleum oil and its products, which it is not the intention of the commission to disturb. There is not sufficient evidence to warrant reducing the rates on carload lots, but it is abundantly proved, the commission says, that the rates on less than carload shipments should be reduced and made uniform.

The rates which have been proposed by the complainant are, in the opinion of the commission, too low to afford a fair remuneration to the carriers, and the commission adopts the following L.C.L. rates (cents per 100 lbs.):

Miles	Rate, cts.	Miles	Rate, cts.
5 and under	7.0	100 and over 95	16.5
10 " over 5	7.5	110 " " 100	17.0
15 " " 10	8.0	120 " " 110	17.5
20 " " 15	8.5	200 " " 190	21.5
[And so on, 5 mills increase for each 5 miles up to 100 miles; then 5 mills each 10 miles up to 300 miles.]		300 " " 290	26.5
		350 " " 300	27.0
		400 " " 350	27.5

In making joint rates over two or more lines on less than carloads add 6 cents, provided that joint through rates shall not exceed the rates named for 400 miles single line mileage, which shall be the maximum for all hauls between any points in the state of Louisiana.

Traffic Club of Chicago.

Isham Randolph, who was one of the engineers that accompanied Mr. Taft on his recent trip to the Panama canal, addressed the Traffic Club of Chicago at a luncheon on March 2. Mr. Randolph defended the lock type and said that the canal should be finished by January 1, 1914. His description of the canal was illustrated by stereopticon views.

The list of candidates for officers for the ensuing year that have been nominated by the nominating committee was given in the *Railroad Age Gazette* March 5, page 478. Two members' tickets have since been nominated. One of these tickets, for which F. P. Eyman, C. A. Bovee, Wm. J. Young, J. T. Morrison, Wm. Borner, E. C. Nettles and Ward Wire are sponsors, is as follows: President, W. M. Hopkins; First Vice-President, George T. Nicholson; Second Vice-President, Oscar F. Bell; Third Vice-President, F. B. Bowes; Secretary, John T. Stockton; Treasurer, John H. Grace. Directors for the two years: F. B. Montgomery, E. B. Boyd, H. C. Barlow and Guy S. McCabe. The other of the members' tickets, for which W. H. Wharton, Geo. H. Hull, C. A. Johnson, G. F. Perkins, R. C. Ross, R. J. Wood, P. E. Thomas, J. W. Taylor, H. E. Dickinson, C. H. Stevens and J. F. Hartsough are sponsors, is as follows: President, Oscar F. Bell; First Vice-President, H. A. Snyder; Second Vice-President, A. G. Huckin; Third Vice-President, C. B. Hopper; Secretary, John T. Stockton; Treasurer, John H. Grace. Directors for two years, G. H. Ingalls, E. W. Green, E. F. Bisbee and F. O. Becker. The election will be on March 30.

Railways Aiding Farmers.

The New York Central is preparing to run a special train, carrying lecturers and exhibits, for the instruction of farmers along its lines; and similar purposes are reported on the part of the Lehigh Valley and the Delaware & Hudson. The Erie ran a train of this kind some months ago, in connection with the Agricultural College at Cornell University. The lectures in the farmers' special train which was run by the Pennsylvania Railroad in Pennsylvania last November, were attended by about 5,000 farmers. Officers of the Pennsylvania say that as a result of what they have done to promote good farming in New Jersey, the value of products shipped from the southern part of that state in the month of July, 1908, was $1,178,000, which was about 50 per cent. more than the value of the same articles shipped in the year before. In Indiana the last of February four thousand farmers listened to lectures given on the Erie Railroad's "Seed Corn Special."

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Albert T. Perkins, President of the Marshall & East Texas, Vice-President of the St. Louis, Brownsville & Mexico, and Vice-President of the Houston Belt & Terminal Railway, was elected also on March 4 a Director of the Chicago, Milwaukee & Gary, and within a very few days will be elected President of the last named road, succeeding H. W. Seaman, resigned. He was born October 2, 1865, at Brunswick, Me. After graduating from Harvard University in the class of 1887, he began railway work in October of the same year as a clerk in the general freight office of the Chicago, Burlington & Quincy at Chicago. In August, 1888, he was made chief clerk in the Contracting Agent's office. From October to December, 1889, he was a Traveling Freight Agent, and in January, 1890, he was made chief clerk of the general freight office at St. Louis, Mo. In January, 1893, he was appointed General Agent at Hannibal, Mo., and in January, 1894, was made Local Freight Agent, at St. Louis. In January, 1897, he was appointed Superintendent of Freight Terminals, at St. Louis, and in February, 1899, Superintendent of Terminals at the same place. In June, 1902, he was appointed Superintendent of the St. Joseph division, Missouri district, with office at St. Joseph, Mo. On April 1, 1906, he became Expert Adviser of the Municipal Bridge & Terminals Commission of St. Louis. He was made Railroad Adviser of the St. Louis Trust Co. on December 1, 1907, and on January 1, 1908, was also elected First Vice-President and Managing Director of the St. Louis, Brownsville & Mexico. On August 19, 1908, he was elected also President of the Marshall & East Texas.

A. T. Perkins.

David Q. Lewis has been appointed the Assistant General Claim Agent of the Chicago & North Western, with office at Chicago.

R. A. Kleinschmidt has been appointed the General Solicitor for Oklahoma of the Atchison, Topeka & Santa Fe, succeeding the firm of Flynn & Ames.

J. H. Lauderdale, Local Treasurer of the Colorado Southern, New Orleans & Pacific, has been elected the Treasurer, succeeding W. C. Dufour, resigned.

Darius Miller, First Vice-President, and Daniel Willard, Second Vice-President of the Chicago, Burlington & Quincy, have been elected Vice-Presidents of the Colorado & Southern. A. D. Parker, Vice-President of the Colorado & Southern, continues in general charge of all the company's affairs in the west.

Hon. J. M. Dickinson, General Counsel of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, having been appointed Secretary of War in the cabinet of President Taft, the Law Department of those roads will be handled as follows: Blewett Lee, General Attorney of the Illinois Central, and General Solicitor of the Indianapolis Southern, will have charge of the territory south of the Ohio river and the state of Indiana. He will also have charge of matters pertaining to interstate commerce, railway mortgages and bonds and corporate questions for the entire system. William S. Kenyon, General Attorney of the Illinois Central, will have charge of the territory north of the Ohio river, except the state of Indiana. He will also have charge of matters pertaining to contracts and off-line district suits for the entire system. C. N. Burch, General Solicitor of the Yazoo & Mississippi Valley, will hereafter report to Mr. Lee. The District Attorneys will report to the General Attorneys in their respective territories and the Local Attorneys in Minnesota and in Illinois in the territory north of Minonk and west of Cook county, will hereafter report to Mr. Kenyon. The General Attorneys will report to the President of the road.

Operating Officers.

F. A. Butterworth has been appointed the Manager of the Pere Marquette-Lehigh Valley Line, with office at Buffalo, N. Y.

W. D. Barclay has been appointed the General Manager of the Canadian Northern Quebec and the Quebec & Lake St. John, with office at Quebec.

H. M. Eshelman, Train Despatcher of the Trinity & Brazos Valley, has been appointed a Chief Train Despatcher, succeeding Joseph Munday, promoted.

J. C. Westcott, Trainmaster of the Atlantic Coast Line, has been appointed a Chief Night Despatcher of the Chicago & Alton, with office at Bloomington, Ill.

Herbert B. Calkins has been appointed the Acting Superintendent of the Missouri division of Wells Fargo & Co. Express, with office at St. Louis, Mo., succeeding C. R. Teas, transferred to the Milwaukee lines.

Grant S. Maxwell, formerly with the Texas & Pacific, has been appointed the Manager of the Freight Bureau Department of the Dallas Chamber of Commerce, with office at Dallas, Tex., succeeding J. C. Farley.

The Red River division of the St. Louis & San Francisco has been abolished and that territory divided as follows: The Creek and Sherman districts to the Southwestern division have been placed under the jurisdiction of H. F. Clark, the Superintendent at Sapulpa, Okla. The Ardmore and Arkinda districts to the Central division have been placed under the jurisdiction of LeRoy Kramer, the Superintendent at Ft. Smith, Ark.

D. F. Bucher, Superintendent of Car Service of the Mexican Central, has been appointed the Superintendent of the Gomez Palacio division of the National Railways of Mexico, with office at Gomez Palacio, succeeding L. S. Bourne, transferred. G. P. De Wolf, Engineer of Maintenance of Way and Bridges and Buildings of the National Lines of Mexico and the Hidalgo & Northeastern, has been appointed the Superintendent of the Monterey and Gulf division, with office at Monterey, succeeding E. E. Sirrine, resigned.

D. B. Fleming, Trainmaster of the New York Central & Hudson River, with office at Utica, N. Y., has been transferred as Trainmaster to West Albany, N. Y., succeeding W. H. Spice, promoted. C. D. Dager succeeds Mr. Fleming. F. B. Harrington has been appointed a Trainmaster, with office at Albany, in charge of passenger service on the main line and the West Shore, and such other duties as may be assigned to him. L. Phelps, Assistant Trainmaster, with office at Utica, will report to Mr. Fleming on matters relating to freight service and to Mr. Harrington on matters pertaining to passenger service.

John W. O'Brien, whose appointment as a Superintendent of the Lake Erie & Western, with office at Muncie, Ind., has been announced in these columns, was born January 17, 1872, at Paris, Ill. After a public school education he began railway work October 14, 1886, as operator and yard clerk of the Terre Haute & Peoria, now a part of the Vandalia, at Paris, Ill. In 1888 he was transferred to Decatur, Ill., as operator and superintendent's clerk of the same road. In 1889 he was made ticket agent, chief clerk and cashier of the Chicago & Western Indiana, at Chicago, and in 1891 was appointed Train Despatcher of the Lake Erie & Western, at Lafayette, Ind. In 1893, he was made Chief Despatcher of the same road at Lafayette, and in 1906 Trainmaster at Lima, Ohio, which position he held until his recent appointment.

Traffic Officers.

F. A. Nelson has been appointed a General Agent of the Kansas City, Mexico & Orient, with office at Kansas City, Mo., succeeding C. L. Hogan, resigned.

M. L. Fuller has been appointed a Traveling Immigration Agent of the Missouri Pacific, with office at St. Louis, Mo., succeeding A. H. Sevier, resigned.

H. C. Moran has been appointed a Commercial Agent of the St. Louis, Brownsville & Mexico, with office at Corpus Christi, Tex., succeeding C. J. Payton, resigned.

J. M. Andrew has been appointed a Traveling Freight Agent of the Baltimore & Ohio, with office at Huntington, W. Va., succeeding Frank W. Milling, transferred.

L. J. Broderick has been appointed a Traveling Freight Agent of the Iowa Central, with office at Peoria, Ill., succeeding O. T. Fagg, transferred. Mr. Fagg's office was at Monmouth, Ill.

G. P. French, Contracting Freight Agent of the Wabash, has been appointed a Traveling Freight Agent, with office at Salt Lake City, Utah. C. J. Helmer succeeds Mr. French, with office at Denver, Colo.

J. R. Mills, the chief clerk in the General Freight Offices of the Kansas City Southern, has been appointed the Assistant General Freight Agent, with office at Kansas City, Mo., succeeding Charles E. Perkins, resigned to go with another road.

W. J. Young, Commercial Agent of the Illinois Central, has been appointed the Export and Import Agent, with office at Chicago. H. M. Metz, Assistant Commercial Agent, succeeds Mr. Young, with office at Chicago. J. W. Rhodes, Commercial Agent of the Illinois Central and Indianapolis Southern, succeeds Mr. Metz, with office at Chicago. B. T. Breckenridge, Traveling Freight Agent of the Illinois Central, succeeds Mr. Rhodes, with office at Indianapolis, Ind. J. H. Lipsey succeeds Mr. Breckenridge, with office at Matoon, Ill.

Engineering and Rolling Stock Officers.

Malcolm Baxter, Master Mechanic of the Western Ohio Railway, has resigned, effective April 1.

J. F. Leonard, General Inspector of Signals of the Chesapeake & Ohio, has resigned to go into the railway and electrical supply business at Richmond, Va.

W. H. Fenley has been appointed the Signal Engineer of

the Chicago Great Western, succeeding C. A. Christofferson, whose resignation we have formerly announced.

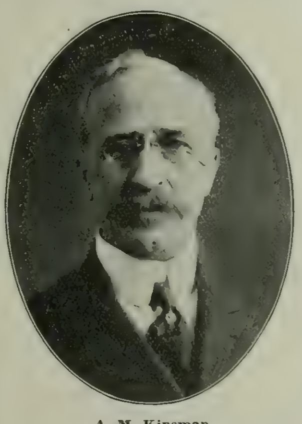
E. V. Williams has been appointed a General Foreman, Locomotive department of the New York Central & Hudson River, with office at Avis, Pa., succeeding H. B. Whipple, promoted.

E. H. Hohenstein has been appointed a General Boiler Inspector of the Chicago, Rock Island & Pacific, with office at Horton, Kan., succeeding W. B. Embury, assigned to other duties.

The jurisdiction of Charles H. Cartlidge, the Bridge Engineer of the Chicago, Burlington & Quincy for the Lines East of the Missouri river, has been extended over the Lines West of the Missouri river.

The Mechanical Department of the National Railways of Mexico has been divided into two districts, the Eastern and the Western. The Eastern district will be the main line from Mexico City to Laredo, with all branches, including the main line from Mexico City to San Juan del Rio, the narrow gage system, the Cuernavaca district and the districts Gonzalez to Acambaro, Gonzalez to Jaral del Valle, Monterey to Hipolito and Paredon to Saltillo. The Western district will be the main line from San Juan del Rio, inclusive, to Ciudad Juarez, and all branches west, and will take care of all engines running into western terminals, such as those running between San Luis and Aguascalientes, Torreon to Saltillo and Gomez Palacio to Hipolito. The Eastern district will be in charge of Superintendent of Mechanical Department M. J. Schneider, with office at San Luis Potosi. The Western district will be in charge of Superintendent of Mechanical Department J. J. Waters, with office at Aguascalientes.

Arthur Monroe Kinsman, whose appointment as Chief Engineer of the Baltimore & Ohio was announced in these columns last week, was educated at the Worcester, Mass., Institute of Technology. He began railway work as rodman on a branch line of the Boston & Maine in 1877, and a year later became levelman on the Illinois Central. Later he was promoted to transitman, and then Resident Engineer. In 1880 he was appointed Engineer of Surveys and Construction on the Chicago, Milwaukee & St. Paul. After remaining here but a year, he was appointed Resident Engineer of the Illinois Central, and later became Division Engineer and then Superintendent of Construction. In 1895 he was appointed Chief Engineer of Construction and Maintenance of Way of the Wisconsin & Michigan. In 1899 he was appointed Engineer of Construction of the Baltimore & Ohio lines west of the Ohio river, with office at Akron, Ohio, and four years later was made Engineer of Construction of the entire Baltimore & Ohio system, with office at Baltimore, which position he held up to March 1, when he was made Chief Engineer.



A. M. Kinsman.

Purchasing Officers.

William McMaster, Assistant Purchasing Agent of the Chicago, Indiana & Southern and the Indiana Harbor Belt, has been appointed the Industrial Agent, with office at La Salle street station, Chicago, succeeding K. H. Bell, resigned. The position of Assistant Purchasing Agent has been abolished.

OBITUARY.

John W. Bastedo, District Passenger Agent of the Atchison, Topeka & Santa Fe at Detroit, died last week.

George I. Humphrey, who for 10 years was Tourist Passenger Agent of the Chicago & North Western and the Union Pacific, died March 1 of pneumonia at Saratoga, N. Y.

John A. Head, formerly the Superintendent of the Boone division of the Chicago & North Western, and for many years a railway contractor, died on March 2, at Rockford, Ill. He was 78 years old.

Noble D. Munson, formerly Superintendent of the Chicago, Burlington & Quincy, at Quincy, Ill., and at one time a member of the Illinois Railroad and Warehouse Commission, died at St. Paul, Minn., on March 7. He was born at Bristol, Vt., on September 21, 1827.

Frederick S. Winston, General Solicitor of the Chicago & Alton and the Michigan Central, died on March 7, at Pasadena, Cal. He was a member of the law firm of Winston, Payne, Strawn & Shaw, of Chicago, and was a national authority on corporation law. He was born in Franklin county, Ky., on October 27, 1856.

Joseph William Blythe, General Counsel of the Chicago, Burlington & Quincy, died suddenly from heart disease near Wapello, Iowa, on March 6, while on a hunting expedition with a party of friends. He was born on January 16, 1850, at Cranbury, N. J. He was educated at Princeton University and Hanover College, Indiana, and was made General Counsel of the Burlington in 1901.

Railroad Construction.

New Incorporations, Surveys, Etc.

Aberdeen & Asheboro.—Plans are said to have been made by this company to build an extension from a point in Montgomery county, southeast via Rockingham to a point in Richmond county.

Alberta & Great Waterways.—W. R. and D. O. Clarke, bankers, Kansas City, Mo., are said to have announced that construction will begin this spring and that contracts for bridges and trestles have been let to J. A. L. Waddell. (Jan. 29, p. 235.)

Canadian Pacific.—This company plans to carry out improvements during 1909 on its western lines as follows:

Completion of double track on remaining 18 miles between Fort William, Ont., and Winnipeg, Man.

Extension from Teulon, Man., northerly about 17 miles, from a point two miles north of Komarno towards the Icelandic river.

Track is to be laid on the Mowbray branch from Mowbray, Man., southeasterly 6.5 miles.

On the line from Saskatoon, Sask., west to Wetaskiwin, Alb., 325 miles, track is to be laid from Wilkie, Sask., the present western terminus, 99.6 miles west of Saskatoon, to Hardisty, the present eastern terminus of the Wetaskiwin branch, 131.7 miles.

Branch to be built from Weyburn, Sask., to a point 20 miles west.

In Alberta, the line from Lacombe, east to Stettler, 51 miles, is to be extended east 35 miles.

A branch is to be built from Cheadle, Alb., on the Calgary section of the main line, north to the Lacombe-Stettler line, 40 miles.

A branch is to be built from Kipp, Alb., on the Macleod section of the Crow's Nest Pass line, north to a point on the Little Bow river, 28.5 miles.

Work will be continued on the bridges being built over the Belly river and the Old Man river. Between Fort William, Ont., and Winnipeg, Man., and on the Estevan (Sask.) section, 85-lb. rails will be laid on 60 miles, and ballasting will be carried out on the Souris, Man., and Estevan sections for 100 miles, and on the Yorkton, Sask., section for 30 miles. Extensions will be made to passing tracks and new tracks laid on the Last Mountain, Sask., and Estevan sections; an overhead bridge will be built at First street, Brandon, Man.

On the Western division 85-lb. rails will be laid as follows: Edmonton, Alb., section, 100 miles; Macleod, Alb., section,

53 miles; Cranbrook, B. C., section, 3 miles; ballasting will be carried out on the Portal, Sask., section, 50 miles; Lethbridge, Alb., section, 17.2 miles; Edmonton section, 100 miles; Macleod section, 30 miles; additional passing tracks will be laid on the Swift Current, Sask., section, with other extensions and additions to passing sidings, and betterments to bridges are to be made at various points of the division. A new yard is to be laid out at Moose Jaw, Sask., and a gravity water supply installed at Regina, Sask.

On the Pacific division ballasting is to be carried out on 16 miles of the Cascade, B. C., section, and the Cisco bridge is to be replaced with a heavier structure, of similar type to the existing one; a number of wooden bridges are to be replaced with permanent structures.

Additions to passing tracks, changes of line and improvements to yards are to be made in British Columbia at Kamloops, Mission Junction, Spences Bridge, North Bend and Vancouver. A new 280-ft. steel bridge is to be built on the Esquimalt & Nanaimo Railway.

Carolina, Clinchfield & Ohio.—Bids are said to have been asked by this company for an extension from the present northern terminus at St. Paul, Va., north to the Chesapeake & Ohio at Elkhorn City, Ky., about 40 miles. (Feb. 19, p. 379.)

Crow's Nest & Northern.—An officer writes that it is expected to have the line from Crow's Nest, B. C., to Crown, 12 miles, completed this year. C. L. Butterfield, Chief Engineer, Spokane, Wash. (March 5, p. 481.)

Dakota Western.—Incorporated in South Dakota with $2,000,000 capital, and headquarters at Whitewood. The company proposes to build a line from Whitewood, S. Dak., northeast to Attainment, in Meade county, 30 miles. The incorporators include W. P. Boniwell, H. T. Cooper and T. W. Thompson, of Whitewood; R. Cleaver and F. A. Robinson, of Empire, S. Dak.

Denver & Lincolnton.—A charter is said to have been granted this company in North Carolina. The plans call for a line from Lincolnton, N. C., northeast to Denver thence south via Triangle to Lowesville, 25 miles. Address E. W. Shed, Carthage, N. C.

Esquimalt & Nanaimo Railway.—See Canadian Pacific.

Gulf Line.—This company is said to be planning to build an extension from its present southern terminus at Bridgeboro, Ga., southwest to Camilla, 20 miles. The extension is eventually to be continued southwest to Bainbridge, about 60 miles from Bridgeboro.

Hudson & Manhattan.—The fourth and last of the tubes under the North river, New York City, was blown through on March 11. The north of the two down-town tubes, which is 6,000 ft. long, will be used for westbound traffic.

Hudson Bay Railway.—Projected from The Pass, near the eastern boundary of Saskatchewan, Canada, northeast via Spirit Lake, either to Fort Churchill or to Port Nelson. An estimate of the comparative cost of the alternate routes from Spirit Lake shows the Fort Churchill route to be about 465 miles long and to cost about $11,608,000 for construction, with about $6,000,000 additional for harbor and terminal improvements, and the Port Nelson route to be about 397 miles long and to cost about $8,677,000, but the terminal and harbor improvements at the latter place would be greater than at Fort Churchill. John Armstrong, Ch. Engr., is said to favor the Port Nelson route, as that place is open to navigation from one to two months longer than Fort Churchill, and it is about 70 miles nearer Winnipeg.

Lake Erie & Eastern.—Incorporated in Ohio to build a steam line from Lorain, Lorain county, southeast, via Youngstown, to a point near Lowellville, Mahoning county. Rights of way have been purchased through the city of Youngstown and franchises now being sought for crossing certain streets. J. W. Fawcett, Ch. Engr., Youngstown, Ohio.

Lake Superior & Long Lake Railway & Transportation Company.—Incorporation has been asked for by this company from the Ontario legislature to build a line from a point near the Canadian Pacific in the Thunder Bay district, Ont., near Black's, northeasterly via Owl lake and Long lake, to a point on the National Transcontinental (Grand Trunk Pacific). The company asks permission to operate a line of car ferries, steamers and barges on Owl lake and on Long lake, in connection with the proposed line. R. A. Pringle, solicitor, Cornwall, Ont.

Manufacturers' Railway.—According to press reports this company is planning to establish large freight yards south of St. Louis, Mo., and build an extension, also a belt line.

Milbrook Company.—See New York, New Haven & Hartford.

Morrisdale Railway.—Incorporated in Pennsylvania with $40,000 capital stock to build from Morrisdale, Pa., through Clearfield county. Clark Steele, President, Northumberland, Pa.

Nashville & East Tennessee.—An officer writes that six miles of track are now laid on the line building from Asheville, N. C., to Huntdale, about 45 miles. The work will include one 1,600-ft. tunnel. Asheville Fuel, Dray & Construction Co., contractors, Asheville, N. C. B. N. Lee, Chief Engineer, Asheville. (March 5, p. 481.)

New York & Portchester.—See New York, New Haven & Hartford.

New York, New Haven & Hartford.—This company has applied to the New York Public Service Commission, Second district, for permission to acquire all the capital stock of the New York & Portchester and the New York, Westchester & Boston. The Millbrook Company, a subsidiary of the New Haven, now owns nearly all the New York & Portchester stock and over two-thirds of the New York, Westchester & Boston stock. The New Haven has advanced money to the Millbrook Company for construction, etc., and now wants to abolish this intermediary company and deal directly with the two railways, building one or both of them and beginning actual operation. (Feb. 19, p. 381.)

New York, Westchester & Boston.—See New York, New Haven & Hartford.

Oregon & Washington.—See Oregon Railroad & Navigation Co.

Oregon Railroad & Navigation Co.—An officer of the Oregon & Washington writes that contracts have been let for building the Tacoma, Wash., tunnel, which will be 8,650 ft. long, single tracked. (Nov. 27, p. 1460.)

An officer of the Oregon & Washington writes that contracts have been let for building the single track from the boundary line betwen Aberdeen, Wash., and Cosmopolis, to a point opposite Gates City, in Chehalis county, about 38 miles. (Feb. 12, p. 331.)

Sapulpa & Interurban (Electric).—An officer writes that contracts for bridging and grading are about to be let. Bridging includes one 300-ft. pile and steel bridge and a 200-ft. trestle. D. W. Patton, Chief Engineer, Poteau, Okla. (March 5, p. 482.)

Sault Ste. Marie & St. Joseph Island.—Application has been made to the Ontario legislature by this company for incorporation. The company proposes to build a line from a point in the Algoma district near the Canadian Pacific, in the municipalities of Johnson and Tarbutt, via Campement d'Ours, thence to a point on St. Joseph Island near Gowas bay, or to a point on St. Joseph Island near Boulanger Point, thence via Richard's Landing and Marksville, to a point in the municipality of Jocelyn on St. Joseph Island; also a line from the first named point westerly to Sault Ste. Marie. Permission is asked to operate the necessary car ferries between the island and the mainland. P. T. Rowland, solicitor, Sault Ste. Marie, Ont.

Texas Roads.—According to press reports from El Paso, Tex., the Cieneguata Copper Co. has been granted a charter in Mexico to build a narrow gage line from the company's mines in the Sahuaripa district to Tonichi, Sonora, on the proposed extension to the Cananea, Yaqui River & Pacific, about 40 miles.

Texas State.—Reports from Austin, Tex., indicate that a bill has been introduced in the legislature for an appropria-

tion of $150,000 to extend this road from Rusk, Tex., south about 100 miles, towards Houston, which may eventually be the southern terminus. (Jan. 29, p. 236.)

Virginian Railway.—An officer writes that it is expected that track-laying will commence on the Winding Gulf branch about April 1, and to have the entire branch to Pemberton completed by November. (See this road under Railroad Financial News.)

Wicomico Electric & Power Company.—Charter is said to have been given in Maryland to build a line from Nanticoke Point, Md., to Willard, in Wicomico county, 35 miles, also for a number of branch lines each to be 15 miles long. As soon as final arrangements are finished construction work is to be begun. M. V. Brewington, President, and J. D. Price, General Manager, Salisbury, Md.

Railroad Financial News.

Baltimore Terminal Co.—See Washington, Baltimore & Annapolis.

Bessemer & Lake Erie.—In the year ended December 31, 1908, the company operated 210 miles of main line and had gross earnings of $5,240,951, a decrease of $1,136,001 from 1907. As in the case of the Pittsburgh & Lake Erie, nearly all of the decrease in gross earnings was accounted for by a decrease in the earnings from freight. These earnings amounted to $4,888,970 last year, being $1,077,196 less than in the previous year. Total operating expenses were $3,176,315, or $455,362 less than in 1907. It will thus be seen that there was a saving in expenses, due to a decrease in traffic. The saving was not in proportion to the falling off in earnings, so that the operating ratio, which was 56.95 per cent. in 1907, became 60.61 per cent. last year.

The number of tons of revenue freight carried in 1908 amounted to 9,357,966, or 1,977,395 tons less than in 1907. The average receipts per ton per mile were 0.439 cents in 1908 and 0.438 cents in the previous year. The ore movement in 1908 was 4,715,023 gross tons, showing a falling off of 1,128,163 tons for the year. The Bessemer road had a call on the ore shipments for the Carnegie furnaces in the Pittsburgh district, but this movement did not begin until the middle of June, so that for the first six months of 1908 a large percentage of the equipment was idle; but during the month of October there was handled from the dock to furnaces 815,000 tons of ore, which is the best record for any one month in the history of the road, 780,000 tons during August, 1907, being the previous high record. As is to be expected on a road handling such a large percentage of low-grade tonnage, the average trainload is very heavy, being 931 tons in 1908. The percentage of northbound tonnage was 34.76 and southbound tonnage 65.24 per cent., while the average trainload northbound was 517 tons and southbound 1,345 tons.

Chicago, Milwaukee & Gary.—The control and the management of this property are now passing into the hands of the St. Louis Union Trust Company interests. The securities of the syndicate, headed by H. W. Seaman, which several months ago acquired the Illinois, Iowa & Minnesota and changed its name to the Chicago, Milwaukee & Gary, have been deposited with the St. Louis Union Trust Co., and this company has arranged to finance all the road's present needs and its needs for two or three years to come. Albert T. Perkins, Railway Adviser to the St. Louis Union Trust Co., and executive of the roads which the St. Louis Union Trust Company interests control, was elected a director on March 4, and in a few days will be elected President, succeeding Mr. Seaman, and a new board of directors will be elected which will be controlled by the St. Louis Union Trust Co. interests but on which the parties now in control will have representation. Mr. Seaman will remain on the board. The syndicate now in control has put $5,000,000 into the property and operates 125 miles of line from Momence, Ill., to Rockford. The road is ballasted with gravel, is well tied and is laid with 70-lb. rails. Of this 125 miles of line the company owns all but 25 miles between Joliet and Aurora, which is leased from the Elgin, Joliet & Eastern. Besides the 100 miles of main line it has valuable terminals at Rockford, DeKalb and Momence and 23 miles of sidings. It connects with the Chicago & Eastern Illinois at Momence; the Wabash at Manhattan; the Michigan Central and the Elgin, Joliet & Eastern at Joliet; the Burlington and the Elgin, Joliet & Eastern at Aurora; the North Western and Great Western at DeKalb; the Great Western at Wilkinson; the St. Paul at Kirkland, and the Burlington, the North Western and the Illinois Central at Rockford. It owns nine locomotives, 350 freight cars, of which 300 are large modern furniture cars, and a few passenger cars. Owing to its location in a manufacturing district and its connections with a large number of important trunk lines, it is favorably situated to build up a large business in hauling manufactured products to the trunk lines and coal and raw materials from them. When the Illinois, Iowa & Minnesota was re-organized as the Chicago, Milwaukee & Gary, it was expected to make of it an outer belt around the Chicago district, extending from Milwaukee to Gary. Whether the extensions originally contemplated or any others will be made, those in control are not now prepared to say. It is possible that motor cars will be put on to handle passenger business.

Denver, North Western & Pacific.—The Colorado-Utah Construction Co., which is building the Denver, North Western & Pacific, has sold $1,000,000 one-year 6 per cent. notes to George H. Burr & Co., Chicago. The notes are secured by bonds of the railway company, endorsed with the personal guarantee of David H. Moffat, President of the Denver, North Western & Pacific.

Fonda, Johnstown & Gloversville.—The company has recently authorized an issue of $1,000,000 6 per cent. cumulative preferred stock. The stock is subject to call at 105, and has the same voting rights as the common. The road runs from Fonda, N. Y., to Northville, 26 miles.

Georgia Terminal Co. of Atlanta.—The United States Circuit Court on February 15 appointed H. M. Atkinson and P. S. Arkwright, receivers of the Atlanta, Birmingham & Atlantic, also receivers of the Georgia Terminal Co. and the Alabama Terminal Railroad of Birmingham, Ala., and Bessemer.

Grand Trunk Pacific.—Glyn, Mills, Currie & Co., London, offered February 20-25 £1,000,000 ($5,000,000) 4 per cent. debenture stock of the Grand Trunk Pacific at 90. Interest on this stock is guaranteed by the Grand Trunk. The proceeds of the sale are to be used for the purchase of additional rolling stock, which will be required on the opening of the Prairie section and the Lake Superior branch.

London & North Western.—During the half year ended December 31, 1908, gross earnings from 1,975 miles operated and from rents, etc., totaled £8,068,435 ($40,342,175), a decrease of £306,788 ($1,533,940) from the earnings in the corresponding period of 1907. Working expenses amounted to £5,132,107 ($25,660,535) in the 1908 half year, being £221,577 ($1,107,885) less than in 1907. After paying interest on debenture stock and rents and leases, the company had a surplus available for dividends of £2,311,332 ($11,556,660), and adding that to the £96,967 ($484,835) surplus for the previous half year, there was left available for dividends for the half year £2,408,299 ($12,041,495) as compared with £2,499,437 ($12,497,185) in the corresponding half year of 1907. In all, £2,306,941 ($11,534,705) was paid in dividends, the annual rate on the consolidated stock being reduced from 7¼ per cent. in 1907 to 6¾ per cent.

The receipts from the 43,879,986 passengers carried amounted to £3,637,533 ($18,187,665), and the receipts from the carrying 25,613,873 tons of merchandise, live stock and minerals carried amounted to £4,729,652 ($23,648,260). The figures for the number of passengers carried are somewhat lower than for the corresponding half year of 1907, as are the number of tons carried, but the receipts from passengers were slightly greater in 1908 than in the previous year, while the receipts from freight were less.

There was spent for maintenance of way, works and stations £768,211 ($3,841,055) as against £830,377 ($4,151,-

885) in 1907, and for locomotive repairs and presumably renewals, £1,406,030 ($7,030,150) as against £1,503,564 ($7,517,820) in the previous year. Repairs of cars cost £426,648 ($2,133,240) as against £409,723 ($2,048,615).

The balance sheet shows sundry outstanding accounts of £1,875,694 ($9,378,470), and cash on hand of £2,027,771 $10,138,855), and general stores of materials on hand of £1,647,186 ($8,235,930).

MILLBROOK COMPANY.—See New York, New Haven & Hartford.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—See Wisconsin Central.

MISSOURI, OKLAHOMA & GULF.—The Fanco-American Bank is quoted as announcing the sale of 2,500,000, 5 per cent. bonds of the Missouri, Oklahoma & Gulf at 92½.

MISSOURI PACIFIC.—Kingdon Gould has been elected a director, filling the place made vacant some months ago by the resignation of Stuyvesant Fish. R. M. Galloway has also been elected a director.

NEW YORK & PORTCHESTER.—See New York, New Haven & Hartford.

NEW YORK, NEW HAVEN & HARTFORD.—The company has applied to the New York Public Service Commission, Second district, for permission to buy from the Millbrook Company the stock of the New York & Portchester and the New York, Westchester & Boston, and also whatever remaining stock in the Westchester company may be acquired from other parties.

The New York, New Haven & Hartford owns a majority of the shares of the Millbrook Company, which in turn owns all the stock of the New York & Portchester except nine shares, and the control of the New York & Portchester and the New York, Westchester & Boston is now held by the New Haven company, but it wishes to do away with the Millbrook Company so as to deal directly with the Westchester and Portchester roads.

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

PENNSYLVANIA.—That part of the annual report for the year ended December 31, 1908, giving the financial results of the year's operation has been made public; but that section giving traffic statistics and other details of operation has not as yet been made public. The *Railroad Age Gazette* will review the report editorially when the complete figures are at hand.

The total gross earnings of all the transportation companies east and west of Pittsburgh and Erie owned, operated or controlled by, or affiliated in interest with, the Pennsylvania Railroad system, amounted to $274,338,804. This is a decrease from 1907 of $52,446,722. Operating expenses, including taxes, amounted to $203,605,536, a decrease of $45,010,425. There was a surplus after payment of dividends, extraordinary expenses and charging off amounts to the extraordinary expenditure fund of $1,051,563 last year as compared with $4,023,372, a decrease of $2,971,808. The Pennsylvania Railroad proper, which owns and operates the Pennsylvania lines east of Pittsburgh and Erie, and whose earnings and expenses were of course included in the above figures, had gross earnings of $136,296,871, and operating expenses, including taxes, of $101,400,993, leaving net earnings from operation of $34,895,878, and after paying $2,706,-685 rental on roads operated on basis of net earnings, and adding $14,388,702 other income, the Pennsylvania Railroad had a gross income of $46,577,895. After deducting fixed charges and rentals, there was left $28,207,660 as compared with $33,575,056 in 1907. There was charged for extraordinary expenditures $4,538,981, and for dividends $18,-875,681. In 1907 there was charged $3,260,651 for extraordinary expenditures and there was transferred $2,500,000 to the extraordinary expenditure fund. Dividends were paid at the rate of 6 per cent. in 1908 and 7 per cent. in the previous year. There was a balance transferred to profit and loss of $659,131 in 1908 and $2,351,424 in the previous year.

As we have previously announced, the stockholders are to vote on March 23 on the proposal to issue $80,000,000 bonds. At a meeting held March 9, Moorefield Storey offered a resolution directing that the new bonds be sold through open and competitive bidding, thus doing away with the necessity for having bankers underwrite the issue. The resolution was referred to the incoming board of directors.

PEORIA & EASTERN.—Officers are quoted as saying that the annual interest due April 1 on $4,000,000 4 per cent. non-cumulative income bonds not being earned during the 1908 year, is not to be paid.

PITTSBURGH & LAKE ERIE.—The annual report for the year ended December 31, 1908, shows that, with an operated mileage of 191 miles, gross earnings for that year amounted to $10,397,843, a decrease of $4,506,567 from 1907. Nearly all of this decrease was in the earnings from freight traffic, which amounted last year to $8,962,172, a decrease of $4,343,-680 from 1907. Operating expenses also show a decrease, the amount spent in 1908 being $5,415,097, or $1,569,159 less than in 1907, the greatest decrease being in the cost of conducting transportation, $2,825,280 being spent for this account last year, or $720,546 less than in 1907. There was spent last year for new construction (additions and betterments) and charged to income account, $1,135,327, or less than half of what was spent in 1907. There was spent for new equipment (additions), $1,608,579, or $609,107 less than the amount spent in 1907. Dividends were reduced from 12 per cent. to 10 per cent., making a saving last year of $200,000. After payment of dividends, the company had a surplus of $339,892 as compared with $1,300,342 in 1907.

The decrease in freight earnings is explained by a decrease of 8,580,082 in the tons of revenue freight carried, and a decrease of 0.023 cents per ton per mile in the amount received for freight transportation. The number of tons of revenue freight carried last year totaled 19,215,-998, and the amount received per ton per mile was 0.705 cents. Bituminous coal formed 41 per cent. of the tonnage of freight carried in 1908, and amounted to 7,911,266 tons last year as against 10,478,649 tons in the previous year. The character of the business of the Pittsburgh & Lake Erie is shown by the fact that 77 per cent. of its total tonnage was products of mines in 1908, and the efficiency with which it handled this low grade tonnage last year is indicated by an average revenue train load of 1,058 tons.

SALT LAKE & OGDEN.—N. W. Harris & Co., New York, and the Harris Trust & Savings Bank, Chicago, are offering $500,000 Salt Lake & Ogden first mortgage 5 per cent. bonds of 1909-1934 at 98. The proceeds of the sale are to be used to pay the road's floating debt of $150,000 and to complete and electrify its line. The road, operated by steam over private right of way, runs from Salt Lake City, Utah, through several intervening towns to Ogden, 35½ miles.

VIRGINIAN RAILWAY.—Stockholders have authorized $1,500,000 first mortgage 5 per cent. bonds (which under the mortgage may be issued on branch lines at the rate of $50,000 per mile) on account of the construction of the Winding Gulf branch in West Virginia.

WISCONSIN CENTRAL.—The committee appointed by the directors to make arrangements for the acquisition of the Wisconsin Central by the Minneapolis, St. Paul & Sault Ste. Marie announce that the Soo having secured a substantial interest in the common stock, desires to acquire control of the property through a lease or other lawful method, and has agreed to issue its "leased line stock certificates" in exchange for the preferred stock, which stock will be held in trust by the Bank of Montreal. By the terms of the "leased line stock certificates" the Minneapolis, St. Paul & Sault Ste. Marie will obligate itself to pay to the holders of such certificates 4 per cent. per annum, payable semi-annually for the term of 99 years, on conditions which the committee consider adequate for the protection of the interests of the holders. Holders of the preferred stock who desire the exchange must on or before March 20 deposit their certificates, subject to an agreement dated March 20, 1909, with either the Empire Trust Co., New York; the American Trust Co., Boston, Mass., or the Anglo-Austrian Bank, London, England.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Granite City Railway, St. Cloud, Minn., will be in the market soon for 2 electric locomotives.

The Temiskaming & Northern Ontario, reported in the *Railroad Age Gazette* of February 12 as being in the market for 2 switching locomotives, has placed that order with the Canadian Locomotive Co., for July delivery.

The Chicago, Burlington & Quincy, reported in the *Railroad Age Gazette* of February 12 as being in the market for 25 locomotives, has ordered 25 Pacific locomotives from the Baldwin Locomotive Works for May and June delivery.

The Grand Trunk Pacific, reported in the *Railroad Age Gazette* of December 4 as being in the market for 50 locomotives, and on January 22 as having ordered 25 road locomotives from the Montreal Locomotive Works, Ltd., has ordered the 25 Mogul locomotives from the Canadian Locomotive Co., the entire order being for delivery during June and July, 1909.

General Dimensions.

	Road.	Mogul.
Weight on drivers	74,060 lbs.	138,176 lbs.
Total weight	121,688 "	161,976 "
Cylinders	18 in. x 24 in.	20 in. x 26 in.
Diameter of drivers	69 in.	63 in.
Boiler, type	Extended wagon top.	Extended wagon top.
Boiler, wkg. steam press.	200 lbs.	200 lbs.
Heating surface, tubes	1,259 sq. ft.	1,688.5 sq. ft.
" " firebox	126 "	188.1 "
" " total	1,385 "	1,876.6 "
Tubes, number	210	271
" outside diameter	2 in.	2 in.
" length	11 ft. 2¾ in.	11 ft. 11 in.
" material	Steel—Diamond B.	....
Firebox, type	Sloping.	Sloping.
" length	95¾ in.	120 in.
" width	41⅞ "	40⅛ in.
" material	Steel.	Steel.
Grate area	28 sq. ft.	33.43 sq. ft.
Water capacity	7,000 U. S. gals.	7,000 U. S. gals.
Coal capacity	10 tons.	10 tons.
Tractive effort	18,158 lbs.	28,063 lbs.

Special Equipment.

Axles	Hammered iron or steel
Bell ringer	Pneumatic G. T. R. standard
Boiler lagging	Wood and asbestos
Brakes	Westinghouse American
Brake-beams	G. T. R. standard
Brake-shoes	Perfecto on drivers
Couplers	Washburn or Melrose
Driving boxes	Cast steel
Headlight	G. T. R. standard
Injector	Hancock
Journal bearings	Canadian bronze
Piston and valve rod packings	U. S. Metallic
Safety valve	World
Sight-feed lubricators	G. T. R. standard
Driving box lubricators	Franklin
Springs	Montreal Steel Works and Peech & Tozer
Staying	Radial
Steam gages	Utica
Steam heat equipment	Gold and Safety C. H. & L. Co.
Tires	Open hearth
Valve gear	Stephenson
Valves	Richardson

Each locomotive will carry a 15-ton Norton jack and a Tilden or other make replacer.

CAR BUILDING

The St. Louis, Brownsville & Mexico is in the market for five passenger coaches.

The Sapulpa & Interurban (Electric) is in the market for cars. See Railroad Construction.

The Granite City Railway, St. Cloud, Minn., will be in the market soon for 10 fifteen-ton flat cars.

The Canadian Northern has ordered 4 first-class coaches, 2 second-class coaches and 2 combination passenger and baggage cars from the Silliker Car Co.

The Atlantic Coast Line, reported in the *Railroad Age Gazette* of March 5, is in the market for 2 combination mail and express cars. These cars will weigh 40 tons and will be 60 ft. 4½ in. long, 8 ft. 10½ in. wide and 9 ft. ⅝ in. high, inside measurements, and 63 ft. 4 in. long over buffers, 61 ft. 2 in. over end sills, 9 ft. 10½ in. wide and 14 ft. 3 in. high, over all. The underframes will be of wood, and the bodies of wood with steel end framing. Special equipment will include:

Bolsters, body	Double iron
Bolsters, truck	Composite
Brakes	Westinghouse high speed
Brake-beams	Diamond special
Brake-shoes	Steel back
Brasses	A. C. L. standard solid
Couplers	Janney-Buhoup
Doors	A. C. L. standard
Door fastenings	A. C. L. standard
Draft gear	Westinghouse friction
Dust guards	Harrison
Heating system	Gold direct
Journal boxes	A. C. L. standard cast iron
Lighting system	Pintsch incandescent and oil
Paint	A. C. L. standard
Platforms	Dummy
Roofs	A. C. L. standard
Side bearings	Chicago Ry. Equip. Co. anti friction
Springs	A. C. L. standard
Trucks	A. C. L. standard, 4-wheel
Vestibules	Dummy-Pullman pattern
Vestibule diaphragms	Ajax
Wheels	33 in. special cast iron
Window fixtures	Adlake

The New York Central Lines announced on March 5 the equipment ordered and to be ordered for delivery during 1909, including the total of 71 locomotives, 203 passenger cars and 5,450 freight cars. Contracts have already been given for 3,350 freight cars distributed as follows:

New York Central & Hudson River:
- 1,000 self-clearing steel hoppers. Standard Steel Car Co. (*R. A. G.*, January 15.)
- 1,000 standard box cars...... Merchants' Despatch Co.
- 200 stock cars.................... Haskell & Barker
- 150 flat cars.......... Company shops, West Albany.

Lake Shore & Michigan Southern:
- 1,000 self-clearing steel hoppers.. American Car & F'dry (*R. A. G.*, January 15.)

Bids are being received for the remainder of the freight equipment, consisting of the following cars for the lines indicated; and orders will probably be placed within a few days.

Lake Shore & Michigan Southern	1,000 box cars
Michigan Central	1,000 box cars
New York Central & Hudson River	100 flat cars.

Contracts have been placed for 135 passenger cars as follows:

New York Central & Hudson River:
- 50 standard 70-ft. coaches.... American Car & Foundry
- 2 vestibuled smokers .... American Car & Foundry
- 3 dining cars.......................... Pullman Co.
- 7 steel buffet cars .... Pullman Co.
- 11 steel postal cars.................... Pullman Co. (*R.A.G.*, January 29.)
- 10 milk cars. .... West Albany Shops

Lake Shore & Michigan Southern:
- 20 standard 70-ft. coaches .... Pullman Co.
- 5 standard coaches .... Barney & Smith
- 1 dining car .... Pullman Co.
- 2 steel buffet cars. .... Pullman Co.
- 3 steel postal cars .... Pullman Co.

Michigan Central:
- 11 standard 70-ft. coaches .... Barney & Smith
- 1 dining car .... Pullman Co.
- 2 steel buffet cars...................... Pullman Co.

Cleveland, Cincinnati, Chicago & St. Louis:
- 1 dining car. .... Pullman Co.

Rutland:
- 6 milk cars................. Osgood, Bradley & Sons

Bids are being received for passenger cars as follows:

New York Central & Hudson River:
- 36 steel baggage and express cars.

Lake Shore & Michigan Southern:
- 2 café coaches.

Michigan Central:
- 3 coaches with smoking compartments.
- 2 combination coach and baggage.
- 10 steel baggage and express.
- 2 combination baggage and mail.
- 2 combination baggage, mail and express.

Cleveland, Cincinnati, Chicago & St. Louis:
- 3 combination coach and baggage.
- 5 steel baggage and express.
- 3 combination baggage and mail.

The 71 locomotives will be distributed as follows:

Lake Shore & Michigan Southern:
- 20 freight.

Michigan Central:
- 18 freight.
- 12 passenger.
- 15 switch
- 1 decapod.

Cleveland, Cincinnati, Chicago & St. Louis:
- 5 passenger.

The Grand Trunk Pacific has ordered 16 first-class coaches, 10 colonist cars, 8 second-class coaches, 5 parlor cafe cars and 3 dining cars from the Canada Car Co.

The Chicago, Burlington & Quincy, reported in the *Rail-*

road Age Gazette of February 12 as being in the market for 25 chair cars, has ordered 12 chair cars from the American Car & Foundry Co. These will be built at the St. Charles works and are for delivery in May. No additional chair cars will be ordered at this time.

IRON AND STEEL.

The Chicago & Alton is in the market for about 9,000 tons of rails.

The Chicago, Indianapolis & Louisville is in the market for 2,000 tons of rails.

The Chesapeake & Ohio is said to have given an order for 500 tons of bridge steel to the Pennsylvania Steel Co.

The Delaware & Hudson is said to have ordered 4,000 tons of rails from the Bethlehem Steel Co. and 250 tons of titanium rails from the Pennsylvania Steel Co.

The Minneapolis, St. Paul & Sault Ste. Marie, reported in the *Railroad Age Gazette* of February 5 as being in the market for 500 tons of plate girders for a bridge at St. Paul, Minn., is said to have ordered 400 tons from the Pennsylvania Steel Co.

The New York Central Lines have placed orders for a total of 101,000 tons of rails, the 1909 requirements, for early delivery, as follows: Lackawanna Steel Co., 51,000; United States Steel Corporation, 42,600; Algoma Steel Co., 5,400, and Bethlehem Steel Co., 2,000. The apportionment to the different roads of the system will be as follows: B. & A., 7,000; N. Y. C. & H. R., 37,000; Rutland, 2,000; P. & L. E., 9,000; L. S. & M. S., 15,000; C. C. C. & St. L., 5,000; L. E. & W., 2,500; C. I. & S., 3,500, and Mich. Cent., 20,000

General Conditions in Steel.—The United States Steel Corporation is said to have turned the tables on the independents and is now underbidding them. Prices seem to be the secondary consideration, with business getting the first. Reports indicate that the open market and subsequent price cutting has brought out a large amount of new orders, and that the Corporation booked on an average of 25,000 tons per day since the cutting began. The New York Central Lines is at present the most discussed railway system as regards steel, due to the placing of its 1909 rail requirements, 101,000 tons. These rails will be billed at the market price at the time of delivery, and although there is no variation from the present price of $28 at this time, it is possible that there will be before the rails are delivered. The New York Central specifications have the effect of lowering the price on these rails, as they are said to call for much better product than the old specifications did. The New York Central equipment requirement announced last week has resulted in inquiries regarding probable price concessions by manufacturers, especially those using a large amount of steel.

RAILROAD STRUCTURES.

BRANDON, MAN.—See Canadian Pacific under Railroad Construction.

BROWNSVILLE, TEX.—The St. Louis, Brownsville & Mexico and the National Railways of Mexico will jointly build a new bridge across the Rio Grande river at this point. The contract for the substructure has been given to the Foundation Co., New York, and for the superstructure to the Wisconsin Bridge & Iron Co., North Milwaukee, Wis. The bridge will be about 500 ft. long and is to be finished in six months.

CHICAGO.—The Chicago & North Western has given the contract for the construction of a steel viaduct at North State street over its tracks, extending from the Chicago river to Kinzie street, to the Ketler Elliot Erection Co., Chicago.

LONG ISLAND CITY, N. Y.—The Thompson avenue highway viaduct across the new Sunnyside yards of the Pennsylvania has been opened for traffic. It is 766 ft. long, and including approaches, 2,000 ft. long.

SALT LAKE CITY, UTAH.—The Denver & Rio Grande is having plans prepared by Henry J. Schlacks, Chicago, for the superstructure of its proposed station. It will be 105 ft. x 340 ft., two stories high, except the central part containing the waiting room, and will be of fireproof steel and concrete construction. The exterior will be of pressed brick and stone with metal roof, and the interior calls for a large amount of marble and mosaic work. It will cost, including platforms and subways, $600,000. Plans will be completed by March 13. (July 17, 1908, p. 549.)

TEMPLE, TEX.—The Belton & Temple Traction Co. is preparing plans for enlarging its present car barns and repair shops to double their present capacity. A number of new machines and labor saving devices will be installed.

SIGNALING.

The Long Island Railroad has this week awarded to the Union Switch & Signal Company a contract for automatic block signals from The Raunt to Far Rockaway, about five miles, or about 10 miles of track. This is on the Rockaway division, which is electrically operated, with a third rail. Alternating current will be used for the signal track circuits. The new signals will be a continuation of the installation made by the Hall Signal Co. and described in this column February 12.

Steel Production and Capacity.

Including the Gary plant, the United States Steel Corporation will have a yearly capacity of about 3,500,000 tons of rails, the Gary plant supplying about 1,000,000 tons of this. As shown by the following table, this capacity is larger than the average annual production of rails by all companies in the United States. The actual capacity of all companies is probably about 6,00,000 tons.

Production of United States.

Year.	Tons.	Year.	Tons.
1908	1,921,611	1903	2,992,477
1907	3,633,654	1902	2,947,933
1906	3,977,889	1901	2,874,639
1905	3,375,929	1900	2,385,682
1904	2,284,711		

Supply Trade News.

The Northwestern Railway Supply Co., Chicago, has changed its name to the Central Railway Supply Co.

Edwin R. Kent & Co., Chicago, have removed their offices from 23 West Randolph street to the Commercial National Bank building.

E. E. Brosius, Alliance, Ohio, has been appointed the Sales Engineer of Pawling & Harnischfeger, Milwaukee, Wis., builders of traveling cranes.

The Belton & Trenton Traction Co., which is planning to enlarge its car barns and repair shops at Temple, Tex., will install a number of new machines.

The Ohio Locomotive Crane Co., Bucyrus, Ohio, has been incorporated by C. F. Mitchell, F. A. Bell, C. S. Rogers, M. E. Carroll and P. J. Carroll. The capital stock is $15,000.

The American Car & Equipment Co., 730 Old Colony building, Chicago, has just furnished a number of passenger cars for the Haag Shows as well as the M. L. Clark Shows.

Joseph F. Leonard, General Inspector of Signals of the Chesapeake & Ohio, resigned on March 1 to go into the railway and electrical supply business. His new office is in Richmond, Va.

The time for presenting designs at Milan, Italy, for the prize competition for automatic car couplers has been extended to March 31, 1909. The first prize is $2,000 and the second $1,000.

At the annual meeting of the stockholders of the Union Switch & Signal Co., Swissvale, Pa., held this week, it was stated that the company had unfilled orders on hand for business amounting to $1,357,000.

The Rockwell Furnace Co., New York, has purchased the factory, drawings, patterns, etc., of the Rockwell Engineering Co., and the business will hereafter be transacted under the name of Rockwell Furnace Co.

The Dorner Railway Equipment Co., Chicago, has been incorporated to buy and sell new and second-hand railway equipment. Capital stock, $2,500. The incorporators are: Otto G. Knecht, John W. Tibbitts and Ralph J. Taylor.

The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has opened a district office at 1108 Schofield building, Cleveland, Ohio. The new office will be in charge of C. J. Kruse, of the engineering department of the Cutler-Hammer company.

David J. Evans, who recently resigned as Manager of Sales for the Rail Joint Company, New York, is President of the Andresen-Evans Co., Chicago. H. P. Andresen continues as Vice-President and Chief Engineer of the latter company, which makes ore and coal unloading and conveying bridges, etc., and improved types of grab buckets.

The Vulcan Steam Shovel Co., Toledo, Ohio, has received an order for two large electric shovels, weighing 110 tons each and carrying four-yard dippers, from the Dolese & Shepard Co., Chicago. These shovels will be used for handling rock in quarries. The Vulcan Company says the prospects for the present year are very bright, contracts having been received for many of its shovels.

The Indianapolis Railway Mail Equipment Co., Indianapolis, Ind., the incorporation of which was reported in our issue of March 5, has been organized to develop an automatic mail catching and discharging device, patents on which it holds. The device has been tested three times by the government postal authorities and has been reported on favorably at least twice. At the suggestion of the postal authorities, the company will equip a short division of some railway for the purpose of making an extended test of the apparatus, covering a period of six months. Ernest L. Killen is Secretary, Newton Claypool building, Indianapolis.

The Independent Pneumatic Tool Co., Chicago, has appointed Manning, Maxwell & Moore, Washington street and Railroad avenue, Seattle, Wash., its exclusive representatives for the sale of Thor pneumatic tools and appliances in the state of Washington, except Clark county, and for the territory of Alaska. The Portland Machinery Co., 61 First street, Portland, Ore., has been appointed exclusive agent in Oregon and for Clark county, Washington. The business of the Independent company has shown a decided increase in these districts during the past few months and a complete line of Thor piston air drills, reaming, tapping flue rolling and wood boring machines, pneumatic riveting, chipping, calking and beading hammers and other air appliances will be carried in stock by its new representatives.

At the exhibit to be held next week at the Coliseum in Chicago, the G. Drouvé Company, Bridgeport, Conn., will show its Anti-Pluvius puttyless skylight and the Lovell window operator in space No. 83, northeast corner of the building. The Anti-Pluvius skylight has been furnished for a number of the well-known buildings that have recently been built or are now building, namely: The Fifth Avenue office building, New York; the Central Railroad of New Jersey ferry terminal, New York; Chicago City Railway car houses; new Lackawanna station at Scranton, Pa.; the Blake & Johnson Company's new plant at Waterbury, Conn. The Lovell window operator has been specified and used in connection with extensions and improvements made to plants in various parts of the country. The company will be represented by members of its staff from Bridgeport and Chicago offices.

For the fiscal year ended December 31, 1908, the gross earnings of the Railway Steel-Spring Co., New York, were $5,920,464. After deducting manufacturing, operating, administrative expenses, etc., the balance was $1,145,519. Charges of $169,899 were made for maintenance and depreciation. The remaining earnings, added to the previous surplus, amounted to $3,830,614. The interest on the Latrobe plant 5 per cent. gold bonds amounted to $209,692, and after deducting this, together with dividends on preferred and common stock, the surplus on December 31, 1908, was $2,270,942. Among the assets on the balance sheet as of December 31, 1908, are: Plants, properties, etc., $30,535,811; merchandise on hand, $1,914,250; accounts receivable, $1,211,790, and cash, $343,878. Among the liabilities are: Preferred stock, $13,500,000, and the same amount of common stock; Latrobe plant 5 per cent. gold bonds, $4,083,000; accounts payable, $588,000, and bills payable, $200,000. During the year there was added to capital account for additions to plants and properties, $245,173. The improvements and additions under construction at the Latrobe plant have been completed.

Julian L. Yale, President of Julian L. Yale & Co., Chicago, died of apoplexy at his home on March 3. The business of Julian L. Yale & Co. will probably be continued under that name. Mr. Yale was born in Herkimer county, N. Y., on March 26, 1840. He was a son of Linus Yale, the inventor of the Yale lock, and he was for a time connected with the Yale Lock Co., where he helped to assemble the first Yale locks made. He was for a time connected with New York establishments; then coming west he held several important positions with railways, the most important being that of Purchasing Agent of the Cleveland, Columbus, Cincinnati & Indianapolis, now a part of the Cleveland, Cincinnati, Chicago & St. Louis. After resigning from this position he went into the railway supply business at Cleveland, Ohio, representing among other firms the Carnegie Steel Co., Pittsburgh, Pa. He was appointed General Sales Agent of the Illinois Steel Co., Chicago, and this position he retained for eight or ten years, resigning to establish the firm of Julian L. Yale & Co., founded in 1897. He introduced the Shelby steel tube to the railway market, and was the representative of the Lackawanna Steel Co., New York, for a number of years. He was a member of the Chicago Club, the Union Club, the Illinois Athletic Association, the Cliff Dwellers, the Minnesota Club of St. Paul, the Union Club of Cleveland, the Union League Club of New York and the St. Louis Club. His success as a business man and his personal honesty made him a large number of close friends in all parts of the country.

TRADE PUBLICATIONS.

Rock Drills.—The Ingersoll-Rand Co., New York, in Form No. 4,002, illustrate and describe Sergeant rock drills, showing a number of illustrations of these drills in operation.

Street Cars.—The J. G. Brill Co., Philadelphia, are mailing three colored lithographs framed in heavy cardboard mats, showing the Brill convertible, semi-convertible and Narragansett cars.

Concrete Chimneys.—The Weber Company, Chicago, has just issued a pamphlet which contains a review of concrete chimneys, covering their origin and development. Another pamphlet, containing a list of industrial companies throughout the United States at whose power plants these chimneys are installed, is also being sent out.

Retaining Walls.—The Concrete-Steel Retaining Wall Co., Concinnati, Ohio, has just issued a 24-page pamphlet which describes the Bone system of retaining wall construction, including the standpoint of economy and advantages. The catalogue contains a number of half-tone illustrations and line cuts show various designs of this wall.

Electric Interlocking.—The Union Switch & Signal Co., Swissvale, Pa., has issued a catalogue of 200 pages, describing in complete detail its "all-electric" switch and signal machines. Signals and outdoor apparatus are shown, as well as machines, but there has been no attempt to include fittings which are common to all types of interlocking.

Riveting Machinery.—Catalogue No. 10, just issued by Chester B. Albree Iron Works Co., Allegheny, Pa., illustrates and describes Pittsburgh riveting machines and special types of pneumatic compression riveters. This catalogue presents the latest forms of the Pittsburgh riveting machines, showing the improvements which have been suggested by various operators.

Coal and Ash Handling Machinery.—Catalogue 32-A of the Jeffrey Manufacturing Co., Columbus, Ohio, describes with a number of illustrations, coal and ash handling machinery for

power plants. A large number of illustrations show existing installations, and line drawings show plans and elevations of a number of power plants in which these systems have been installed.

The Chicago & North Western, Union Pacific and Southern Pacific.—These roads have issued a unique brochure giving in detail the schedule of the Chicago White Sox Baseball Club on its second annual California training tour. The publication is in the shape of a baseball and contains photographs of all the members of the Chicago team, together with a map of their proposed schedule and views of scenery that they will pass.

Locomotive Driver Brake Shoe.—The Acme locomotive driver brake-shoe is illustrated and described in a recent pamphlet issued by the Allen & Morrison Brake-Shoe & Manufacturing Co., Chicago. The greater part of the publication is given to the results shown by the Acme brake-shoe under various conditions and severe tests in comparison with the "B" type, which is generally recognized as standard, and the plain cast iron shoe.

Bar, Mesh and Fabric Reinforcement.—The General Fireproofing Co., Youngstown, Ohio, is distributing a 28-page catalougue describing the square lug bar, cold twisted lug bar, expanded metal and wire fabric reinforcement which it manufactures. A large number of photographs show the various structures in which reinforcement of one of these types has been successfully used. Several pages are devoted to showing the style of mild steel wire fabric and slab thickness required for various live loads and spans.

Grinding Wheels and Machinery.—A catalogue just issued by the Norton Company, Worcester, Mass., covers the subject of alundum grinding wheels, grinding machinery, glass cutting wheels, India oil stones, etc. Alundum, the abrasive material used in the manufacture of these wheels, is said to be an electric furnace product. The catalogue is one which should be valuable to any one interested in the use of grinding wheels, as it contains a large number of line drawings showing sizes of the wheels made by this company. The catalogue also contains some mechanical data for particular use in this connection.

North Western-Union Pacific Tours.—The North Western-Union Pacific Tourist Department, S. A. Hutchison, Manager, 212 Clark street, Chicago, is distributing a 34-page pamphlet describing the personally escorted tours to California, Mexico, Utah and Colorado, via the Chicago Union Pacific and North Western Line and connections. Four tours have been arranged to leave Chicago on January 16 and 30 and on February 6 and 18. The pamphlet contains several views of scenery and sights included in the trip as well as complete information regarding hotels, rates, service, etc. A copy of the publication may be had upon request.

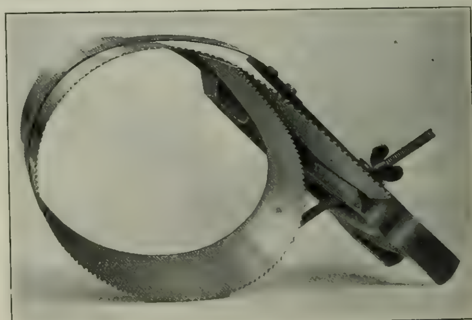
Refractories.—A small catalogue just issued by the Harbison-Walker Refractories Co., Pittsburgh, Pa., is a very neat and valuable hand book on the subject of silica, magnesia, chrome, fire clay brick and other refractories, which should be a very reliable hand book, as practically all the illustrations, cuts, etc., are said to have been supplied by the owners or patentees of the furnaces illustrated. The book is well bound in leather, and contains about 160 pages printed on heavy glazed paper. Stippled drawings showing the natural color and shape of various fire bricks for furnaces. A large number of plan and elevation drawings of blast furnaces, coke ovens, furnaces, etc., are included. A number of halftone illustrations show the various standard boiler settings, and several pages are devoted to tabulated data of particular use to those interested in fire bricks.

Vanadium Steel Hand Saws.

Few people have ever seen a carpenter's hand saw capable of being rolled to a complete spiral, without breaking and without straining beyond its elastic limit. It is also beyond the experience of most people that the same kind of a saw, designed for wood cutting, is capable of sawing through a 20-penny nail and a $1\frac{1}{4}$-in. gas pipe, without changing its set or dulling its teeth. The photographs show one of these saws rolled to a volute and clamped in that position after it has done this unusual work. Ten days later the clamp was loosened and the saw became absolutely straight. The picture of Mr. Wilson, President of the Union Saw Company, Williamsport, Pa., sawing through pipe is even more impressive. At the invitation of Joseph M. Flannery, of the American Vanadium Company, Pittsburgh, Pa., he came to New York and, in a parlor of the Waldorf-Astoria, talked to a party of deeply interested gentlemen on the art of tempering steel for saw blades and of his experiments and experiences. He answered many

Mr. Wilson Cutting Gas Pipe With His Hand Saw.

questions and his audience kept him busy for nearly two hours. He refused to answer about steel manufacture, of its science or its components; but of the results of tempering different kinds of steel he was full of positive information. He illustrated by testing a few hacksaw blades and by using hand saws to the point of abuse. After bending the saw blade to a spiral, it returned straight. It was then



Saw Rolled and Clamped; Returning Straight.

bent in a reverse direction to a spiral, and it persisted in returning to a straight line. Due to the vanadium and the skilful tempering, this saw steel has such toughness, hardness and high elastic limit that it would be difficult to destroy its usefulness. The steel he is using contains 0.18 per cent. of vanadium. The human interest in the meeting was even greater than the subject of it, for Mr. Wilson appeared to advantage, a master of his art and a natural gentleman.

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CONTENTS

The average life of a timber ore dock on the Great Lakes is from ten to twelve years. The rebuilding of ore docks on these lakes requires yearly from ten to fifteen million feet of lumber. The waning supply and increasing cost of timber makes this a considerable item. It is natural, therefore, that attention should be given to the substitution of steel and concrete for wood in the construction of these docks. The Duluth & Iron Range Railroad has already built such a dock—the first in America. In a recent paper before the Northern Railway Club, W. A. Clark, chief engineer of this road, discussed the merits of this construction as compared with timber. Ore docks of permanent construction would not have been justified until recently because of the rapid growth in size of lake vessels. But now it is felt that boats have about reached their limit of draft, unless large amounts of money are spent in dredging harbors and passages; therefore it is not likely that their length and beam will be increased much. Under these circumstances a dock construction which will be good for 25 or 30 years at least, and costs only about two and one-half times as much as timber, is justified. Important advantages are the minimized fire risk, with consequent low insurance and security against interruption to use. In his paper Mr. Clark states that in placing the concrete for the foundations of the dock the cement under water was very slow in setting because of the low temperature of the water, and was therefore in danger of being washed out of the aggregate before it could set. It was therefore decided to heat the water. To do this the contractors ran a pipe, carrying steam at 60 lbs., the length of the dock and by means of hose discharged steam into confined areas, each about 18 ft. x 50 ft. This raised the temperature of the water to about 45 deg. Fahr., and helped greatly the initial setting of the cement. The pockets of the dock are wood, though a few have concrete partitions as an experiment and have proven satisfactory. The use of reinforced concrete for pockets was suggested, although they would probably have to be wood-lined to prevent the heavy pieces of ore from chipping and roughening the concrete surface.

The increasing expense of track maintenance, due to tie renewals and the more extensive use of tie plates, suggests some reference to a foreign practice which we believe has not been tested in this country and may not be generally known. On the Prussian State Railways slabs of elastic material are used as bed plates in the permanent way for preventing or reducing noise on bridges, for protecting wooden bridge beams and switch ties, for preventing the wear of the rail seat on metal ties, and generally for reducing the rigidity of the track, at crossings, switches and bridges where the rolling stock is subjected to severe shock and the track material to rapid wear. Felt, leather and woven fabric slabs have all been used as elastic bed plates. It was found that felt slabs became hard, and lost their elasticity, and consequently their property of reducing the hammering and noise. Leather slabs have been more successful. They are made of strong bullock hide, $\frac{3}{16}$ to $\frac{5}{16}$ in. thick, and cost about 75 cents to $1 per sq. ft., depending on thickness. These leather slabs have been in use on the Prussian state lines since 1901 on bridges and switches, and are still in good condition. They are placed between the metal bridge girders and the ties, and at switches between the rail and the metal tie. In both cases the desired object of reducing noise and protecting the ties was fully attained. As the elasticity of these slabs has not become impaired after eight years' service, they are regarded as a very satisfactory method of preventing rigid metallic hammering, and they not only save the rails and ties but the rolling stock as well, and doubtless prevent many fractures which are ordinarily produced by shock where the rail is so rigidly supported but not entirely smooth or continuous. Woven slabs have also been used extensively for the same purpose. They are made of layers of woven material and of felt sewn together, compressed to $\frac{13}{32}$ in. thickness and impregnated. They were first used in 1903 for protecting pine ties at switches and for preventing noise, and cost about 50 cents per sq. ft. It was found that they would not withstand the hammering at switches and that they pressed out laterally. When rails are laid on metal bed plates on masonry these woven slabs have been found useful in preventing the plates from being driven into the masonry. The manufacturers of woven slabs claim that for tie plates in main line track they have given satisfactory results and shown a life of six years, the ties showing no appreciable wear; whereas, the metal tie plates have been appreciably driven into the ties where the woven slabs were not used. From the additional life given to the ties they show that the use of the elastic woven slab is economical. There are numerous places in railway track where noise is a sure indication of undue wear, and the use of an elastic medium, such as these here described, in the track at street crossings of elevated lines in cities, or at track crossings where the rails wear rapidly and the rolling stock is often damaged, would often improve conditions materially, not only in the prevention of noise but in a saving in cost of maintenance. It is also probable that the addition of the elastic slab between the rail and the steel tie or concrete tie, would improve

conditions in the experiments now being made with such ties in this country. They would have a tendency to reduce the wear, stop much of the noise and render the fastenings more secure. The German practice as above briefly described may therefore be worthy of further investigation.

That portion of the report of the Committee on Iron and Steel Structures of the American Railway Engineering and Maintenance of Way Association which deals with impact tests is quite brief, consisting of a tabulated description of the work done during the past year and a short statement regarding the magnitude of the detail work of analyzing the records. The report states that about 15,000 records on tests have been secured and that there has not been sufficient time in which to properly study and analyze these records. This is altogether reasonable, of course, and the committee has acted wisely in declining to present any conclusions, even temporary ones, which must be based on incomplete analyses. A necessary postulate of the Maintenance of Way Association specifications for live loads and unit stresses is the ability to calculate stresses in the structure to as complete a degree as possible. The tendency of engineers during the last 10 years has been to "edge up" on unit stresses, gradually increasing the allowable stress, which has culminated recently in two or three deplorable examples of over-confidence, with which our readers are familiar. The only safe basis for unit stresses exceeding one-third of the elastic limit of the material is in absolute knowledge of the stresses to be carried, and the work of the committee on Impact Tests is bound to bear good fruit if it is properly considered before conclusions are presented. When this shall have been done, it is reasonable to assume that at least one of the now almost unknown elements of live load stress will have been evaluated, or at least that a substantial addition will have been made to the science of bridge design. It is in such work as this that the Maintenance of Way Association can be of greatest usefulness. There appears to be a tendency, as displayed in some of the reports, to assume to settle, for all time and for all men, many questions which ought not, in the nature of things, to be finally settled. As a clearing house for ideas, for good practice, for the comparison of best methods of railway maintenance, for the sharpening of wits and broadening of view of the keenest and most practical engineers in the country, this association has unequaled opportunities for good, and has already employed them most ably. Therefore, any tendency toward finality, toward the conclusive settlement of all questions presented, should be checked and the association allowed to exercise its fullest opportunities along the lines of improvement of existing conditions and addition to existing knowledge. The brevity of the sub-committee's report on impact tests and its omission to draw conclusions is therefore to be commended rather than otherwise. It is to be hoped that the association will carry this work to a successful conclusion by affording the committee such further support as may be required.

THE ART OF SIGNALING.

Improvements in railway signaling follow one another so fast that to define at any given moment the "state of the art," as courts have to do in patent suits, is a difficult undertaking. Everything is done in a rush, and the more comprehensive "art of railroading" has itself been so much neglected that when any manager sets out to bring his materials and practice up to date he encounters a complex problem and he is likely to require of the signaling department, as well as of other departments, all manner of impossible things. It is very interesting to take a look at the situation, however, even if the aspect be somewhat indistinct.

The letter ballots which have just been announced by the secretary of the Railway Signaling Association are not the least significant indication of the present state of this art. A return of 500 intelligent votes, representing the views of probably 100 enterprising and educated signal engineers, marks a great change from the time, not many years ago, when trained signal experts were few and far between and mostly in the employ of the manufacturers; or even two years ago, when the association had no effective means of recording and clarifying its collective opinion, and contained very few men able and ready to make a well digested report. Under the present constitution the membership of this association, which does the thinking in this important field of railway work, can do the deciding as well; and we believe will do it. With due deference to their elders, the signal engineers will, of course, secure the confirmation of their views by the "AREMOW" (American Railway Engineering and Maintenance of Way Association) before they herald them very loudly; but the older engineers are too busy to do much analyzing in the signal department, unless the proposals which are put forth have important and obvious defects. Still less is the American Railway Association likely to take any useful and positive action unless decided disapproval of some measure may seem to be necessary. Indeed, the question of action or inaction on the part of either of the larger associations may become relatively unimportant, for the proposals of the signal engineers are finding favor on their merits. The two principal codes of specifications, for mechanical interlocking and electric interlocking, are already popular, notwithstanding some defects yet to be cured; and the "comprehensive scheme of signaling" (the upward inclination of the semaphore, etc.) has come into use faster than any like change of so radical a nature ever came into use before.

The signal engineers are making progress in the art of talking as well as in thinking. The debate at Chicago this week must prove valuable and instructive. At this writing the arguments are still hidden in the minds of the four gentlemen who are the principals in the contest, but as these men are among the most astute in the association, we risk nothing in predicting a profitable outcome. A limit of time and the presence of a sharp antagonist give to a speech or an essay a vigor not to be had in any other way. One of the most crying needs in the signaling field is a means of more thoroughly enlightening the hundreds of superintendents, trainmasters and other officers who have some authority in signaling matters but have not educated themselves up to the point of exercising their authority with the highest wisdom; and a debate should be useful in meeting this need.

These evidences that the personnel of the signal world has made important advances are, indeed, the most interesting feature of the present situation. On the narrow question of the exact present status of the art, such evidence would perhaps not appeal to a court at all; but on the question of the tendency of the art and of how much alive it is, it is significant. However, the signal experts have not confined themselves to thinking, or to thinking and talking; they do things. In interlocking, the all-electric apparatus is becoming more and more common, and the installation of old forms of apparatus because of lack of confidence in the new is not so much heard of. The use of the "upper quadrant" semaphores at Philadelphia, Washington and other places seems to have removed all distrust of the novelty, and nobody is longer afraid of it. The New York Central and the Boston & Albany, we understand, are to adopt for their new interlockings not only the upward inclination but the whole "comprehensive scheme" of the signal association, which means, no doubt, the early adoption of the scheme throughout the New York Central lines; for in interlocking, the change from old to new is neither very expensive nor at all revolutionary. As Mr. Rudd of the Pennsylvania is one of the originators of the scheme, we may expect before long to see that road also signaling "up in the air" everywhere, and with the two biggest trunk lines leading the movement, with their 23,000 miles of line, there will be no question as to their having a following.

In automatic block signaling also, the New York Central seems to be taking advanced ground, and we may soon expect

to see its costly "controlled manual" apparatus going out of use. Indeed, it seems inevitable that this change will be forced on the company, for its block sections at present are two and three miles long. The growth of traffic will necessitate shortening these to one mile, or less, and it is hardly supposable, in the face of the excellent records which automatic signals are now making, that the company will double its force of signalmen for the sake of maintaining the manual system.

This element—the cost of employing signalmen—will undoubtedly force the adoption of automatic signals on all of the busiest roads sooner or later, almost without exception. But roads less busy also find for automatics an increased field of usefulness, as is seen in the action of the Southern Pacific, the Rock Island, and the St. Louis & San Francisco; and the use of automatics in place of interlocking at junctions, as illustrated in our issue of February 19, has interesting possibilities. Possibilities of economy and simplicity are also evident in the "light" signals in use in tunnels on the Long Island and the New York Central, and the semaphore may have to look out for its laurels even in daylight. The installation on the Long Island road, described in this paper February 12, gives promise of a very general amelioration of the troubles connected with insulated joints, and other improvements, made or forthcoming, seem likely to reduce somewhat the enormous expense of signaling on electric roads. The use of the controlled manual by the Burlington on single track without time-tables or "train orders," and the abolition of time-tables on a thousand miles of single track on the Northern Pacific indicate that at last the superintendents as well as the signal engineers are advancing the art of signaling.

It is not necessary to go more deeply into the subject to make clear that the art of signaling is in competent and enterprising hands, but there is still a great deal of territory to be conquered. Orders for hundreds of miles of block signaling make cheerful reading, but the need is for thousands of miles Interlocking, as well as block signaling, lags. The construction of new interlocking plants has not been checked by dull business so badly as have some other lines of railway enterprise, but this department ought to be much *more* active than almost any other. Even the advertising agents ought to put their shoulders to the wheel in this matter, so as to aid in doing away with the discreditable anachronism of having the fastest trains making dead stops at unsignaled crossings.

But is the art of railroading making progress commensurate with that in the art of signaling? One of our best railways has lately had a disastrous and ominous rear collision of passenger trains because good signals did not receive good attention from the engineman and fireman; and a still worse collision occurred on another important road, which ought to be one of the best, but whose managers appear to have been utterly oblivious to the virtues of the space interval principle—not a block signal on the whole road. If prominent companies persistently postpone the introduction of the block system, the public will surely try to punish them in some way—and legislative punishments are likely to hit innocent and guilty alike. Moreover, the public is not so unskilful at punishing as it once was. If our boasted surprise checking does not produce "results," and collisions continue to occur even with good signals and good men, the public will feel confirmed in its belief that machines are better than men, and will require automatic stops. The fact that on the ordinary railway doing a miscellaneous business the use of automatic stops will introduce new troubles, is not likely to affect the lawmakers very much when they are told of specific cases where the apparatus would have saved a score or two of lives.

The advocate of automatic stops may not always have all of the conservatives solidly arrayed against him. The automatic stop and the cab signal are twin brothers, and they help each other; and the cab signals on the Great Western of England seem now to enjoy the hearty though unofficial favor of the conservative Board of Trade. These signals have given such a good account of themselves that Colonel Yorke, the chief inspector of the board, seems willing to have their use indefinitely extended; and if cab signals find favor generally the automatic train stop propaganda will get some of the benefit of it. Willing or unwilling, government functionaries, whether in England or America, will be forced to give favorable consideration to automatic apparatus after it has made a few fortunate records, for one positive example, which everybody can comprehend will outweigh thousands of cases of good results from the old plan of depending on the engineman; for to the popular mind these latter seem negative.

NEW RAILWAY BUILDING.

The fifteenth regular Construction Record of the *Railroad Age Gazette* appears in this issue. The endeavor has been to present a brief but complete record of existing railway construction. The material has been carefully compiled from our own current construction items, supplemented by official information given us by the engineering departments of the railways. In this record we have been conservative, including only such work as we know to be actually under way, or—as in cases of new projects—only those for which surveys have been made, or which we have reason to suppose will be carried through. Those larger railways, on which work is projected but not actually under way, have also been included, as the projected work is an important indication of future expansion.

This record actually shows a much larger amount of work under way than did the record of last year. During that time, one of forced economies, there was a large amount of partly completed work, actual construction of which was held up as a result of the financial situation. The work then under way, in most cases, and especially in those where it was of great magnitude, was being done by those companies which had sufficient funds in hand to carry on the improvements and the work then under way. A comparison of the records of the Pennsylvania for 1908 and 1909 indicates that there was no substantial cessation during the past year of the work projected or under way in 1908. The Southern Pacific record for 1908 showed work actually under way on six of its subsidiary lines, while the present record shows the same condition on nine lines. This comparison, however, does not reflect the condition which existed throughout the year, as the work which was reported under way in March of last year was later suspended and has been resumed within the past few months. The same condition applies in a number of cases, and the construction records of any two years can, at their best, only be compared as indicating activity at the particular time. The Annual Construction and Annual Mileage records differ very materially in this respect, the one showing activity at a particular time and the other progress. It is noticeable throughout this record for the United States, that the words "work under way" have replaced those of "work temporarily suspended" in the record of last year.

There is at the present time great activity in Canada, both in work under way and new projects, the very large number of the latter having been presented to Canadian Parliament within the past two months. Progress during the year has not met the hopes and expectations of the country, although there was no cessation of work, as was the case in the United States. Of the portion of the Grand Trunk Pacific being built by the Canadian government under the name of the National Transcontinental, the line from Winnipeg, east to Lake Superior Junction will very probably be completed during the year, as well as the Grand Trunk Pacific connection from Fort William to Lake Superior Junction. On the Canadian Pacific, work is now under way on about 375 miles, including extensions and double tracking. On the Canadian Northern, including the lines in Ontario and Quebec, work is under way on about 550 miles with surveys made on as many miles additional.

In Mexico, on the lines of the Southern Pacific Company, concessions for rebuilding the Sonora Railway, from Nogales,

Ariz., south to Guaymas, 265 miles, have been granted; work is under way on the Cananea, Yaqui River & Pacific at the several openings from Guaymas south to Guadalajara and it is expected that the line will be operating within three years.

CHANGING TENDENCIES IN RAILWAY LOCATION.

The paper in another column, describing the Carolina, Clinchfield & Ohio, gives an excellent example of the attitude that engineers and investors have grown into during the past few years. Curiously enough, it is an approach to the attitude assumed by some of the opponents of railway building in the early days, who, arguing from the standpoint of the canal, maintained that a railway to be efficient must be destitute of grades and curves. While the builder of to-day does not go quite to the point of the complete elimination of these necessary evils of the road, an attempt is made to approach that degree as closely as possible, and it is common practice to place very definite limits within which the locating engineer must keep his profile and alinement when he is sent into the field. Naturally these limits vary with the topography of the country, and they are apt to be crowded to the last notch of present possibilities. Of course it would be possible to locate a line between any two points that would run on a uniform grade and be perfectly straight, but it would be necessary in most places to do as was suggested, when a similar possibility was pointed out for a West Virginia location, to stay in the air or under ground all the time.

Next comes the lines that are building, or have been built, where the location is the best available with the present means of construction, and we must bear in mind that a location which we consider admirable to-day as affording the best possible route for economical operation, may be among the obsolete impossibilities of fifty years hence. To name names and cite cases, it is probable that the Berkshire division of the New Haven, from Bridgeport north, was regarded as a fine piece of location when it was built. It has about the same grades as the local fall of the river which it follows, and it twists and turns and clings close to the bank throughout almost its whole length. It is a case of very light side-hill cut and cast that could be done with the pick and shovel and barrow, which were the available tools of the time. Dynamite was unknown and the steam shovel had not been dreamed of.

Contrast this with two other locations recently made: the Virginian and the Clinchfield. One runs from the coal fields of West Virginia to the sea with only one grade—that over the Alleghanies—that exceeds the fixed 0.2 per cent., while the other is located across the highest and heaviest part of the Blue Ridge on a 0.5 per cent.

These contrasts show two things: first, that the facilities of construction have increased to a marvelous extent, else these new roads could not have been built at all; and, secondly, that operators and owners are looking much further into the future than they did and are incurring the tremendous expense involved in low grades and easy curves, not to save money in first cost but in the years of operation that are to follow. And it is this same spirit that has led, on some roads, to the recent practical abandonment of old locations and to spending millions in the elimination of curves and grades—work which literally amounts, in some cases, to staying under ground or in the air for long distances.

The result, or the cause, as you please, of this, is that while the demands made upon the locating engineer are more severe than they have ever been before, he is allowed a greater latitude in the matter of expense. In fact, the whole method has been changed.

To revert to the former comparison, it is probable that the old Housatonic Railroad was located on the first line run and that reconnaissance was quite as limited. It was a case of putting down a line that could be operated, and putting it down at low cost through a comparatively easy country. At the time, the railway surveys were the only ones in existence.

This is in sharp contrast with the methods of the Virginian and Clinchfield. To start with, each had the benefit of the magnificent topographical maps of the United States Geological Survey. With these, a careful and comprehensive study of the country could be made and routes marked out over which a promising preliminary could be run, and it was even possible, at times, to make a rough estimate of quantities before a party was sent into the field. Then, when this was done, instead of adhering to a single or to a few parallel preliminaries, the whole wide belt of possible territory was run in. This covered practically the whole width of a state in some cases, and instead of deviations to touch large towns and traffic centers, they were ignored and the whole effort concentrated on getting the shortest line between terminals that could be kept within the prescribed limits of grade and curves. It would be rash to say, in any case, that the best possible location has been obtained, but it is at least within reason to say that it would be difficult to find a better.

All this involves fine instrument work, and we have had so much of it that we have come to expect tunnel headings to meet without a perceptible offset, and a spiral approach to every curve is a foregone conclusion. But it is interesting to note in this connection what emphasis and importance the engineers who have had to do with this work place upon the eye of the locating engineer. The man who can grasp the possibilities of a country and who, on what is little more than a reconnaissance can point out the way that is to be finally adopted, is the man upon whom these low-grade lines depend. Consequently, more and more importance is being attached to the reconnaissance.

In all this, methods are being constantly improved and, while there is frequently no begrudging necessary expenses, the field party is expected to work with great rapidity and accuracy. For such work as this in a rough country it is respectfully suggested that some engineer will soon startle his fellows by making his reconnaissance in the car of a dirigible balloon! This suggestion is really not very chimerical, and any man who has attempted to gather in a clear idea of the topography of a mountain country like that covered by the Appalachian range, by climbing trees on high summits will appreciate the value of a vehicle that can lift him above everything and let him see like a bird what lies below and what he has to contend with. Not only can a general topographical impression be obtained at a glance, but it can be photographed and retained; and then barometric readings at landings or on the faces of cliffs will convey some advance idea of what the preliminaries should be depended upon to check. In this way the reconnaissance, instead of being a hasty examination of a belt of country that is "essentially very rough and rapid," may be raised into the category of the operations that are ranked as painstaking and accurate, and will enable the engineer to be sure that he is making no mistake when he decides that one route is distinctly superior to another.

It is work such as that recently done that marks the advance in field work and sets the pace for that which is to follow. That the pace will be an ever quickening one and increasingly strenuous, we cannot doubt, but to just what point it will ultimately bring us it is impossible to tell.

The steam shovel, the air drill and dynamite have made locations possible that would have been out of the question with pick, barrow, hand drill and blasting powder. So, even now, we hear rumors of tunneling machines that are to bore the rock as the auger does the wood, and of conveyors that will do for a cut and fill what they are already doing for coal and grain. If these things come true, we may find that location will be cut to lower limits of grade and curve, and the roads approach more nearly still to the old ideal of their opponents. At any rate, it is well to consider occasionally what is demanded, and how managers and builders are coming to realize more and more clearly every year, that low grade and easy curves are an indispensable condition in the location of a railway that is to be successful under the stress of modern competition. Unless these conditions are fulfilled, what might

otherwise be a paying property is pretty sure to be a failure. Yet it requires a bold prophet to lay out a railway like the Virginian, on a location almost devoid of traffic points between the bituminous coal and the sea, while the expenditures to get a low grade entail a heavy perpetual charge on earnings. The results of these economic experiments are going to be interesting landmarks in the railway history of the next decade.

NEW RAIL ORDERS AND SPECIFICATIONS.

The orders given for heavy rails in recent months have been sufficient to start the large mills. The new specifications indicate that the deadlock between manufacturers and railways has been broken, and there is a general feeling of satisfaction among them over the prospect of a supply of much better rails than have been rolled in the past few years. The agitation brought about by numerous rail failures and rapid wear has been productive of good to both interests. The dull period following the panic served to make steel manufacturers less independent, and it allowed ample time for a thorough investigation of the subject by the railways.

Probably never was a technical subject connected with railway construction and operation more thoroughly discussed by such a large number of prominent experts. As a result of this, the rail sections have been changed, methods of manufacture have been greatly improved, and the whole business of making, inspecting and purchasing rails has been placed on a more satisfactory basis. It will be interesting, therefore, to notice the principal changes which have been made in rail sections and rail specifications. The sections now used by several large lines, which may be regarded as representative of the new practice, are illustrated on another page of this issue.

The new specifications for rails issued by the larger lines include chemical requirements for open hearth rails, and the orders are usually for as large a tonnage of this grade of steel as the mills are prepared to supply within the time limits. The growth of the open hearth rail manufacture in the United States has been rapid. In 1903 only 45,000 tons were rolled. In 1907 the amount rolled had increased to 252,000 tons and in 1908 to 567,000 tons. The Bessemer rail production reached its maximum in 1907 when 3,380,000 tons were rolled, while in 1908 it was the smallest since 1897, less than the average for the ten preceding years, and only 1,354,000 tons. The open hearth rails rolled in 1908 equaled 42 per cent. of the Bessemer. The present capacity of the steel works in the United States for the manufacture of open hearth rails, including the new Indiana Steel Works just going into operation, is nearly 2,000,000 tons, or about 50 per cent. of total new rail requirements in prosperous years.

The new Pennsylvania specification makes no change in the chemistry for Bessemer rails, but adds a second classification in the chemistry of open hearth rails. The previous specification of April, 1908, made 0.03 phosphorus and 0.80 carbon the upper limits, while the new one makes the upper limits for Classification A, phosphorus 0.03 and carbon .083; for Classification B, 0.04 phosphorus and 0.75 carbon. The desired carbon for the two grades is 0.75 for the lower phosphorus, and 0.70 for the higher, thus following the general law that for each 1/100 per cent. phosphorus added the carbon should be reduced 5/100 per cent. on account of the brittleness due to excessive carbon and phosphorus. The reason for making two classifications for open hearth rails relates principally to the cost of manufacture. It was thought desirable to specify phosphorus as low as 0.03 so that high carbon could be used and the wearing quality of the rails, particularly on curves, would be materially improved. But the extra time required in the open hearth furnace to reduce phosphorus from 0.04 to 0.03 results in some increase in the cost of manufacture, and a slight addition to normal price per ton is added for the Class A rails.

A clause has been added which excludes ingots that have been so overheated that the scale on the sides becomes liquid.

The requirements under the drop test are less rigid than those of the previous specification and some concession has been made to the manufacturer in this particular which is not likely to insure better rails so far as the brittleness of Bessemer rails is concerned. The former requirement was that "if a test piece breaks under the drop without showing physical defects all rails made from that heat shall be rejected absolutely." The present provision permits of a retest after failure of the first, allowing two more pieces from the same heat to be tested, and if neither of these fails the rails are accepted as No. 1 or No. 2, according to the deflection. If either of the second test pieces fail all rails from that heat will be rejected. The provision that drop testing shall be continued to the destruction of the specimen in case the first piece breaks without showing physical defects, is an added precaution which should result in a material benefit to the railway by reducing the number of piped rails which, in spite of the usual inspection and tests, get into the main track. This new feature in drop testing has been obtained by some concession to the rail maker, as it is agreed that if the test piece does not break under ordinary conditions, but when nicked and tested shows pipe, the top rail from each ingot will be accepted as "special" rails, and marked differently. These rails will be regarded as inferior and not used in main line track. For open hearth rails it is required that makers shall furnish inspectors with complete chemical analysis for each melt.

The new Baltimore & Ohio specification for Bessemer rails, dated January 25, 1909, is similar to the Pennsylvania in chemical requirements, but for open hearth the chemistry is somewhat different. The upper limit for phosphorus is made 0.04 for all rails made by that process. Manganese is allowed as high as 1.00 per cent. and carbon 0.80 per cent. This specification also allows re-tests. It provides that drop tests shall be made of two test pieces of rail rolled from the top of different ingots and if either fails a third piece shall be tested. The new Pennsylvania Railroad specification requires the drop test pieces to be cut from the rail bar next to either end of the top rail. The Baltimore & Ohio also requires the drop test to be carried to destruction so that an examination can be made of the fracture and pipe or other interior defects can be detected; and acceptance of the rails is based on the clean fracture as well as the amount of deflection. The effort to enforce the discard of a certain per cent. of height of ingot to eliminate segregation appears to have been abandoned and the new specifications now simply require that there shall be sheared from the top of the ingot sufficient discard to insure sound rails.

The Canadian Pacific has prepared a new specification for rails which is interesting because it is intended to meet the severe winter conditions of Canada when the track is frozen rigid for long periods. It was prepared also with special reference to the conditions of rail manufacture in that country. Two rail mills in Canada have a capacity about equal to the ordinary requirements of Canadian railways. The Dominion Iron & Steel Co, at Sidney, N. S., manufactures basic open hearth steel only. The product of the Algoma Steel Co. at Sault Ste. Marie, Ont., is 75 per cent. acid Bessemer and 25 per cent. basic open hearth. The Bessemer rails have only .085 phosphorus and the average carbon is 0.58, and for open hearth steel the upper limit for phosphorus is 0.06 and the lower limit for carbon 0.60. The standard section for new rails on the Canadian Pacific is 85 lbs. and this is preferred to the 100-lb. rail on account of the unfavorable experience due to square breaks with the 100-lb. rail having A. S. C. E. section. This decision is based upon the fact that the 80-lb. A. S. C. E. section, having identical chemical composition under the same traffic and like climatic conditions, did not break as frequently. The Canadian Pacific has in track now 85,000

tons of the new 85-lb. rails. In their manufacture it was found that when they approached the saw they were of more even temperature in all parts of the section, the rail head being cooler than in the old section. Therefore a finer grain of steel was produced, having better wearing qualities. The more equal distribution of material between the head and the base simplified the cold straightening to such an extent that it required 40 per cent. less work than the old section with its thin flange and thick head. The straightening of the rails under the cold press seriously impairs their strength and is one of the principal causes of fracture. If the 100-lb. rail had been given the advantage of a better balanced section it also could have been rolled with a cooler head and would have required less cold straightening and given better service.

The Canadian Pacific drop test for open hearth rails is more severe in most of its provisions than those already mentioned. It requires that from each 50-ton heat three rail butts shall be tested, and each butt must be taken from the top end of the first, middle and last ingots cast of each heat. The supports are 4 ft. apart and the height of drop is 20 ft, for the 85-lb. section. If two of the test pieces are not broken and show a deflection of less than 3¼ in. the heat is accepted. If two fail it is rejected. There are no retests and less is left to chance than is in most of the rail specifications used in the United States. The practice as to discards in Canada also appears to be more definite and satisfactory than in the United States. After cutting off sufficient to square up the end, at least 12 in. more of seemingly solid steel is cut from that end of the bloom, and if the steel does not then look solid the cutting must continue until it does. In the same specification the drop test for Bessemer rails is 18 ft. and the minimum deflection 3¼ in. A rail butt from every third heat is taken from the top end of the first ingot. If it fails a second test is made and if it fails all rails made from that heat are rejected.

The Santa Fe received last year a supply of open hearth rails from the Bethlehem Steel Co., and they were among the first rolled by the new mill. The specification required 0.04 phosphorus and 0.60 carbon. The section is a special one which is a modification of the A. R. A. series A, so as to obtain a weight of 85 lbs. per yard. It is shown in our article on rail sections.

The Burlington has ordered a large tonnage of open hearth steel and adopted the 90-lb. section, Series A, recommended by the American Railway Association. Its specifications requires that there shall be sheared from the end of the bloom formed from the top of the ingot 9 per cent. discard, or until sound metal shows on the end of the sheared section. "The chemical composition shall be within the following limits: Carbon, 0.55 to 0.65; manganese, 0.75 to 1.00; silicon, not to exceed 0.20; phosphorus, not to exceed 0.06. For every point (0.01) phosphorus is reduced below 0.06, carbon may be increased four points (0.04), the maximum carbon to be 0.80." The requirements in the drop test provide that at least two test pieces shall be selected from each heat by the inspector, and the height of drop for the 90-lb. rail is 19 ft. If the first test piece breaks then two others from the same heat are tested and if either of these fail all the rails from that heat are rejected. If both meet the requirements, then the rails from that heat will be accepted. It is also provided that rails shall not vary throughout their entire length more than 5 in. from a straight line in any direction when delivered to the cold straightening press. Those which vary beyond that amount are classed as second quality rails.

Inspectors using the new Pennsylvania rail specifications have discovered quite a large percentage of piping. Testing to destruction discloses such piping even in the tests that had failed to break under the drop, thus clearly indicating that there must have been a very large number of piped rails delivered to the railway companies under former practice. The rail makers have been much disposed to contradict the possibility of a large percentage of piped rails existing; in fact, have in many cases taken the position that undue stress had been placed upon that defect. Some authorities, for instance, have argued that with many failed rails the defects which have been classed as pipes have really been caused by the presence of slag which under the strain of traffic had acted as a wedge splitting the steel. While that may have happened in some cases, many failures causing accidents have been due to pipes, and some method of inspection should be used to detect them.

In conclusion, it is evident that the rail question in general is in an experimental stage, but making satisfactory progress toward improved standards. The new sections with a heavy base having a larger area than the head, have already shown important results in reducing cold straightening and in producing a finer steel structure due to cooler rolling. The open hearth steel, with phosphorus less than half that in Bessemer, will largely reduce rail breakages due to brittleness. The drop tests must be readjusted to suit the testing machine with a standard anvil and definite foundation. The one important matter which remains unsettled and indefinite is that relating to discard, segregation and the other items which affect the structure of the rail by producing pipes and similar imperfections. These will be found as frequently in open hearth rails as in Bessemer, and the best safeguard thus far proposed is testing under the drop to destruction, so that the fracture may be examined. This feature must, therefore, become an important part of a good rail specification even at an extra cost per ton.

Letters to the Editor.

TITLE TO PATENTS VS. TITLE TO LAND.

New York, March 2, 1909.

To the Editor of the Railroad Age Gazette:

Our government, when viewed from a mechanical and engineering point of view, presents some striking defects in construction with a consequent low percentage of efficiency in operation. Although there are a good many poorly designed machines in the government shop, I will direct attention only to those located nearest my corner.

The patent office report for 1908 shows a surplus of $724,544. From experiences I have had in the office, it seems to me that this surplus could be applied advantageously to increasing salaries for the present number of employees, or to adding to their number; preferably the former. This is a case where a few well trained men are better than many green ones. As it is now, the applicant, or his attorney, frequently finds it necessary to educate the examiner in charge, in the most fundamental principles of patent law before allowable claims would be allowed. Not long ago I received an official acknowledgment rejecting one claim with the statement, "Applicant cannot be allowed to multiply claims by adding old elements to previous combinations."

I asked for a review of that action and criticized the statement by saying, "It is my impression that the addition or subtraction of one or more elements to or from a previous combination is just what constitutes the invention, and is the subject of patent," of course, provided the new combination is useful. Two other claims were rejected on Smith & Jones. I have had claims rejected that way before and it took me six months to convince the examiner in charge that the fact that my claims each alone involved structures from both patents cited was just what entitled me to a patent.

We spend large sums each year to tell the farmer maybe it will be raining or clear to-morrow. Many millions are now being spent to reclaim arid lands in the West, and then, when this land has been acquired and made valuable by the expenditure of government money, individuals may acquire per-

petual title by the payment of minor fees as a manifestation of their intention to use the land. But when a person makes an invention, which is the nearest possible approach to making something out of nothing, and is the result of individual effort, a shaky title and rights of ownership are granted only for 17 years. This looks like a blunder in governmental construction. It is illogical, inconsistent and unjust, and the ill effects are becoming more and more apparent.

More substantial encouragement and protection should be extended to inventors. There is not as much reason for perpetual land titles as there is for perpetual patents. I think land titles should be half as long as patents, and that the periods should be about 20 and 40 years, respectively.

OLIN S. PROCTOR.

HIGH RAIL JOINTS AND THE TAMPING HABIT.

Philadelphia, Pa., March 1, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

A recent development on one of the Eastern railways has brought out a rather peculiar phase of track maintenance, which very plainly shows the reason that such large sums are being spent for track labor.

The railway in question was just beginning to use angle bars of the deep girder type, and the peculiar condition to which I wish to refer was brought to the attention of the officers in the form of a complaint. The track foremen made reports that the new bars caused high hard spots at the joints. An investigation of this very unusual complaint proved that the rails were generally high at the ends as reported, and frequently along the middle portions also, and usually low at the quarter points. Some cause acting with well-defined regularity was producing this peculiar effect. Further investigation revealed the cause, and brought to light the feature which is worthy of attention in connection with the present track development. The track men had the joint tamping habit. The deep girder bars were designed to have about the same stiffness as the rail, and therefore, where the bolts were kept tight, required no more tamping at the joints than under the other ties along the rail. The man with the pick had become so accustomed to the practice of skipping along from joint to joint to do his work under the old style angle bars having only one-third as much stiffness as the rail, that the new track naturally received the same habitual tamping as the old, while, at the same time, the ballast under the joint ties of the new track had remained as high and as solid as along the rest of the rail on account of their being no greater deflection at the joint than elsewhere. Consequently these already solid bearings were packed all the tighter, and the hard high places in the track were caused directly by habit rather than by the new type of bars. For the same reason the middle portions of the rails were often high, on account of the extra tamping along the length of the joint ties and under the opposite rail.

The remedy was simple and effective. The tamping was materially reduced, and a revised working method resulted in more evenly distributing the work along the rail. The men were instructed to sight for the low spots, and to raise them wherever they could be detected along the rail, rather than do all the surfacing by automatically skipping from joint to joint. A man with a wrench took the place of a number of pick wielders.

The theory underlying this occurrence is quite apparent, and is so strikingly in accord with an editorial which appeared in the *Railroad Gazette*, April 12, 1907, on "Continuous Rails for Uniform Track Structure," that I would refer your readers again to that able presentation of a theoretical principle which now seems to be well borne out by facts.

Uniformity seems to be the thing most desired in a railway track, and uniform tamping along the rails should serve as a good indicator of such conditions. An upper rail structure having an equal stiffness throughout, together with reasonably uniform drainage and sub-grade conditions, should act to produce the desired end. On the other hand, it is clear that a weak joint which allows excessive deflection of the rail structure will destroy this uniformity under any conditions and will be specially persistent in adding to maintenance troubles where the drainage is not the best. In the latter case a "pumping joint" is the result, and the depth of the holes into which all the surrounding water is drained largely depends upon the stiffness of the joint bars, the tightness of the bolts and the amount of abnormal deflection which the bars permit. All railways cannot be built with stone ballast on nicely elevated banks with efficient ditches along the sides, and we will always have with us the low-lying, marshy districts, where the most aggravated form of the joint tamping disease is contracted. Roads that have heretofore used the old style light angle bars may continue to do so under the increasing loads without any unusual tamping symptoms showing themselves, except in their expense accounts; but in order that the full benefits may be obtained as the new type of deep girder angle bars are being substituted: Look out for the "joint tamping habit."

M'LEOD THOMSON.

Contributed Papers.

RECENT RAIL SECTIONS.

The Pennsylvania has adopted the sections for 85 and 100-lb. rails which were designed and recommended by its rail committee in September, 1907. The 85-lb. section has a head with vertical sides; the width of base is ½ in. less than the height of rail, and the thickness of the base is ⅛ in. greater than that of the A. S. C. E. section. The head of the 100-lb. rail has sloping sides, and the top corners have a $\frac{7}{16}$-in. radius. The thickness of the base averages ⅛ in. larger than the A. S. C. E. section and the width of base is only 5 in., compared with 5¾ in. in the A. S. C. E. section. The width of base is $\frac{11}{16}$ in. less than the height of the rail

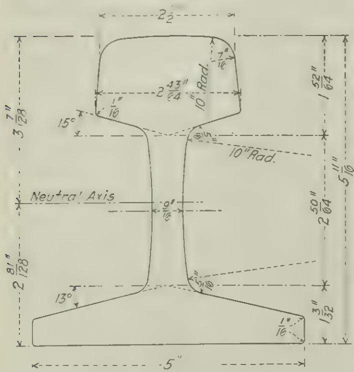
The 90-lb. section adopted by the Burlington is that proposed by the American Railway Association in Series A. This appears to be a compromise section, the thickness of the base being only about $\frac{1}{16}$ in. more than in previous practice. The height of rail is ½ in. greater than the width of base. In this rail the effort to balance the section is carried so far as to make the area of base 3.6 per cent. greater than the head.

The 85-lb. section, adopted by the Canadian Pacific, has the section balanced with 4.2 per cent. greater area in the base than in the head. In the Pennsylvania 85-lb. section the area of the head is 2.2 per cent. greater than that of the base. The Canadian Pacific section has the same height as the Pennsylvania section, 5⅛ in. The reason for limiting the height to this dimension has been explained by Mr. Gutelius of the Canadian Pacific, as follows:

"When shimming becomes necessary the rails must bend sufficiently to receive their support from the ties, and if the rail is too rigid or too hard it is liable to break. For this reason we deem it wise to limit the height of rail to 5⅛ in. and place the additional strength on those portions which are most likely to crack or break."

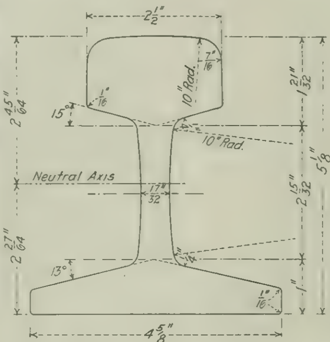
The Canadian Pacific was not satisfied with the A. S. C. E. sections, either 80 or 100 lbs., and their experience with 100-lb. rails had been very unsatisfactory owing to breakage, and the majority of such breakages showed laps or seams near the center of the flanges. The explanation of such mechanical troubles was that they were produced by the necessity of spreading the steel for so wide and thin a flange, and through the peculiar way in which the rolls were designed, this lap was frequently produced, and also that the distribution of the metal of all of the A. S. C. E. sections, and particularly the heavier ones, led to an undue amount of work in the cold straightening.

They were not prepared to adopt the 100-lb. section as their standard one, owing to the greater cost entailed by that weight of rail. Nor did they think the 80-lb. section was quite heavy enough, and therefore they compromised upon an 85-lb.



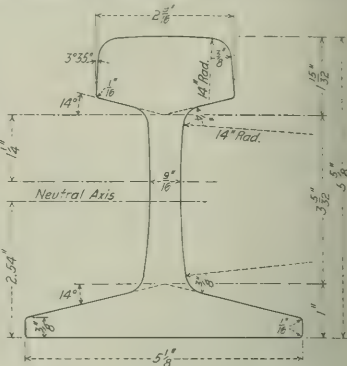
Pennsylvania, 100-lb.

		Per ct.
Area of head	4.09 sq. in.	41.0
" " web	1.85 "	18.6
" " base	4.03 "	40.4
Total	9.97 sq. in.	100.0
Moment of inertia		41.9
Section modulus	Head	13.71
Section modulus	Base	15.91
Ratio periphery head to area head		1.59
" " web to area web		3.58
" " base to area base		2.43
" total periphery to total area		2.30



Pennsylvania, 85-lb.

		Per ct.
Area of head	3.57 sq. in.	42.2
" " web	1.51 "	17.8
" " base	3.39 "	40.0
Total	8.47 sq. in.	100.0
Moment of inertia		29.1
Section modulus	Head	10.77
Section modulus	Base	12.02
Ratio periphery head to area head		1.73
" " web to area web		3.81
" " base to area base		2.69
" total periphery to total area		2.48

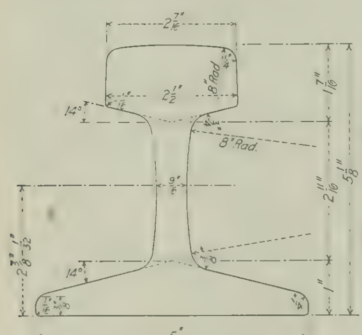


Burlington, 90-lb.

		Per ct.
Area of head	3.20 sq. in.	36.2
" " web	2.12 "	2.40
" " base	3.50 "	39.8
Total	8.82 sq. in.	100.0
Moment of inertia		38.70
Section modulus	Head	12.56
Section modulus	Base	15.23
Ratio periphery head to area head		1.90
" " web to area web		3.30
" " base to area base		2.63
" total periphery to total area		2.52

one. In designing it, Mr. Gautilius took the exact dimensions of the head of a 75-lb. rail which had given them extremely satisfactory service, and then proportioned the rest of his section to that, making the new section weigh 85 lbs. per yard, and with this new section that they have had satisfactory rolling results.

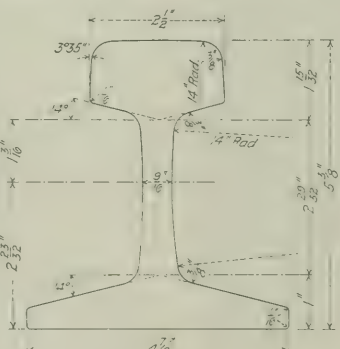
The 85-lb. section adopted by the Santa Fe for the open hearth rails rolled last year at Bethlehem is a special one and a modification of the A. R. A., Series A. The shape of the



Canadian Pacific, 85-lb.

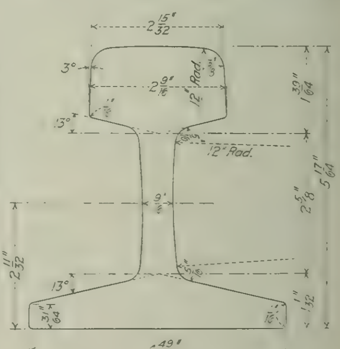
Vertical inertia, 29.492. Horizontal inertia, 7.139

	Percentage Area.	Percentage Cooling.	Sec. modulus Vertical.	Sec. modulus Horiztl
Head	36.77	1.965	10.425	.....
Web	22.21	3.081	......	.....
Base	41.02	2.875	12.84	2.855
Total	100.00	2.586	......	.....



Santa Fe, 85-lb.

		Per ct.
Head	3.09 sq. in.	37.01
Web	1.90 "	22.75
Flange	3.36 "	40.24
Total	8.35 sq. in.	100.00



Baltimore & Ohio, 90-lb.

Similar to A. R. A. Series B.

head and base and the splice bar angles are similar to the A. R. A. sections. The height of rail is 5⅝ in., and the width of base 4⅞ in. To prevent this narrow base from cutting into soft ties and canting, it is intended to use tie plates at each bearing. For a 90-lb. section it is proposed by the chief engineer of this system to use the A. S. C. E. 85-lb. section, with sufficient added to the lower side of the base to secure the proper weight. The present standard splice bars can then be used.

The 90-lb. section adopted by the Baltimore & Ohio has the narrow and thick base, which is characteristic of the new styles, and most of its principal dimensions are expressed in 64th inches. It is similar to the A. R. A. proposed standard Series B.

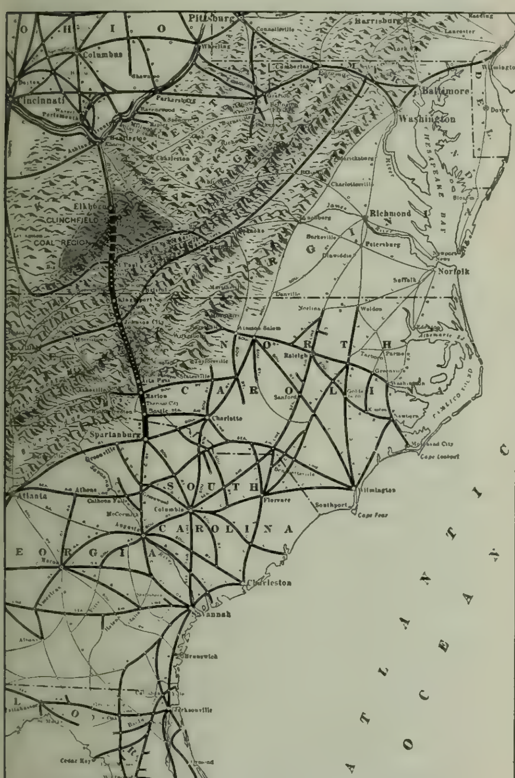
A large power station is being built to supply electricity to Tokio, Yokohama and other Japanese cities. The six 3-phase, 25-cycle generators are direct coupled to vertical water wheels, driven by a 600-ft. head of water on the Oi river. The current will be transmitted 105 miles at 6,600 volts pressure. The line will be carried on steel towers 50 ft. high and 450 ft. apart.

THE CAROLINA, CLINCHFIELD & OHIO RAILWAY.

BY GEORGE L. FOWLER,
Associate Editor of the *Railroad Age Gazette*.

GEOGRAPHICAL AND GEOLOGICAL LOCATION.

It is well-known that the natural barrier to traffic between the plains and rolling country of the West and the comparatively narrow strip of Atlantic coast country of the United States is the great Appalachian chain of mountains extending from the Canadian line nearly to the Gulf, without a single low level break from the northern boundary of Pennsylvania to the Gulf states, a distance of approximately 1,050 miles. The lines of travel and of commerce, following those of least resistance, first went through the low gateway of central New York, and then, as the demand for inter-communication increased, other routes were developed and available passes were occupied by the Baltimore & Ohio, the Pennsylvania, Chesapeake & Ohio, and Norfolk & Western, south of which there was nothing until the Atlanta gateway was reached.



General Location; Carolina, Clinchfield & Ohio.

The Appalachian chain is roughly divided into two mountain ranges, known as the Alleghany and the Blue Ridge, which overlap each other in the general northeast-southwest direction in which they lie, the Alleghany being to the west with the highest points at the northern end of the line and the Blue Ridge to the south. The latter "rises gradually from less than 1,000 ft. in Alabama to more than 6,600 ft. in western North Carolina. From this culminating point they descend to 3,000 ft. in southern Virginia, rise to 4,000 ft. in central Virginia, and again descend to 2,000 ft. on the Maryland-Pennsylvania line." A direct route from Cincinnati and what was the old middle west of Ohio and Indiana, passes over the highest points of the mountains in western North Carolina. As such a route was not open, traffic between these points went east over the Chesapeake & Ohio or Norfolk & Western until it had crossed the mountains, and then turned south over the lines paralleling the range, or dropped down to the west and came by way of Chattanooga, Rome and Atlanta, both roundabout, but presenting an overwhelming advantage because of the low grades existing as compared with the climb that would have to be made on the direct line.

There is another point to be borne in mind in this connection, of vital importance to a complete understanding of the strategic value of the Clinchfield line, which is purely geological. The outcropping rocks of the Appalachian range are divided into two groups by the great Pocahontas fault. The fault was caused by an upheaval of the eastern portion, carrying with it the deposits of the carboniferous epochs. These deposits have since been eroded and have disappeared from the present formations, so that no coal is now found east of a sharply marked line following the northeast-southwest direction of the mountains from Pennsylvania to Alabama, and it is over or around all of this eastern group that the coal of the western fields must be carried in order to reach the markets of the Carolinas and Georgia. The result is that the coal fields of southwestern Virginia and eastern Tennessee though physically nearest the markets referred to, have really been among the most remote commercially because of the roundabout line of travel that had to be followed to reach them. It is quite natural, therefore, that a direct through line between the points of supply and demand should long have been earnestly desired by the people of the southeast, to whom it meant a supply of cheaper coal.

The conditions of modern transportation, however, are such that a route, even though short, cannot compete with the older and longer ones if it is hampered by heavy grades and the lighter train loads that go with such conditions, for the whole basis of economy lies in handling heavy units. So it follows that any new and direct route across the Blue Ridge mountains that is to compete with those already in existence must be a low level line. The chief engineer of one of the great railway systems, after a reconnaissance and examination of the topography, recently declared such a line to be impossible. In other words, a railway to meet the demands of modern transportation could not be built across the Blue Ridge mountains on the western boundary of North Carolina.

As already stated, this direct north and south line has long been sought, and the problem has been variously studied and its solution attempted, but, unfortunately for its earlier consummation, the promoters failed to realize the necessity for a concentration of effort at strategical points, as well as the need of a low grade, in order to meet competition and obtain all of the advantages of the modern high burden-bearing equipment and the movement of large units. Consequently even though the ill-fated Charleston, Cincinnati & Chicago, that was organized in 1889 and did a large amount of work, had been pushed across the Blue Ridge to completion it would have failed to have met the specifications set forth because of the high ruling grades. These were 1 per cent. and more without compensation. A comparison on the ground clearly illustrates the difference between the old and new methods of location. It is especially necessary to emphasize this point, and it will be repeatedly referred to. The old method was so to locate the line that it could be built at a minimum cost per mile, using sidehill cutting wherever possible, and following every bend of ravine and ridge. The new method is to substitute tangents for curves and to cut through the ridges and fill or bridge the ravines.

The magnitude of the work involved in the low-grade method can best be appreciated by a study of the topography of the country traversed. The mountain region of the states

crossed by the Blue Ridge is a series of steep slopes, sharp ridges, narrow hollows and valleys and swift mountain streams with very little bottom or tillable ground. This roughness and the general scope of the difficulties presented are shown in the reproduction of the view from Pumpkin Patch mountain, where the ridges and hollows are defined and the location of the narrow thread of the new railway can be seen. This is characteristic of the ruling topography from Dante to Marion.

HISTORY OF THE CLINCHFIELD PROJECT.

After the failure of Baring Bros. and the cessation of work on the Charleston, Cincinnati & Chicago, Geo. L. Carter obtained control of the property as well as that of a small mining road, the Lick Creek & Lake Erie, seven miles long, and started in to develop it into a first-class low-grade line. The first objective point was to secure a line from the coal fields, as the source of traffic, to the markets on the southeast side of the Blue Ridge. The starting point was, therefore, temporarily fixed at Dante, Virginia, the present seat of the Clinchfield Coal Corporation, to which reference will be made again, but with final objective point at Elkhorn City, Ky., the terminus of the Big Sandy division of the Chesapeake & Ohio Railway.

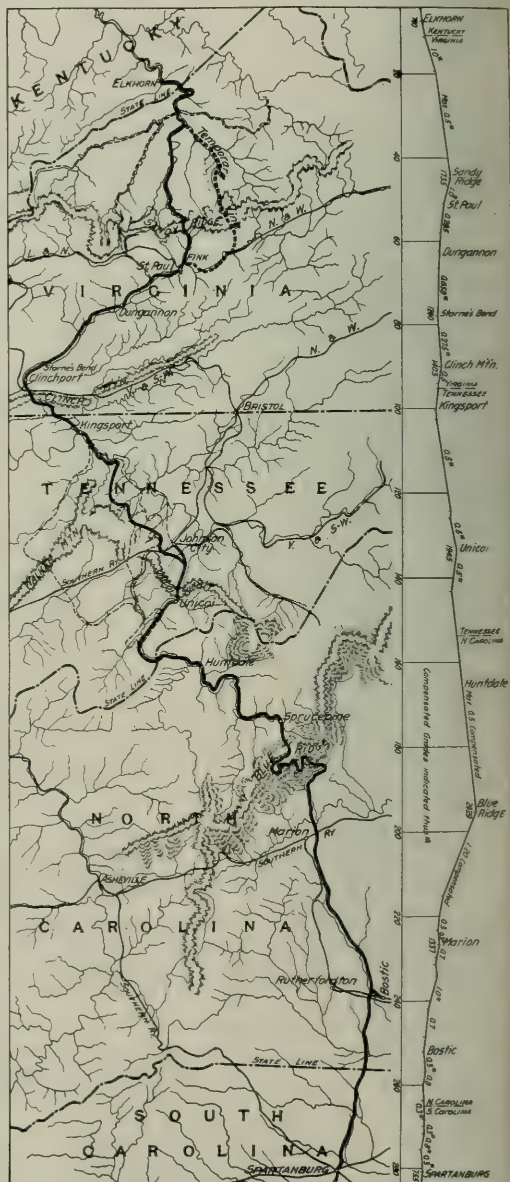
Dante is located at the head of Lick creek, about six miles from Fink, on the Clinch Valley division of the Norfolk & Western. The valley here splits into three hollows which are true cul-de-sacs, and in which the first of the coal operations are located. The elevation is about 1,750 ft. above tidewater. It is in this valley that the old Lick Creek road was located, and which is now occupied by the northern end of the completed Clinchfield road. Here the work done has been that of easing the original profile and alinement, straightening the channel of the creek, and building an assembling yard. The work would be considered heavy were it not for the much heavier work to follow.

LOCATION.

From Fink to St. Paul the line follows the Norfolk & Western Railway and then crosses it and the Clinch river to follow down that stream for 37 miles. Along the upper reaches of this river the road follows down on the surveys of the C., C. & C., but instead of hugging the bank closely and scraping out a side cut it plunges through the ridges and fills the ravines. It is especially to be noted that in building this line, the policy pursued has been to use fills for the ravines, rather than to span them with a viaduct, by means of which construction future maintenance charges will be greatly decreased. This holds for the whole length of the line, and the steel viaduct has been used only where there was some local reason for not putting in a fill. So down through the upper part of the Clinch valley where the topography is very rugged, we find fills and cuts requiring the removal of large quantities of rock and earth, mostly the former, running up to 22,000 cu. yds., while those of from 2,000 to 3,000 cu. yds. are of common occurrence. The grade on this section of the line is favorable to traffic, with only a few grades against loaded movement, having a maximum of .275 per cent., although the country abounds in ridges that rise abruptly from the river.

After passing Guest river, 14 miles from Dante, the valley widens, the bottom lands are fertile and rolling, but the necessity for heavy work continues, if a good alinement and a steady descent is to be obtained. Here the cuts and fills are not always very high, though at times they rise to between 50 ft. and 60 ft., with quantities pressing close on 30,000 cu. yds. The grade varies from level to 0.30 per cent. favorable to southbound traffic, and this continues on to milepost 78, or 33 miles from Dante, where the road crosses back to the left or east bank of the Clinch river. This stretch of valley widens in places to from 1 to 3 miles and is bounded on either side by steep hills. Then, at the lower portion, the hills gradually approach the river on each side culminating in a long cliff on the left bank just below the crossing.

Here for a distance of about 10 miles to Speer's ferry we find some of the heaviest work on the road. This bank of the river is formed by almost vertical cliffs of a hard sedimentary rock and the location required the cutting of a shelf on the side of the cliff for nearly the whole distance, the character of which can be seen in the illustration of the cut near Clinchport. The cost of this work was proportionately high, running at about $180,000 per mile. The ruggedness of this territory is illustrated by the twin tunnels where two ridges



Map of Country from Elkhorn, Ky., to Spartanburg, S. C.

View from Pumpkin Patch Mountain, Showing Character of Country and Track of the Carolina, Clinchfield & Ohio.

come down to the river each of which had to be tunneled and yet their facing portals were only 200 ft. apart. The reason for crossing the river and running through such heavy working was to start well back for the climb to the tunnel through the Clinch mountains. So while there is a slight ascent before reaching the Clinch river bridge, it is at that point that the real ascent starts. The elevation is 1,265 ft. at the bridge and from that on the adverse grade varies from 0.12 to .275 to Speer's ferry and the quantities rise to 230,000 yds. for some of the fills and from 30,000 to 35,000 for the cuts with no small quantities and all rock. The extreme case is found in the Gate Branch fill which is 135 ft. high and contains 300,000 cu. yds. For some of these fills extensive borrowing was required as in the case of the Doe Branch fill, shown in the illustration. This fill is 125 ft. high and required about 250,000 cu. yds. for its formation, in spite of the fact that it was flanked at each end by rock cuts 60 ft. and 65 ft. high, respectively.

Near the end of this part of the line is Copper creek viaduct,

90-ft. Solid Rock Cut on East Bank of Clinch River, Near Clinchport, Va.

1,090 ft. long and 168 ft. high, which would have been made a fill had it not been for special local conditions.

For the past few miles described the road has been approaching the Clinch mountain range on a diagonal line. At Speer's ferry it turns abruptly toward it and into a tunnel through it.

At the bridge over Troublesome creek at Speer's ferry the road has reached an elevation of 1,380 ft. and immediately thereafter plunges into the Clinch mountain tunnel, 4,100 ft. long. This tunnel presented some exceedingly great difficulties to excavation because of the character of the rock. Of all the formations in this region that of the Clinch mountain synclinal is the most resistant. Entering the tunnel from the north there was first a thickness of 2,100 ft. of Sevier shale;

then 400 ft. of Bays sandstone; 530 ft. of Clinch sandstone; 40 ft. of Rockwood formation, and 1,030 ft. of Chattanooga black shale. Geologically these rocks, with one exception, belong to the Silurian epoch and some of them are exceedingly hard. The Sevier shale is a calcareous and sandy shale, with thin beds of impure limestone; the Bays sandstone is a red sandstone and sandy shale; Clinch sandstone is an exceedingly hard coarse white sandstone; the Rockwood formation is a sandy shale and ferruginous sandstone, and the Chattanooga black shale a carboniferous shale. Of all these, the Clinch sandstone offered the greatest difficulty because of its hardness. In one case, the contractors were 72 hours drilling a 6 ft. round of holes, while in one month the heading was advanced less than 60 ft. Timbering was found to be unnecessary and was soon abandoned, and the concrete lining will be put in direct.

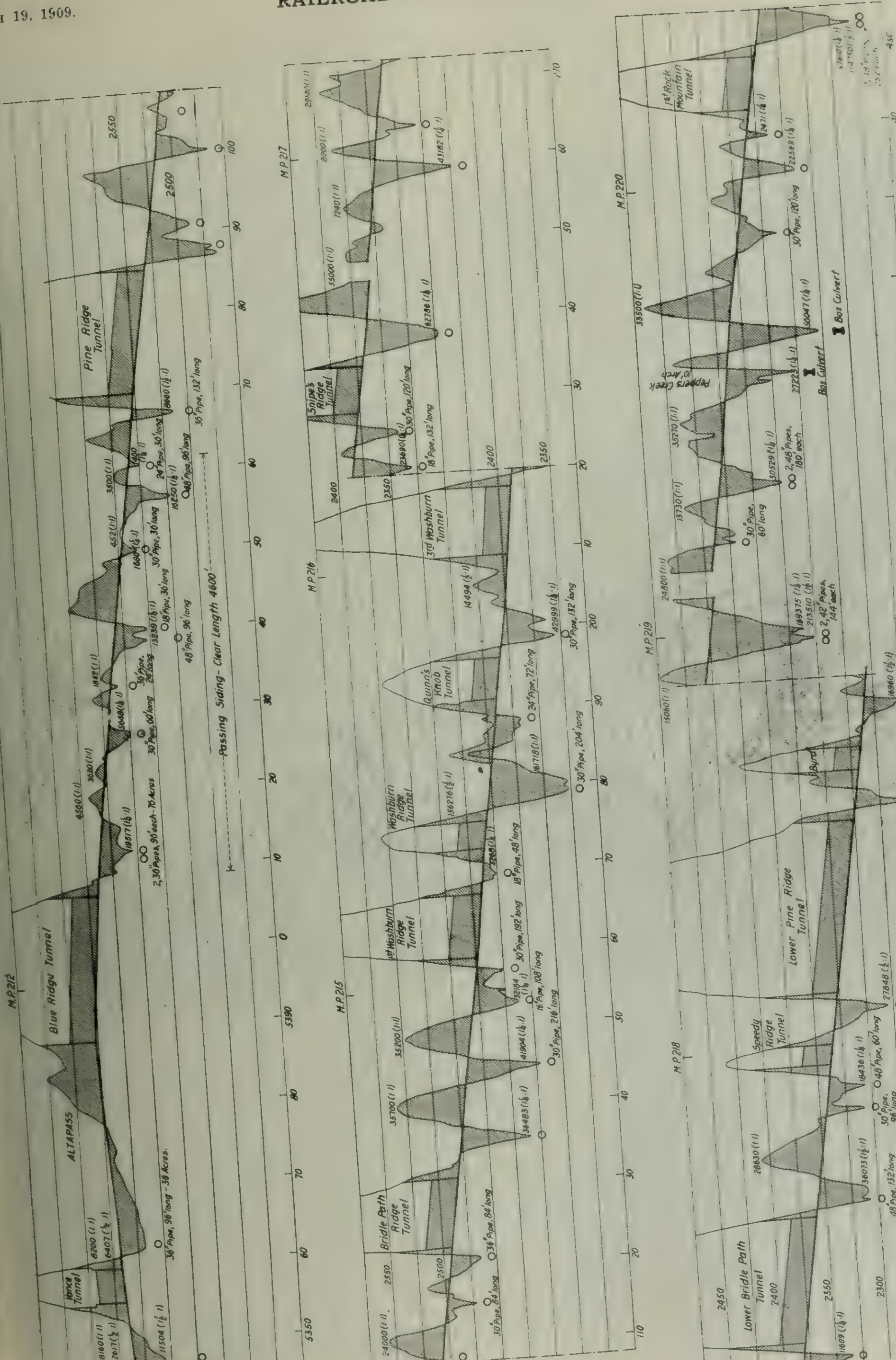
After leaving this tunnel the road crosses to Big Poor summit on a rising 0.256 per cent. grade and passes that point through a 62,000-cu. yd. cut. Then comes a long easy descent on grades of from .38 to .50 per cent., across a succession of ridges involving a constant change from cut to fill and fill to cut. Some of this work has a depth of 75 ft. along Opossum creek and the North Fork of the Holston river. The road then goes down the main stream of the same name with no change in the magnitude of the work, the cuts rising to a yardage of 120,000, and this through a valley of good bottom land with fertile cross valleys on either side. This holds to milepost 100½ where there is a change of grade and the maximum of half of one per cent. is used at intervals to the summit at Soldiers' Home and near Johnson City, though much of it is below .40 per cent. Immediately after crossing the Holston river the country becomes heavy again and the hills rise from 300 to 400 ft. on each side of the line, involving heavy cuts and fills, that at Soldiers' Home having a yardage of 268,000. Not only was this cut a heavy one, but some of the material removed was almost worthless for filling. It was known as loblolly mud, a soft, sticky clay that flows out to a slope of nearly or quite 2 to 1 before it will stand.

At Johnson City there is a projecting bluff of Cherokee

Shelf in Rock on Banks of the Clinch River.

Fill Over Doe Branch, 125 ft. Deep at Center. Contains About 250,000 cu. yds.

The tracks used by the contractor in obtaining borrow from the solid rock are shown in the left of the photograph.



Three Characteristic Sections of the Carolina, Clinchfield & Ohio; Showing Cuts and Fills.

mountain which with Buffalo mountain rises to 2,500 ft. The road skirts these hills and rises to Unicoi summit and then drops down to a level spot, Erwin, on the Nolichucky river, 16 miles from Johnson city. This place will be made a division terminal, and the main shops of the road will be located there. It is one of the few widenings of the valley that occur.

The line then soon crosses the Nolichucky and entering a gorge cut by it through the mountains, starts seriously on its climb to the summit of the Blue Ridge. The character of the country is best described by reference to the accompanying photographs. For 8 miles the roadway is again almost literally carved out of the face of the cliffs and the rock yardages are computed by the thousands. The cliffs rise on either side of the stream to from 2,000 ft. to 2,500 ft., which is from 200 ft. to 600 ft. above the road, while in some places the cut amounts to 110 ft. in height, while back of this the mountains would ordinarily suffice. The work is, therefore, heavy for the whole distance, and it required the removal of 540,000 cu. yds. of material in the 39 miles between the north end of the gorge of the Nolichucky and the summit of the Blue Ridge at the west portal of the McKinney Pass tunnel. This was done to obtain a maximum ruling grade of .5 per cent. compensated with a maximum curvature of 6 deg.

The summit reached and passed in a tunnel 1,850 ft. long, there follows the spectacular descent down the eastern slope on a 1.2 per cent. grade compensated and over the seven-legged loop shown in the illustration. As the road leaves the summit it drops down the side of a spur running out from the side of the valley, to its end and then makes a complete turn around the end and comes back to a point 1,800 ft. away from the start, horizontally and about 440 ft. below, after a run of 7 miles. Referring to the plan of this portion of the loop it

In the Gorge of the Nolichucky River.

rise to 2,500 ft. above the stream. Beyond this the valley of the Nolichucky widens a little, changing its name to the Toe river at the state line, but for the whole distance to the summit tunnel at McKinney's Pass there are the same steep high hills with projecting ridges and deep, narrow, retreating hollows necessitating cut after cut and fill upon fill, nearly all in rock. The material is softer than that encountered north of Johnson City, along the Clinch river, or in the mountain of the same name. Much of it is a mica schist, or a quartz schistose rock that breaks easily and is quickly penetrated by a drill. In fact, there are large mica deposits along this portion of the line. At one place there is a mica quarry where sheets of clear whiteness a foot square or more are obtained. Where clay is encountered it is soft and greasy to the touch with the contained mica, and is quite unsuited to standing in fills at a sharp angle, but will slide out to a 2 to 1 slope, thus greatly increasing the required quantities above those that will be seen that the tunnels on the two legs are opposite each other with the lower one the longer. This is because they are both driven through the same side spur, one higher up and shorter than the other, because the two sides are nearer the ridge and closer together. At the neck, near the swell at the end of the loop, the tracks are only 200 ft. apart horizontally and yet the distance by the rails is about 2 miles. A part of this track is shown in the corner of the first loop. The upper grading in the background is a contractor's road and not the main line.

The topography is indicated to an extent by the tunnels, on this descent. These are always through spurs projecting from the sides of the mountain. The work here, while heavy, is not on the gigantic scale of that which has preceded, and after a run of 21 miles in which the air line distance traveled is 4.09 miles, the road, at milepost 233, is running along the banks of the North fork of the Catawba on the Atlantic drainage, 1,434

Pumpkin Patch Mountain at Toecane, N. C.

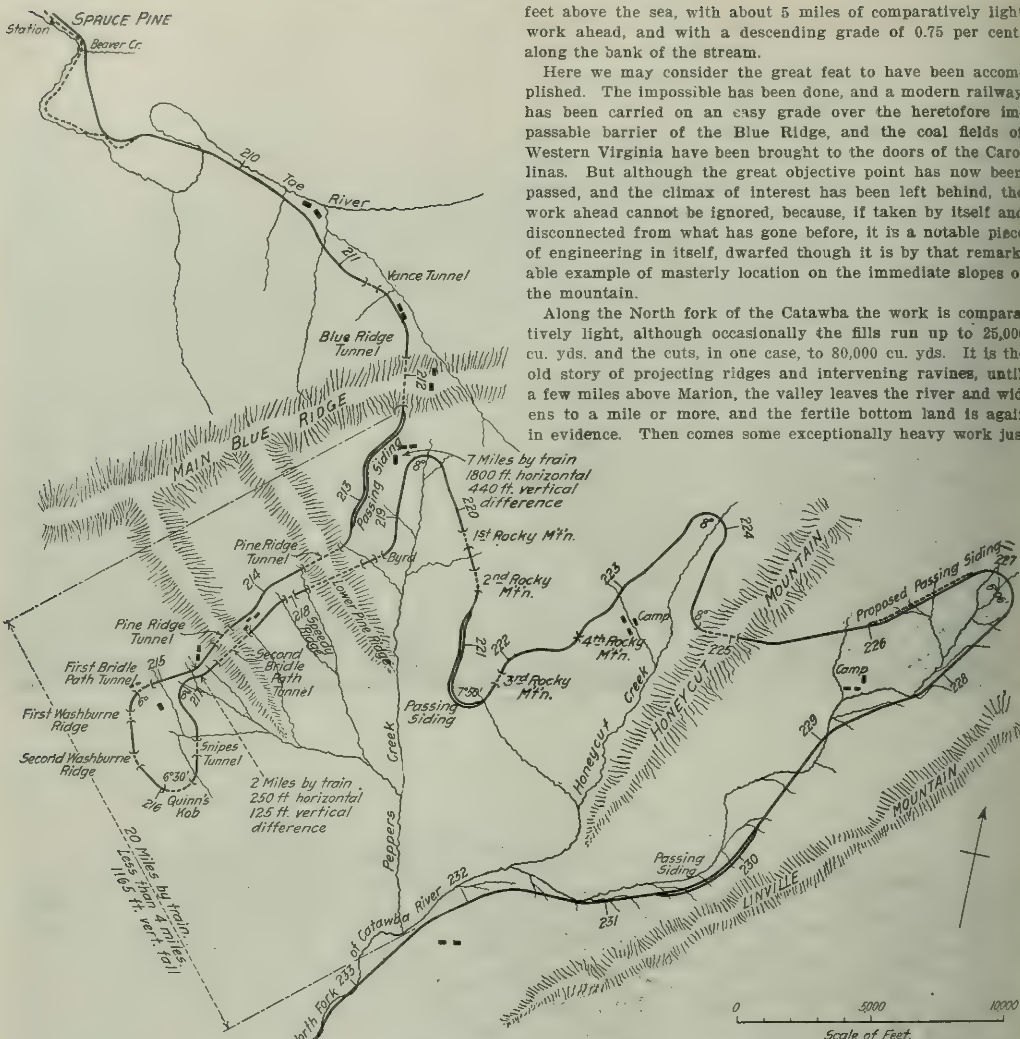
On the Blue Ridge at the Corner of the First Loop.

Actual distance from viewpoint to lower track, 250 ft. Distance by rail, 2 miles. Difference of elevation, 125 ft. The roadway in rear of compressor plant is that used by the Shay geared locomotive in delivering supplies over the mountain during construction.

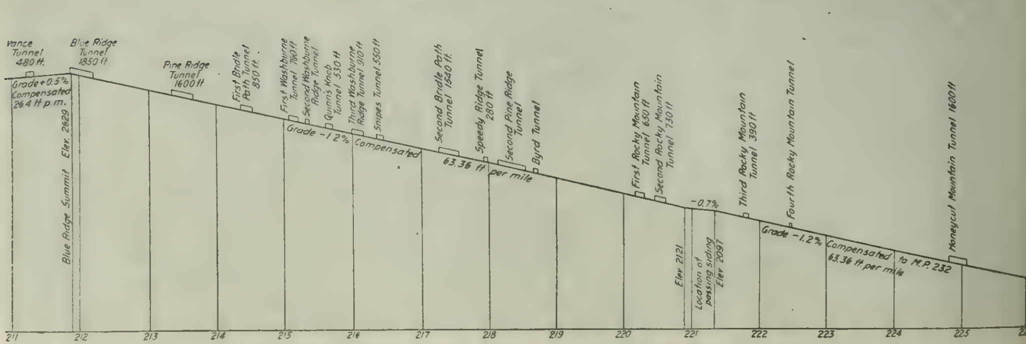
feet above the sea, with about 5 miles of comparatively light work ahead, and with a descending grade of 0.75 per cent. along the bank of the stream.

Here we may consider the great feat to have been accomplished. The impossible has been done, and a modern railway has been carried on an easy grade over the heretofore impassable barrier of the Blue Ridge, and the coal fields of Western Virginia have been brought to the doors of the Carolinas. But although the great objective point has now been passed, and the climax of interest has been left behind, the work ahead cannot be ignored, because, if taken by itself and disconnected from what has gone before, it is a notable piece of engineering in itself, dwarfed though it is by that remarkable example of masterly location on the immediate slopes of the mountain.

Along the North fork of the Catawba the work is comparatively light, although occasionally the fills run up to 25,000 cu. yds. and the cuts, in one case, to 80,000 cu. yds. It is the old story of projecting ridges and intervening ravines, until, a few miles above Marion, the valley leaves the river and widens to a mile or more, and the fertile bottom land is again in evidence. Then comes some exceptionally heavy work just



Located Line from Spruce Pine to Crossing of Catawba River.



Compensated Grades; Vance Tunnel to Honeycut Mountain Tunnel.

north of Marion where the hills crowd in close on the road, and there is one fill of 217,000 cu. yds. flanked by cuts of 109,000 and 105,000 cu. yds., respectively.

From Marion to Bostic, 28 miles, the location is through a heavy rolling country, involving for a modern line some exceedingly heavy steam shovel work. There are cuts running from 100,000 to 165,000 cu. yds., and in one case there is a fill of more than 285,000 cu. yds. The material in this region varies from a mica schist, where the slopes of cuts will stand very straight and true, to a soft clay that flows easily under pressure and is apt to come down in cuts and yield in fills until the equilibrium is reached on a slope of 2 to 1 or more.

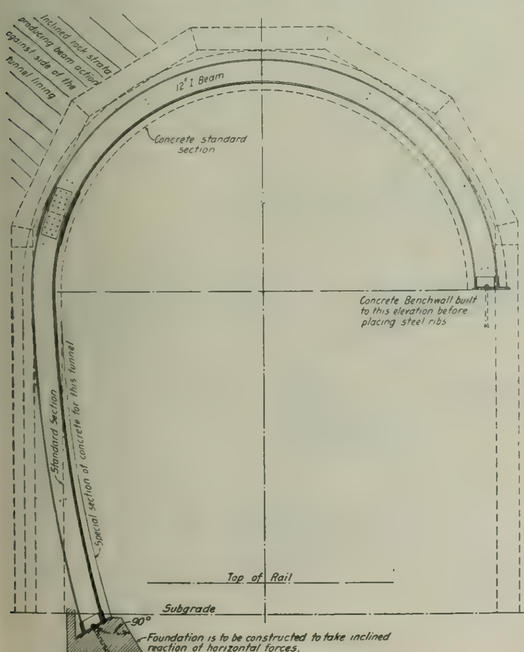
Soldiers' Home Cut, Johnson City, Tenn.

85 ft. at center. 500,000 cu. yds. removed.

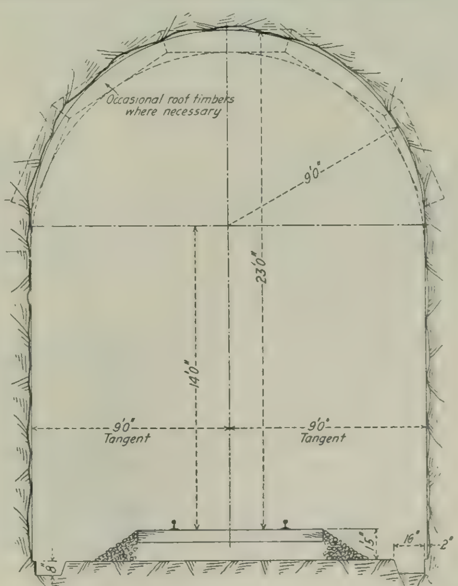
From Marion to Bostic there is an excellent opportunity to compare the old and new methods of location. For the whole distance the Clinchfield line is paralleled by an older road, built years ago when heavy trains were unknown, and present facilities for construction did not exist, so that low first cost had to be the object of the locating engineer. This line swings and twists among the hills, rising and falling with the local contours, using 1 per cent. grades uncompensated on curves with prodigal liberality, and so not only cutting down the locomotive capacity but adding a mile and a half to its length as compared with the new line. There are four or five summits in the distance, so that the estimated increase

Tunnel Portal, Showing Packing and Inclined Strata.

of rise and fall is three or four times that of its younger companion. The new road, on the other hand, drops down on an easy grade of .80 per cent. over curves of 4 deg. for about six miles, then for two miles climbs on a maximum of .5 per cent. to the summit, and then down into Bostic on the



Tunnel Reinforcement.



Standard Tunnel Section Where Permanent Lining Is Not Needed.

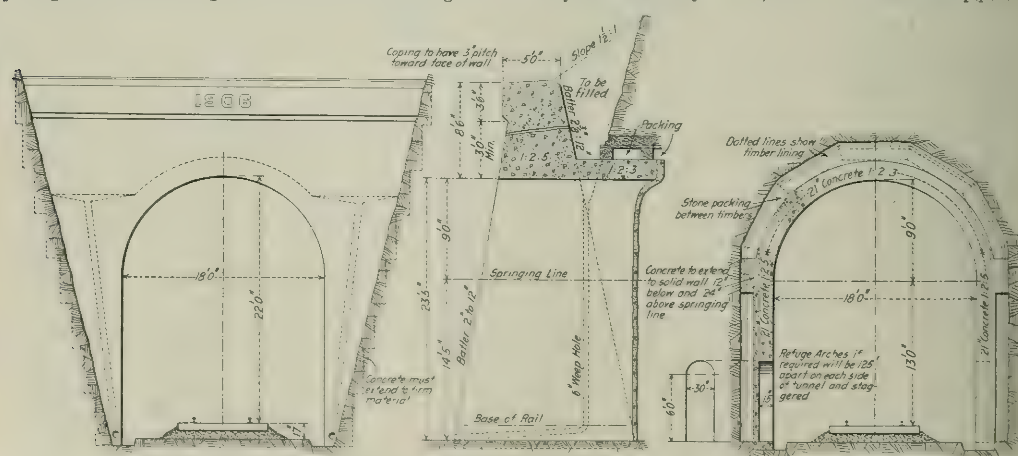
same grade and with the same curves as before. In one case we have a line adapted for high speeds and heavy trains; in the other, one that must always be limited in capacity and efficiency, although it was fully up to current demands and the prospects of future requirements at the time it was built. This difference of method is especially emphasized at one point, where, in order to avoid two grade crossings, the Clinchfield built a new track on its own alinement for the older road, and so reduced not only its grade but cut off 881 ft. in $2\frac{1}{2}$ miles.

The location of the line has been treated fully in order to convey as clear an idea as possible of the character of the country and of what it means to put a modern low-grade line through it. It requires not only the highest grade of engineering talent to locate where others have searched and declared the obstacles unsurmountable, but it requires the assurance of a large and paying traffic from the start as well as implicit belief on the part of the investors that their assurance is well founded, and that its promises will not fail. What that is in the instance before us we shall presently see.

For use in passing the Blue Ridge and in furnishing construction camps with the necessary supplies, a light temporary line was built over the mountain. Where the yardage was heavy and the point remote from rail communications, other temporary lines were built across country from the nearest point having rail communication. In one instance this involved building a line four miles long. Where streams were in the way of the roadbed or threatened to wash it away, their course was changed and their channels straightened, as at Dante and on the north fork of the Catawba river. Where a bridge was needed to facilitate communication and connect the rails, erection was driven at top speed, as in the case of the bridge over the south fork of the Holston river, a deck-rivetted truss of four spans of 120 ft., and two deck plate girders 60 ft. long, which was erected in 11 working days. Where steam shovel work was possible the excavating and hauling was kept at top notch. Thus, between Marion and Bostic, a total yardage of 3,100,000 was removed and the work was done at the rate of 30,000 cu. yds. a month by a single steam shovel. When this was completed it was followed by track laying that, with a track-laying machine, touched 9,750 ft. a day. The whole line of track and bridges between Marion and Bostic was completed in less than three months. Now that the rails are down, the work of taking up sags in the fills, keeping the track up to grade and the placing of ballast is being followed with the same vigor. It seems probable that, before the summer is over, the settlement and movement will have so far ceased that normal conditions of operation can be maintained over the whole line.

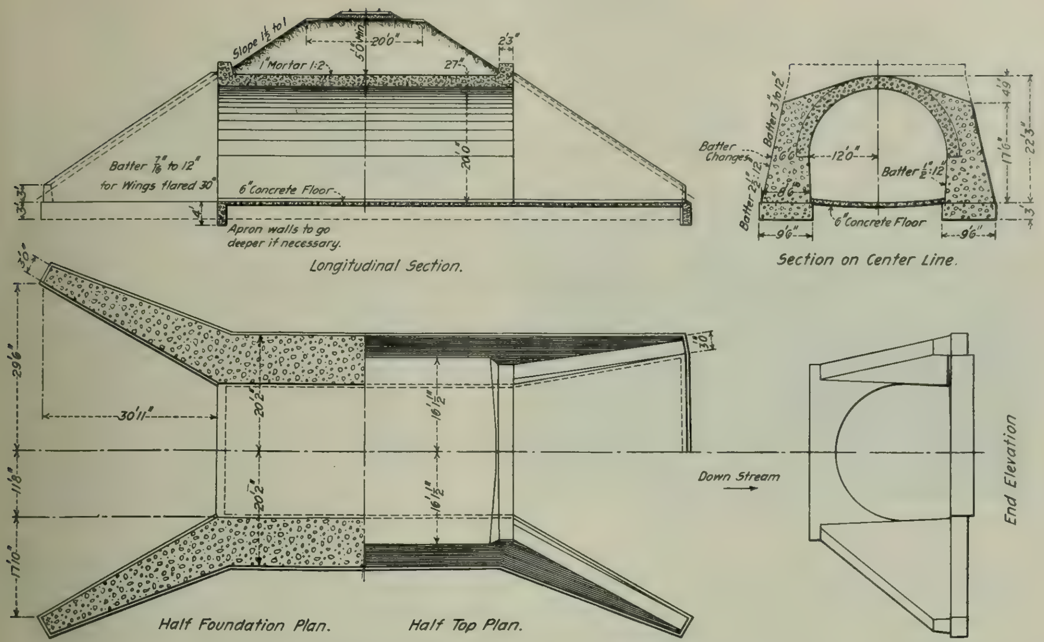
To sum up what has been done, there is, first of all, a road 209 miles long, all over a heavy location, and part of it heretofore regarded as impassible. The construction involved moving 16,000,000 cu. yds. of material from cuts and placing the same amount in fills, a task that was somewhat increased because of the impossibility of always effecting a perfect balance, with resultant waste and borrowing. Of this material about 40 per cent. was solid rock, 20 per cent. loose rock and 40 per cent. earth. There were also required 225,000 cu. yds. of masonry and 6,800 tons of cast iron pipe for

Portal of Vance Tunnel, near Altapass, N. C.



Face of Portal. *Section of Portal.* *Section of Lining.*

Standard Concrete Tunnel Portal and Lining.

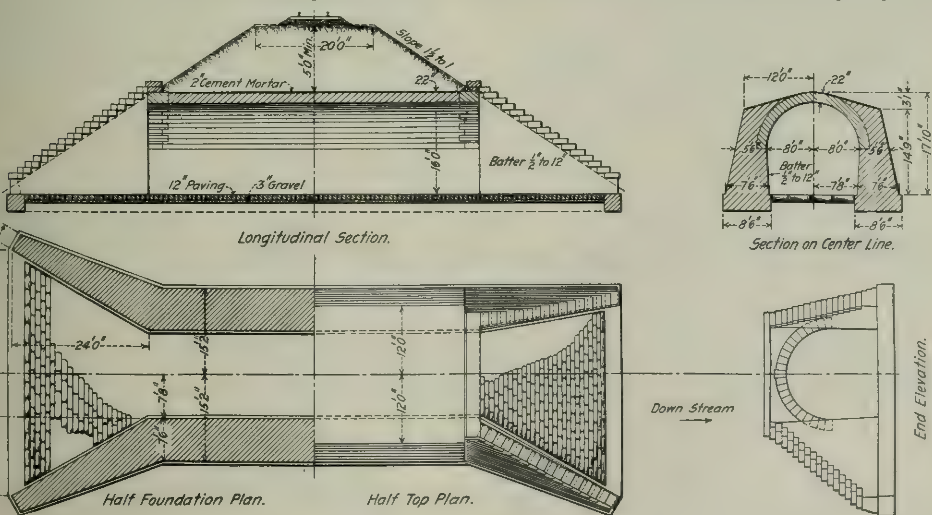


Standard Concrete Arch Culvert. 24 ft. Span.

culverts. On the line there are 36 tunnels aggregating about six miles in length, while 7,000 tons of steel were used in the bridges. For the uncompleted portions of the line between Bostic and Spartanburg and Dante and Elkhorn, Ky., the estimates are that between the two former places there will be 2,000,000 cu. yds. of cut and the same of fill, about half of which is completed, and, between Dante and Elkhorn, there will be 2,500,000 cu. yds. of each.

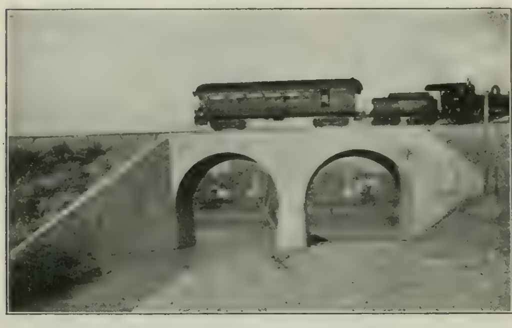
TUNNELS.

The location across the mountain spurs often involved tunnels at frequent intervals, as on the south slope of the Blue Ridge, where in one case there are three closely spaced on a short tangent. Allusion has already been made to the unreliable character of much of the material removed from the cuts. A similar difficulty had to be met in much of the tunnel work. In a number of cases the roofs would not stand without timbering, and in some instances the timbering that was used was subjected to very severe stresses because of the tendency of the rock to slide. After the coal deposits and their accompanying shales have been left behind, the rocks have been subjected to an upheaval action, and stand at all angles from a horizontal to the vertical. Frequently the dip



Standard Stone Arch Culvert. 16-ft. Span.

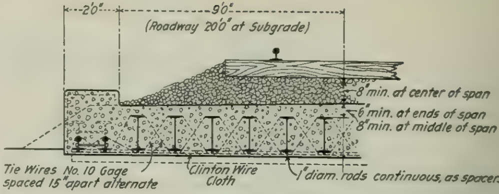
crosses the tunnel line at a sharp angle. Towne's tunnel in the Clinch valley is one of a number of examples where extraordinary measures had to be taken to prevent a cave-in of the roof and sides. The rock is a carboniferous shale, so tilted that the dip of the strata lies at an angle of about 30 deg. with the horizontal, and the material presses in so hard that the timbering is under a heavy stress. The vertical 12-in. x 12-in. side timbers are bent 2 in. out of line



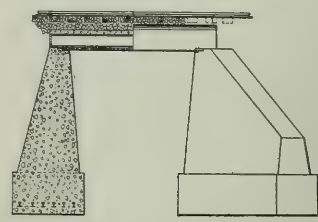
Reedy Creek Concrete Arch Bridge.

in places, and in some cases double timbering has been required to hold the load, and even this is badly bent. In order to carry the roof and sides permanently and stiffen the concrete lining against side thrusts, it has been reinforced by a 12-in. I-beam bent to a semi-circle with one end resting on the concrete base and the other riveted to a straight leg that comes down the side of the tunnel on a batter and has its foot carried by a concrete pedestal at the bottom. The whole is buried in and covered to a depth of 4 in. by the concrete lining. By comparing the resulting contour with that of the standard it will be seen that some of the bottom clearance is sacrificed, but the tunnel is of ample width to permit this. The steel beams are bent and afterwards annealed, and are set on from 2-ft. to 5-ft. centers, dependent upon the character of the rock and the intensity of the pressure that they will be called upon to carry. The stresses on this reinforcement were calculated on the basis of a uniformly loaded beam, on the hypothesis that the timbering was upon the point of fracture.

For the regular tunnel construction two standard sections have been adopted. One is that used in rock that is solid enough to stand without timbering, and which has an arched



Cross Section-Solid Floor.



Standard I-Beam.

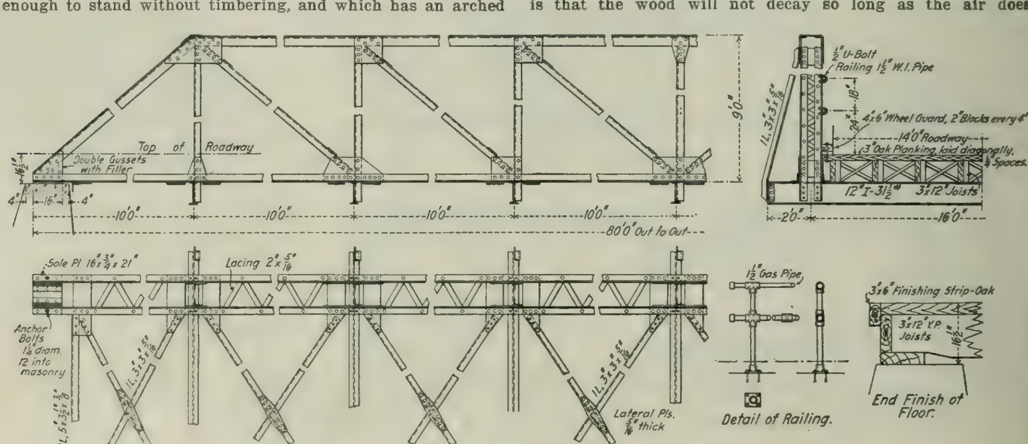
Concrete Bridge, for clear spans 10 ft. to 24 ft.
Live load—Cooper's E-60.

roof of 9 ft. radius with a total width of 18 ft., with adjustments of track on curves to maintain ample clearances. The schedule that has been issued for this increase is as follows:

Degree of curve.	Distance from center line of track. Inside of curve.	Outside of curve.
1 deg.	9.21 ft.	8.79 ft.
2 "	9.41 "	8.59 "
3 "	9.56 "	8.44 "
4 "	9.68 "	8.32 "
5 "	9.81 "	8.19 "
6 "	9.94 "	8.06 "
7 "	9.97 "	8.03 "
8 "	9.98 "	8.02 "

Where tunnels are on curves of more than 8 deg. special instructions are issued as to clearance.

Tunnels lined with concrete have the same inside dimensions, but the excavation is made enough larger to permit the use of 21 in. of concrete inside the timbering which is always left in position. The space between the timbers is packed with spalls when they can be conveniently obtained; and when not, cordwood is packed in above the concrete and against the rock. The principle upon which this is done is that the wood will not decay so long as the air does



Standard Steel Overhead Highway Crossing.

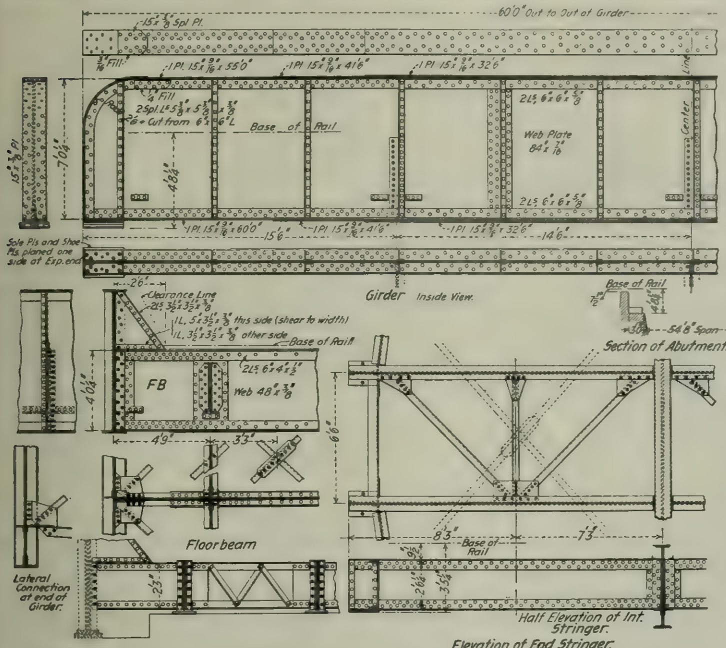
not have access to it, and this condition is considered existent in this case. The concrete for the arch is a 1-2-3 mixture, and that for the side walls is a 1-2-5. These are rather richer mixtures than those frequently used. The reason therefor lies in the nature of the sand that is obtainable. Mica is an almost omnipresent mineral and it gives to most of the sands such a slippery quality that it is not safe to use any of them without testing, and this is done in all cases. Then, in order to raise their quality to that of standard sand a percentage of crusher screenings, as determined in the laboratory, is added.

At the sides of the tunnel lining the concrete is carried out to the solid wall for a distance of 2 ft. above and 1 ft. below the springing line of the arch so as to make sure that the thrust is carried out against the rock by the concrete and not through the packing. The sides are provided with refuge niches, staggered and set 125 ft. apart on each side. The faces of the walls are coated with 1 in. of 1-2 mortar applied when the forms are filled.

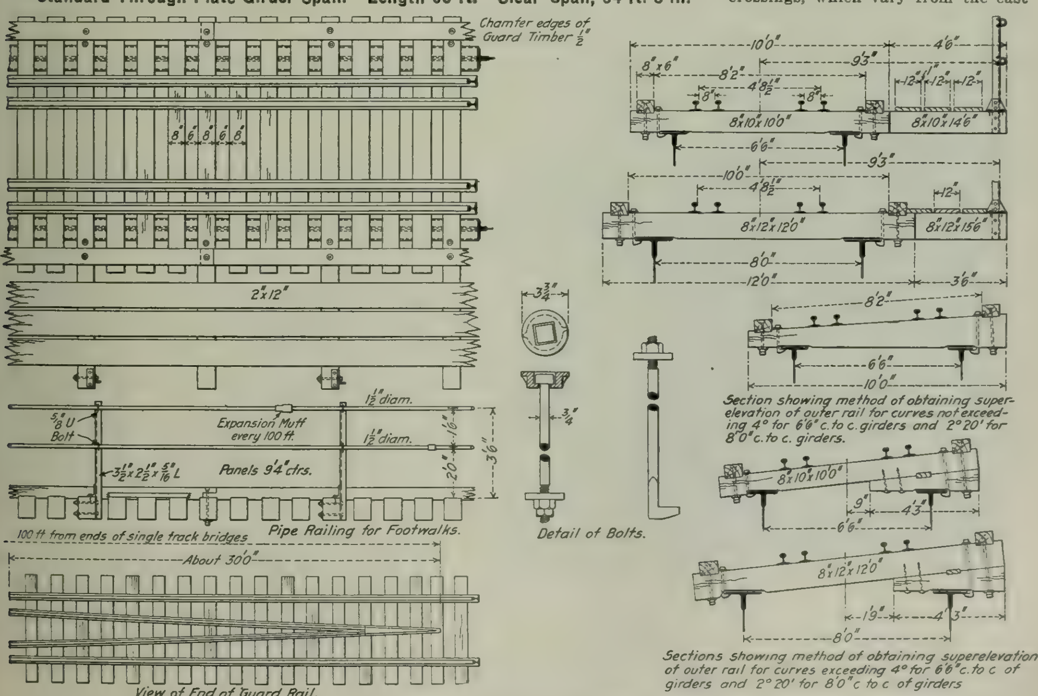
The portals are capped with a parapet, as shown, made of 1-2-5 concrete and provided with weep holes to take care of the drainage from the bank behind. They have a batter at the front of 2 in. to the foot and are also faced with a 1-2 cement mortar applied as before.

BRIDGES AND CULVERTS.

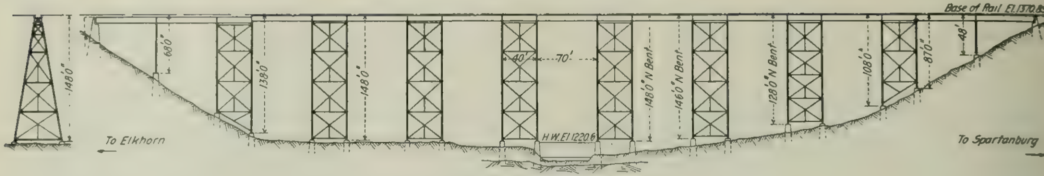
Paralleling the tunnels in importance on the road are the water course crossings, which vary from the cast



Standard Through Plate Girder Span. Length 60 ft. Clear Span, 54 ft. 8 in.



Standard Floor for Bridges.

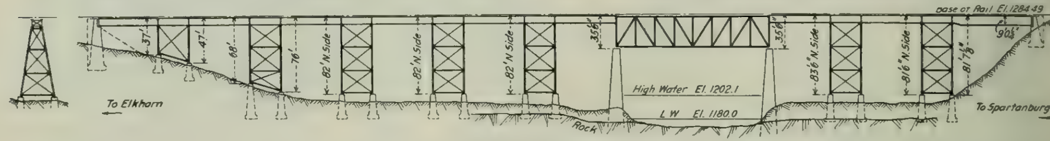


Copper Creek Viaduct.

iron pipe buried beneath a fill to the bridges and viaducts several hundred feet long. Cast iron pipe are used wherever possible, in diameters up to 48 in. When two such pipe are insufficient to provide the necessary area of waterway, box culverts are used of increasing size until a bridge becomes necessary.

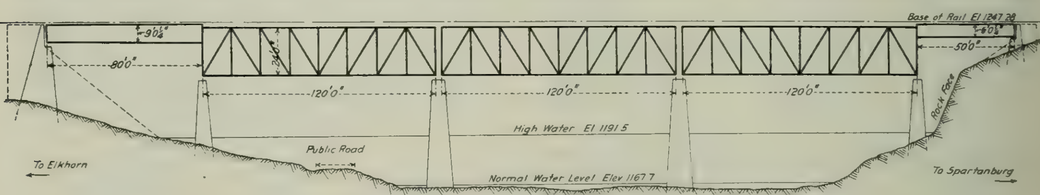
In the concrete used in the culverts, abutments and wing walls, little or no reinforcing is used. The illustration of the 24-ft. concrete viaduct shows a typical structure as used for various spans on the road. The foundations will, of course, this, for both the single and double culverts of 4 ft. spans, the top slab is reinforced by tension rods at the bottom, with diagonals reaching up to the ends. For the longer or 6-ft. spans old rails are used, with a layer of wire cloth of 3 in. x 8 in. mesh set 1 in. below the rails and the whole embedded in a 1-ft. slab of 1-2-3 concrete.

When the spans rise above these dimensions an I-beam concrete bridge is used. This form of construction is used for spans of from 10 ft. to 24 ft., though it by no means follows that it is used instead of plate girders for the longer spans.



Catawba River Bridge.

extend deeper wherever it may be necessary in order to obtain a proper footing. The downstream wing walls are either straight or flared, according to local conditions, such as the shape of the banks, the rate of discharge and similar conditions. The quality of the concrete varies with the location in the structure. For example, it is a 1-3-6 mixture in the foundations and backings, a 1-2-5 in the side walls, wings, parapets and paving, and a 1-2-3 in the arch. The specifications allow angular stone that can be handled by one man The cross section shows the method of construction very clearly. The I beams rest at either end on seats formed of rails embedded in the abutments, and are tied together by No. 10 wire spaced 15 in. apart and fastened to a wire cloth netting placed 1 in. below the bottom of the beams, with 1-in. round rods set in between as spaces. The concrete is flat at the bottom and is 2 in. thick below the beams and is crowning at the top, both longitudinally and transversely, with a minimum thickness of 8 in. at the center, of 4 in. at the sides



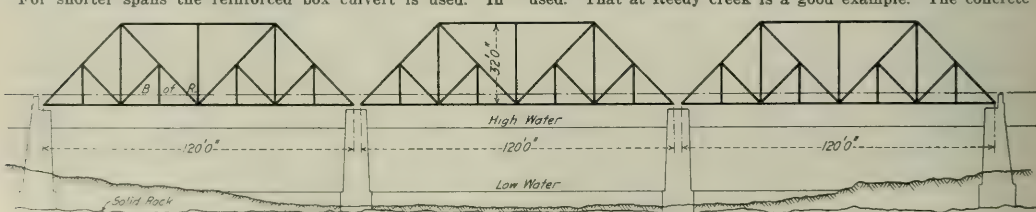
Bridge Over North Fork of Holston River.

to be used in the abutments and backing, provided they are placed not less than 4 in. apart in the clear and are wholly embedded in the concrete. Finally, the crown of the arch is coated on the outside with a 1-2 mortar.

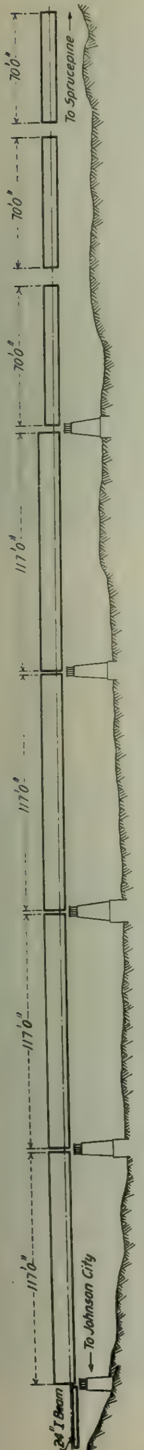
Provision is also made in the standards of the company for stone arch culverts, as illustrated. If the arch is built of brick, 5 rings are used and these receive an outside coating of 1 in. of 1-2 cement mortar. Other than this the requirements as to shape and dimensions of wing walls and foundations are the same as for the concrete culverts.

For shorter spans the reinforced box culvert is used. In and 6 in. at the ends. Along the sides there is a curb 2 ft. wide and rising 6 in. above the floor to prevent the ballast from flowing away. In the curb and filling, the 1-2-3 mixture is used, in which 1 in. is the maximum dimension for the stone, and the top surfaces are plastered with 1 in. of 1-2 cement mortar, well troweled so as to shed water. The sections and quantities used for this type of crossing of various spans is as shown in the table on the following page.

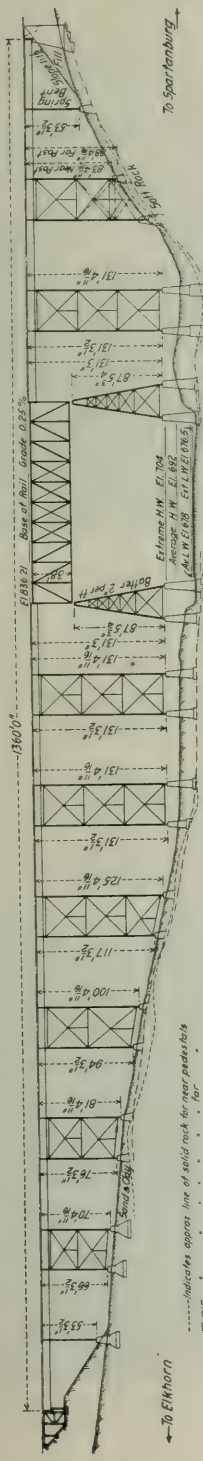
Closely allied to the I-beam construction, as far as span is concerned, is the concrete arch bridge, a few of which are used. That at Reedy creek is a good example. The concrete



Starnes Bend Bridge Over the Clinch River.



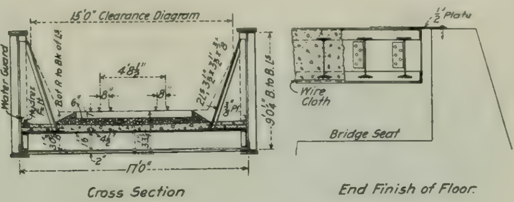
Nolichucky River Bridge.



Broad River Bridge.

is not reinforced, but stands by itself, except for a line of wire cloth near the inner surface that acts as a temperature reinforcement. In the case referred to each of the two arches is of 30-ft. span.

Next in order of magnitude of span comes the girder bridge,



Details; Kendrick's Creek Bridge.

an example of the design of which is given in the illustration of the 60-ft. span. One of the first points that strikes the eye in looking at one of these bridges in position is the great

Spans, Number and Sections Used in Crossings.

Span.	No. I-beams.	Section.	
10 ft.	8	15 in. 42	lbs.
12 "	12	15 " 42	"
14 "	12	15 " 60	"
16 "	{10	18 " 60	"
	{4	12 " 31½	"
18 "	{10	20 " 65	"
	{4	12 " 31½	"
20 "	{10	20 " 80	"
	{4	12 " 31½	"
22 "	{10	24 " 80	"
	{4	12 " 31½	"
24 "	{10	24 " 95	"
	{4	12 " 31½	"

depth as compared to the span. The specifications issued require that the depth shall preferably be not less than one-twelfth the span and as great as economical conditions will

Clinch River Bridge at Starnes Bend.
3 spans of 120 ft. each.

permit. This requirement is always more than met and, in many cases, the depth is fully one-eighth the span, as in the case illustrated.

The standard loading for all bridges on the line is Cooper's Class E 60, consisting of two consolidation engines, weighing

213 tons each, including tender, and followed by a train load of 6,000 lbs. per lineal foot. To this is added the effects of impact and vibration, determined from the formula:

$$I = S\left(\frac{300}{L + 300}\right)$$

in which

I = Impact.

S = Calculated maximum live load stress.

Compression, gross section, $16{,}000 - 70\,\frac{l}{r}$.

Shear on shop-driven rivets and pins, 12,000.

Shear on turned bolts, 9,000.

Shear on plate girder webs, cross section, 10,000.

Bearing on pins and rivets, shop driven, 24,000.

Bearing on turned bolts, 18,000.

Fiber stress on pins, 24,000.

Nolichucky River Bridge—Unaka Springs, Tenn.

4 spans of 117 ft. each; 3 spans of 70 ft. each.

L = Length of loading which produces the maximum stress in the member.

All parts of the structure are so proportioned that the sum of the maximum stresses shall not exceed the following amounts in pounds per sq. in., except that the combined stresses from wind and other loads may increase the unit stresses by 25 per cent:

Tension, net section, 16,000.

Expansion bearings on flat surfaces, 2,000.

Expansion bearings on rollers, per linear inch, $600 \times D$.

Bearing plates on granite masonry, 600.

Bearing plates on sandstone and limestone, 500.

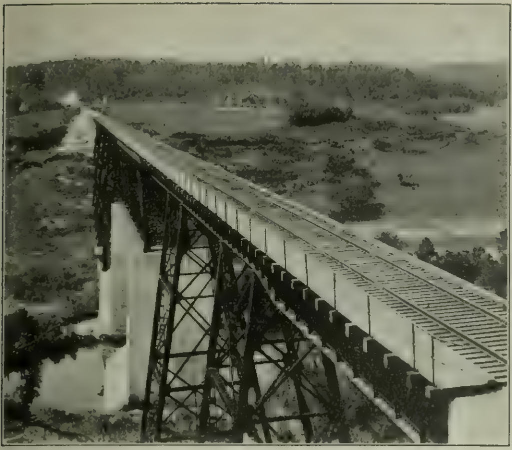
Bearing plates on Portland cement concrete, 500.

l = Length of member.

r = Least radius of gyration.

D = Diameter of roller.

Copper Creek Viaduct, near Clinchport, Va. (1,360 ft. Long. 168 ft. Base of Rail to Stream.) Erected Complete in Five Weeks.



Catawba River Bridge. 840 ft. Long.
Channel span, 150 ft. long. Tower girders, 30 ft. long. Intermediate spans, 60 ft. and 80 ft. long. River piers, 73 ft. above water level.

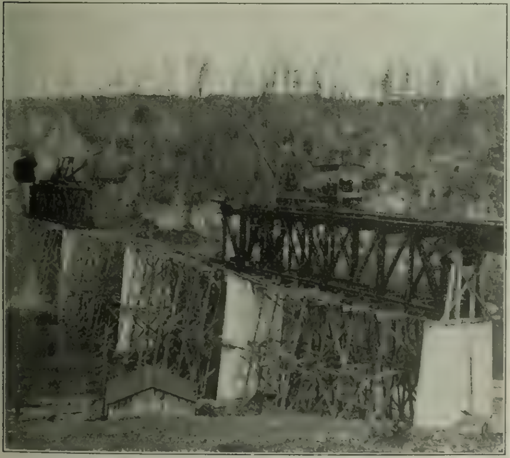
All dimensions in inches. These specifications are essentially those adopted by the American Ry. Engineering and M. W. Association.

Attention is called to these unit stresses as being quite in accord with the older and more conservative ones, and as far below those that have recently been applied to structures of great magnitude that have not been wholly satisfactory or safe, and which have consequently been subjected to rather severe criticism.

In the general design of these girder bridges, there is nothing particularly novel other than those indicated, with local exceptions, to some of which attention will be called later. The girder bridges are built without any camber. The upper corners of abutment ends of through plate girders are rounded to a radius of about one-third the depth of the girder, which radius is never to be less than 18 in.

Before considering the viaducts and pin and riveted bridges, attention is called to the floor used on the structures. The girders are spaced 6 ft. 6 in. and 8 ft. from center to center, according to length of span, and the ties are spaced 6 in. apart. The ties are held to the girders by hook bolts and each fourth one is lengthened to 15 ft. 6 in. to support a footwalk 3 ft. 2 in. wide along one side of each bridge, 200 ft. or more long. The outer edge of this is protected by a railing whose uprights are 3-in. angles with the pipe rails held in place by U bolts. This is an exceedingly stiff construction and is markedly stronger than the one usually made with pipe posts held to the ties by flanges and lag screws. An inner guard rail set 8 in. from the rail is used on all bridges of more than 20 ft. span, and is carried out to a distance of 100 ft. from each end of single-track bridges where the two rails come together in a frog point.

For cases other than for deck plate girder spans that can be tilted by means of shoes of unequal depth, two methods of obtaining the superelevation of the rail on bridges are in use. One is for curves not exceeding 4 deg. on girders 6 ft. 6 in. between centers. In this a tie thicker at one end than at the other is used with an even taper from end to end. This construction is also used on curves up to 2 deg. 20 min., where the girders are 8 ft. between centers. For curves exceeding 4 deg., with girder spacing of 6 ft. 6 in. as well as 8 ft., a plain straight tie is used, notched on the low side to fit over and rest squarely on the girder, and carried at the other end by a wedge of the proper thickness, to which it is both spiked and bolted and prevented from slipping by a 2-in. x 6-in. x 8 in. oak key gained into both pieces, and then bolted to the girder by the usual hook bolt. For girders 6 ft. 6 in. between centers, the ties are 8 in. x 10 in. x 10 ft. long; for the 8-ft. distance these dimensions are increased to 8 in. x 12 in. x 12 in., the same sectional dimensions for the ties holding for the work on curves.



Bridge Over South Fork of Holston River. Steel Work for This Structure Was Erected Complete in 11 Working Days.
4 spans of 120 ft. each; 2 spans of 60 ft. each.

Bridge Over North Fork of Holston River.
3 spans of 120 ft. each; 1 span of 30 ft.; 1 span of 50 ft.

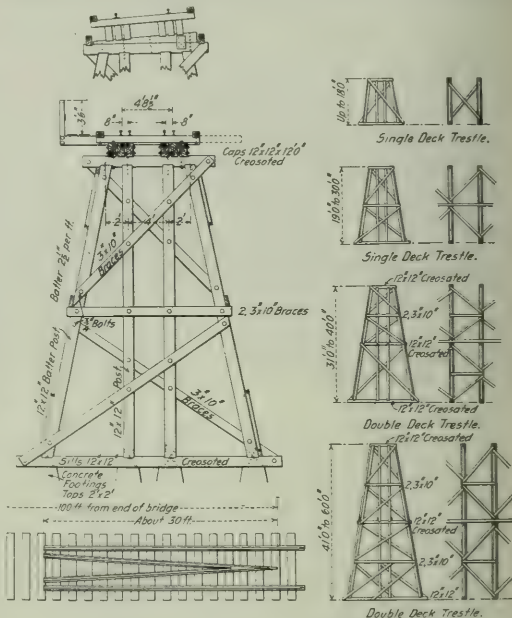
Another form of floor used on certain plate girder bridges where a shallow construction is necessary is the colid concrete. In this form the cross floor beams are I-shaped built in with the girders. A concrete slab floor is built in between and embedding the I beams. It extends down for 2 in. below the bottom of the beams and has a wire cloth of 3-in. x 8-in. mesh in it, set 1 in. below the bottom of the beams. At the top the concrete has a minimum thickness of 4½ in. and with a concave upper surface rising to about 12 in. at the sides. Here there is also a water guard of waterproofing material, over which there is a steel guard formed of a 3-in. x 2½-in. x ¼-in. angle, placed between the stiffeners and bolted to the

girder with ⅝-in. bolts. The ballast and ties are then placed on the bridge in the usual manner with a depth of about 6 in. of ballast below the ties. For the concrete, the 1-2-3 mixtures is used with stone that will pass a 1-in. ring. Drainage is obtained by 4-in. wrought iron drip tubes passing down through the concrete on the center line of track.

There are several long plate girder bridges on the line, among the most notable of which is that over the Nolichucky river near the lower entrance to the gorge, to which allusion has already been made. This bridge is a through plate girder construction, having four 117-ft. and three 70-ft. spans. In the design all parts have been planned so that they can be used again without alteration in case a revision of the line should be made and a new crossing effected at this point. The girders can be used for a deck span and the floor beams can be used for shallow concrete floors such as that illustrated. In the outline of the bridge shown, it appears that there is a 30-ft. span not provided for in the above list. It has been decided, however, to do away with this, build wing walls to the pier, fill in the opening and thus substitute a fill for this span.

The statement has already been made that it has been the policy of the road to use fills instead of viaducts except where local conditions prevent. One of these places is at Copper creek a short distance west of the Clinch mountain tunnel. At this point a broad ravine is crossed by a deck plate girder viaduct 1,090 ft. 8 in. long and 168 ft. from the bed of the stream to the base of the rail. The tower spans are 40 ft. and the intermediates 70 ft. With this arrangement there are eight towers and nine 70-ft. spans, as well as 70-ft. 4-in. spans at each end. The outer ends of the latter, with the adjoining 70-ft. spans, are carried on single rocker bents. The towers are footed on concrete pedestals, and those for the center spans have a height of 148 ft. to the base of rail and are four stories high. In the construction of this viaduct 1,510 tons of steel were used.

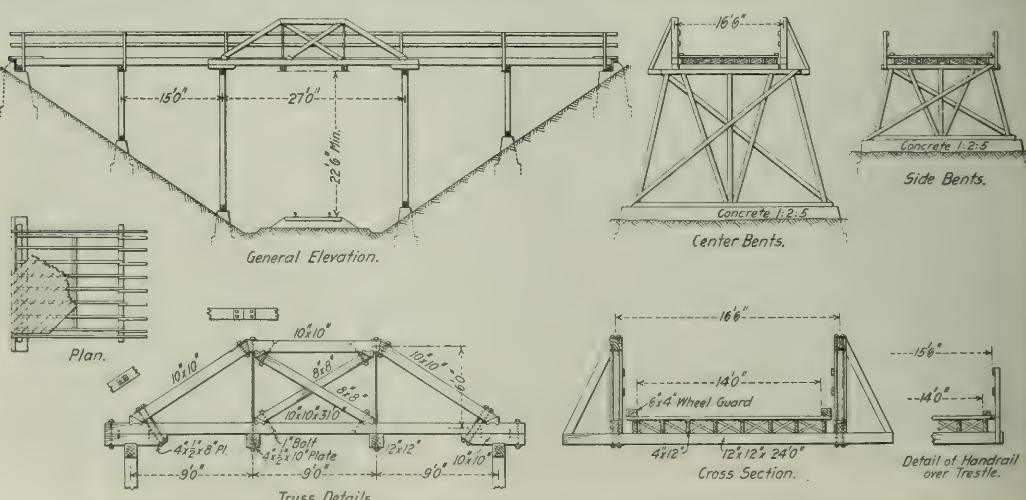
Other viaducts are combinations of the plate girder and riveted truss spans. Such a bridge is that over the Catawba river. In this, the tower spans are not as high as at Copper creek, and the spans are cut to 30 ft. with 60 ft. for the intermediate. The principal point of interest in this bridge is to be found in the channel span, which is 150 ft. This is a riveted deck truss span with a depth of 30 ft., or one-fifth the span. Instead of carrying the ends of this truss on steel towers, as has been done elsewhere, and which involves a breaking of the batter of the tower legs and a concentration of expansion stresses, two concrete piers that are 90 ft. high to the bottom of the foundation are used. With this, the expansion of the adjoining plate girders is taken on the seats on the tresses, and there is a corresponding reduction of thrust. In addition to this, the piers are far better adapted to resist the action of flood waters than steel towers would be, and will require no future attention or maintenance charges. This design, in addition to being especially well adapted to



Standard Trestle Details. Heights to 60 ft.

the location, presents a very artistic appearance when viewed from any direction.

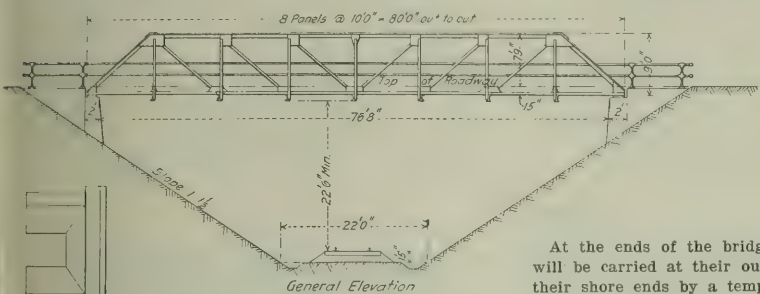
As the road thus far constructed lies among the mountains and therefore on the headwaters of the streams, it follows that the spans are usually short, and so have been confined

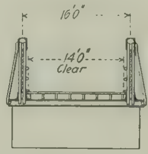


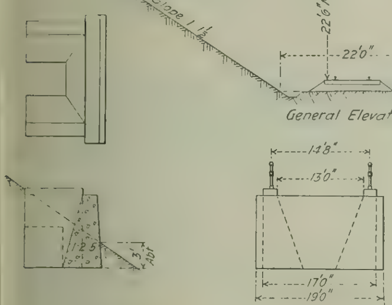
Standard Design for Typical Wooden Overhead Highway Bridge, Single Track Crossing.

exclusively to plate girders and riveted truss spans. In these it has been the aim to make the depth of the trusses as great as economical conditions will permit. In the case of the Starnes bend bridge over the Clinch river, which is illustrated as typical of the through truss construction, the depth is 32 ft. from center to center of chords on 120-ft. spans, with eight panels of 15 ft. each. This is an open-floor structure for single track, and is built according to the standard bridge specifications of the road.

Another type of riveted truss is illustrated by those over towers and spans are similar to those used on Copper creek. That is, the tower spans are 40 ft. and the intermediates are 70 ft. These dimensions are used at all points when the height is over 100 ft., whereas when the height is less than 100 ft. the dimensions are made 30 ft. and 60 ft., respectively. As on other roads, the pin-connected truss is used where the span exceeds 150 ft. In the case of Broad river, where the channel span is 200 ft., that type is used. The depth of the truss is 38 ft. from center to center of chords and the trusses are 16 ft. between centers.

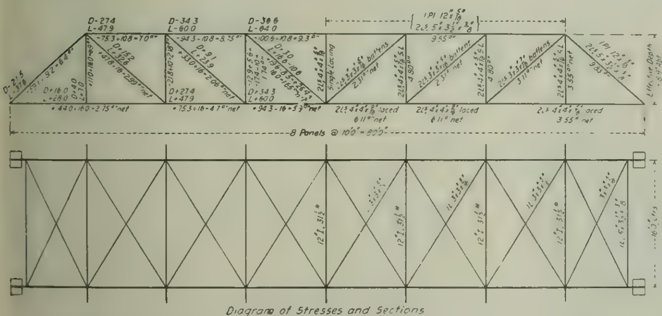






At the ends of the bridge there are 70-ft. girders which will be carried at their outer ends by rocker bents and at their shore ends by a temporary wooden crib set upon the fill. The intention is to let this construction stand for a year or two until the bank has become thoroughly settled and compacted, and then to drive concrete piles and build the permanent concrete abutments.

For the channel span towers the piers are of reinforced concrete. This construction was adopted in this case in order to withstand the stresses imposed by the longitudinal and lateral thrust of the trains. Another point of interest in connection with the concrete here is one that applies to all pier construction on the line. The piers are built about ¾ in. high and the material is allowed to harden. It is then bush hammered down to exact heights. The result of this is that far more accurate work is obtained than is possible where an attempt is made to build to exact height in the first place. The latter frequently results in the necessity for shimming one leg or another of a tower or permitting it to stand slightly out of line. The accuracy that is obtained with this method is exemplified in the case of the Copper creek viaduct, where every tower stands so exactly plumb that any existing error is so slight that it cannot be detected by the most carefully adjusted transit. The method costs a little more for the concrete and its dressing, but this extra expense is more than saved by the avoidance of all adjusting schemes in the erection, and in the assurance that all parts will be in place as designed.



Standard Steel Overhead Highway Crossing. 80 ft., Out-to-Out.

the North and South forks of the Holston river, in which the former is shown completed and the latter with the falsework in position during construction. In the case of that over the North fork, the bridge consists of three single-track spans of deck-riveted trusses with an open floor. Each span has a length of 120 ft. with a depth of 24 ft. from center to center of chords and a width of 13 ft. from center to center of trusses. The piers are of 1-2-5 concrete on 123-ft. centers. As indicated on the outline, there is likely to be a rise of 26½ ft. between low and high water, so that a bridge across the whole opening of the valley was a local necessity.

When the road has escaped from the mountains and come out from among the foothills to the lower levels of the open country, the streams become wider and bridges of longer span will be required. For this work the pin-connected structure will be used, as in the case of the Broad river crossing, which is on the Bostic-Spartanburg extension and which is now being vigorously pushed to completion. This bridge is a combination viaduct and bridge in which the

These examples of bridges are given as typical of those that will be used on the line, and as showing the wide range of structures demanded by a line running from the mountain district of steep slopes and narrow valleys with swift streams liable to a sudden rise to the open country of the south.

TIMBER TRESTLES.

As an auxiliary to the regular bridge and viaduct construction, it is frequently necessary to use timber trestles for temporary structures or for branch line spurs. Although nothing of this sort will enter into the permanent structure of the road, certain standards have been adopted. These are arranged as one, two, three and four-story bents, and are shown in outline. In detail they do not differ essentially from those used elsewhere, except in the strength which is calculated, like all of the permanent bridges, for the Cooper E 60 loading. The same rule is also applied in the matter of

footwalks and railing, but the method of caring for the superelevation of the outer rail is different. On the wooden trestle an inclined filler is laid directly on the cap of the bent and the stringers are bolted on top of it. This gives their top surfaces the proper inclination for the ties, which are bolted directly to them. It will be noticed, too, that the filler, besides being spiked to the cap, is held in place at the thick end by two 12-in. plates spiked in place.

Ordinarily, the feet of the posts will be carried by concrete piers put beneath the sills, but occasionally a timber grillage may be used. Where the trestle stands on a curve that is sharper than 1 deg., a continuous pier extending the whole length of the sill will be used. In order to protect the timber from dampness, all of the caps and stringers are covered with No. 26 galvanized iron that is lapped down over the vertical faces for 2 in. and nailed. For protection against fire, four ties are carried out 4 ft. beyond the guard timbers, at intervals, for the support of water barrels. It thus appears that though these trestles are considered as auxiliaries, the same provision has been made in their design as though they were to be permanent.

HIGHWAY CROSSINGS.

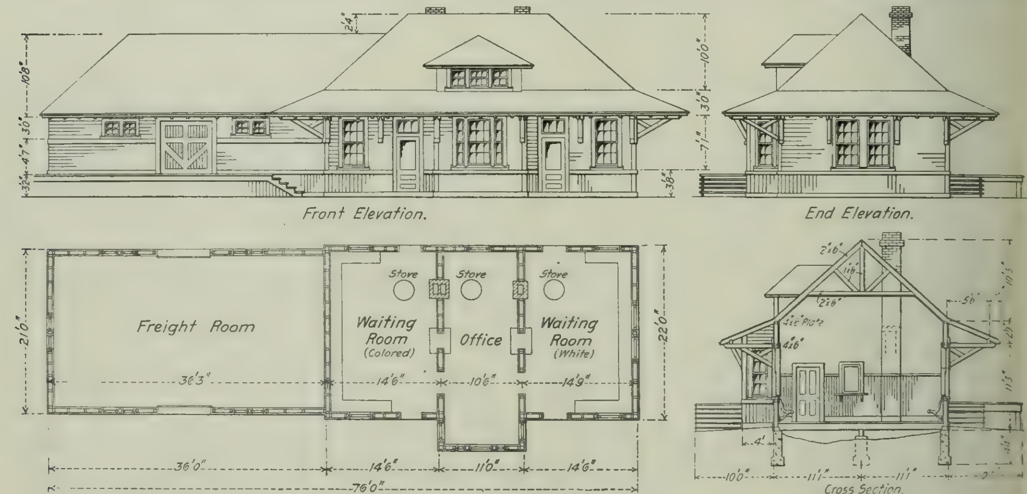
Closely allied to the bridges for carrying the road are those for the overhead highway crossing. In this construction it has first been taken into consideration that the country is new; the wagon roads are about as bad as they can be and still be passable, and the traffic upon them is correspondingly light. It is therefore unknown what the demands of the future may be, and it has been decided to await developments before erecting expensive bridges.

The first bridges of this character, therefore, that have been built have been of wood like those shown in the illustration. The design is exceedingly simple, and can be seen by a glance at the engraving. Attention is merely called to the liberal lateral clearance of 27 ft. between bents supporting the towers, and the height of 22 ft. 6 in. from the base of the rail to the clearance plane of the structure. With this overhead clearance there is no danger to a man on the top of the ordinary box car.

If, however, road traffic develops at any point so as to warrant the construction of a better structure, provision has been made for it in the designs of a standard steel overhead highway bridge. This bridge is for a span of 76 ft. 8 in., which is that corresponding to a clear height of 22 ft. 6 in. above the rail and spanning the distance between cut slopes of 1 to 1½. It is calculated for a dead load of 400 lbs. per lineal foot of truss, and a live load of 100 lbs. per sq. ft. of floor, with a roadway of 14 ft. in the clear. None of these bridges has been built as yet, and it is not likely that there will be for some time to come, until highway traffic finds itself.

STATIONS.

From the outline of the country that has been given, it is evident that there are no large towns upon the road. As it stands, it runs from the little village of Dante, Va., to the imperceptible one of Bostic, N. C., only touching one of any size at Johnson City, Tenn., a place of 6,000 inhabitants. Hence no provision need be made, at present at least, for any very elaborate station facilities. Yet it is necessary that there should be something, and at a number of points there are indications that a considerable traffic will be handled. In order to meet these conditions, a simple country station building has been designed. It is a frame structure 76 ft. long and 22 ft. wide. It has the usual separate racial waiting rooms of the South, each 14 ft. x 20 ft., with an office having a bay window and extending across the building between the two. These three rooms occupy 40 ft. of the length, and the remainder, 36 ft., is occupied by a freight room with wide doors at front and back. Along the three outside walls of the freight house there is an elevated platform for loading. The main building is 14 ft. high to the eaves and 24 ft. 3 in. to the ridge pole, and has an overhanging shelter around the passenger end of the station. It is simple in design and will probably be used at all small stations where it is found necessary to erect a building.



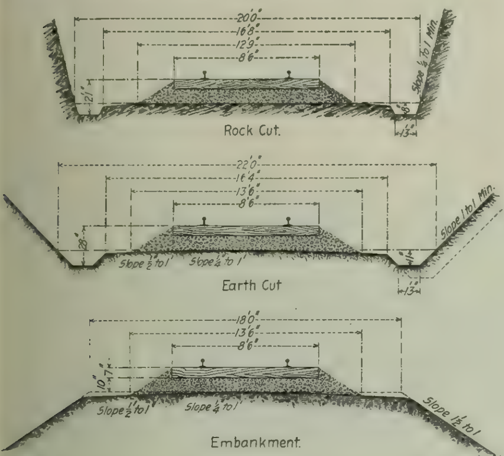
Standard 22 ft. x 76 ft. Combination Station.

TRACK.

In order to make such a road as that described efficient, a good track is of course a necessity, and this is being provided as rapidly as possible. The road is new, and the work of raising settled places in the fills, cleaning ditches and draining cuts is being pushed as rapidly as possible. At present there are five rock crushers (three main and two auxiliaries) at work, with a capacity of 1,500 cu. yds. of rock ballast per day, which is to be used for the whole length of the line, at the rate of about 1,000 cu. yds. to the mile for the first lift. In places where the cuts are wet and soft, a regular Telford construction is being put in; that is, large stones are laid upon the sub-grade to raise it to line, and finer stone on this for ballast to carry the track. The standard cross section of the track calls for a crowned roadway with a slope of ½ in. to 1 ft. from the ends to the ties to the edge of the berm with crowning slope of ¼ in. to 1 ft. from the ends of the

ties to the center of the track. There is 10 in. of stone ballast below the ties, and these are 7 in. thick. While the standard width of fills is 18 ft. at sub-grade all structures are designed for a corresponding roadbed width of 20 ft.

The rail weighs 85 lbs. to the yard, and is carried in the standard first-class track by 18 ties for a 33-ft. rail, whose



Standard Roadbed Sections for Single Track.

joints are staggered and of the suspended type, with Bonzano continuous and other forms of improved joints. For second-class track on spurs and sidings, only 16 ties are used for a 30-ft. rail, which in reality makes but little difference in the spacing, as compared with the first-class track.

For track laying, the instructions are to lay the heart side down and select the best ties for joints, and that in laying them there shall not be less than 6 in. between adjacent faces and that their ends on the west side of single track and the outside of all double track shall be in line. It is required that the spikes shall be driven vertically, not less than 2½ in. from the edge of the ties, and on the same side for all outside spikes and on the opposite side for the inside. For the rail-laying the following schedule has been adopted:

Allow	$\frac{5}{16}$	in.	open joints	for	temperature of	5°	below zero
"	¼	"	"	"	"	20°	above zero
"	$\frac{3}{16}$	"	"	"	"	45°	"
"	⅛	"	"	"	"	70°	"
"	$\frac{1}{16}$	"	"	"	"	95°	"
"	0	"	"	"	"	120°	"

Tie plates are used on all bridges and on all curves above 3 deg. The maximum superelevation allowed is 5 in., which corresponds to speeds of 30 and 40 miles an hour on 7 and 6 deg., respectively, although speeds of 35 and 45 miles per hour will be allowed. For sharper curves, the speed will be reduced to 30 miles. In this superelevation the grade line is maintained along the inner rail, and the superelevation obtained by raising the outer one. In case a permanent structure establishes the elevation of the outer rail, the same is maintained on the adjoining curved track. As all curves have a spiral approach at each end, the elevation at the point of the spiral is zero and increases proportionately with the spiral until the required elevation is reached at the point of the spiral curve. The spirals are laid out in accordance with Sullivan's tables, based on Crandall's formula using 35-ft. chords.

For the cuts and fills, a minimum slope of 1½ to 1 is prescribed, though in places the inclination is much less than this owing to the soft and flowing nature of the material. In the case of wet cuts, the ditches are being tiled, and in all cases an intercepting ditch is dug back of the crest of the cut to carry off the water and protect the slopes from wash and erosion. In this way the bed is kept dry, even in places that would otherwise be very wet. Where the road has been completed over settled or rock bed it is already in first-class shape for heavy traffic at high speeds.

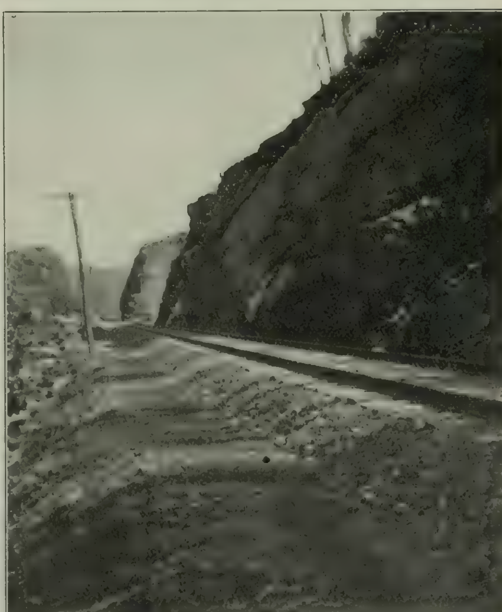
As the road is a single-track line and a traffic with long and heavy trains is expected, ample provision is made all along for passing sidings of the standard length of 4,400 ft., though in a few isolated instances the local conditions have been such that it has been advisable to depart from the standard and use shorter lengths.

FREIGHT CARS.

It is probably quite superfluous to say that on such a road as this the 50-ton capacity car is to be the standard and that it will be of steel. There will be four types of these cars: a flat, a flat bottom gondola with twin hoppers, a hopper bottom gondola, and a box car with steel underframing and wooden superstructure. In these, all of the underframings are built up of shapes, and no pressed steel sills are used at all. All cars have Schoen steel wheels.

The flat cars will have a length of 40 ft. and a width of 9 ft. over the sills, and will weigh, inclusive of trucks, 38,780 lbs. The flat bottom gondolas have the same length but are 7 in. wider and weigh 41,300 lbs. The hopper bottom gondolas are only 31 ft. 6 in. long; are 9 ft. 6 in. wide, and weigh 36,400 lbs. All are rated at 100,000 lbs. capacity, with the possibility of the usual 10 per cent. overload. The cars are of standard types and designs that have been used elsewhere and present no novel features of construction.

For passenger equipment the road has taken a stand with the most advanced. All baggage, express and postal cars will be of all-steel construction, while the passenger coaches will have steel underframes with wooden superstructure. Shapes and built-up sections will be used, to the exclusion of pressed


Track and Ballast.

shapes, the cars being built in accordance with the designs in use on the Pennsylvania Railroad.

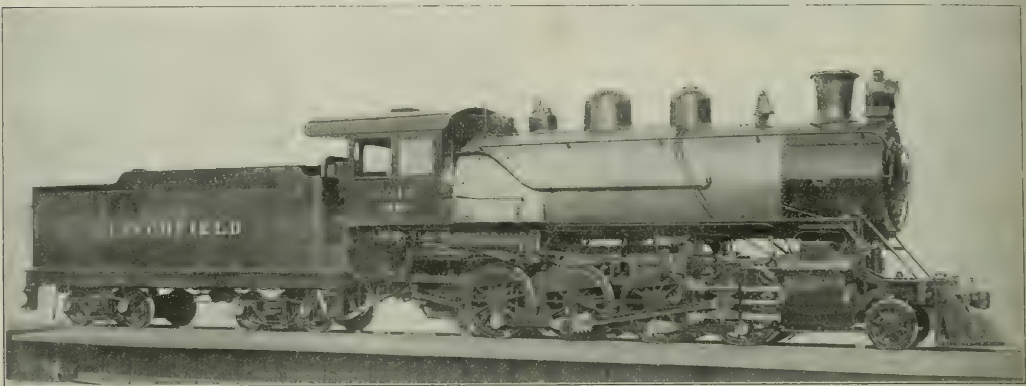
LOCOMOTIVES.

With a low-grade line for heavy traffic the motive power must also be in harmony therewith. At present the standard locomotives are 10-wheel and consolidations, the former for passenger and the latter for freight service. Those now being received, illustrations of which are given, are not intended as

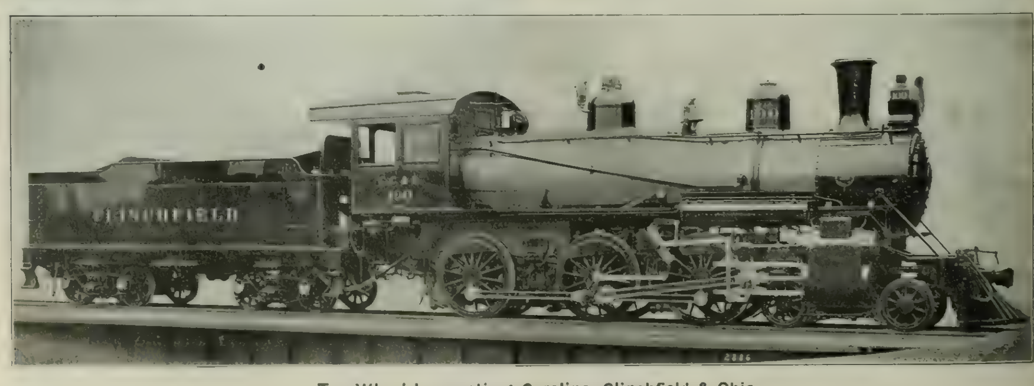
permanent standards, but are regarded as a light type that will be replaced by heavier ones as soon as the fills have settled and are capable of supporting heavier wheel loads. The present consolidations weigh nearly 200,000 lbs., of which 178,650 lbs. are upon the drivers. It was the intention to replace these by others similar to the old Bessemer engines, weighing 250,000 lbs., of which 225,000 lbs. are upon the drivers; but upon more mature consideration it is thought probable that Mallet articulated compounds will be used, similar to those built by the Baldwin Locomotive Works for the Great Northern Railway, which were illustrated in the *Railroad Age Gazette*, Dec. 18, 1908. One of these engines has been ordered for trial, and if it proves satisfactory for the long haul of about a hundred miles over the Blue Ridge, the type will be used for regular road service instead of the consolidations referred to. These engines will be duplicates of those built for the Great Northern, except that the diameter of the driving wheels will be increased from 55 in. to 57 in., and certain other details, such as driving and truck boxes, will be changed so as to be interchangeable with those of the engines already in hand. It is for this reason that the diameter of the drivers has been changed, as 57 in. is that adopted for the consolidations, and it is desired to have uniformity and interchangeability as far as possible. This same idea has been carried out in the designs of the 10-wheelers and consolidations, and as many parts as possible have been made interchangeable on the two types of locomotives. These include the injectors and all of the cab fixtures, the truck wheels, driving and truck boxes. The firebox is wide and is carried at the back by the usual buckle plate and rests at the front on a cast steel shoe that slides in a seat bolted to the frames. The engines are built with cast steel frames, and have the cylinders cast with half saddles. They are fitted with air bell ringers, the Westinghouse ET6 air-brake, and an 8½-in. cross compound pump. The front end is arranged to be self-cleaning.

The following are some of the principal dimensions of these engines:

	Consolidation 2-8-0.	10-Wheel 4-6-0.
Cylinder, diameter	22 in.	20 in.
Piston, stroke	32 "	26 "
Boiler, diameter	76¾ "	60 "
Boiler, thickness, sheets	11/16-in.	9/16 and ⅝-in.
Steam pressure	190 lbs.	190 lbs.
Firebox, length	108 3/16 in.	120 3/16 in.
" width	71¾ "	40 "
" depth, front	74½ "	73 "
" depth, back	65½ "	62 "
" thickness, sides and crown	⅜ "	⅜ "
" " back	5/16 "	5/16 "
" " tube	½ "	½ "
" water space, front	5 "	5 "
" water space, sides and back	4 "	4 "
Tubes, material	Steel	Steel
" thickness	11 in.	11 in.
" number	412 "	295 "
" diameter	2 "	2 "
" length	15 ft. 3 in.	15 ft. 3 in.
Heating surface, firebox	182 sq. ft.	174 sq. ft.
" " tubes	3,272 "	2,343 "
" " fire-brick tubes	28 "	...
" " total	3,482 "	2,517 "
Grate area	54 "	33.3 "
Wheels, diameter, driving	57 in.	63 in.
" " truck	33 "	33 "
" " tender	33 "	36 "
Journals, main driving	9½ in. x 13 in.	9 in. x 13 in.
" other driving	9 " x 13 "	9 " x 13 "
" truck	6½ " x 12 "	6½ " x 12 "
" tender	5½ " x 10 "	5½ " x 10 "
Wheel base, driving	16 ft.	15 ft.
" " total engine	24 " 6 in.	26 " 5 in.
" " engine and tender	56 " 9½ in.	59 " 8¾ in.



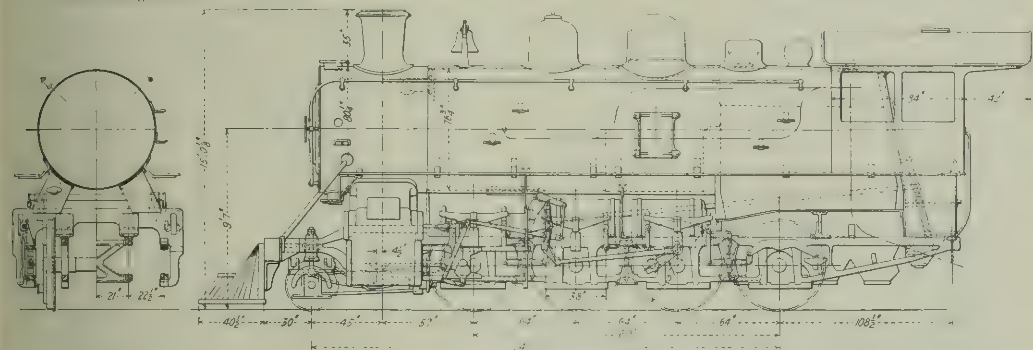
Consolidation Locomotive; Carolina, Clinchfield & Ohio.



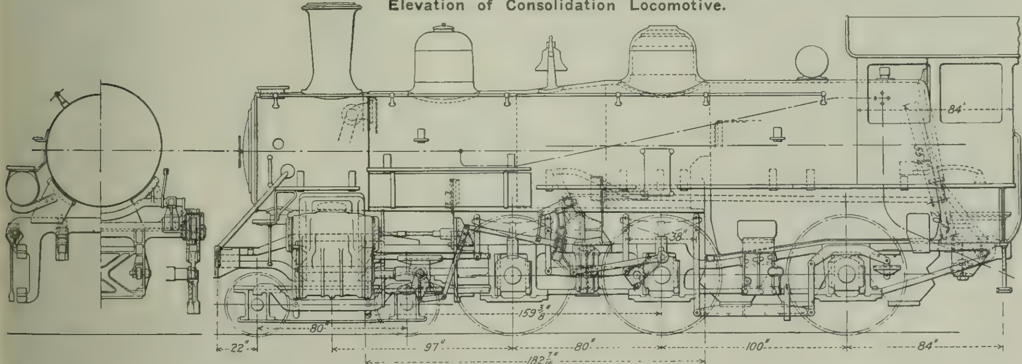
Ten-Wheel Locomotive; Carolina, Clinchfield & Ohio.

	Consolidation 2-8-0	10-wheel 4-6-0
Weight on driving wheels	178,650 lbs.	125,300 lbs.
" on truck wheels	20,500 "	38,300 "
" total engine	199,150 "	163,600 "
" engine and tender, about	350,000 "	284,000 "
Tank capacity, water	7,500 gals.	6,000 gals
Tank capacity, fuel	12½ tons.	12 tons.
Tractive effort	43,882 lbs.	26,660 lbs.
Weight on drivers / Total weight =	89.5*	76.6*
Weight on drivers / Tractive effort =	4.07	4.69
Total weight / Tractive effort =	4.54	6.13
Tractive effort x diameter drivers / Heating surface =	718.34	667.29
Heating surface / Grate area =	64.48	75.58
Firebox heating surface / Total heating surface =	5.22*	6.91*
Weight on drivers / Heating surface =	51.30	49.78
Total weight / Heating surface =	57.19	64.99
Displacement of 2 cylinders =	14.08 cu. ft.	9.45 cu. ft.
Heating surface / Displacement of 2 cylinders =	247.30	266.34
Grate area / Displacement of 2 cylinders =	3.83	3.52

*Per cent.



Elevation of Consolidation Locomotive.



Elevation of Ten-Wheel Locomotive.

SHOPS.

At present the facilities for shop and engine work are meager, but large shops are being erected at Erwin, and will be pushed to completion as rapidly as possible. In this connection attention is called to the large size of the turntables that are being installed. While the wheel base of the longest of the locomotives at present in service is less than 60 ft. and a 75-ft. turntable would be of ample length, provision is being made, not only to take the Mallet compounds that will be used and will have a wheel base of nearly 74 ft., but for future growth, and 100-ft. turntables will be used.

The table itself is of the usual plate girder design. It is supported on a central concrete pier 17 ft. square and carried down to firm earth. It is pyramidal in shape and is 6 ft. square at the top to receive the table center. In the foundation a 1-3-6 mixture is used which is changed to a 1-1-2 at the top.

The pit is paved with brick, and there is a steel curb at the edge. The wall is of 1-3-6 concrete, reinforced at the bottom with rails laid en grillage 6 in. apart. The curb is protected by 10-in. 35-lb. I beams and an inverted T rail is embedded in the concrete to give a firm bearing to the running rails.

WATER.

In connection with the locomotive work a great deal of pains is being exercised in the selection of the water to be used and the location of the tanks. Analyses are made of all waters that are considered and those are discarded that are impregnated with scale forming properties to any extent. This is possible to an extent in the south where the waters are pure, that could not be done elsewhere. Occasionally water is found that contains 18 or 19 grains of incrusting material to the gallon, but these are promptly discarded for others with less. Indeed, 7 grains of incrusting matter to the gallon is the worst that will be used, although it does not seem probable that it will be necessary to go as high as that. There are some analyses that show as low as 0.0816 grains of incrusting matter, and these, with those running up to about 4 grains, are the ones that will be used.

Owing to the hilly nature of the country these waters will, for the most part, be piped down from above so that the tanks will be fed by gravity and pumping stations be dispensed with. In one case, at the summit of the Blue Ridge, a very pure water has been obtained which contains only about one-half grain of incrusting matter to the gallon. This water will be piped down the side of the mountain for four miles to a tank

400 ft. below. This is the longest run on the road, but serves to indicate the pains that are being taken in all details to hold everything up to the high standard that has been set by the location and general construction.

TRAFFIC.

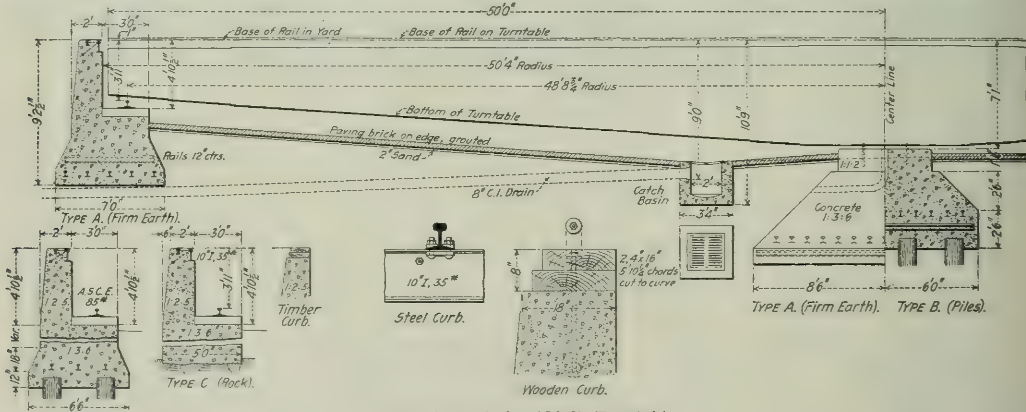
What are the prospects that this costly road, built from the small mining village in southwestern Virginia to Spartanburg, S. C., without a single large town *en route*, can be made to pay? And further, what inducements can be offered to extend it further to the north to Elkhorn City, Ky., on the Big Sandy river, to a connection with the C. & O. Railway, through a territory as heavy and difficult as any that has been traversed by the southern section?

The answer is "Coal." Careful investigations have been made during the past few years as to the coal consumption in the territory to which the road is tributary, and it has been found to be about 6,000,000 tons annually for the two Carolinas and as much more for Georgia and Florida. The rate of increase has been about 8 per cent. per annum and it is estimated that had transportation facilities from the coal fields been adequate this increase would have been at least 10 per cent. Up to the present the supply has come from the Alabama district, which is the nearest as well as from the eastern Tennessee mines and those of West Virginia. In the latter case, the coal goes east over the Norfolk & Western to Roanoke and then south to Winston-Salem for distribution further on, while the New river product goes east over the Chesapeake & Ohio to Lynchburg and Petersburg and thence south over the Atlantic Coast Line. From the Alabama fields there is the direct eastern connection to Savannah and Charleston. This appears like a strenuous competition until it is analyzed.

Suppose now, we take the actual distances to be hauled from the several assembling points in the different fields to the large centers of the South. Take Columbia, S. C., and Wilmington, N. C., as examples. From Bluefield, on the Norfolk & Western, to Columbia, via Roanoke, Winston-Salem, over the Southern and the Atlantic Coast Line, it is 420 and 498 miles to Columbia, S. C., and Wilmington, N. C., respectively. From Hinton, on the Chesapeake & Ohio, to Columbia, via Lynchburg and the Southern Railway and Wilmington via Richmond and the Atlantic Coast Line, it is 479 and 557 miles, respectively. Then from Birmingham to Columbia it is 405 miles. As against these figures, the Clinchfield route has 337 miles from Dante to Columbia and 476 miles to Wilmington. Therefore, if the quality of the coal is the same, the traffic balance should be in favor of the new line.

It is, of course, difficult to find a coal equal to or superior to that of the great Pocahontas seam, with its 7 per cent. of ash and 70 to 80 per cent., or even more, of fixed carbon, but comparatively little of this coal goes south, as the demand at the coast takes a large percentage of the output. The New river coal ranks next, with about 75 per cent. fixed carbon and 7 per cent. ash, while the Birmingham coal comes last in the list with 62 per cent. carbon and 8 per cent. ash, to which a high sulphur content must be added. The coal that the Clinchfield will carry into the south in competition with these, ranges from 62 per cent. carbon and 6.35 per cent. ash, in the Lower Banner seam, to 74 per cent. carbon and 3.5 per cent. ash in the Imboden seam, developing 14,631 and 15,576 British thermal units per pound, respectively. From this it appears that the coal is at least capable of holding its own with that now on the market.

With a good road and a good coal, it then remains to discuss the quantity in sight and the facilities for mining. The property is situated in Dickenson county in the southwest corner of Virginia, though Dante is in Russell county. The operating company, the Clinchfield Coal Corporation, owns about 250,000 acres, or practically a whole county. Its present yearly output is about 650,000 tons, which has been marketed for the past five years over the Clinch Valley division of the Norfolk & Western. Extensive improvements are being made upon the property. New openings in the outcrop are being made, tipples are being built, and the valley of Lick creek is being developed with extensive sidings and switchback approaches to the mines. It is the intention of the company to extend these facilities as rapidly as the work can be done, and it is hoped that by January 1, 1910, the output will be at the rate of 2,000,000 tons per year, and that this can steadily be increased until it amounts to from 6,000,000 to 10,000,000 tons. It is estimated that the seams on the property, now known to exist, contain at least 1,000,000,000 tons. This is deposited in six seams. The upper, known as the Edwards or Clintwood, ranges from 4 ft. to 9 ft. in thickness. About 400 ft. below this is the Upper Banner, from 3 ft. 10 in. to 9 ft. thick, with an average of about 5 ft. Below this by from 100 ft. to 140 ft. is the Lower Banner, averaging 4 ft. thick. Then 240 ft. lower comes the Widow Kennedy, a wavy seam, uncertain in the amount contained and having a thickness running from ¼ in. to 14 ft. These are all outcropping seams that are above the surface. About 200 ft. below the surface at Dante there is the Imboden, a high grade coal with a seam running from 4 ft. to 19 ft. and averaging about 6 ft. Then, last of all, and from 90 to 100 ft. lower, is the Jawbone, from 2 ft. to 6 ft. thick. All these seams have a dip to the northwest on an inclination of about 1 deg., in common with all of the other coals of the region. Below them all is the great Pocahontas seam, and it is estimated that if the thinning of the seam and the dip that is known to exist at Pocahontas on the Norfolk & Western, hold down to southwestern Virginia at the same rate, the seam exists at from 1,200 ft. to 1,300 ft. below the surface at Dante, and is there about 6 ft. thick. This is a surmise, and borings are to be made to determine its truth or



Standard Pit for 100-ft. Turntable.

falsity. If it is found, it will add many million tons to the quantity given above.

As these coals are new upon the market and are not yet well known, the following analyses are given as an indication of the quality.

	Upper Banner.	Lower Banner.	Widow Kennedy.	Imboden.
Moisture	1.16	2.00	2.25	1.02
Volatile combustible	31.39	29.12	25.22	21.05
Fixed carbon	63.22	62.53	65.22	74.76
Ash	4.23	6.35	7.31	3.17
Sulphur	.72	.82	1.51	.61

These analyses are good indications of the rise in the quality of coal as we go to the lower seams, because of the greater pressure and age, as well as the more thorough coking to which it has been subjected.

Not only is this coal well adapted to steam purposes but it cokes well and compares favorably with the Connellsville standard. In a recent report on the subject, Prof. Andrew S. McCreath said that after an examination of 48-hour cokes made in beehive ovens from Upper and Lower Banner coals, he found that the Upper Banner "is a bright, hard-bodied coke, equal in its physical properties to the standard Connellsville coke. In its cellular structure, from the freedom secured in the beehive oven, it is disposed to finger structure, with slight shattering conditions. The coke from the Lower Banner seam is somewhat firmer than its associate. Both cokes exhibit good coking work, especially in these 48-hour cokes. Both samples present the bright, silvery glaze which distinguishes the Connellsville standard variety. These cokes are equal to the standard in appearance. In physical properties they are nearly equal to the best Connellsville coke. In hardness of body, which is one of the principal requirements in blast furnace coke, they are equal to the best coke. Their cellular structure assures rapid combustion in the blast furnace. In sustaining the charges burden in blast furnace work, they approach very closely to the best standard and excel the Pocahontas variety. In chemical purity they stand between the Connellsville and the Pocahontas. The content of sulphur is very moderate."

The analyses of the four cokes under consideration are as follows:

	Connellsville.	Pocahontas.	Upper Banner.	Lower Banner.
Moisture	0.42	0.345	....	....
Volatile matter	0.80	0.341	1.735	1.886
Fixed carbon	87.46	92.694	87.711	87.407
Ash	11.32	5.882	9.660	10.095
Sulphur	.69	0.738	0.892	0.612
Phosphorus	.015	0.0063	....	....

"The general average will compare very favorably in physical and chemical properties, with the standard Connellsville and superior to the Pocahontas coke in physical properties."

This, in brief, is an outline of the sources and amount of traffic that this new road can expect to handle, in a direct southern coal trade, without any regard to the outlet to the north that will be effected as soon as the line is opened from Dante to Elkhorn City. When this has been accomplished, it is estimated that there will develop a large through merchandise traffic, which has been placed as high as $3,000 per mile per year.

PASSENGER TRAFFIC.

The local business will undoubtedly be light for some time, but when it is considered that this will be the shortest line between Cincinnati and points in North Carolina, South Carolina, Georgia and Florida, besides offering scenic attractions that are not equaled by any other route, it is a reasonable expectation that passenger traffic will eventually develop into considerable magnitude.

SUMMARY.

The Clinchfield line will originate the great bulk of its own traffic. It depends upon a commodity in constant and growing demand throughout the territory it serves, which it expects to handle successfully in competition with its neighbors, because its location is that of a first-class, low-grade modern railway capable of hauling a heavy tonnage in large units at a minimum cost.

THE WESTERN PACIFIC.*

BY P. S. HILDRETH.†

Any important railway construction develops new conditions and methods of meeting them which are of interest, and the Western Pacific, now approaching completion, is particularly worthy of note because of the initial high standard of construction work on which the entire line is being built. Probably no railway, before or since the West Shore, has originally been as well located and substantially constructed, and these methods are certainly new to western railway building. Exceptional study has been given to location to secure the best of what will permanently affect the success of the enterprise, including grade, alinement, ample facilities at terminals and conditions forming permanency of roadbed and assuring economy of operation.

ROUTE.

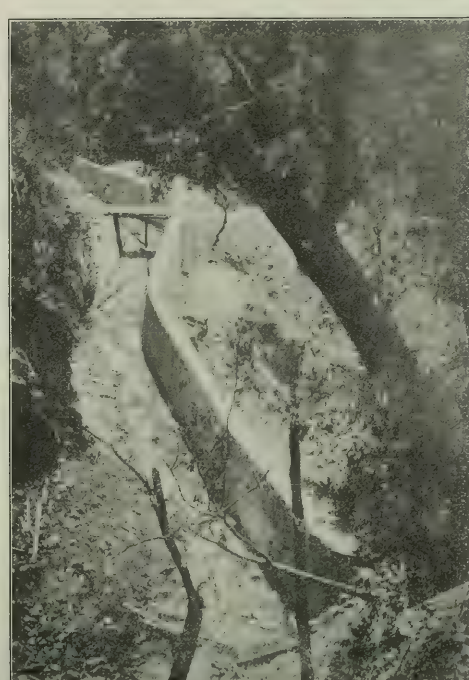
The Western Pacific is an extension of the Denver & Rio Grande System, west from Salt Lake City to San Francisco, 927 miles, connecting the Gould system with the Pacific Coast and the Orient. From San Francisco, its terminal on the west, ferry connects with Oakland (3.5 miles) from which the line runs southeast to Niles (29.6 miles) and then east through the Niles canyon and over the summit of the Coast range at Altamont (55.9 miles) to the crossing of the San Joaquin river, avoiding the tule beds and low land to the north; then due north in the valley of the Sacramento through Stockton (93.7 miles), Sacramento (138.5 miles), Marysville (179 miles) and up the Feather river valley to Oroville (204.9 miles). A few miles north of Oroville, the railway enters the canyon of the Feather river and begins the climb of the 1 per cent. grade, which is the maximum grade on the road and from Bloomer Siding (218.9 miles) is continuous for almost 100 miles. On entering Plumas county the direction changes to the east, following the North Fork of the Feather river and then the East Branch, Spanish creek and Spring Garden creek (293.7 miles) then crossing a divide through Spring Garden tunnel (297.2 miles) 7,306 feet long, to the valley of the Middle Fork. At Spring Garden tunnel, the elevation is 4,043 feet and for about 20 miles before reaching the tunnel and 30 miles thereafter several rich valleys in the Sierras are crossed. Just before reaching the tunnel, development work is necessary to maintain the 1 per cent. maximum grade. This is accomplished by a loop, known as Williams Loop. At Mile Post 314.4 the line crosses the Willow creek viaduct, the highest steel structure on the line, 175 feet high and 1,340 feet long. Four miles beyond is reached the head of the 1 per cent. grade (318.7 miles). Still running east the line crosses the Continental Divide at an elevation of 5,018 feet at Beckwourth Pass by the Beckwourth tunnel, 6,006 feet long (340.4 miles). Immediately after leaving this tunnel the line turns due north and runs to Honey Lake, then east again, crossing into Nevada, and northeast across Smoke Creek Desert, Granite Creek Desert and Black Rock Desert to Deep Hole (430.3 miles), then due east to Winnemucca (532.2 miles), where it reaches the valley of the Humboldt river adjacent to the Central Pacific Railway. From Winnemucca it follows the Humboldt river valley, in sight of the Central Pacific, to Wells (717.1 miles) then turns southeast to Flower Lake Pass, which is crossed through the Flower Lake Tunnel, 5,657 feet long (753.7 miles), then northeast to Silver Zone Pass, crossed by another ingenious development, where a horseshoe curve, five miles long, on a 1 per cent. grade, takes the place of what would, if a direct route were followed, be a 3 per cent. grade. Thence the line runs southeast to Wendover (806.7 miles) at the western edge of the Great Salt Desert. From Wendover the line is run

*An article dealing with the traffic conditions of the Western Pacific appeared in the *Railroad Age Gazette* September 11, 1908. In a later article, the standards of construction will be illustrated.

†Inspecting Engineer for the bankers.

Oakland Terminal, with Southern Pacific Terminals on Either Side.

West Portal of Smith Point Tunnel.
Short tunnel through shoulder of hill. Crib-work protection at foot of embankment.



Deflection of Stream.

Eagle Point.

on a tangent of 43 miles to Knolls (845.2 miles) on the east edge of the desert, then generally easterly to the southern end of Great Salt Lake near Grants (696.9 miles). It then crosses the lake in shallow water for seven miles and follows the shore of the lake to Garfield (913.2 miles) and thence directly east to Salt Lake City.

LOCATION.

The drainage of the Feather river was considered by Mr. Judah when locating the Central Pacific and he made an

Timber Lined Tunnel.

examination of the Middle Fork. The excessively heavy character of the work and the time necessary to construct undoubtedly led him to abandon such a route. In 1866, A. W. Keddie, for many years County Surveyor of Plumas county, and connected with the Western Pacific during location and construction as Assistant Engineer, made a reconnoissance down the canyons to Oroville for a wagon road from the Sierra valleys, which could be used in winter. He found that by following the North Fork he could get a low grade and that the snow line was above the bottom of the canyons, whereas on the Middle Fork there were two feet of snow. In 1869 a company, known as the Oroville & Virginia City Railroad, employed Mr. Keddie, and he made a location down the North Fork, getting a grade of 65 feet to the mile. This survey was being made at the time the Central Pacific was opened. In 1892 W. H. Kennedy, acting for the San Francisco & Great Salt Lake Railroad, conferred with Mr. Keddie and located a line down the North Fork on a grade of 1.36 per cent. Two of the present division engineers of the Western Pacific were in the party. The railway company abandoned the work, apparently because of lack of funds. In 1902 the Stockton & Beckwourth Pass Railroad, organized by San Francisco interests, employed Mr. Keddie as Chief Engineer; in 1903 he was succeeded by and associated with George L. Dillman, of San Francisco, and the railway company was consolidated with the San Francisco Terminal Company, under the name of the Western Pacific Railway. Mr. Dillman made a general location through to Salt Lake City and adopted a line north of the present route where the cost of construction was much less, but the maximum grade for a short distance was 2½ per cent. In 1905 Mr. Gould became interested and V. G. Bogue succeeded Mr. Dillman as Chief Engineer. The several branches of the Feather river were carefully investigated, and it was found that by following the main branch from Oroville to the junction of the Middle and North Forks, then the North Fork, East Branch, Spanish creek and Spring Garden creek and tunneling through the divide back to the Middle Fork it was possible to get a one per cent. maximum grade through the Sierras. Ingenious development was necessary, as previously noted, and also at Beckwourth and Flower Lake Tunnels, Sand Pass and other points. From Niles east through the Coast range the line is close to the old line of the Central Pacific, but higher, with more expensive construction, slightly better maximum grade and overhead crossings.

In the Humboldt river valley from Winnemucca to Wells, there is remarkable evidence of the value of careful study in location and of being last in the field in railway construction. The Central Pacific, which was reconstructed in 1904, is 193 miles long with five tunnels of a total length of 8,900 feet and 27 crossings of the Humboldt river. The Western Pacific, 185 miles, has a similar grade, except for one summit more, with rise and fall of 33 feet and an overhead crossing with a loss of 24.5 feet; the track is not undulatory, the curvature is slightly less; there are 5 tunnels, whose total length is 5,300 feet, and 24 pile bridge crossings of the Humboldt river. The line was originally 3 miles shorter than at present, but this distance was introduced to get well away from water. The study given to the location and number of lines run is

Interior of Unlined Tunnel.

evidenced by the fact that in calculating the length 72 equations in stationing have to be taken into consideration.

GRADES.

The condensed profile of the line was shown in the *Railroad Gazette* of April 12, 1907, and remains practically the same. The maximum grade is 53 feet to the mile. Eastbound, this occurs on 100 miles in the Sierras and two short stretches less than 8 miles each at Flower Lake Tunnel and Silver Zone Pass. Westbound, the maximum grade runs 30 miles getting up Silver Zone Pass, about 10 miles at Antelope Summit and

Berry Creek Trestle and Tunnel.

Looking East from Tunnel No. 6.

for 12 miles from the San Joaquin valley to Altamont. There are two important, three minor and four small summits eastbound, with a total ascent of 9,385 feet, and two important, three minor and three small summits westbound, with a total ascent of 5,076 feet.

ALINEMENT.

The maximum degree of curvature adopted is 10 degrees, compensated at the rate of .035 ft. per degree. All curves of 2 degrees and over are spiraled. Length of tangent between curves is not less than 200 feet. The total number of curves is 932; total length, 957,901.72 feet; total curvature, 30.275 degrees, 65¾ minutes. The average length of curve is 1,027.79 feet and average degree of curvature 3.09. The longest tangent is 42.63 miles. There are forty 10-degree curves; one hundred and thirty-seven 8 to 10 degrees, inclusive, and three hundred and fifty-six 5 to 10 degrees, inclusive. Of the maximum degree curves, thirty-eight occur in the Sierra mountains.

DIVISIONS.

The division points and the length of run between them are as follows:

Division Point.	Mile post.	Length of run, miles.
Oakland, Cal.	3.5	...
Stockton, Cal	93.7	90
Oroville, Cal.	204.9	111
Reposa, Cal.	321.6	117
Deep Hole, Nev.	430.0	108
Winnemucca, Nev.	532.0	102
Elko, Nev.	665.0	133
Wendover, Nev.	807.0	142
Salt Lake City, Utah	927.0	120

Shops will be located at Sacramento and Salt Lake City

The following table shows the number of summits, percentage and length of grades on the several divisions:

	Eastbound				Westbound			
		P. c. of grades—miles				P. c. of grades—miles		
	Summits.	1.0	0.8,	0.4, or less	Summits.	1.0	0.8,	0.4, or less
San Francisco to Stockton	2	8	30	55	2	19	0	72
Stockton to Oroville	0	0	0	111	0	0	0	111
Oroville to Reposa	1	100	0	17	0	0	0	117
Reposa to Deep Hole	2	1	0	107	2	4	18	85
Deep Hole to Winnemucca	1	0	13	89	1	7	0	95
Winnemucca to Elko	0	0	0	133	0	0	0	133
Elko to Wendover	2	15	0	125	2	41	0	101
Wendover to Salt Lake C.	1	0	8	112	1	0	9	111

SPECIFICATIONS.

The important features of the specifications, characteristic of the high class of construction, are as follows:

Grading.—Embankments are made of choice of material with large rock in the base of fills, coarser material on the sides and slopes and selected material on the top. Embankments without borrow pits are protected by bermes and ditches. Embankments on slopes are founded on steps cut into the slope and the toe of embankment is protected by large pieces of rock. Borrow pits are drained to leave no stagment pools. Riprap, slope walls or cribs are used to protect embankments subject to wash of water. In cuts, rock excavation is carried 12 in. below subgrade. Bermes of 20 ft. are required and side drains of large capacity.

Bridges.—Steel bridge structures are used for all important crossings. Forty are required on the road, their total length being 9,261 ft. The designs provide for a loading of two locomotives coupled, each weighing 177½ tons, followed by a uniform train load of 5,000 lbs. per lineal foot. Bridge piers are generally of concrete.

Wing Dam to Protect Embankment.

Tunnels.—The minimum width, inside, is 16 ft. and the larger tunnels are 17 ft. wide. They are 22½ ft. high above the surface of the subgrade, and are also cut 1 ft. below that point. The curve of arch is semi-circular, with springing line 14 ft. above subgrade. Tunnels are generally lined with timber and concrete used where necessary.

Cross Ties.—White cedar, Douglas fir, sugar pine or yellow pine; for the eastern and western ends of the line ties have been brought from Oregon and for the central portion from the section of the Sierra mountains adjacent to the railway. Ties are 8 ft. long, 7 in. thick and not less than 7 in. nor more than 12 in. wide.

Rails and Track Work.—Rails are 85-lb., A. S. C. E. section, furnished by the Colorado Fuel & Iron Co. A large proportion of them are of open hearth steel, intended particularly for use on grades and curves but also used elsewhere. Rails are 33 ft. long, and are laid with broken joints. Ties are spaced not more than 24 in. apart on centers, with selected ties under the rail joint and next to joint tie. Rails on curves

Roadbed of Solid Salt.
Track before being raised and finished.

Great Salt Lake Mud Desert.

are machine curved for all curves over 1 deg. On curves the outer rail is elevated 1 in. for curves of 1 deg. or less and at the rate of ½ in. for each additional degree of curvature up to 4 deg.; on curves of more than 4 deg. an additional spike is required on each tie at each rail and brace chairs are used as directed.

Ballast.—The entire line is ballasted with the most suitable material available and in many cases, where there is a choice of material, it is hauled up to about 50 miles. The minimum depth of ballast is 6 in. below the ties with an increase of depth depending on the character of material in subgrade and the kind of ballast available.

Sidings.—Lengths vary from 2,500 to 4,000 feet. They are laid with second-quality 85-lb. rails or carefully inspected second-hand 65-lb. rails from the Denver & Rio Grande.

WATER.

Whatever may be the facts as to the antagonism between alcohol and mankind in general, it is undoubtedly true that the engineers worst enemy is water. In the construction of the Western Pacific, the engineers have had to contend with water and with the lack of water under conditions some of which are unusual.

High Fill, Showing Circular Unloader.

Shortly after leaving Salt Lake City, the road follows close to the shore of Great Salt Lake and crosses the southern end of it by a fill in shallow water for about 7 miles. The grade is close to the lake surface and has been largely built with ballast train. The economy of a low bank can be appreciated when it is considered that for miles material could not be scraped by teams from the right of way or adjacent property to a depth of more than a few inches before striking water. The material available in the bottom land is fine sand and silt and is easily blown or washed from the banks; when wet it gives insecure support for a heavy rock fill. The water of Great Salt Lake is heavily saturated with salt and has a surprising effect upon earth or rock fills. The effect of the waves upon a heavy rock fill with earth on top is in evidence in the approaches of the Lucin cut-off of the Central Pacific, where settlement has been caused by undermining the large rock and by wash of both rock and earth. Some smaller stones, lying loose among larger, have been washed about until they have been rounded and largely worn away.

The problem of the Western Pacific was to secure a roadbed, without sacrifice of distance, that would wash or settle least and be sufficiently above water. This has been accomplished by broad, low banks which do not overload the underlying material, hastily thrown up at first to permit track to be laid and subsequently raised with coarse gravel and finer material for ballast. Slopes are riprapped where exposed to wave action. During the first winter (1906-7) the material of the hastily made banks was largely carried away by wind and the wash of rains and of shallow water. During the months of June and July, 1907, the water in Great Salt Lake rose nearly 5 ft. above the elevation in January, 1906. The banks were rapidly raised by gravel dumped from trains, and riprap was placed as quickly as possible. Although the water averaged less than 2 ft. in depth, there was constant wash and it was only after increasing the width of banks and coating the slopes with coarse gravel and riprap that wash was reduced to a minimum. This wash was not from heavy wave action in a considerable depth of water, but was from the water blown to the south end of the lake giving slight depth and the apparently insignificant action of waves probably not over 2 in. in height. The sub-grade was about 1 ft. above the lake surface in July, 1907, and is now 3 ft. above, or 2 ft. above maximum elevation.

About 100 miles west of Salt Lake City, the railway reaches the Great Salt Desert and crosses it on a tangent of 43 miles, more than 30 of which are on material of salt and earth which after rain becomes a mud comparable to the gumbo of Nebraska. Wild animals, cattle and at least one band of emigrants attempting the crossing have perished from fatigue and lack of water, having been unable to proceed or turn back. The problem was to construct without delay and to avoid settlement. Careful soundings has been made and an assured firm bottom found at a depth not exceeding 14 ft. below proposed grade. All material for banks had to be brought by train from the eastern edge of the desert. Planks were laid lengthwise of the track; on these, men stood and the ties were placed, then the rails. Loaded gravel cars were backed out on the track and dumped and the track raised. The completed banks are broad and low; the material coarse, with excellent finer gravel for ballast. No serious settlement has occurred and none is likely.

Toward the western edge, the great salt springs, which contribute largely to the characteristic salinity of the lake, serve the useful purpose of furnishing an excess of salt, making a hard subgrade. For eight miles the roadbed is on a bed of solid salt.

The lack of fresh water for locomotives was another problem. It is brought to the railway by a 6-in. pipe line 18 miles long from a mountain spring 800 ft. above and six miles south,

opposite Delle. Later it will be piped to the edge of the desert, about 25 miles further west. From the desert west the water supply is from driven wells or mountain springs; it is excellent but has been secured only after elaborate and expensive search.

In the valley of the Humboldt river, which the road reaches at Wells and follows to Winnemucca, there are 24 crossings. The choice of structure lay between pile trestles, economical, quick to construct but temporary, and steel structures, expensive, a source of delay but permanent. The former were chosen and the slight fall of the river, width of river bottom lands and corresponding sluggish current and minimum danger from ice and washouts make this choice a wise one. The roadbed itself is well above high water.

From Winnemucca to Beckwourth Pass, the summit and eastern edge of the Sierras, there are no problems from parapet walls when the time shall come. Where a high fill occurs over a waterway, the stream, if possible, is diverted and taken on either hill side in an artificial channel with flat slope, to beneath the track close to grade, thereby reducing the velocity of the current and avoiding the danger of damming and washout or scour of a culvert at the bottom of the fill. It also makes less expensive construction. Care is taken to make the bottom of the fill of large rock to allow water from the small adjacent drainage area to seep through. All slopes on the upper side of both cuts and fills are well protected by side ditches of ample capacity. Fills with toes in a stream are rip-rapped or protected with wing dams, and many channel changes have been made of streams to get the water away from too close quarters.

One of the most valuable features of the railway lies in its relation to snow. The moisture-laden winds of the

Electric Scraper at Work in Cut and Fill.

water except to secure an ample supply of fresh water. Just west of Beckwourth Pass the line enters Sierra Valley, the source of the Middle Fork of the Feather river, and except for a change to the North Fork it follows the waters of the Feather river to the Golden Gate.

Through the Sierras the problems of handling or avoiding water are those usual to railway construction in mountain country, except that the streams are more than usually subject to flash rises. The high water of April, 1907, the highest on record at many points, proved the general safety of the location of the line and gave valuable information as to desirable increasing of channel sections by blasting large boulders and projecting points. Crossings of large streams are by substantial steel bridges on concrete piers. Culverts are of hewn timber, as befits a timber country, and large enough to permit the placing of cast iron pipe and concrete

Pacific pass over the Sierras and give heavy snowfall, but east of them it is not considerable. In the valleys of the Sierras the depth of snow varies according to elevation and locality, the latter undoubtedly due to the effect of adjacent mountain peaks on the moisture-laden winds. The Western Pacific has its summit at Beckwourth Pass at the extraordinarily low elevation of 5,018 ft. and thereafter runs in a zone exceptionally free from snow. Not only are these natural conditions extremely favorable, but the line has been, generally, located on the northern or sunny side of the slopes of the valleys. As a result, the depth of snow on that portion of the line in the Sierras will rarely exceed 2 ft. for about 50 miles and will be taken care of by a single snow plow, which for frequent winters will not be used at all. There are no snow sheds, and maintenance charges due to snow will be a minimum. At the summit of the Central

Pacific the average maximum depth of snow exceeds 20 ft., and 40 miles of snow sheds are required.

Following the turbulent waters of the Feather river, the line reaches the edge of the Sacramento valley at Oroville, and to a point beyond Stockton runs almost due south in a flood country crossing the tributaries to the Sacramento from the east by long bridge structures. A grade line well above the surrounding country and frequent openings, in size based liberally upon experience, are the features. Slopes adjacent to openings are rip-rapped. Cement pipes with concrete parapet walls are used for small openings; pile trestles or beams on small concrete piers for those of moderate size, and steel spans for the more important crossings. It is a practice established by the Southern Pacific to construct the piers of larger bridges of piles heavily planked. The Western Pacific avoids the tule swamps, which are crossed by both the Southern Pacific and Santa Fe and have been a source of much difficulty in maintenance because of settlement and creeping track.

Marysville, Sacramento and Stockton are in the low lands of the Sacramento valley and in flood season are protected by levees. Stockton offers no serious difficulty for a railway entrance, but Marysville apparently necessitated either heavy grading, overhead street crossings and yards outside the city or station grounds, with a grade each way and complications regarding street crossings. The difficulty was avoided by using the west levee and grading yards adjacent to the center of the city by borrowing dredged material from the Yuba river. At Sacramento the Central Pacific main line occupies the levee on the north, and a grade crossing and elevated tracks across the city were undesirable. On the south the ground is higher, the levee is crossed at grade and the line rises from the level of the city streets. At the Central Pacific tracks the Western Pacific has built an undercrossing from which, to the north, the line rises to a second levee on the banks of the American river and the bridge crossing. The levee at this point was raised and side levees carried south to the main levee. As an additional precaution against flooding the city, heavy gates, designed to keep out the water, are built as a part of the undercrossing. In January, 1909, these saved the city from flood.

In San Francisco bay the waters are infested with the teredo. All dock and bulkhead work is of timber impregnated with 12 pounds of creosote oil to the cubic foot. The Oakland shore has a gradual slope and has necessitated constructing terminal grounds, comprising 359 acres, for a distance of two miles from the shore line. Material has been pumped by dredges and retained by an existing government wall on the south and by bulkheads.

CONTRACTORS' METHODS.

The Utah Construction Co., Ogden, Utah, have several contracts for grading, covering that portion of line from Salt Lake City to Oróville, Cal., about 725 miles. Its methods of handling the work have been on old-fashioned lines, but with well equipped camps, ample supplies and a large mechanical outfit. Its stock has been sturdy, well taken care of and well fed. Exceptionally good management has been shown in keeping camps well supplied with good food and water, and this has been no small undertaking for work on the desert and in the canyons. In the canyon of the Feather river a wagon road for hauling supplies was constructed in advance of railway construction and at an expenditure of nearly $500,000.

In the spring of 1907, Oroville was flooded and cut off from railway connection for 10 days. This construction company opened its storehouse for the supply of the citizens, somewhat to its own inconvenience and loss. On the work it has had steam shovels and a large supply of simpler mechanical equipment, but has not gone into any elaborate new methods of doing work. One of its sub-contractors undertook to make a large cut and fill by hydraulic methods. He was successful in so doing, until the work was stopped by the Government Debris Commission because of some real or fancied waste of material to the river. The debris laws forbid hydraulic mining or deposit of material in any tributary of San Francisco bay.

The E. B. & A. L. Stone Co., San Francisco, had the contract for grading between Oakland and Oroville and made use of several ingenious methods of handling earth. A scraper, hauled by cable and electric power, was installed in one of the large cuts near Altamont but did not prove entirely successful because of frequent breakdowns and was finally abandoned. On another large fill a device known as the merry-go-round was installed at the end of the fill. It consisted of a revolving table with tracks upon which dump cars were backed and from which material was distributed over a wide area and in advance of the solid bank, thereby avoiding the use of trestle.

The Western States Construction Co. has the contract for a tunnel in San Francisco and constructing embankment between the east end of the tunnel and the freight slip at the water front over soft ground. The length of fill between streets was 250 ft. with grade 35 ft. above the mud flat. It was necessary to first fill with rock, and in some places this sank to a depth exceeding 30 ft. in the mud. The use of a temporary trestle was not feasible and suspension cables 2 in. in diameter were strung over the length of the fill to support a temporary track from which material could be dumped to make the fill. The temporary track, about 50 ft. in length, with supporting timbers, was hung from the cables and rested on the finished dump at the inner end. It was moved forward as the material was placed, thereby avoiding the use of trestle.

Track laying was done by the railway forces, and track-laying machines were used when any considerable length could be laid continuously. Over a mile of track per day was frequently laid; the best record was 7,800 ft., between Sacramento and San Francisco.

On March 1, 1909, 60 per cent. of track had been laid; 90 per cent. of grading done; 28 out of 42 tunnels completed, and all others nearly completed; and 24 out of 40 bridges erected. The portion of the line from Salt Lake City to Shafter, 160 miles, is in operation with trains three times a week, and from Marysville, Cal., to Berry Creek, 46 miles, with daily service. It is expected that the entire line will be in operation by the fall.

INCREASED EXPENSES ALL OVER EUROPE.

The *Journal* of the German Railroad Union, reviewing the year 1908, remarks that all over Europe railway earnings have tended to decrease, while working expenses increased. Up to that year the increase in working expenses was due chiefly to higher prices for supplies, especially coal and iron. In 1908 higher wages was the chief cause. The rapid increase in traffic for some years previous had compelled important increases in the number of employees, and the general prosperity an increase in wages. A very large part of these employees form a permanent corps, not discharged whatever the condition of traffic, and with rates of pay intended to be permanent. Under these circumstances the percentage of earnings absorbed by working expenses has been larger than ever before, approximating the proportions with which we have long been familiar in America.

The Austrian state railway authorities have drawn up a scheme for higher rates, expected to add about $1,000,000 annually to passenger and $7,000,000 to freight earnings. The state has recently acquired important private railways whose rates were higher than the state railway rates, and the application of the proposed new rates will leave them somewhat lower than the old company rates, but will advance charges on the old State stystem.

BUSH TRAIN SHED AT SCRANTON.

The accompanying photographs show the train shed at the new Scranton, Pa., station of the Delaware, Lackawanna & Western. A general description of this station appeared in the *Railroad Age Gazette* of November 13, 1908. This is the second shed of this kind erected under the designs of Lincoln Bush, until recently Chief Engineer of the Lackawanna, and now a consulting engineer, with office at 1 Madison avenue, New York. The first one, that at the Hoboken, N. J., terminal of the road, was described in *The Railway Age* of August 25, 1905; the *Railroad Gazette* of September 1, 1905; and *The Railway Age* of May 29, 1908.

The Bush train shed consists of longitudinal units meeting over the tracks so as to make a continuous structure, except for the narrow openings, or smoke ducts, over the locomotive stacks. The roof is supported on longitudinal rows of columns, 27 ft. apart on centers, resting in the reinforced concrete platforms. The transverse main rafters are continuous between the columns and form the only breaks in the con-

End View of Bush Train Shed, Scranton.

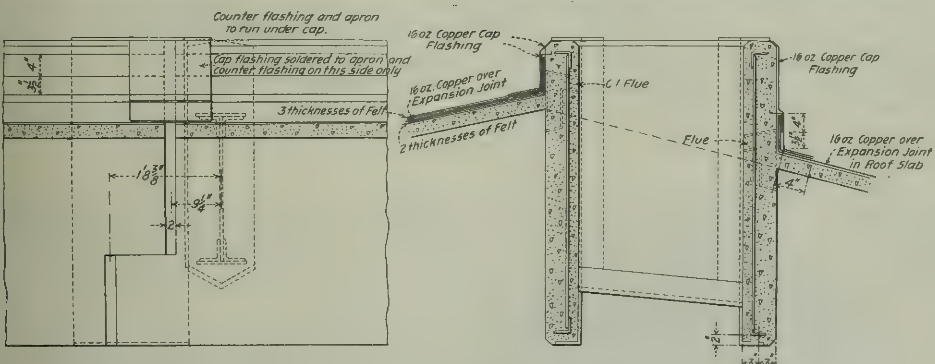
Bush Train Shed at Scranton.

tinuity of the openings over the smokestacks. The vertical clearance from the top of the rail to the underside of these main rafters at center line of track is 16 ft. 6 in. Framed to these rafters are longitudinal purlins which support the reinforced concrete roof slabs and the skylights. Between the columns are longitudinal girders supporting the inner ends of the intermediate rafters, whose outer ends are riveted to the framework of the smoke duct purlins. This framework consists of a pair of light, latticed purlins.

Side View of Bush Train Shed, Scranton.

The longitudinal girder between the columns is built up of two channels and a plate, forming a trough, which is lined and sloped with concrete with a surface finish of copper and serves as a rain-water gutter. The girder is braced at the columns with gusset plate and angles, built up with a curved flange corresponding to that of the main rafters, so that the four members spring away from each column on harmonious lines. The columns are of cast iron and the roof framework of wrought steel. The weight of the metal complete per square foot of shed area, including columns and anchor bolts, is 20.09 lbs. The roof slabs are of concrete, 2½ in. thick, reinforced with 3-in. No. 10 expanded metal, the finished surface being four-ply slag.

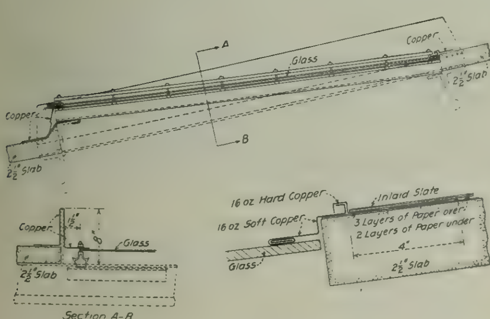
The steel framework of the smoke ducts and the main rafters where they pass through the smoke ducts are encased in concrete. This concrete casing is reinforced with expanded metal. At the ends of the shed, and at cornices along the two sides of the shed, all metal work is encased in concrete, as shown in the photographs. The sides of the ducts are high enough to prevent driving rain or snow from reaching the platforms. The longitudinal gutters mentioned above are drained by leader pipes running down inside every other supporting column, where they connect with drains under the platforms. The air space between the inside of the columns and the outside of the drain pipes insulates them from freezing, and the drain pipes are not exposed, adding to the appearance of the shed and eliminating possible damage to drain pipes from baggage trucks. The electric lights are arranged in longitudinal lines between the columns. The arc lights visible in the accompanying photographs were installed for temporary use only. In day time, ample light reaches the interior through the skylights and the smoke ducts. In the



Details of Smoke Duct.

Hoboken shed, the combined area of skylights and smoke ducts is about half the total area of the shed.

The main advantages of these sheds are: first, the original cost is much less, being about 40 per cent. less than the cost of a high-roofed shed in the case of a large terminal; second, cost of maintenance is very much less; third, there is more light; and, fourth, there is no smoke or gas inside the shed and much less noise. One of the large items of saving is in maintenance cost of painting. The steel work is never exposed to engine gases and smoke. At the smoke ducts, where it would be in contact with these gases, it is protected by concrete. The accompanying drawing shows the details of the smoke duct construction. In the walls of the duct immediately under roof slab are small flues which allow any gases which might get behind the smoke duct, or any heated air rising from the platform level, to escape to the duct and thence to the open air. When paint is required, high scaffolding is not needed, which means a further saving. Aside from



Details of Skylight.

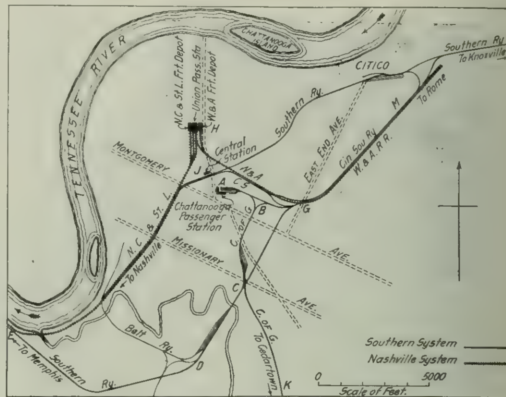
material, there is saving in the first cost of the shed because of the ease of erection. Everything can be handled by derrick cars, doing away with false work, and the work is easily carried on without interference with traffic or inconvenience to the public.

As the accompanying photographs show, there are skylights on each side of the smoke ducts, admitting light directly to the windows of the cars on the track below. They are Anti-Pluvius skylights, made by the G. Drouve Co., Bridgeport, Conn. They are laid in units. The frame of the skylight is a ⅛-in. channel on which, at intervals of 18 to 20 in., are fastened malleable iron bridges or stirrups. These support flat iron bars with elongated holes engaging brass studs screwed into the stirrups. The glass plates rest on sheet metal guides, strips of cow hair felt being laid between the glass and the guides as cushions, while on top of the glass are corresponding strips of felt, held in place by sheet metal guides. No putty or cement is used. An accompanying drawing shows the details of the skylight construction and the copper flashing which protects the joints. Three-eighth inch glass is used, made by the Mississippi Wire Glass Co., New York. In the Hoboken shed, sheets of glass 27 in. x 86 in. were used. These proved to be rather too large, a number of them cracking, although this is not as serious as would be the case if plain glass were used, as the wire reinforcement holds the glass together and there is no leakage. In the Scranton shed, the sizes were cut down to 20 in. x 60 in., which is now believed to be the best size for skylight work. This size will also be used in the skylights which are going to be installed in the Bush train shed of the new Chicago & North Western passenger terminal at Chicago. In other respects, the skylights in the Scranton shed are nearly the same as those in the Hoboken shed, except that their area is not so large in proportion to the total roof area, the shed being narrower and entirely open on one side. In the Hoboken shed, side lights of similar material are used. The roof of the Bush shed is accessible for painting, cleaning or removal of snow. In the Hoboken shed, however, this has not been necessary, dirt and smoke not accumulating on the glass. In the winter of 1906-1907, although there were four heavy snowstorms, no snow was shoveled from the roof or skylights. Light penetrates a moderately thick layer of snow lying on the skylights. In one case, with 10½ in. of snow on the shed good and ample light came through the smoke ducts. Although there were high winds during this storm, not more than ⅜ in. of snow reached any of the platforms. If snow is removed from the roof, it may conveniently be shoveled through the smoke ducts into gondola cars beneath.

CHATTANOOGA PASSENGER TERMINAL STATION.

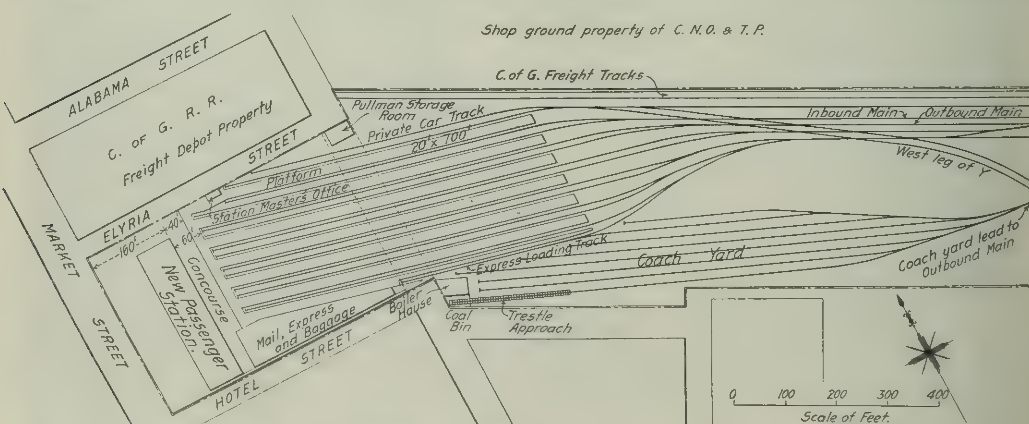
The new terminal station of the Chattanooga Station Company will care for the passenger trains and traffic at Chattanooga, Tenn., of the Southern Railway, the Central of Georgia, the Cincinnati, New Orleans & Texas Pacific, and the Alabama Great Southern.

The station building is essentially a useful, straightforward and clean-cut structure, easy and economical of maintenance, with no waste spaces. There is no attempt at extravagance or overloading of any kind, either in ornamentation or color. The exterior is harmonious and interesting in color and design, big and simple in scale, original in treatment and has a strong individuality and character.



Location of Chattanooga Passenger Station.

In planning the terminal, it was designed primarily to suit the uses of the average individual, giving him every possible convenience and comfort that he has a right to expect, and then to make the building sufficient for the uses of a great number of people by simply increasing each service to the capacity required. The majority of people using a railway station are strangers. A stranger departing from a town goes to the station and on arriving at the building the first thing that occurs to him is how to get into the building, and then how much time he has to catch his train. Therefore the most important and unmistakable features of a station facade



Layout of Chattanooga Passenger Station Buildings and Tracks.

should be a door and a clock. In a large building, where many door and window openings are necessary, the entrance should be so clearly marked that there could be no question whatever, in the mind of a stranger, where the door is through which he must enter.

The accompanying photograph of the facade of the Chattanooga station shows that there could be very little question as to where the main entrance is, it being in the center, projecting beyond the main wall and being the largest opening of the facade. It is, moreover, of such dimensions that the stranger would be instinctively drawn to this entrance. In the center of this large opening, over the doors, is to be a clock, so that once one starts to enter the station he will do so naturally and at the same time be able to see how much time he has before his train leaves.

Main Entrance.

When he enters through the outer door he finds himself at once in a large, light, so-called waiting room. In the case of the Chattanooga station this name is badly applied, as the large central dome-covered room is in reality little more than an ample passageway to the trains, around which are disposed, plainly visible, all the services that might be necessary to the man taking a train. This latter point is a most important point in planning a building of this type, as a stranger should not have to be directed by signs and guides to the natural and usual services. On entering the waiting room, he can see at a glance the ticket office, telephone and telegraph offices, the entrance to the lunch room, paper and magazine stand, fruit and cigar stand, smoking room, which is really the waiting room for men, the ladies' retiring room and the information bureau, while straight in front of him he finds the same size doors as the ones he has entered, leading to the concourse and trains. All this service, therefore, becomes quick and easy of access, and he can go to one or more of them directly and without loss of time. The fact that a man has use for a waiting room and smoking room in the station, presupposes a certain amount of time at his disposal. On entering the smoking room, he finds the same sequence of special services, barber shop and other conveniences provided for him. The ladies' waiting room is provided for in a quiet corner of the building, leading out of the main room, but away from the noise of trains and confusion of the station service, and providing a reasonable and comfortable spot in case waiting becomes a necessity.

Refreshment service, both lunch and dining room, are arranged so as to be accessible from the town side, directly from the station itself and from the concourse. This latter access is provided for people who might be coming in on one train and going out on another, and wishing to take a meal at the station between trains. Passengers can go directly to the dining room from the concourse and go back to the train without having to go through the station proper, thereby avoiding the confusion of arriving and departing passengers.

Negroes are provided with the same simple, direct and logical scheme of service; their department has been also so planned that no signs or guides are necessary to direct them where to go for what they want.

In close connection with the general waiting room service, the outgoing baggage room is so arranged that a person can enter the waiting room, buy a ticket and check his baggage and get on the train, his progress being more or less in the same line and direction, thereby saving time and complication. The gates to the trains are numbered, and there only are signs to be found, these being necessary, as several trains, of course, use the same tracks at different times of the day and night.

Chattanooga Passenger Terminal Station.

The incoming passenger wants to get out of the station as quickly, as directly and with as little trouble as possible. Platforms from the incoming trains lead to the main concourse, and from this main concourse the incoming passengers can go directly to the street, to the cab stand and hotel

busses without having to go through the station proper. Incoming baggage is taken care of in a room opening off the concourse. The cab stand, etc., is at the end of the concourse.

Quite apart from the passenger service, and still directly accessible to the tracks, as well as to the street, are the United States mail department and the Southern Express building. Also centrally located, in a small separate building, are the station master's quarters and the railway telegraph department. All the buildings are heated and served from a separated and isolated power plant building, which, although the station is fireproof in every way, takes the boiler and machinery equipment, and other possibly dangerous features, out of the building proper, thereby minimizing the fire and accident risk.

The following are some of the general dimensions of the important rooms and services:

Main waiting room	68 ft. x 82 ft.
Men's smoking room	34 " x 42 "
Ladies' retiring room	26 " x 40 "
Lunch room	24 " x 72 "
Dining room	38 " x 42 "
Main concourse	60 " x 310 "
Ticket office	21 " x 40 "
Baggage room	60 " x 80 "
Mail room	48 " x 75 "

The accompanying map shows the location of the new terminal with respect to the various railways entering the city. The new passenger station is at "A." It is an end station, and the trains of the Southern and the C., N., O. & T. P. from the north and northeast will enter over the lines of the C., N., O. & T. P. at East End avenue (M. G. on the map), while trains from the south and southwest will enter over lines of the Central of Georgia (K. C. B.) and the new lines of the Southern and the Alabama Great Southern (F. E. D.).

Concourse.

No freight trains will enter the new station, this being strictly a passenger station. At the point "C" (crossing of the Central of Georgia by the Belt Railway) freight trains

Main Waiting Room; Chattanooga Station.

will continue on the Belt Railway from "C" to "G" and connect with the C., N. O. & T. P. at East End avenue. Passenger trains will take the Central of Georgia from "C" to "B" and enter the passenger station at "A.

To facilitate the movement of trains within the yards of the station company and to enable all trains to back into the station, the double track main leads are arranged in a Y, about 1,800 ft. east of the concourse of the main building. There are 14 tracks entering the station, and there is an eight-track coach yard south of the passenger tracks, with a capacity for storing about 65 coaches.

There are six individual sheds, of the butterfly canopy type, each 700 ft. long, and six concrete and granolithic platforms 20 ft wide. A concrete platform runs from the concourse along the baggage, mail and express departments and terminates at the east end of the passenger sheds. This platform is for handling or trucking baggage and express matter. The west leg of the Y runs through to the north side of the platforms

Skylights, Roofing and Train Sheds.

and forms a ladder track with a series of double and single slip switches from which any track leading into the station may be reached. In each lead to the Y there are two tracks, No. 1 being an inbound track and No. 2 an outbound track.

The whole system of tracks composing the Y, the leads thereto, and the double and single slips are controlled by all electric interlocking from a brick tower two stories high, situated within the Y, from which tower every switch and signal is visible. The frame in the tower contains 105 working levers, with 11 spare spaces. The power is furnished by a 3-h.p. motor generator, and there are 57 storage battery cells. The signals are semaphores on iron posts. The interlocking includes insulated track joints and electric lighting of signals. Wooden trunking is used for conduits.

The general layout for the yards and tracks is shown on the accompanying plan. The west leg of the Y is a 10-deg. curve and the east leg about 13 deg. The station tracks are laid with 80-lb. rail, and the Central of Georgia freight tracks with 70-lb. rail. The coach yard is laid with 60-lb. rail and stiff No. 7 frogs. For the station tracks, No. 8 spring-rail frogs are used on turnouts, and the slip switches have movable switch points.

Electric current for the station building is furnished by the city. The power house for heating was built by George Becking, Chattanooga, who was also the contractor for the train sheds. The heating and lighting was laid out by Henry G. Meyer. The Black & Boyd Manufacturing Co., New York, furnished the lighting fixtures, and the J. Livingston, Jr., Co. handled the electric wiring. The plumbing fixtures were from the John Douglas Co., Cincinnati, Ohio. The Eastern Granite Roofing Co., New York, supplied the roofing; it was laid by J. C. McFarland & Co., New York, who also made and put in the sheet metal work and skylights. The hardware came from the Yale & Towne Manufacturing Co., New York, and the interior finish from the Batavia & New York Woodworking Co. The General Railway Signal Co., Rochester, N. Y., furnished the signals.

We are indebted for the above description to Fairfax Harrison, President of the Chattanooga Station Co., to Donn Barber, Architect, and to William D. Jenkins, Engineer in Charge.

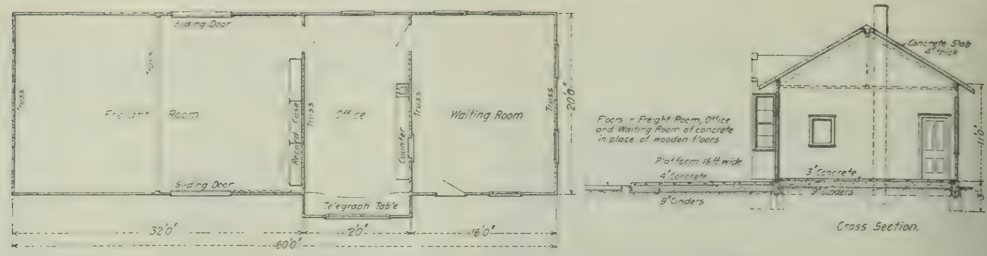
SMALL FIREPROOF PASSENGER STATIONS ON THE WABASH.

The Wabash Railroad has been building at various points on its line small stations of fireproof construction to take the place of wooden buildings. The first was built at Manhattan, Ill., not far from Chicago. The framework is steel with

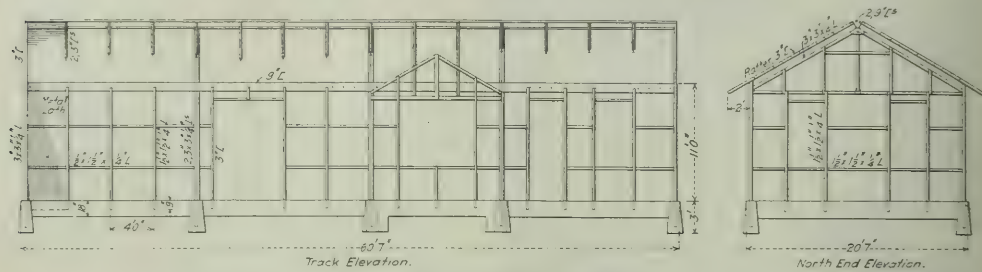
Fireproof Station for the Wabash at O'Fallon, Mo.

"Trussit" lath attached thereto, on which is plastered a wall 3 in. thick. The roof is made in similar manner, without using forms, but is 4 in. thick. This station is as nearly fireproof as it can be made, and for this reason the ceiling follows the contour of the roof. The floor is concrete. Alternate floor plans were put on the drawings, one being wood laid on cinders; but concrete was used in this building as well as in another of the same style at Sullivan, Ill. The cost of these stations, with the platforms, was around $2,000 apiece.

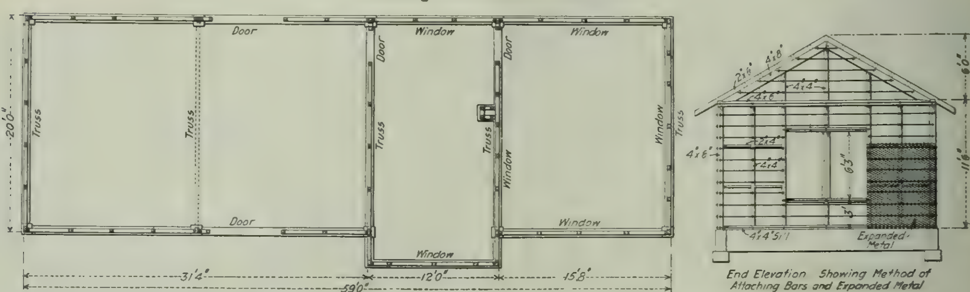
This cost was thought too great for small-town stations such as these and it was therefore decided to try another design having a wooden framework. Drawings of this are shown also. Three of this design have been built, at O'Fallon and Jameson, Mo., and Milan, Mich. Expanded metal is attached to ½-in. round iron bars secured to the studs of the building



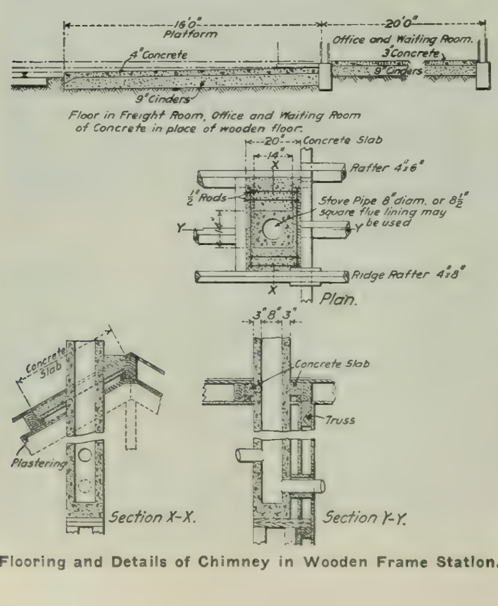
Plan and Cross Section; Manhattan Station of the Wabash.



Framing of Manhattan Station.



Wabash Fireproof Station with Wooden Framework.



Flooring and Details of Chimney in Wooden Frame Station.

both inside and out and plastered, the outer wall being 1½ in. thick, plastered on both sides of the expanded metal, and the inner wall 1 in. thick, plastered on one side. The ceiling is attached to the under side of the roof purlins, thus leaving no vacant space between ceiling and roof. This construction is practically fireproof.

Special attention was given to the chimney. It is made of concrete, with either a stove pipe lining or a tile flue. Where the chimney passes through the roof there is a concrete slab. A common cause of fire—faulty chimney construction and inadequate protection at ceiling and roof—is avoided by these precautions. These stations also have the concrete floors overlaying cinders, instead of wood. These stations cost about $1,500 each, or about the same as a frame station of the same size They present a pleasing appearance, both inside and out, are substantial, and the maintenance charges should be low.

We are indebted to A. O. Cunningham, Chief Engineer, for the foregoing data.

A number of the Chinese railways, by their charters, are privileged to import railway materials free of duty. The other companies have, for the most part, obtained a similar privilege by administrative decree. It has now been decided that these latter may enjoy this privilege only for three years. The others have it permanently by contract. This will affect chiefly lines not yet built.

ANNUAL MAINTENANCE OF WAY CONVENTION.

The first session of the tenth annual convention of the American Railway Engineering and Maintenance of Way Association was called to order at 10 o'clock a. m. on Tuesday, March 16, at Chicago, by the president, William McNab, Principal Assistant Engineer of the Grand Trunk Railway.

The minutes of the last meeting were adopted without reading and the president then delivered his annual address.

President's Address.

Your association has completed a decade of active work, and during that period has made an enviable record, and now occupies a prominent position in the front rank of railway organizations and engineering societies.

The advantage gained by this status turns on the beneficial influence it exerts in connection with the objects of the association — the advancement of knowledge pertaining to the scientific and economical location, construction, operation and maintenance of railways—an influence which has been imparted to the railway world in a degree of usefulness, universal in its scope and almost unparalleled in its import. This feature should be especially gratifying to the members on this particular anniversary. More especially should this appeal to us, as few, if any, kindred bodies have, within the same period or similar length of time, acquired the growth, stability, practical usefulness and, in general, the high standing attained by this association.

In modern days, the science of railway engineering occupies a wide range in the domain of civil engineering in the generic sense. This fact was appreciated even in the early days of railway construction by the compilers of the lexicons of that period, the term "Civil Engineer" being defined by them as "one who plans railways, harbors, docks, etc."—railways apparently being given first place in importance.

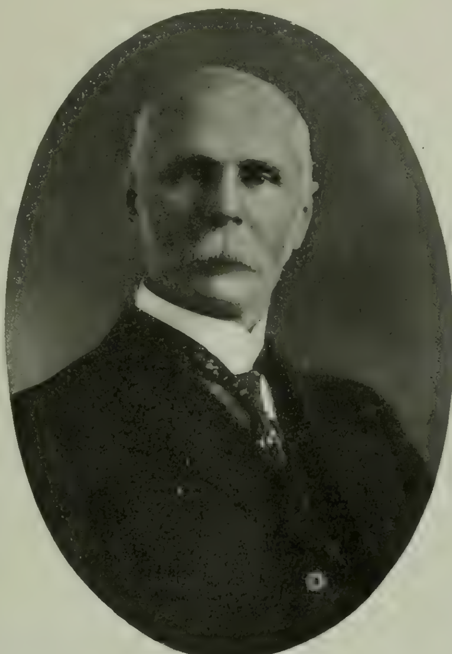
From these early days down to the time when the present classification of expenditure was introduced, each railway was practically a law to itself in regard to physical standards, as well as to clerical and accounting methods considered necessary for its proper care.

In the course of time, however, the field covered by what is comprehended under the term "railway engineering" became so enlarged and so important that direct supervision in detail from one source was found inadequate, even though the authority enjoyed the broad title of civil engineer.

During that period there was in a more or less degree a lack of proper appreciation of the value of technical education and training as an adjunct to the practical working of the railway, and the results of experiments made from time to time by certain railways individually to establish a justification for proposed changes were, in regard to real value, not altogether satisfactory to the railway world in general. The experience gained from such investigations, desirable or undesirable as the case might be, was often acquired only after the expenditure of large sums of money, direct or indirect, and the ascertained facts were jealously guarded by the interests concerned.

To the railway world, however, the results of such investigations, even if known to be of benefit, did not meet all the requirements essential to a comprehension of what was expedient from an ecomonic standpoint, and the lesson which should have been taught, viz., that as much, if not more, valuable experience is to be acquired through failures rather than from successes, was not properly brought home.

The text books upon particular subjects connected with railway engineering in use in earlier days were produced under private or individual auspices. As a general rule they were ably edited, yet the perspective embraced was circumscribed by reason of existing circumstances, and the value of their use was necessarily limited on account of lack of systematic re-issue of such volumes with supplements to meet changing conditions. Special articles upon railroad technical matters which appeared from time to time lacked the value of full discussion and information thus imparted did not meet requirements, therefore the interest created could only be looked upon as more or less temporary and superficial.



WILLIAM McNAB,
President, Maintenance of Way Association.

Railway engineering, as a great department of knowledge, eventually came to be so subdivided in order to meet the conditions of the times, that each subdivision practically developed into a distinct science, yet each department retained possession of all the elements tending to form a harmonious whole. Evolution in this respect, however, progressed slowly, and the methods and standards in use were in many instances adhered to too long, partly because their chief recommendation lay in the fact that they were time-honored or that there was a lack of knowledge of better substitutes.

Nowadays, fewer text books on details of railway construction and maintenance emanate from private sources, for the output of your association, viz., the conclusions and principles of practice arrived at by its various committees, which eventually find their way into the Manual of Recommended Practice, have become the source of appeal in their respective spheres. If reference be made to the discussions preceding the adoption of such conclusions and principles of practice to be found in our Proceedings, it will be noted that every detail has been thoroughly covered.

The bibliography of the association is, in consequence, liberally made use of to advantage, not only by the members, but by the executive officers of our railways, as being practically authoritative on railway technical details. In this general connection we are amply justified in stating that there need be no hesitancy in accepting as good modern practice, based upon scientific methods, the general principles which are recommended therein. You are all aware that before any of the various recommendations are adopted and disseminated, they have been thoroughly discussed and voted upon in open convention by the most competent and up-to-date body of railway engineers to be found anywhere, and in no other organization is there a greater degree of care exercised to guard against inconsistencies than is exhibited in our own.

But while there is every reason to be proud of our achievements during these past ten years, we should not rest content, but endeavor to keep our work up-to-date by eliminating from our Recommended Practice what in course of time has become obsolete and perfecting that which is considered worthy of retention, in order that our Recommendations may be safely relied upon as representing the best practice that can be devised for the time being.

In no quarter of the world do the diversities of nature, both physical and climatic, exist in a greater degree than on the North American continent, and for this reason the

problems confronting railway engineers afford ample opportunity for the exercise of that particular knowledge which your association was formed to advance, namely, that pertaining to the scientific location, construction, operation and maintenance of railways.

Great progress has been made in that respect since the formation of the association ten years ago, as will be noted by reference to the historical sketch prepared by the secretary. It is realized more fully that the railway problems coming under our immediate purview are being brought under the influence of common conditions and tendencies.

We meet the propositions which ever present themselves with the knowledge that conditions to-day are not to be governed entirely by the experience acquired in earlier days. It is our endeavor also to realize how in carrying out the objects of the Association, true economics require proper discernment between what is expedient and what is essential, as well as a clear insight into what will tend to the permanent commercial success of the companies by whom we are respectively employed. We are also striving, and not unsuccessfully, for a better understanding of the relationship of capital invested to maintenance and operating expenses. In this respect it is borne in mind, that as the ratio of progress of all kinds is ever increasing, and that as railways are commercial undertakings, the various factors which produce the greatest permanent profit per cent of the expenditure as well as those which have an adverse effect must be carefully studied. We realize more and more the value of a free exchange of experiences and the practical uses that such exchange can be put to as well as the results brought about by scientific analyses of theories that have not yet been put to experimental tests.

Since your last Convention, the Board of Direction, as well as the Association as a whole, has been called upon to sustain a heavy loss in the removal by death of two of its most valued members, namely, your late President, Walter G. Berg, and D. D. Carothers, Member of the Board of Direction. In every department of the Association's interests, with which they were respectively connected, their work was accomplished with a thoroughness that left a deep and lasting impress upon the minds of their colleagues and fellow-members, while their genial personalities endeared them socially to the membership generally. Opportunity will be afforded during this Convention for remarks from members eulogistic of the life and character of both the deceased officers.

Your President having been actively connected with the Association since its inception, desires now to bear testimony to the zeal shown by the officers and directors in shaping the destiny of the Association, and guarding its best interests. Acknowledgement is also made of the earnest devotion of the chairmen, vice-chairmen and members of the committees, and of the members of the Association individually in the work, and it may be accepted as entirely within the limits of modesty if it be said that by reason of the elements just mentioned, the work has been carried on with a degree of perfection that otherwise would have been impossible.

It may also be said that during the past decade, railway construction could not have progressed to the extent and in the manner it has, nor the railways themselves been as efficiently maintained as they have been and are being maintained, if it had not been for the organization and co-operation shoulder to shoulder, individually and collectively of the members of the American Railway Engineering and Maintenance of Way Association.

The Secretary and Treasurer then read his report. The cash balance on hand March 15, 1908, was $15,852. The receipts during the year were $13,078 and expenditures $12,783, leaving a balance to credit of $295. The cash balance on hand March 15, 1909, was $16,147.

The total amount of the impact test fund was $5,582, and the amount expended to date $5,315, leaving a balance on hand of $267.

The membership at the last annual report was 680; members admitted during the year, 120; deceased, 8; resignations, 8; membership March 15, 1909, 784.

The following members died during the year: Walter G. Berg, D. D. Carothers, H. G. Fleming, Theo. Schidlovsky, E. E. Styner, J. W. Leahy, Dennis Sheahan, C. E. Sheriff.

The first report considered was Uniform Rules. An abstract of the report and discussion begins on page 584.

Signaling and Interlocking was next taken up. An abstract of the report and discussion begins on page 586.

The report of the special committee on Brine Drippings from Refrigerator Cars followed. See page 590.

The reports on Yards and Terminals and Rail, were acted on without much discussion and closed the afternoon session. The former is given on page 592, the latter, page 594.

The first part of the evening session was devoted to memorial exercises for the late Walter G. Berg, who was elected President of the Association last year, and D. D. Carothers, member of the Board of Directors and chairman of the Committee on Rail. The speakers were A. W. Johnston (N. Y. C. & St. L.), J. B. Berry (C., R. I. & P.), H. T. Balliet (N. Y. C.), J. P. Snow (B. & M.), E. F. Ackerman (L. V.), C. Frank Allen (Mass. Inst. Tech.), Hunter McDonald (N. C. & St. L.), and W. M. Camp (Ry. & Eng. Review) for Mr. Berg, and L. C. Fritch (I. C.), A. W. Thompson (B. & O.), Earl Stimson (B. & O. S. W.), J. E. Greiner (B. & O.), A. S. Kinsman (B. & O.) and W. C. Cushing (Penna.) for Mr. Carothers. Suitable resolutions were passed.

The report on Track begins on page 597.

The morning session of the second day was opened with the report on Ties. The abstract begins on page 599.

An abstract of the report and discussion on Wooden Bridges and Trestles begins on page 602. In connection with the abstract it should be noted that at a later session of the convention Chairman Jacoby reported that the committee had had another conference relative to the change in designation of "No. 1 R. R. Grade" and "No. 2 R. R. Grade," and had decided to change the ones agreed on with the Yellow Pine Manufacturers' Association to "railroad heart" for first grade and "railroad falsework" for second.

Wood Preservation was then discussed. See page 606.

The report on Ballasting, which was taken up next, and the discussion is abstracted, beginning on page 613.

Records, Reports and Accounts, the last report of the Wednesday session, begins on page 611.

The tenth annual dinner of the Association was held in the banquet hall of the Auditorium Annex, Wednesday evening, March 17. President McNab presided, and the attendance was very large.

The first speaker of the evening was Hon. George W. Ross, ex-Prime Minister of Ontario, who has served thirty-five years in the Canadian Parliament, and is now a senator. Taking the services of the railways in promoting international fellowship as his topic, he delivered an eloquent oration on the national aspects of the transcontinental railways in the United States and Canada, and spoke feelingly of the great railway builders—Van Horne, Shaughnessy and Hays—whom Canada has borrowed from the United States, and of James J. Hill, the great railway builder whom the United States borrowed from Canada.

Blewett Lee, General Attorney for the Illinois Central Railroad, was the next speaker. Mr. Lee expressed his conviction that civil engineering was likely to be considered, *par excellence*, the learned profession before many years. It is founded on mathematics, the invention of the Evil One, to give a taste of what will happen to you in the hereafter if you aren't good! Mr. Lee said there was no other profession which makes such demands on physical strength and moral courage. Civil engineers have every opportunity to graft, but they simply don't do it.

John T. Cade, vice-president of the Federal Signal Company, spoke in humorous vein, but pointed his moral with the lesson of progress in all things. He was followed by Past-President Hunter McDonald, Chief Engineer of the Nashville, Chattanooga & St. Louis, who spoke strongly of the system of straight and honorable promotion by which the Association chose its presidents, and of the services of the Association in promoting good fellowship among civil engineers.

Dr. J. A. Holmes, chief of the Technological Branch of the United States Geological Survey; Colonel H. G. Prout, first vice-president and general manager of the Union Switch & Signal Co.; F. R. Coates, of the Committee on Arrangements;

Captain Azel Ames, of the Kerite Insulated Wire & Cable Co., and L. C. Fritch, Consulting Engineer of the Illinois Central Railroad Co., also made brief addresses, after which a silent toast was drunk to the memory of Mr. Berg and Mr. Carothers. The exercises then came to a close, after singing the American and British national anthems.

The third day's sessions were begun with Signs, Fences, Crossings and Cattleguards, which is given on page 622.

The report on Roadway was considered next. The abstract of the report and discussion begins on page 625.

The report on Buildings, which followed, together with the discussion, is abstracted, beginning on page 628.

The committee on Iron and Steel Structures then submitted its report. Included with this was the report of the subcommittee on Length of Flat Spots on Car Wheels. The abstracts of the report and discussion begin on page 635.

The special committee on Uniform General Contract Forms came next, the report and abstract beginning on page 636.

The last regular report was on Masonry. The abstract and report of the discussion begins on page 637.

The committees on Economics of Railway Location and Electricity submitted progress reports.

Special committees on Conservation of Natural Resources, Standard Specifications for Cement, and to co-operate with the National Advisory Board on Fuels and Structural Materials, also submitted progress reports.

The following officers for the ensuing year were elected:

President, William McNab, Principal Assistant Engineer Grand Trunk.

First Vice-President, L. C. Fritch, Consulting Engineer, Illinois Central.

Second Vice-President, W. C. Cushing, Chief Engineer Maintenance of Way, Pennsylvania Lines, Southwest System.

Secretary, E. H. Fritch.

Treasurer, W. S. Dawley, Chief Engineer, Missouri & North Arkansas.

Members of Board of Directors, three years each, A. H. Rudd, Signal Engineer Pennsylvania Railroad, and A. W. Thompson, Chief Engineer Maintenance of Way, Baltimore & Ohio.

The following are the committees for the ensuing year:

I—Committee on Roadway.

Geo. H. Bremner (Chairman), Engineer Illinois District, Chicago, Burlington & Quincy, Chicago.

S. B. Fisher (Vice-Chairman), Chief Engineer, Missouri, Kansas & Texas.

John C. Beye, Locating Engineer, Chicago, Rock Island & Pacific.

D. J. Brumley, Principal Assistant Engineer, Illinois Central.

Moses Burpee, Chief Engineer, Bangor & Aroostook.

W. C. Curd, Assistant Engineer, Missouri Pacific.

W. M. Dawley, Assistant Engineer, Erie.

Walt Dennis, Office Engineer, Kansas City Southern.

Paul Didier, District Engineer, Baltimore & Ohio.

C. Dougherty, Civil Engineer, New York, N. Y.

A. M. Kinsman, Chief Engineer, Baltimore & Ohio.

D. MacPherson, Assistant Chief Engineer, National Transcontinental.

L. B. Merriam, Division Engineer, Grand Trunk Pacific.

M. P. Paret, Civil Engineer, Kansas City, Mo.

W. D. Pence, Professor of Railroad Engineering, University of Wisconsin.

John C. Sener, Contracting Engineer, Chicago, Ill.

H. J. Slifer, General Manager, Panama Railroad.

J. A. Spielmann, Engineer Maintenance of Way, Baltimore & Ohio.

J. G. Sullivan, Assistant Chief Engineer, Canadian Pacific.

J. E. Willoughby, Engineer of Construction, Louisville & Nashville.

R. C. Young, Chief Engineer, Lake Superior & Ishpeming and Munising Railways.

II—Committee on Ballasting.

John V. Hanna (Chairman), Chief Engineer, Kansas City Terminal Railway.

C. A. Paquette (Vice-Chairman), Assistant Chief Engineer, Cleveland, Cincinnati, Chicago & St. Louis.

O. P. Allee, Assistant Engineer, Kansas City Southern.

F. J. Bachelder, Division Engineer, Baltimore & Ohio.

W. J. Bergen, Assistant to Chief Engineer, New York, Chicago & St. Louis.

J. G. Bloom, District Engineer, Chicago, Rock Island & Pacific.

H. B. Dick, Division Engineer, Baltimore & Ohio.

J. B. Dickson, Assistant to General Manager, Erie.

W. H. Grant, Manager of Construction, Canadian Northern Ontario.

H. E. Hale, Assistant Engineer, Missouri Pacific.

G. D. Hicks, Superintendent, Nashville, Chattanooga & St. Louis.

C. C. Hill, Division Engineer, Michigan Central.

S. A. Jordan, Engineer Maintenance of Way, Baltimore & Ohio.

E. R. Lewis, Division Engineer, Michigan Central.

J. M. Meade, Engineer E. G. D., Atchison, Topeka & Santa Fe.

C. S. Millard, Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.

R. D. Starbuck, Assistant Chief Engineer, Michigan Central.

F. J. Stimson, Engineer Maintenance of Way, Grand Rapids & Indiana.

G. M. Walker, Jr., Roadmaster, Atchison, Topeka & Santa Fe.

S. N. Williams, Professor of Civil Engineering, Cornell College, Mt. Vernon, Ia.

III—Committee on Ties.

E. B. Cushing (Chairman), Southern Pacific.

E. E. Hart (Vice-Chairman), Chief Engineer, New York, Chicago & St. Louis.

A. F. Dorley, Division Engineer, Missouri Pacific.

W. F. H. Finke, Tie and Timber Agent, Southern.

E. D. Jackson, Assistant Engineer, Baltimore & Ohio.

F. G. Jonah, Terminal Engineer, New Orleans Terminal.

H. C. Landon, Engineer Maintenance of Way, Buffalo & Susquehanna.

A. F. Stewart, Assistant Chief Engineer, MacKenzie-Mann Company, Toronto, Canada.

W. D. Taylor, Chief Engineer, Chicago & Alton.

A. W. Thompson, Chief Engineer Maintenance of Way, Baltimore & Ohio.

Hermann von Schrenk, Supervisor of Timber Preservation, Rock Island, Chicago & Eastern Illinois and Frisco.

G. H. Webb, Chief Engineer, Michigan Central.

H. S. Wilgus, Engineer Maintenance of Way, Pittsburgh, Shawmut & Northern.

IV—Committee on Rail.

Chas. S. Churchill (Chairman—Director), Chief Engineer, Norfolk & Western.

R. Montfort (Vice-Chairman), Consulting Engineer, Louisville & Nashville.

Robert Trimble (Secretary), Chief Engineer Maintenance of Way, Northwest System, Pennsylvania Lines.

E. B. Ashby, Chief Engineer, Lehigh Valley.

J. A. Atwood, Chief Engineer, Pittsburg & Lake Erie.

A. S. Baldwin, Chief Engineer, Illinois Central.

J. B. Berry, Chief Engineer, Chicago, Rock Island & Pacific.

M. L. Byers, Chief Engineer Maintenance of Way, Missouri Pacific.

W. C. Cushing (Director), Chief Engineer Maintenance of Way, Southwest System, Pennsylvania Lines.

F. A. Delano, President, Wabash.

Dr. P. H. Dudley, Rail Expert, New York Central.

C. H. Ewing, Engineer Maintenance of Way, Philadelphia & Reading.

John D. Isaacs, Consulting Engineer, Harriman Lines.

Thos. H. Johnson, Consulting Engineer, Pennsylvania Lines.

Howard G. Kelley (Past-President), Chief Engineer, Grand Trunk System.

J. W. Kendrick, Second Vice-President, Atchison, Topeka & Santa Fe.

George W. Kittredge (Past-President), Chief Engineer, New York Central.

D. W. Lum, Chief Engineer Maintenance of Way and Structures, Southern.

Jos. T. Richards, Chief Engineer Maintenance of Way, Pennsylvania Railroad.

J. P. Snow (First Vice-President), Bridge Engineer, Boston & Maine.

A. W. Thompson, Chief Engineer Maintenance of Way, Baltimore & Ohio.

V—Committee on Track.

L. S. Rose (Chairman), Signal Engineer, Cleveland, Cincinnati, Chicago & St. Louis.

C. E. Knickerbocker (Vice-Chairman), Engineer Maintenance of way, New York, Ontario & Western.

E. C. Blundell, General Roadmaster, Chicago, St. Paul, Minneapolis & Omaha.
Garrett Davis, Superintendent, Chicago, Rock Island & Pacific.
T. H. Hickey, Roadmaster, Michigan Central.
R. H. Howard, Engineer Maintenance of Way, Chicago & Eastern Illinois.
C. B. Hoyt, Superintendent Track, New York, Chicago & St. Louis.
J. B. Jenkins, Assistant Engineer, Baltimore & Ohio.
John R. Leighty, Division Engineer, Missouri Pacific.
C. E. Lindsay, Engineer Maintenance of Way, Electric Zone, New York Central.
J. C. Nelson, Engineer Maintenance of Way, Seaboard Air Line.
P. C. Newbegin, Maintenance Engineer, Bangor & Aroostook.
H. T. Porter, Chief Engineer, Bessemer & Lake Erie.
G. J. Ray, Chief Engineer, Delaware, Lackawanna & Western.
Wm. G. Raymond, Dean State University of Iowa, Iowa City, Ia.
S. S. Roberts, Assistant Professor of Railroad Engineering University of Illinois, Urbana, Ill.
F. A. Smith, Civil Engineer, Chicago, Ill.
W. D. Wheeler, Chief Engineer, Minneapolis & St. Louis.
A. A. Wirth, Engineer Maintenance of Way, Pennsylvania Lines.

VI—Committee on Buildings.

O. P. Chamberlain (Chairman), Chief Engineer, Chicago & Illinois Western.
Maurice Coburn (Vice-Chairman), Engineer Maintenance of Way, Vandalia Line.
Geo. W. Andrews, Inspector of Maintenance, Baltimore & Ohio.
H. M. Cryder, Fullerton Building, St. Louis, Mo.
Wm. T. Dorrance, Designing Engineer, New York Central.
C. H. Fake, Chief Engineer, Mississippi River & Bonne Terre.
P. F. Gentine, Division Engineer, Missouri Pacific.
E. N. Layfield, Chief Engineer, Chicago Terminal Transfer.
M. A. Long, Architect, Baltimore & Ohio.
John S. Metcalf, Civil Engineer, Chicago, Ill.
L. D. Smith, Engineering Department, Southern Pacific.
C. H. Stengel, Designing Engineer, Virginian.

VII.—Committee on Wooden Bridges and Trestles.

H. S. Jacoby (Chairman), Professor of Bridge Engineering, Cornell University.
James Keys (Vice-Chairman), Assistant Engineer, Union Pacific.
F. H. Bainbridge, Resident Engineer, Chicago & Northwestern.
W. S. Bouton, Engineer of Bridges, Baltimore & Ohio.
Geo. A. Casseday, Bridge Engineer, Great Northern.
R. D. Coombs, Structural Engineer, Pennsylvania Tunnel & Terminal.
Wm. Graham, Assistant Engineer, New York, New Haven & Hartford.
L. J. Hotchkiss, Assistant Bridge Engineer, Chicago, Burlington & Quincy.
Hans Ibsen, Bridge Engineer, Michigan Central.
J. A. Lahmer, Principal Assistant Engineer, Kansas City Southern Railway.
F. B. Scheetz, Superintendent of Bridges, Missouri Pacific.
W. F. Steffens, Engineer of Bridges and Buildings, C. C. & O.
E. G. Taber, Chief Engineer, Spokane International.
G. R. Talcott, Resident Engineer, Georgia & Florida.
C. C. Wentworth, Principal Assistant Engineer, Norfolk & Western.
P. H. Wilson, Civil Engineer, Devon, Pa.

VIII.—Committee on Masonry.

A. O. Cunningham (Chairman), Chief Engineer, Wabash.
W. H. Petersen (Vice-Chairman), Bridge Engineer, Chicago, Rock Island & Pacific.
W. J. Backes, Chief Engineer, Central New England.
G. J. Bell, Division Engineer, Atchison, Topeka & Santa Fe.
C. W. Boynton, Inspecting Engineer, Universal Portland Cement Company.
W. H. Chadbourn, Chief Engineer, Chicago Great Western.
W. W. Colpitts, Chief Engineer, Kansas City, Mexico & Orient.
T. L. Condron, Consulting Engineer, Chicago, Ill.
B. Douglas, Tunnel Engineer, Detroit River Tunnel.
L. N. Edwards, Assistant Engineer, Grand Trunk.
Richard L. Humphrey, Consulting Engineer, Philadelphia.
C. H. Moore, Engineer of Grade Crossings, Erie.
J. W. Schaub, Consulting Engineer, Chicago, Ill.
G. H. Scribner, Jr., Consulting Engineer, Chicago, Ill.
A. N. Talbot, Professor Mining and Sanitary Engineering, University of Illinois, Urbana, Ill.
G. H. Tinker, Bridge Engineer, New York, Chicago & St. Louis.
Job Tuthill, Engineer Bridges and Bldgs., Pere Marquette.

IX.—Committee on Signs, Fences, Crossings and Cattle-Guards.

W. D. Williams (Chairman), Chief Engineer, Cincinnati Northern.
K. J. C. Zink (Vice-Chairman), Assistant Engineer, Grand Trunk Pacific.
A. G. Boughner, Office Chief Draftsman, Baltimore & Ohio.
A. E. Douget, District Engineer, Transcontinental Railway.
A. M. Funk, Division Engineer, Baltimore & Ohio.
Paul Hamilton, Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.
C. W. Johns, Assistant Engineer, Chesapeake & Ohio.
H. L. Laughlin, Engineer Maintenance of Way, Minneapolis, St. Paul & Sault Ste. Marie.
J. W. Orrock, Chief Draftsman, Canadian Pacific.
P. Pietri, Division Engineer, Baltimore & Ohio.
R. O. Rote, Principal Assistant Engineer, Lake Shore & Michigan Southern.
C. H. Stein, Engineer Maintenance of Way, Central Railroad of New Jersey.

X.—Committee on Signaling and Interlocking.

A. H. Rudd (Director-Chairman), Signal Engineer, Pennsylvania Railroad.
L. R. Clausen (Vice-Chairman), Superintendent, Chicago, Milwaukee & St. Paul.
Azel Ames, Kerite Insulated Wire & Cable Company.
C. C. Anthony, Assistant Signal Engineer, Pennsylvania R. R.
N. E. Baker, Signal Engineer, Illinois Central.
H. S. Balliett, Engineer of Maintenance of Way, New York Central.
H. S. Cable, General Superintendent, Construction Department, Chicago, Rock Island & Pacific.
C. A. Christofferson, Signal Engineer, Northern Pacific.
C. E. Denney, Signal Engineer, Lake Shore & Michigan Southern.
W. H. Elliott, Signal Engineer, New York Central.
G. E. Ellis, Federal Signal Company, Albany, N. Y.
W. J. Harahan, Assistant to President, Erie.
M. H. Hovey, Homewood, Ill.
A. S. Ingalls, Assistant General Superintendent, Lake Shore & Michigan Southern.
J. C. Mock, Electrical Engineer, Detroit River Tunnel Co.
F. P. Patenall, Signal Engineer, Baltimore & Ohio.
J. A. Peabody, Signal Engineer, Chicago & Northwestern.
Frank Rhea, General Electric Co., Schenectady, N. Y.
W. B. Scott, Assistant Director Maintenance and Operation, Harriman Lines.
Thos S. Stevens, Signal Engineer, Santa Fe System.
J. E. Taussig, Terminal Superintendent, Wabash.
H. H. Temple, Superintendent, Baltimore & Ohio.

XI.—Committee on Record, Reports and Accounts.

H. R. Safford (Chairman), Chief Engineer Maintenance of Way, Illinois Central.
H. J. Pfeifer (Vice-Chairman), Engineer Maintenance of Way, Terminal Railroad Association of St. Louis.
S. D. Brady, Chief Engineer, Little Kanawha.
J. M. Brown, District Engineer, Chicago, Rock Island & Pac.
M. C. Byers, Chief Engineer, St. Louis & San Francisco.
A. L. Davis, Assistant Engineer, Illinois Central.
T. H. Gatlin, Engineer Maintenance of Way, Southern.
C. H. Gerber, Resident Engineer, Union Pacific.
Edward Gray, Engineer Maintenance of Way, Southern.
E. E. Hanna, Division Engineer, Missouri Pacific.
O. L. Holman, Assistant Engineer, Maintenance of Way, Great Northern.
Paul Jones, Superintendent, Cincinnati & Muskingum Valley.
Henry Lehn, Maintenance of Way Accountant, New York Central.
J. H. Milburn, Chief Draftsman, Baltimore & Ohio.
G. L. Moore, Engineer Maintenance of Way, Lehigh Valley.
A. G. Norton, Resident Engineer, Erie.
C. W. Pifer, Roadmaster, Illinois Central.
J. F. Schwed, Lake Shore & Michigan Southern.
W. H. Sellew, Principal Assistant Engineer, Michigan Cent.
V. D. Simar, Acting Chief Engineer, Duluth, South Shore & Atlantic.
J. E. Turk, Superintendent, Philadelphia & Reading.
R. W. Willis, Engineer, Missouri District, Chicago, Burlington & Quincy.
W. P. Wiltsee, Assistant Engineer, Norfolk & Western.

XII.—Committee on Uniform Rules.

Jos. O. Osgood (Chairman), Chief Engineer, Central Railroad of New Jersey.
F. L. Nicholson (Vice-Chairman), Engineer Maintenance of Way, Norfolk & Southern.
C. C. Anthony, Assistant Signal Engineer, Pennsylvania R. R.
G. D. Brooke, Assistant Engineer, Baltimore & Ohio.
W. H. Elliott, Signal Engineer, New York Central.
C. N. Kalk, Chief Engineer, Wisconsin Central.
G. L. Moore, Engineer Maintenance of Way, Lehigh Valley.
J. B. Myers, Division Engineer, Baltimore & Ohio.
J. A. Peabody, Signal Engineer, Chicago & Northwestern.

XIII.—Committee on Water Service.

C. L. Ransom (Chairman), Resident Engineer, Chicago & Northwestern.
M. H. Wickhorst (Vice-Chairman), Engineer of Tests, Chicago, Burlington & Quincy.
J. L. Campbell, Engineer Maintenance of Way, El Paso & Southwestern.
Robert Ferriday, Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis.
G. H. Herrold, Division Engineer, Chicago Great Western.
E. G. Lane, Engineer Maintenance of Way, Baltimore & Ohio.
A. S. Markley, Master Carpenter, Chicago & Eastern Illinois.
C. A. Morse, Chief Engineer, Atchison, Topeka & Santa Fe.
L. P. Rossiter, Division Engineer, Baltimore & Ohio.
A. D. Schermerhorn, Division Engineer, Union Pacific.

XIV—Committee on Yards and Terminals.

F. S. Stevens (Chairman), Superintendent, Philadelphia & Reading.
E. E. R. Tratman (Vice-Chairman), Resident Editor, Engineering News, Chicago, Ill.
Hadley Baldwin, Superintendent, Cleveland, Cincinnati, Chicago & St. Louis.
W. C. Barrett, Division Engineer, Baltimore & Ohio.
G. H. Burgess, Engineer Terminal Improvements, Erie.
L. G. Curtis, Division Engineer, Baltimore & Ohio.
A. H. Dakin, Jr., Engineer, Chicago, Milwaukee & St. Paul.
H. T. Douglas, Jr., Chief Engineer, Wheeling & Lake Erie.
A. C. Everham, Assistant Tunnel Engineer, Detroit River Tunnel Co.
M. J. Henoch, Assistant Engineer, Louisville & Nashville.
H. A. Lane, Assistant Engineer, Baltimore & Ohio.
B. H. Mann, Signal Engineer, Missouri Pacific.
A. Montzheimer, Chief Engineer, Elgin, Joliet & Eastern.
G. F. Morse, Assistant Engineer, Central Railroad of New Jersey.
W. L. Seddon, Chief Engineer, Seaboard Air Line.
C. S. Sims, Vice-President, Delaware & Hudson.
W. E. Dauchy, Division Engineer, Chicago, Milwaukee & St. Paul.
A. C. Dennis, Assistant Engineer, Canadian Pacific Railway.
P. M. LaBach, Assistant Office Engineer, Chicago, Rock Island & Pacific.
C. J. Parker, Principal Assistant Engineer, New York Central.
J. E. Schwitzer, Assistant Chief Engineer, Canadian Pacific.
Francis Lee Stuart, Chief Engineer, Erie.
W. L. Webb, Consulting Engineer, Philadelphia, Pa.

XVII.—Committee on Wood Preservation.

W. K. Hatt (Chairman), Professor Civil Engineering, Purdue University, Lafayette, Ind.
R. N. Begien (Vice-Chairman), Assistant Engineer, Baltimore & Ohio.
E. H. Bowser, Chief Timber Inspector, Illinois Central.
Lincoln Bush, Consulting Engineer, New York, N. Y.
O. Chanute, Consulting Engineer, Chicago, Ill.
C. K. Conard, Assistant Engineer, Erie.
W. H. Courtenay, Chief Engineer, Louisville & Nashville.
C. G. Crawford, General Manager, American Creosoting Company, Chicago, Ill.
E. B. Cushing, Southern Pacific.
W. W. Curtis, Consulting Engineer, Chicago, Ill.
G. M. Davidson, Chemist, Chicago & Northwestern.
E. O. Faulkner, Manager Tie and Timber Department, Santa Fe System.
V. K. Hendricks, Assistant Engineer Maintenance of Way, St. Louis & San Francisco.
R. L. Huntley, Chief Engineer, Union Pacific.
A. L. Kuehn, General Superintendent, American Creosoting Company.
S. M. Rowe, Consulting Engineer, Chicago, Ill.
Earl Stimson, Chief Engineer Maintenance of Way, Baltimore & Ohio Southwestern.
Hermann von Schrenk, Supervisor of Timber Preservation, Rock Island, Frisco and Chicago & Eastern Illinois.
Howard F. Weiss, Forest Service, United States Department of Agriculture, Washington, D. C.
C. H. Spencer, Engineer, Washington Terminal Company.
C. H. Stein, Engineer Maintenance of Way, Central Railroad of New Jersey.
A. Swartz, Division Engineer, Erie.

XV—Committee on Iron and Steel Structures.

J. E. Greiner (Chairman), Consulting Engineer, Baltimore, Md.
C. F. Loweth (Vice-Chairman), Engineer and Superintendent of Bridges and Buildings, Chicago, Milwaukee & St. Paul.
J. C. Bland, Engineer of Bridges, Pennsylvania Lines West.
C. H. Cartlidge, Bridge Engineer, Chicago, Burlington & Quincy.
C. L. Crandall, Professor Railway Engineering, Cornell University.
B. W. Guppy, Bridge Engineer, Maine Central.
A. J. Himes, Assistant Chief Engineer, New York, Chicago & St. Louis.
Chas. M. Mills, Principal Assistant Engineer, Philadelphia Elevated Railroad & Subway.
A. D. Page, Principal Assistant Engineer, Chicago, Rock Island & Pacific.
C. D. Purdon, Consulting Engineer, St. Louis & San Francisco.
A. F. Robinson, Bridge Engineer, Santa Fe System.
C. C. Schneider, Consulting Engineer, Philadelphia, Pa.
F. E. Turneaure, University of Wisconsin, Madison, Wis.
W. R. Webster, Consulting Engineer, Philadelphia, Pa.

XVI—Committee on Economics of Railway Location.

A. K. Shurtleff (Chairman), Office Engineer, Chicago, Rock Island & Pacific.
C. Frank Allen (Vice-Chairman), Professor Railroad Engineering, Massachusetts Institute Technology.
R. N. Begien, Assistant Engineer, Baltimore & Ohio.
W. Beahan, Assistant Engineer, Lake Shore & Michigan Southern.
J. F. Burns, Roadmaster, Louisville & Nashville.
W. L. Darling, Chief Engineer, Northern Pacific Railway.
C. C. Anthony, Assistant Signal Engineer, Pennsylvania R. R. of Bridges and Buildings, Chicago, Milwaukee & St. Paul.
W. E. Dauchy, District Engineer, Chicago, Milwaukee & Puget Sound.
A. C. Dennis, Assistant Engineer, Canadian Pacific.
L. B. Merriam, Division Engineer, Grand Trunk Pacific.
C. J. Parker, Principal Assistant Engineer, New York Central.
Walter Loring Webb, Consulting Engineer, Philadelphia.

Special Committee on Uniform General Contract Forms.

E. F. Ackerman (Chairman), Assistant Engineer, Lehigh Valley.
J. C. Irwin (Vice-Chairman), Office Engineer, New York Central.
Wm. Archer, Real Estate Agent, Baltimore & Ohio Southwestern.
W. L. Breckinridge, Engineer Maintenance of Way, Chicago, Burlington & Quincy.
W. G. Brimson, Vice-President and General Manager, Quincy, Omaha & Kansas City.
W. S. Kinnear, Assistant General Manager, Michigan Central.
Fred Lavis, Resident Engineer, Pennsylvania Tunnel & Terminal.
E. H. Lee, Chief Engineer, Chicago & Western Indiana.
W. B. Storey, Jr., Chief Engineer, Santa Fe System.
W. F. Tye, Civil Engineer, Montreal, Canada.
C. A. Wilson, Chief Engineer, Cincinnati, Hamilton & Dayton.

XVIII—Committee on Electricity.

Geo. W. Kittredge (Past-President-Chairman), Chief Engineer, New York Central.
J. B. Austin, Jr. (Vice-Chairman), Engineer Maintenance of Way, Long Island.
A. S. Baldwin, Chief Engineer, Illinois Central.
R. D. Coombs, Structural Engineer, Pennsylvania Tunnel & Terminal.
E. P. Dawley, Engineer of Construction, New York, New Haven & Hartford.
L. C. Fritch (Second Vice-President), Consulting Engineer, Illinois Central.
G. A. Harwood, Chief Engineer, Electric Zone Improvements, New York Central.
W. W. Drinker, Assistant Engineer, Erie.
C. E. Lindsay, Division Engineer, New York Central.
H. R. Talcott, Engineer Surveys, Baltimore & Ohio.

REPORTS AND DISCUSSIONS, MAINTENANCE OF WAY CONVENTION.

UNIFORM RULES, ORGANIZATION, TITLES, CODE, ETC.

The committee was instructed to report on the following subjects:

(1) Supplement "General Rules for Government of Employees of the Maintenance of Way Department."

(2) Prepare special rules for foremen and other employees, properly grouped and classified in accordance with and supplementary to the general rules heretofore adopted.

The following additions were submitted for incorporation in the "General Rules":

"Anything that interferes with the safe passage of trains at full speed is an obstruction.

"Employees must exercise the greatest care and watchfulness to prevent injury or damage to persons or property; in case of doubt, they must take the safe course and run no risk.

"Co-operation is required between all employees whose work or duties may be jointly affected."

The following rules governing track foremen, bridge and building foremen, and signal foremen were submitted for approval:

Rules Governing Track Foremen, Bridge and Building Foremen, and Signal Foremen.

TRACK FOREMEN.

(1) Track Foremen shall report to and receive instructions from the ....(Title)..............

(2) They shall be responsible for the proper inspection and safe condition of the track under their charge, and shall do no work thereon that will interfere with the safe passage of trains, except under proper protection.

(3) They must go over their sections, or send a reliable man, at least once a day to make a thorough inspection to see that the track, signals, culverts, bridges, fences, etc., are in safe condition.

(4) If the track or any bridge or culvert, in the judgment of the Track Foreman, is not safe, he must at once put out the proper signals to warn approaching trains and immediately notify the ....(Title)........ of its condition, and do all in his power to repair the defect.

(5) During heavy storms, whether by day or night, whereby the track, or any portion of the company's property, becomes liable to damage, foremen and trackmen must be on duty; and at such times they must go over their sections to make sure that the track is safe, taking danger signals with them.

(6) They must use constant care to see that all waterways are kept free from obstructions.

(7) They must have a copy of the current timetable, and be thoroughly familiar with the rules and regulations thereon, and with the time of trains over their sections. They must carefully observe signals displayed by all trains, and assure themselves before obstructing track that all trains and sections due have passed. No notice will be given of extra trains, and trackmen must protect themselves as prescribed by the Book of Rules. They must provide themselves with reliable watches, and compare time daily with a standard clock or with conductors.

(8) In case of accident, they must at once render all assistance in their power, whether the accident occurs on their own or on an adjoining section.

(9) They must permit no encroachment upon or occupancy of any portion of the company's right-of-way, except by proper authority.

(10) They shall employ such men as the ......(Title)...... will direct, and see that they properly perform their duties. They must keep the required record of the time of their men and of the material used.

(11) They must keep a careful lookout for fires along the track, and prevent, if possible, the destruction of fences, wood or other material, and the spread of fire into adjoining fields. During dry weather they must not permit fires to be started unless they have sufficient force to keep them under control.

(12) They must keep the vicinity of all bridges and trestles cleared of all combustible material, such as chips, bark, dried grass, etc. They must keep bridge seats, tops of piers, and bottom chords cleaned of all cinders and dirt. Where water barrels are furnished, they must keep them filled with water.

(13) They must limit the use of handcars to the service of the company; and they must not permit anyone except employees of the company engaged in the performance of duty to ride thereon, except by proper authority. They must not permit the running of hand or velocipede cars belonging to private parties over the tracks of the company, except by proper authority.

BRIDGE AND BUILDING FOREMEN.

(1) Bridge and Building Foremen shall report to and receive instructions from the ....(Title)........

(2) They shall be held responsible for the proper inspection and safe condition of the structures under their charge, and shall do no work thereon that will interfere with the safe passage of trains, except under proper protection.

(3) They must have a copy of the current timetable, and be thoroughly familiar with the rules and regulations thereon, and with the time of trains over their district. They must provide themselves with reliable watches, and compare time daily with a standard clock or with conductors.

(4) They shall employ such men as the ......(Title)...... will direct, and must see that they properly perform their duties. They must keep the required record of the time of their men and of the material used.

SIGNAL FOREMEN.

(1) Signal Foremen shall report to and receive instructions from the ....(Title)........

(2) They shall be responsible for the proper condition of signals and interlocking plants under their charge, and shall do no work thereon that will interfere with the safe passage of trains, except under proper protection.

(3) They must have a copy of the current timetable, and be thoroughly familiar with the rules and regulations thereon, and with the time of trains over their territory. They must provide themselves with reliable watches, and compare time daily with a standard clock or with conductors.

(4) They shall employ such men as the ......(Title)...... will direct, and must see that they properly perform their duties. They must keep the required record of the time of their men and of the material used.

(5) In case of accident affecting any portion of the signal or interlocking apparatus under their charge, they must at once proceed to the spot with the men, tools and materials necessary to make repairs.

(6) They must investigate and report on the forms provided for the purpose all failures of signals and interlocking plants in their territory.

Conclusions.

(1) Your committee recommends the adoption of the additions to the "General Rules" for publication in the Manual of Recommended Practice.

(2) Your committee recommends the adoption of the Rules Governing Track Foremen, Bridge and Building Foremen, and Signal Foremen for publication in the Manual of Recommended Practice.

The report is signed by R. C. Barnard (Penn. Lines), Chairman; F. L. Nicholson (Norf. & Sou.), Vice-Chairman; G. D. Brooke (B. & O.), W. H. Grant (Can. Nor.), R. L. Huntley (U. P.), C. N. Kalk (W. C.), G. L. Moore (Rutland), J. B. Myers (B. & O.), Jos. O. Osgood (C. R. R. of N. J.), J. A. Peabody (C. & N. W.), J. H. Wallace (Cons. Eng), and C. A. Wilson (C., H. & D.).

The undersigned approved the report, except Rule 3, under Track Foreman, exception being taken to the authority given the track foreman to delegate the daily inspection of track to another man.

G. H. Webb (M. C.).

Discussion.

The chair extended the privileges of the floor to railway officials not members of the association and to college professors to take part in the discussions.

Mr. Barnard: It might be well to say that the greatest difficulty this committee has encountered has been in determining where to draw the line between rules that are sufficiently in detail to cover all the essential points in this department and still be applicable to the majority of roads members of this association, and to exclude such less important rules as you generally find in the small books issued by the various roads for the government of maintenance of way employees and it may be that this association will think that we have not drawn the line in the proper place and have gone too much or too little into detail.

The secretary read the report by clauses.

The President: It will be taken for granted that if there be no objection offered as the clauses are read they will be accepted. The question now is on allowing these clauses to

be incorporated in the Manual of Recommended Practice, and the General Rules.

A vote was taken upon clauses two and three of the report and the same were adopted.

L. C. Fritch (I. C.): Mr. President, I think the word "safe" in the last line of clause 5 ought to read "proper condition." It is the duty of the inspector to see that the condition is proper, as well as safe. I move that the word "safe" be changed to "proper."

The motion was lost.

A. W. Johnston (N. Y. C. & St. L.): It seems to me there is a question as to the requirement in clause 7 that the section foreman must provide himself with a reliable watch. We don't require that in the sense that we simply require them to have their watches examined, and make it an absolute part of their duties under the rules. If, for some reason, he fails to provide himself with a reliable watch, and owing to that failure something happens to bind or make the company liable, it is a serious matter and it is something that we ought to consider carefully.

E. R. Lewis (M. C.): I would move that the word "watches" be added after the last word "conductor."

Mr. Barnard: The committee will accept that.

C. E. Lindsay (N. Y. C.): The word "conductor," is peculiar. We require our supervisors to carry guaranteed watches and the section foremen are privileged to compare their watches with the supervisor's watch.

Mr. Barnard: The idea in preparing that rule was that the supervisor might not be available every day and the section foreman can always find some conductor on a train going by with whom he can compare his watch.

E. R. Lewis (M. C.): I move that the word "adjoining," clause 8, be changed to "and others." There are cases when the foreman is called upon to go further away than adjoining sections.

Mr. Barnard: We accept that suggestion.

Mr. Lindsay: I would like to ask with regard to the first line, clause 10, "they shall employ such men as, etc.,"—does that mean such number of men, or does that relieve the foreman of the responsibility of employing the men, selecting the men and placing upon the officer whose title is omitted the responsibility, or does it mean such men or the kind of men?

Mr. Barnard: Both.

Mr. Lindsay: That relieves the section foreman of the duty of employing his own men.

Mr. Barnard: No, this is the section foreman. His chief will tell him how many men to put on his section and he knows from his general instructions what kind of men to employ, as to their physical ability and so forth.

V. K. Hendricks (St. L. & S. F.): In clause 12 I move that "floor beams and stringers" be added.

Mr. Barnard: If you adopt that, where are you going to stop? You can go into more details and specify other things that they should be kept clear of.

Mr. Hendricks: Then amend by saying "all portions of steel bridges." I think all portions should be kept clean.

The President: Do you mean such portions of the bridge as come directly within the easy access of section foreman?

Mr. Hendricks: Yes sir.

Mr. Hendricks' motion was lost.

C. H. Ewing (P. & R.): I would suggest that we eliminate the detail parts for the reason that bottom chords are specified, and on the deck of the bridge the top chords are more accessible than the bottom. I would suggest that the rule read, "they must keep all accessible parts of bridges clear of cinders and dirt."

Hunter McDonald (N. C. & St. L.): I hardly think the gentleman expects a section foreman to climb up on top of top chords. They are accessible to a bridge man but not to a section foreman.

J. P. Snow (B. & M.): I think the idea of Mr. Ewing is good, that is, leave out details. We cannot draw the line exactly where the section foreman should leave off and the bridge crew come in. It would either be better to cut out all reference to chords and confine the work to masonry or else endeavor to draw a very precise line, which would be a difficult proposition to cover all structures. If we cut out the reference to bottom chords, and so forth, it sems to me it would be all right. I would suggest that to Mr. Ewing.

Mr. Barnard: The committee would accept that.

The President: Do I understand then that it will read "They must keep bridge seats, tops of piers, and so forth, cleaned of all cinders and dirt?"

Mr. Ewing: Yes.

Mr. President: The change is ordered.

Objection was raised by a member.

M. L. Byers (Mo. P.): I would like to ask if the committee would accept the words "readily accessible portions" as a substitute for "and so forth?"

Mr. McDonald: I believe the vote was taken without a full understanding of the situation. I desire to record my protest against any rule which would relieve the section foreman of the duty of cleaning the locomotive sparks off of the iron work of bridges. There is no more potent destroyer of iron work than locomotive cinders and water. It should be the duty of the track walker and section man, and in my judgment should not be confined to sweeping off the masonry. It does not do much harm on the masonry, but it does do a lot of harm on the horizontal members of the steel structure.

Mr. Byers' motion was adopted.

J. B. Berry (C., R. I. & P.): I would like to go back to paragraph 9, after the words "company's right-of-way," and insert at that place the words "and station grounds." Maintenance of way employees draw a marked line as between the company's right-of-way and the station grounds, and if the matter is called to their attention I think they would give more care to it. If there is any one thing on the company's property that requires care from encroachment, it is at the station.

Mr. Barnard: I would ask if we are not encroaching a little bit on the territory of the agent? I think the agent should keep people off his own station grounds. These are instructions for the section foreman.

L. C. Fritch (I. C.): It seems to me that is the very reason why it should be put in, because the section foreman thinks it is the duty of the agent to watch the station grounds, and if we put it in the rules, it makes it the duty of the section foreman. I think it is a very important matter and hope it will be introduced into the rules.

Mr. Berry: With all the care of the section foreman and station agent we are all of us losing property. I have known of many cases where people have been allowed to encroach upon railroad property, even business men in the town, and after the lapse of a few years they claim it as their own property.

The amendment was adopted.

The secretary read the first, second and third sections under "Bridge and Building Foremen."

H. R. Safford (I. C.): Rule 3 is only applicable to bridge foremen, and involves precautionary measures with reference to track construction. It seems to me that the same features should be incorporated in that rule as appear in rule 7 under "Track Foremen." A motion is therefore offered that rule 3 under "Bridge and Building Foremen" be amended, first, by eliminating the word "they" and substituting "bridge foremen" in the first line and making the balance of rule 3 the same as rule 7 under track foremen.

The motion was lost.

M. L. Byers (Mo. Pac.): I am very much in favor of making our rules of such a character that they can be rigidly enforced. Therefore, I move to amend the last sentence of this paragraph 3 by making it read: "They must provide themselves with reliable watches, and when possible compare time daily with a standard clock or conductor's watch."

The motion was adopted and rule 7 under "Track Foremen" changed to read the same.

The remaining rules were read without change.

W. J. Eck (So.): I would suggest to the committee that there be one aditional rule provided, to the effect that the signal foremen must not make any permanent rearrangement in signals or interlocking plants without proper authority.

The President: The committee accepts that and will incorporate it in their report.

E. F. Wendt (P. & L. E.), who is looking after the interests of the Manual of Recommended Practice since the death of Walter G. Berg, called attention to the need of harmonizing the phraseology in all matter intended for the Manual, indicating modifications that would be necessary in these rules before their incorporation therein. He also suggested the advisability of grouping under one heading in the Manual all of the rules applicable to men of the same official grade as foremen, for example.

W. C. Cushing (Penna.): I would like to say a word before the members vote on the adoption of these rules, and that is that they should ask themselves the question, "Will I make use of these rules when I go back home, in formulating my rules for the organization of a maintenance of way department?" It is a very pertinent question and it is our desire to have such matters in our Proceedings as we can stand by and make use of as much as possible.

The President then put the question on the adoption of the rules as amended, which was carried.

SIGNALING AND INTERLOCKING.

This committee consists of 19 members, nearly all of whom are also members of the Railway Signal Association and of Committee No. II of that association. The present report consists largely of matter which was adopted by the Signal Association at its annual meeting last October.

The first thing in this report is a proposed standard agreement for use where two or more roads join in the construction and operation of an interlocking plant. The committee presents a form of agreement filling four pages, but offers this only as a guide for discussion, believing that before the proposed agreement is adopted, parts of it should be considered and acted on by the Railway Signal Association. The conclusions of this report, unanimously agreed upon by the committee, are:

(1) That existing agreements should be given due consideration in the form of arbitraries in the division of construction, renewal, maintenance and operating expenses.

(2) That the proper division of construction, renewal and maintenance expenses is on an operated-unit basis, each party paying for what is required to interlock its tracks, or the residue, where there are existing agreements requiring fixed arbitraries.

(3) The primary operating expense, or the residue after deducting such arbitraries as may be required by existing agreements, should be equally divided among the several parties interested. Where operating expenses are increased by facilities for the exclusive use of one party, such party for whose benefit such facilities are provided should pay the entire additional operating expense.

The form of agreement presented is for an interlocking at an existing crossing, Class A. For a crossing of a new line with an old one, Class B, another form, should be used, and for a crossing of two roads, both new, Class C, still another form would be necessary.

Switchstands.

The committee makes no recommendation on this subject (No. 6) believing that it should wait until a scheme of aspects for signals is adopted.

Manual.

It is also recommended that there be no revision of the Manual until the aspects have been agreed upon, except such as may be made necessary by the specifications and standards which the association may adopt this year.

Symbols.

The sub-committee on this subject has conferred with a sub-committee of No. XI on records, and blueprints of revised symbols were considered; but this committee cannot finally approve these until the question of aspects of signals has been settled.

Specifications for Mechanical Interlocking.

Specifications in this department were adopted in 1907, the same having been adopted by the Railway Signal Association in 1906. Since then the Signal Association has revised the code and, as revised, the committee now presents it in full.

The first part of this report deals with drawbridge protection, but the committee found itself unable to recommend standard apparatus or methods of locking; neither any uniform arrangement of signals, present practice being so diverse. The locking required should be

(a) To insure that the bridge is in proper alinement.
(b) To insure that all bridge surfacing devices are in their proper position.
(c) To lock each rail in proper position for train movement.
(d) To prevent the application of power for purpose of withdrawing bridge latch or opening draw.

FACING-POINT LOCKS.

The committee can find nothing better than "bolt locking" to insure that a switch has responded to the position of the lever. This apparatus should be called a detector lock. With trailing switches and with slow speed signals the expense of bolt locking is not warranted.

The committee then goes on to present its new specifications. These, as revised by the Signal Asociation, are much more full and complete than those heretofore adopted by the Maintenance of Way Association, and the old and the new are printed side by side for comparison. The preliminary clauses, paragraphs 1 to 19 inclusive, have been copied from the specifications for electric interlocking; this in recognition of the desirability of having the two codes alike so far as practicable. The rest of the paragraphs were adopted unanimously by the R. S. A. committee and agreed to by the manufacturer's representatives, who met with the committee.

The Maintenance of Way Association committee, in recommending the adoption of these specifications in place of those heretofore adopted, says that very likely slight amendments will be necessary in the next two or three years.

Specifications for Electric Interlocking.

The committee here presents the specifications adopted by the Signal Association on the recommendation of that association's committee No. III. These specifications are embodied in 130 sections. Under section No. 60 (switches) the committee had much discussion concerning lock rods. The committee has felt that the financial side of any radical change in construction of lock rods which would make necessary a change in switch and lock movements should be handled with due deliberation. The committee feels that there should at this time be given a full consideration of the substitution of some form of hard metals, with a proper adjustable feature, in the locking faces of plunger and rod rather than a radical change in structure. The subject, a vital one, can be viewed as of somewhat the same importance in its line as is that of the frog point in track work where hard metals are now being tested.

Section 130, dealing with drawbridges, is as follows:

At least one lever of the interlocking machine, called the bridge lock lever, shall be assigned for the purpose of locking the bridge. The bridge lock lever when reversed, shall be arranged to lock the bridge in the closed position and to prevent the application of power for the purpose of withdrawing the bridge latch or opening the bridge.

The bridge lock lever, when normal, shall be arranged to lock all levers used for bridge protection in the proper position to protect the bridge, and also to cut off power from all control wires leading to such functions.

A separate locking arrangement shall be provided for each of the following purposes:

(a) To insure that the bridge is in proper alinement.
(b) To insure that all bridge surfacing devices are in their proper position.
(c) To lockall rails in proper position for train movement.

The purchaser will supply complete information, including detail drawings, of bridge locking apparatus to be controlled by the interlocking machine.

NOTE.—It is recommended as a more desirable method of operation that the rails at the end of the draw and on the shore next to the draw be fixed in position and have the necessary locks, and that lifting rails be not used.

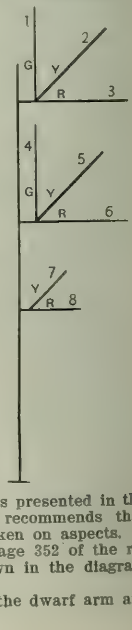
Specifications for Rubber Covered Wire.

These specifications, as adopted by the Signal Association at Washington last October, are recommended in this report for adoption.

Comprehensive System of Uniform Signaling.

The committee recommends the adoption of the report which was adopted at Washington. The essential features of the recommendations of this report are embodied in diagram No. 104, which was shown on page 1196 of the *Railroad Age Gazette*, October 23, last. At the Washington meeting Mr. Stevens (A. T. & S. F.) proposed another code of aspects radically different in some respects from that which had been proposed by the committee, and which had been approved by

1. Proceed at normal speed.
2. Proceed at limited speed.
3. Stop.
4. Prepare to pass next signal at normal speed.
5. Prepare to pass next signal at limited speed.
6. Prepare to stop at next signal.
7. Proceed at low speed.
8. Of no significance, except to mark presence of a low speed signal.



the association, and this alternative code is presented in the present report. The present committee recommends that this be considered before final action is taken on aspects. It is presented in exhibit No. 6, shown on page 352 of the report. Its fundamental principles are shown in the diagram given herewith.

It will be seen that the upper arm and the dwarf arm are

home signals and the second arm is always a distant signal. The upper and lower arms give information leading to the immediate control of a train. The upper arm gives the following indications: 90 deg. position, Normal Speed; 45 deg. position, Limited Speed; 0 deg. or horizontal, Stop. The lower arm is used for slow speed. The second arm gives information leading to the future control of a train. It is a true repeater of the upper arm of the signal in advance. It will be noted in this series of aspects that as the indications become more favorable to the runner, yellow and then green is substituted for red in the order named.

Standard Designs for Specifications for Material.

The committee recommends the adoption of the standard designs and specifications which were adopted by the Railway Signal Association. These are for 1-in. pipe and coupling; gray iron castings; malleable iron castings; machinery steel; wrought iron bars; signal roundels; lenses and glass slides; and for cranks, crankstands, jaws, ladders and about 25 other detail parts of outdoor signal apparatus. The list of these details was given in the *Railroad Age Gazette* of March 5, page 472, in connection with the notice of the March meeting of the Signal Association.

The report is signed by A. H. Rudd, (P. R. R.), Chairman; L. R. Clausen, (C., M. & St. P.), Vice-Chairman; Azel Ames, Jr., (N. Y. C.); C. C. Anthony, (P. R. R.); H. S. Balliet, (N. Y. C.); H. S. Cable, (C., R. I. & P.); C. A. Christofferson, (C. G. W.); G. E. Ellis, (Cons. Engr.); M. H. Hovey, (Cons. Engr.); J. C. Mock, (Det. R. Tun. Co.); F. P. Patenall, (B. & O.); J. A. Peabody, (C. & N. W.); Frank Rhea, (Cons. Engr.); W. B. Scott, (Har. Lines); Thos. S. Stevens, (S. Fe); J. E. Taussig, (Wab.); H. H. Temple, (B. & O.); H. M. Waite, (S. A. L.); Edwin F. Wendt, (P. & L. E.).

Discussion.

Mr. Rudd: There were six subjects specifically assigned to the committee. Subjects 1, 2 and 3 (Specifications for Mechanical Interlocking, Electric Interlocking and Rubber-covered Wire) have all been acted on by letter ballot of the Signaling Association and adopted as specifications. The committee hopes that this association will endorse the action of the Signaling Association. Subject No. 4 (Interlocking Agreement) should be brought up for argument, and No. 5 (Comprehensive System of Uniform Signaling) is a progress report. Some two years ago we adopted mechanical specifications—we never have adopted electrical specifications, we have waited two years for the action of the Signaling Association—and we have never adopted rubber-covered wire specifications. The mechanical specifications submitted are at great variance with the present mechanical specifications of this association. They will probably have to be changed in certain immaterial respects next year, but the specification as it now stands, as completed by the Signaling Association, is so much better than the specifications we have, that I think it should be adopted as a whole.

C. H. Ewing (P. & R.): I would ask the committee when the specifications were adopted by the Railway Signaling Association, and if they have been tried out so as to eliminate the possible defects in a specification which has been recently drawn?

Mr. Rudd: The specifications were submitted to letter ballot last October and adopted. Mechanical interlocking specifications have passed the experimental stage. I do not think there will be any difficulty in carrying out the specifications as at present submitted, because there are, as far as I know, no innovations; it is simply a matter of bringing them up to approved practice.

Mr. Ewing: The committee has excluded the use of wrought iron pipe; they have adopted specifications which permit the use of steel pipe only.

Mr. Rudd: The signal men have been buncoed with wrought iron pipe for the last ten years. The wrought iron pipe we have been receiving has been made of mild steel. If we ordered steel we pay a less price and get better pipe, because some wrought iron pipe is made of a very poor grade of steel.

Mr. Ewing: We should include in these a specification for wrought iron pipe. If we include mild steel, we will get bad steel; if we include wrought iron, we will get better pipe than if we put in steel.

J. C. Mock (Det. Riv. Tun. Co.): The subject was assigned to a sub-committee, and their first draft of a specification calls for steel. We have made a drawing, which is to accompany the material specification, and we have explained to the trade that this drawing will be used for a specification for wrought iron. The specification as submitted to this association, has been changed somewhat from the form in which it was originally written, to raise the tensile strength and limit the elasticity in order to raise it above what could be used for the wrought iron specification, but it is the intention of the sub-committee on Standard Contract to prepare a specification for wrought iron pipe. They thought for the present they would like to have this one tried out, and if we can get pipe in accordance with these specifications it will be all right. After carefully going into the merits of the black and galvanized pipe, the committee decided it would be better to call for galvanized pipe. Of course, that clause can be omitted from the specification by anyone desiring to use black pipe.

Mr. Ewing: I call attention to the committee's recommendation that all pipe posts shall be made of wrought iron.

Mr. Mock: The specifications for the various interlocking installations have been made by various committees, and the commercial term employed is "wrought iron," while, as a matter of fact, it is soft steel, and in these pipe specifications we intentionally change that to steel. The association is trying to harmonize these specifications so we will cut out these little inconsistencies.

Mr. Rudd: The trade name is wrought iron pipe as distinguished from cast iron pipe.

Mr. Ewing: There are reliable manufacturers today who are manufacturing exclusively wrought iron pipe of a very high grade. The only advantage that I have heard mentioned in favor of the steel is its greater tensile strength, elongation. Our experience is that the wrought iron pipe is very much more durable than steel pipe. A steel pipe with a high percentage of manganese begins to pit very soon after it is used and the deterioration is very rapid. Wrought iron does not deteriorate nearly so rapidly. Furthermore, I believe that the wrought iron pipe is a safer pipe to use than steel. Steel pipe, under alternate compression and tension, breaks at the root of the thread. Wrought iron pipe will not; so that I feel it would be a great mistake for this association to pass the specifications for steel pipe only.

On motion by Mr. Ewing the specification for mechanical interlocking was referred back to the committee with instructions to prepare a specification for wrought iron pipe.

The specification on electrical interlocking was received as a progress report.

The specifications for rubber-covered wire were adopted and ordered included in the Manual.

The next subject was Standard Interlocking Agreement for Signal Work.

Frank Rhea (Gen. Elec.): This is a progress report. We felt it was necessary for us to have the association settle, from the standpoint of principle, how the expenses will be divided. It is the desire of the committee that you give us a definite expression on the conclusions that we have presented, or that you give us alternate principles to take their place, in definite form, so that we can then proceed with the conclusion of a final report.

The sample agreement was considered by clauses. Clause 5 provides that the company which constructed the plant shall be in charge of renewals and maintenance, but in the event of its neglect to make certain repairs within 30 days after the second company had notified it of such need, the second company could make repairs and call on the first company to pay its proportion. Mr. Rhea called attention to the fact that this is rather an unusual provision in interlocking agreements as they exist today. There has been a great deal of trouble in one road not properly maintaining interlocking, in not only endangering its own traffic, but endangering traffic of the other interested parties.

L. C. Fritch (I. C.): If there is any question as to the rights of the respective parties it can be submitted to arbitration. It seems to me this clause is covered very well by existing agreements. There is always protection in the use of trackage by the agreements. If the tracks are not in safe condition the second party usually has the right to make such repairs and charge the first party with its proportion of the expense.

Mr. Rhea: Mr. Fritch has made a very good point and the committee merely took advantage of precedent in the line that Mr. Fritch spoke about.

Clause 7 provides that the pay of joint employees be the same as the standards, in the territory concerned, of the company constructing the plant.

Mr. Rhea: That is another provision which has not been general. I have known quite a number of cases where there has been a very fruitful source of misunderstanding as to the salaries. These, of course, are all possible in case of difficulty, to be arbitrated under the arbitration, but it is a good deal better and will eliminate trouble if you have those points explicitly covered.

I would like to call your attention to another paragraph, that bills for expense of the construction shall be made as final bills. I have experienced a good deal of trouble in making partial bills, and I resorted some time past, in cases

where I anticipated having trouble, to making a final bill. The constructing company is allowed a percentage, as a matter of practice, and that percentage, in our opinion, is sufficient to enable them to hold those bills in suspense until they are able to handle it in this way. The party checking the bill is put to much better advantage if he is given a final bill, or is given, in partial bills, a complete statement up to that point.

A. S. Baldwin (I. C.): We have all been troubled by this custom of delaying the payment of a bill on account of probably one or two disputed items, and I have known such delay to be claimed as a cause of breach of contract. I have made it a custom recently to provide that bills should be paid before a certain date, unless there are disputed items, under which circumstances the disputed items are to be withheld and the bill paid on that day.

Mr. Fritch: Mr. Chairman, I want to ask the committee if they have had legal advice on the liability clause?

Mr. Rhea: Yes.

Mr. Fritch: The matter is all there, but the arrangement of it is not, to my mind, as clear as it ought to be. It is usual to divide liability clauses into three parts; first, individual liability; second, joint liability and, third, what you might call the miscellaneous liability. That can be defined, it seems to me in a little better way and divided into three classes. Standard contracts of liability clauses are usually divided in that way, and I would like to suggest to the committee that they see if they cannot further modify or change the wording so as to make it a little clearer.

Mr. Rhea: We will undertake it.

(The secretary then read clauses 13 and 14.)

Mr. Fritch suggested that in many cases a single arbitrator might serve as well as the three provided for in the sample agreement.

J. B. Berry (C., R. I. & P.) suggested that there ought to have been something in the agreement that would stipulate how freight charges should be paid.

Mr. Baldwin: I think there should be some provision that would protect one company against excessive charges on the part of the other, whether for freight, carriage or handling, or anything else, and I would suggest a clause providing that the connecting line should have the privilege of furnishing material if it should desire to do so, or that the prices be made on such a basis as that either company could deliver the material.

On motion by Mr. Fritch, the report on the agreement was accepted as a progress report, and the committee was instructed to confer with the Committee on Uniform Rules in the matter of drafting a completed contract.

The conclusions were then taken up in order. The secretary read conclusion 1.

W. H. Elliott (N. Y. C.): I ask Mr. Rhea under what head he would divide the matter of supplies; would it not be well to insert "supplies" after "maintenance?"

Mr. Rhea: I think the committee would be willing to make an amendment that the road would give due consideration to all expenses involved in the crossing. Our purpose is not to abrogate existing agreements, but that existing agreements shall continue in force and a company that has the advantage of an existing agreement will continue to have it under the changed conditions. That is the purpose and intent of this conclusion.

The conclusion was adopted.

Mr. Baldwin: I call attention to the fact that conclusion No. 2 might be construed by the courts to apply to crossings about to be constructed and I think it would be well to insert, "that with existing crossings, where no previous agreements are in force, the proper division of construction, renewal and maintenance expenses is on an operated-unit basis, etc."

Mr. Rhea: The committee is willing to accept the amendment for the reason we do not believe any recommendation that we make will very largely influence the negotiators in coming situations from giving up the advantage of their tactical position.

Mr. Fritch: I suggest that there be inserted these words: That, in the absence of existing agreements to the contrary, the proper division of construction, renewal and maintenance expenses is on an operated-unit basis, etc.

Mr. Rhea: That is satisfactory.

Mr. Ewing: It seems we are a little bit at sea in this matter. I do not understand that the committee has covered the matter of crossings at all in this conclusion. Under an operated-unit basis each party pays for what is required to interlock its tracks. The road that has prior rights has no business to interlock its own tracks for the construction of another railway.

Mr. Rhea: The intention of conclusion 1 is to protect you now and in the future.

Mr. Rhea moved the adoption of conclusion 2 in this form: "That the proper division of construction, renewal and maintenance expenses is on an operated-unit basis, each party paying for what is required to interlock its tracks, or the residue," eliminating "where there are existing agreements requiring fixed arbitraries," in the last two lines.

Mr. Baldwin: I wish the words, "with existing crossings" in there. I do not want it to be so open.

Mr. Rhea: There are other things besides existing crossings. It may be a junction, not necessarily a crossing; there are other things to interlock besides crossings. I think we might want to make it a little broader than that. Would "existing situations" suit you?

Mr. Baldwin: That will cover it.

Mr. Rhea's motion was adopted.

Mr. Ewing: I move the elimination of conclusion 3, and the insertion in conclusion 2 of the words "and operating" after the word "maintenance."

Mr. Fritch: I am opposed to that, for the reason that clause 3 covers one of the difficulties that we have in interlocking contracts. The strong line may have need for additional men in the tower, and that amendment will burden the weak line with that expense which I think is unfair. A contract that is not fair should not be made. It seems to me that it is a protection to the weak line.

Mr. Ewing: If we are forced at any time to put in a junction or a crossing against our will, it would be a distinct hardship to require us to pay one-half the cost of the operation of that crossing or junction, when we are deriving absolutely no benefit from it. If we are deriving benefit from a crossing or junction, according to the agreement we are required to bear our proportion of the maintenance, construction, etc., of that crossing, based on the advantages we get, so that to my mind it is very necessary that we should allow the operating cost to follow in the line of the direct benefit that we get.

Mr. Fritch: I do not believe that this association should lay down principles that cannot be deviated from. Now, any new contract for an interlocking plant at a crossing of another railway, is a matter of negotiation and the old road usually makes the best arrangement it can. Sometimes the law lays down what procedure shall be followed. But in this particular case you may have a case wherein an interlocking tower and operator is required by one of the roads and not by the other, and it seems to me that this clause exactly covers that point and is very essential.

Mr. Rhea: We do not want to take a narrow view on this proposition. Other public characters have rights as well as those of the companies which we are representing. There is a broader principle than the one of immediate policy involved in this division. The other fellow could not cross our track at grade if the laws did not permit him, and the other man has rights to build his railway, as we had when ours was built. The committee think they have taken a position on which this association can with dignity and with equity appear before any railway tribunal in the United States, or any other country. We all have our responsibilities, as is stated in the report, in safeguarding and expediting traffic.

Our reason for dividing operating expenses on a different basis than construction expenses is that the real equity of each situation is that each man pays for what he really gets. We, as a committee, did not believe that the division of operating expenses on an operated-unit basis can be defended as fair from any point of view. Your operated-units for construction, renewal and maintenance are directly affected just as to what you get. That is a matter which you can locate. You can increase or decrease. With operating expenses, you can have mighty little influence in trimming them. You will pay about so much to operate a station whether you have 24 operated-units or 48 operated-units.

The paragraph in the latter part of conclusion 3 I think is eminently fair and I think is something which has provoked probably as much misunderstanding in interlocking situations throughout the country as any other one subject—one road trying to get the best of another, or get something for nothing, in plain English. There have been a great many cases of that kind, and a great many cases where it has succeeded because agreements in some cases were worded purposely to take advantage which was undue.

Mr. Ewing: I entirely agree with what Mr. Rhea has said as to the division of costs on an operated-unit basis. As to a new junction, or new crossing, the new road has got to accept conditions as it finds them. The old road is there, the new one has got to cross the old road, or connect with it. It puts in an interlocking plant. The old road has not received any advantage at all. Now, what right have we got to say that

they should pay one-half the cost of operating that plant? It seems to me that it is not a fair proposition.

Mr. Baldwin: I quite agree with the view expressed by Mr. Ewing. At the same time the conditions are so varied and the interests at stake differ so very materially, that I believe it to be inadvisable for this association to try to lay down a definite, fixed rule, to govern all cases, and, therefore, I believe a motion to refer back this conclusion to the committee should carry.

J. R. Leighty (Mo. P.): This rule will prevent the interlocking of the crossing of a trunk line by a spur line from another trunk line because the owner of the spur would not be willing to pay one-half the operating expenses of the interlocking plant.

Mr. Elliott: I would like to ask Mr. Rhea how he considers it equitable for a railway crossed by another railway to pay 50 per cent of the operating expenses. Why should not the road which desires the crossing pay the entire expenses of operation?

Mr. Rhea: As I stated previously, it is assumed that existing roads will take care of this in negotiations of new contracts and make the best terms they can. We might have worded that conclusion somewhat differently to make our intent a little more explicit. It is more particularly intended to cover existing situations. The newer railway is being built under the right of eminent domain, as the older one was previously built. You have no right to take the position that you alone can do business and that the other man must be burdened, if he is so unfortunate as to come along later, by all these common expenses. I do not think that you can defend that viewpoint from the standpoint of public policy.

Mr. Elliott: I would like to make an amendment to the motion before the house, that conclusion No. 3 be referred back to the committee to be remodeled in accordance with Mr. Rhea's explanation.

I do not agree with Mr. Rhea in that a new road is obtaining facilities for which the existing road had to pay when it first bought its right of way and built its road and that the expenses of operation of the interlocking plant, incident to the crossing of the new road, should be borne as a part of any other expenses, taxes, construction, property rights, and that the initial road should not be compelled to pay it. In Iowa a law was passed that the old road should pay not only one-third of maintenance expenses, but one-third of cost of construction, and the roads had the point brought before the courts and it was decided that the initial road would have to pay the entire expense of construction, but I believe it is still the law that one-third of the operating expense is paid by the original road.

M. L. Byers (Mo. P.): I would offer this amendment as a compromise between the different views:

That the first sentence of paragraph 3 be omitted.

That the second sentence read: "Where operating expenses are increased beyond the primary operating expenses by facilities for the exclusive use of one party, such party for whose benefit such facilities are provided should pay the entire additional operating expense."

In other words, we do not pass on this point on which we do not seem to be able to agree.

W. C. Cushing (Penna.): It seems to me that we can end this discussion if the committee will say that these conclusions refer only to class A agreements—that is the way I read the report anyhow. I do not think this has anything to do with classes B and C at all, and that being the case, the arguments that have been brought up are entirely foreign to the purpose. If committee says this refers only to class A, I do not think there is anything more to say.

Mr. Rhea: Classes A and B probably.

John V. Hanna (K. C. Ter.): Will the committee explain what is meant by "primary" expenses?

Mr. Rhea: We meant simply the ordinary expenses incurred in operating the ordinary interlocking plant. If you add a lot of block instruments and other expensive apparatus, which require higher salaried men to operate them and more supplies, it seemed to us that it is thoroughly clear that the company getting the benefit of that should pay above what we have termed the primary expense.

Mr. Ewing's motion to refer clause 3 back to the committee for further consideration, and insert the words "and operating" immediately after the word "maintenance" in the second line of conclusion 2 was put to vote and lost.

Mr. Rhea: I move the adoption of section 3 as it stands, with the understanding that it particularly applies to existing situations. This is for the information of the committee and that is the point we would like to have information on, as to existing situations

G. A. Mountain (Can. Ry. Com.): In seconding that, I would go further and say not only present conditions, but future conditions. Where the junior road crosses the single track of a senior road, and that road afterwards puts four tracks down and adds additional appliances, it does not seem to me fair or equitable that the junior road should be saddled with it.

C. S. Churchill (N. & W.): I trust that clause will not be adopted as it will do injustice to many roads. It conflicts with state laws in many states, and there are cases where traffic must be taken into account. If we insist that the small road shall pay one-half the expense of the interlocking plant, then we might as well give up the idea of having any interlocking plant at that crossing.

The morning session then adjourned.

The afternoon session began at 2 o'clock.

E. F. Wendt (P. & L. E.): I move to amend the motion by striking out all words after the word "moved," and substituting the following: that conclusion 3 be referred back to the committee for revision in the light of the discussion of today.

Mr. Rhea: As a member of that committee I must say that I will be left a good deal in the dark as to what the conclusions are. I do not see how, as a committee, we will be able to make any progress. We will simply have to come back next year to have it settled.

Mr. Rudd: I hope that motion will not prevail. It is simply referring back to the committee, saying "You made this report this year, take it back and guess again next year." Give the committee a chance to know how you feel about it.

Mr. Wendt: The strong reason for referring this conclusion back is that a convention is not the best body to endeavor to rewrite a conclusion. The committee itself should revise a conclusion, and the discussion of this morning indicates that there is no general agreement with respect to this question.

C. P. Howard (L. S. & M. S.): It seems that this association would be going rather far to attempt to pass on the question of the adjusting of the cost of constructing or operating any crossing plant. Suppose, for example, that the cost of maintaining and operating the interlocking plant is borne equally by the two railways. If the total cost of operating and maintaining the plant is capitalized at $100,000, the share of the new railroad would be $50,000. If they could prove to themselves that the cost of overhead crossings would be $60,000, of course as far as they are concerned they would be justified in putting in an interlocking plant. It seems to me that is no part of engineering for us to pass on the proportion of expenses and the equity and justice in this matter; that it is a question of public policy and that all that this association could do would be to indicate the basis on which the cost of the interlocking plant could be figured; say, take the operating unit, and that the cost should be calculated on the basis of an operating unit, but it is no part of our business to indicate how much of this cost should be borne by one company and how much should be borne by another company. I think we should keep clear of that.

Mr. Rudd: If the last speaker's assumptions are correct, this committee is woefully wrong in its position. We have assumed, in canvassing the laws and decisions of the various railroad commissions of the country, that there is actually need of an expert opinion on this subject. I have been called before the railway commissions of some half dozen states; the railway commissions are looking for expert advice on the subject as to what is a proper division of this expense. If we are not as an association capable of passing upon what is a proper technical and equitable division of construction, maintenance, renewal and operating expenses, I am rather at a loss to know what association or what class of experts could determine such a question.

Mr. Howard: I think then, that being the case, that this association should go rather slowly in expressing an opinion on that subject. I think it would be certainly wise to leave this subject in the hands of the committee for further consideration.

Mr. Rudd: I think this is a subject which should be handled with great conservatism, but I feel a somewhat narrow view has been taken of this proposition.

W. G. Besler (C. of N. J.) then addressed the convention, but his remarks were not reported.

The motion to refer conclusion 3 back to the committee was carried.

On motion by Mr. Rudd, it was decided that the present specifications for mechanical interlocking be omitted from the Manual to be printed this year, with a note stating that the subject of mechanical specifications is still under consideration.

Mr. Rudd then moved that the report on subject No. 5, Comprehensive System of Uniform Signaling Suitable for General Adoption, be adopted as a progress report.

B. H. Mann (Mo. Pac.): Where the primary aspects have been adopted, does it mean that the secondary aspects are still open for discussion, or does it mean that both the primary and secondary aspects are still open?

Mr. Rudd: As I understand it, the acceptance of the report as a progress report would not commit the association in any way. That is how I intended the motion.

The motion was carried.

The report on subject No. 6, relating to switchstands, was accepted as a progress report.

Mr. Rudd: In regard to subject No. 7, the revision of the Manual, under general instructions, the only change in the Manual will be the printing of specifications for inside wiring, the mechanical specifications having been eliminated, and the power interlocking specifications having been accepted only as a progress report. I move the adoption of the report.

Motion carried.

The report on subject No. 8, Symbols, was adopted as a progress report.

On motion by Mr. Fritch, the thanks of the convention were extended to the committee for its excellent work.

INJURY TO SIGNAL EQUIPMENT, BRIDGES AND TRACK DUE TO BRINE DRIPPINGS FROM REFRIGERATOR CARS.

Before attempting a conference with the Master Car Builders' Association this committee directed its work toward collecting statistics on the extra cost to the maintenance of way departments of railways handling refrigerator commodities, resulting from the present practice of allowing brine from refrigerator cars to drip on or just outside the rails. That this practice is a factor in the maintenance of way costs is a fact already established, although the special committee has not had sufficient time to gather data from which a correct estimate of the aggregate annual expense to all the railroads due to brine drippings could be deduced. Enough has been learned to demonstrate that the question is one of the most important before the association. The expense due to the shortened life of rails and fastenings, bridges and signal equipment, and the attendant expense because of more frequent inspections required and delays to trains on account of signal failures is difficult to express accurately, and any figures must therefore be regarded as approximate only.

As early as 1897 the Master Car Builders' Association received a report on this subject. The report states that the question was first brought to public attention in 1896.

The following is an extract from a report to the Association of Railway Superintendents of Bridges and Buildings in 1898: "One refrigerator car will produce probably 200 gals. of brine every 24 hours, which is distributed over the roadbed and bridges as the car passes along or is held on a siding. The damage is greatest when the cars are not in motion, and on curves where slow speed is maintained. In order to protect bridges in such places it would be necessary to completely cover their decks with a waterproof protection with gutters to carry off the brine. This is necessary because the vents in the present refrigerator cars vary in their positions, thereby making it impossible to construct a single gutter to catch the flow. It has been suggested that attachments be made to all cars in such a manner that the flow of brine will always fall in the center between the rails. This will furnish considerable relief and in places where the flow is excessive, provision could be made to catch this flow and conduct it away from the metal work."

Previous to this, it was well known to signal engineers and those having to do with the maintenance and operation of automatic signals that the drippings from refrigerator cars very seriously affected the operation of signals in wet weather (the heavy summer showers gave certain relief because of the tendency to flush the rail and rail fastenings). In 1901 the subject was mentioned in the Railway Signal Association in connection with a discussion on the maintenance of track circuits. The Michigan Central was at that time experiencing so much trouble because of brine drippings that on certain troublesome sections they resorted to the use of oil on the rails. While this eliminated the signal failures, it was not a satisfactory solution of the problem from a financial standpoint, as the cost of oiling one mile of track per annum was in the neighborhood of $100.

In 1907, at the seventeenth convention of the Superintendents of Bridges and Buildings, the subject was again discussed; and Past-President Johnston, at the ninth annual convention of this association, also called attention to this subject.

The subject was discussed by the General Managers' Association of the Southeast at a meeting held at Atlanta, Ga., on January 16, 1908. The general experience of the members seemed to be that the volume of traffic with brine drip in that territory was so small that the trouble did not constitute a grave problem.

The foregoing shows that the subject has received no continuous or enthusiastic study by any railroad organization with a view of learning just what it costs, and with the exception of the Master Car Builders' report of 1907, no recommendations have been made that would really do much in the way of improving conditions. It appears that the only method that would effectually eliminate the trouble met with so much opposition on the part of the car owners that the Master Car Builders abandoned it without making a recommendation.

Mr. W. C. Cushing's article in the *Railroad Age Gazette* of June 5, 1908, contained some illustrations of the rapid deterioration of spikes and tie plates which is believed to be due largely to brine drippings. We show herewith a few illustrations of tie plates, rail joints, splice bars and a bridge member, none of which have been in service over five years and some less than two years. We have also obtained data from several railroads giving quite careful estimates on the extra cost to the maintenance of way departments, due to brine drippings.

CHICAGO, BURLINGTON & QUINCY.

Bridges.—On lines not exposed to refrigerator traffic, the paint on bridges will last on the average four years and remain in good condition. On lines which are exposed to refrigerator traffic, the iron work on the stringers and floor beams of bridges begins to show "pitting" when protected only by oil paint within a few months after being painted. The cost of cleaning and painting a floor system will average not less than 25 cents per linear foot of bridge. It has been found that certain paints will last about one year, so that the cost on account of brine is estimated at 25 cents per foot per year. There are 150,000 ft. of iron bridge exposed to refrigerator traffic on the system, so that the annual cost of brine drippings on bridges only amounts to $37,500, which is interest on $750,000.

Track.—The deterioration of the plates, angle bars and the rail itself on tracks exposed is, in a great many places, extremely marked. Angle bars have been reduced ⅛ in. at the edge of the lower angle, and tie plates reduced so that nothing was left but the ribs, which were pressed into the wood. This represents a deterioration during less than ten years, the original thickness of the plates being ⅜ in.

MICHIGAN CENTRAL.

Track.—On 545 miles of eastbound track it is estimated that the loss to rails during their life is about 10 per cent., and the effect on bolts, spikes and tie plates, which require more frequent renewals than the same items on westbound track, which is not affected by the brine drippings, is 50 per cent. On this basis we have the following figures chargeable to brine drippings:

Bolts	$ 9,800
Tie plates	27,000
Spikes	8,000
Rails	12,700
Angle bars	1,500
Labor	50,000

Bridges.—The bridge department estimates that the increased cost of painting and more rapid deterioration of bridges amounts to $25,000 per year.

To this is added $4,000 per year because of increased number of track sections, increased amount of battery and the cost of extra maintenance because of these increases, making a total yearly cost of $145,000, which is the interest on $2,900,000.

Signals.—The signal department report details additional cost as follows:

Maintenance of 91 track sections of the eastbound track above the number of sections used on the westbound track	$ 455
1,000 cells of battery	1,700
Extra labor and attendance	100
Labor and material for more frequent bonding and adding third wire	1,000
Extra amount of labor and material for interlocking fittings, connections, cross pipes, etc.	350
Labor of cleaning tracks	395
Total	$4,000

LAKE SHORE AND MICHIGAN SOUTHERN.

The additional cost on account of brine drippings from refrigerator cars on track circuits is as follows: Toledo district, $301, Michigan district, $100; Eastern district, $85, making a total for added battery of $486. To this should be added the cost of additional maintenance. It has also been found that the fiber in insulated joints on the eastbound track requires renewal oftener than the westbound and the estimated cost on this account is $1,500 per year.

The few statements above quoted are representative of existing conditions wherever refrigerator traffic is handled, and indicate only a portion of the enormous total expense incurred by railroads handling this class of traffic in repairing

damage to signal equipment, bridges and track due to brine drippings. In addition to the maintenance of way departments directly affected, there are a number of other items not easily obtainable because somewhat indeterminate; for example, (a) the additional cost for repairs and maintenance of rolling stock; (b) the cost of trains stopped at automatic signals that have failed to operate due to brine drippings; (c) the extra cost for the upkeep of interlocking apparatus, both mechanical and electrical; and the failures and consequent train delays on account of the reduction of the insulating resistances; (d) electrified sections of railroads, using third rail to furnish the current for traction, will find that drippings from refrigerator cars as now arranged will fall on the third rail. This will of course cause rapid deterioration of the rail and rail supports; it will reduce the insulation resistance between third rail and ground, and consequently add to the power station output, add to any electrolytic action that causes damage, and reduce the factor of safety provided for against accidents to persons working about the third rail.

Conclusion.

Your special committee is of the opinion that the damage to railroad equipment, and especially to maintenance of way equipment, and the failures of signaling and interlocking apparatus caused by the present practice of allowing brine to drip from refrigerator cars en route are of such vital importance in operating costs as to call for immediate action on the part of this association, and we recommend that this association formally request the American Railway Association to take such action as will stop the dripping of brine.

The report is signed by J. C. Mock, (M. C.), (representing Committee on Signaling and Interlocking), Chairman; C. H. Cartlidge, (C., B. & Q.), (representing Committee on Iron and Steel Structures), and C. B. Hoyt, (N. Y., C. & St. L.), (representing Committee on Track).

Discussion.

Mr. Mock abstracted the report of the committee and read the conclusions of the report. He further said: The effect of brine drippings on signal apparatus has not been brought out as fully as we hope to in some future reports if it is found necessary to pursue the subject, although there is given here something of what it means to the signaling department of continuing the practice of permitting the brine to drop from the cars as at present.

L. C. Fritch (I. C.): I offer, in lieu of the conclusion of the committee the following resolution:

Resolved, that the subject of brine drippings be referred to the American Railway Association with the recommendation that immediate action be taken to require that brine drippings shall be deposited in the center of the track in order to minimize the damage caused to maintenance of way structures by reason of the present method of disposing of such drippings.

Louis Shaw (Civ. Eng.): I second the motion, but at the same time state that in my judgment carrying the drippings to the center of the track will not obviate the trouble. On all bridges, the brine will be thrown toward the bottom flanges, which will suffer severely. Any appliances that are placed between the track will also be injured. Some effective remedy to do away with the dripping entirely should be discovered. The maintenance department will be put to expense to make provision to catch the brine in the center of the track. It seems to me the remedy lies in something else. If you cannot take care of the brine the whole length of the road, you can probably take care of the bridge. I think the resolution should first start at the root of the disease. I think any member of the association connected with eastern roads can state what the effect is. I know that the chairman himself has had plenty of experience on this score. I should prefer to see a more definite remedy suggested, something to take care of the brine in the car.

G. J. Ray (D. L. & W.): I agree with what Mr. Shaw says, that we should not take any half-way steps in this proposition. It is certainly a very serious thing with some of the eastern roads—it certainly is in our case. I am in favor of taking some positive action, rather than a half-way remedy, for it is only a half-way remedy if you put the brine in the center of the track. I think we should take some action to prevent the dripping of the brine from the cars at all. In the case of signaling work, and also in the case of the rail, bolts, splice bars and bridge structures, it is a serious proposition and an expensive matter, and becomes more expensive as we increase our battery appliances in railroad work. As we become better equipped with signal appliances this damage and trouble we are now experiencing will grow larger and larger, and it is a matter that should be referred to the American Railway Association with a request to take positive action.

W. G. Besler (C. of N. J.): The subject is one of wider influence than its relation to this association, in that the cars and equipment are much affected by the salt brine drippings, as well as the track appliances, and I have recently had correspondence with the chairman of the South Eastern General Managers' Association, and the Chicago association, all on the subject of this damage, not only to the track, but equipment itself, because of brine drippings. I believe that the action proposed by the committee to refer this matter to the executive committee of the American Railway Association and let that association take care of the matter by delegating it to some sub-committee or some proper committee is the proper action. This subject not only relates to the track but to the cars themselves.

The Vice-President: I ask Mr. Besler, as a representative of the American Railway Association, if he thinks the statistics gathered by our committee would be of interest to the American Railway Association?

Mr. Besler: Any committee assigned to cover this matter by the American Railway Association might use the data we have collected and also the data collected by the M. C. B. Association, and other sources on the subject, all of which would go into any action they might conclude to take. It might be possible they would refer back to us for additional action, or otherwise.

A. W. Johnston (N. Y. C. & St. L.): I heartily second what Mr. Besler says. While the motion offered by Mr. Fritch tends to relieve one particular feature of the trouble, it by no means removes the difficulty. The old type of car had a pipe toward the center of the track, and that was the beginning of the deterioration with which we now have trouble. It seems to me the resolution offered by Mr. Fritch should not prevail, but that the committee's conclusion be the basis of a reference of the whole question to the American Railway Association, to deal with as they see fit.

Mr. Fritch: This matter has been under consideration for ten years. The M. C. B. Association has already recommended to the American Railway Association that this subject be considered. I was fully aware that this resolution did not contemplate the full removal of the evil, but on my opinion it will remove at least 75 per cent. Is it not better to get 75 per cent of the loaf rather than to get no loaf at all? We all know dripping brine in the center of the track will affect bridges, but it will not affect track appliances except where there is a crossing or turnout. It will also not affect the wheels of cars. It seems to me, therefore, a practicable move which can be applied at cost not to exceed $5 a car, and which is more within our possibility of reaching than to open the subject again for some method that will cure the entire evil. I am satisfied if this matter is referred to the American Railway Association it will result very much as it did before.

C. H. Ewing (P. & R.): I believe we would be in better form, in going to the American Railway Assocaition, if we did not tell that association how to cure this trouble. Through their committee they will thresh out the thing for themselves.

J. C. Mock (Det. River Tunnel): I think I speak for the committee when I say I think the remarks of Mr. Ewing are in line with what the committee thought proper to do—not to recommend ways and means, because that is not in their province. The cure will have to be effected on another department of the railway, that is, the motive power. We also felt that we should not recommend a half-way measure. The dripping of brine in the center of the track will but little relieve the signal situation, because the leakage is dependent upon the insulation resistance between the rails for the operation of circuit, and on curves and superelevated portions of track we get it spread a good deal over the area between the rails. In many of our track circuits where we should operate 3,000 or 4,000 feet, we have to cut them down to 1,000 feet. We feel as a committee that we should appeal to you on the question of cost. I have no doubt the bridge department, as well as the signal department, might take care of the situation by spending enough money, but we feel as a committee that we should refer this without mentioning how it should be done.

C. P. Howard (L. S. & M. S.): I would suggest that the matter be referred back to the committee to make a report of the annual expense of this brine dripping, and then present the matter to the American Railway Association; or that this resolution be presented to the American Railway Association now, with the information that certain other data would be presented to them later to give them an approximate idea of the damage caused.

Mr. Shaw: I think the plan outlined by Mr. Besler is the best course. The American Railway Association will appoint a committee with sufficient members to investigate this mat-

ter for themselves, going on the various roads affected and getting figures in which they will probably take more interest than in those you might furnish. I think now is the time for action. I think the proper way would be to let Mr. Fritch modify his resolution, or to vote that down and adopt the committee's recommendation and transmit it with the resolution that the association recommends immediate action.

Mr. Fritch's resolution was lost.

The motion on the conclusion of the committee was adopted.

YARDS AND TERMINALS.

The work of the committee was concentrated mainly upon two subjects: (1) The operation of hump yards; (2) the use of machinery for handling freight.

The Operation of Hump Yards.

The committee presented valuable information as to the details of methods of operation employed at a number of freight yards of the gravity type. There is little opportunity, however, for generalizing or drawing conclusions, owing to the varying local conditions. The matter is therefore given in appendices in convenient form for the information of those engaged in the design or operation of freight yards. (Appendices A and B.) Two separate inquiries were made by the committee: (1) As to the method of operating hump yards; (2) as to the number of yards of this type in use or contemplated. From the replies to the latter series a table was compiled showing 82 such yards in use. (Appendix C.)

There was a preponderance of opinion in favor of placing track scales on the hump. The location varies from 30 ft. to 300 ft. below the summit.

Some advantages of using two scales are also pointed out. They enable separate parallel tracks to be built for summer and winter conditions, and also allow the regular work to continue while one of the scales is under repair. But two parallel humps cannot be used at one time in connection with one classification yard, and to provide an additional or alternate hump for use in emergencies entails a loss of room and distortions of lines in both. There is, therefore, a reasonable doubt as to the value of such installations. At principal gateways of movement, and at points of origin of large volumes of freight of mixed character, and wide distribution the classification should be made, first, as to fast or slow movement, and, second, as to destination.

The question is presented therefore as to the relative merits of the alternative plan of providing a second classification yard with the second hump to be used for fast freight, thus making it possible to take either hump out of service for a limited time without causing complete stoppage of classification, and making it possible to nearly double the classification with a comparatively small increase in facilities. The second hump might be parallel with or in tandem with the first, according to local conditions.

The relation of the percentage or proportion of cars to be weighed to the location of scales on the hump or elsewhere is not yet determined. We have testimony to the effect that the scale should not be located on the hump unless about 25 per cent of the cars to be handled must be weighed. We also have the opinions of men who are in charge of large hump yards that handle thousands of cars daily, that the scale should be located on the hump regardless of the number or proportion of cars to be weighed. We assume therefore that the greatest economy would be secured by locating the scale on the hump if it is assured that from 5 to 10 per cent of the cars must be weighed.

Probably the most important matter for consideration in connection with the subject of prompt and economical handling of freight is proper classification as to character and destination. Therefore when high-class freight has been properly grouped it should not be mixed again with slow freight at a division terminal or point of divergence, but without mixing with freight of different character, should be classified as to destination only in preparation for further movement.

We do not need to omit scales from humps on account of loss of efficiency caused by their installation, but we do need generally better yard design, steeper grades between the summit of humps and the receiving ends of the classification tracks, and better facilities for the return of car riders.

In hump yards in which the grade approaching the hump is heavy the cost of operation is excessive, because a large amount of power is required to get the cars to the summit. In some cases very large engines are used. In other cases two large engines are coupled, and in many cases trains that were hauled into the yard with one engine are cut in two or more sections to be pushed over the hump.

In some cases the lack of room has caused heavy grades approaching a hump, with consequent increase in cost of operation, and in many places where lack of room has prevented gravity classification, it could be successfully employed if the cars could be handled promptly on approach grades that are too heavy for operation by locomotives. We present, therefore, as a suggestion the plans of works that have been in successful operation for many years in Pennsylvania for operating freight traffic over short routes with inclined planes (by cable) instead of over longer routes with ordinary grades by locomotives. These works are still used extensively, notwithstanding the fact that much time and study have been devoted to the problem of devising cheaper and more satisfactory methods. The operation is generally on double tracks, the cars being hauled up by a wire cable first on one track and then on the other. In some cases empty cars are lowered as a partial counterpoise, thereby making it possible to increase the load to that extent. (A description is given in Appendix D.)

It is thought that where more than one engine is required to push a train over the hump, or where the approach grades are too steep to be operated successfully or economically by locomotives, the question of substituting stationary power is worthy of consideration.

Freight Transfer by Movable Platforms.

We have been unable to obtain any further information on the subject of transferring freight by means of movable platforms, as no installations using this method are known to be in service.

Terminal Freight Houses.

Under this heading plans and brief descriptions of the methods used in handling freight are given of the Grant street freight station (Pittsburgh) of the Pennsylvania Lines; Wabash-Pittsburgh Terminal Ry.; Missouri Pacific, at Kansas City; Pennsylvania Lines, at Columbus, Ohio, and Indianapolis, Ind.

With reference to the general arrangement of buildings and platforms and the track layout of freight terminals, Mr. Rockwell, Chief Engineer of the Lake Shore & Michigan Southern, submitted plans of the recent freight layout on the Middle Ground at Toledo. The result obtained with this layout is about as follows: In the old house, which this supersedes, 29 gangs of six men each handled 200 cars in 24 hours at a cost of about 45 cents per ton. In the present houses, the same amount of work is done with 17 gangs of six men each at a cost of about 35 cents per ton. It is estimated that when business increases sufficiently so that there will need to be handled 400 cars in 24 hours, it can readily be done with 30 gangs at a cost of not to exceed 30 cents per ton.

Particulars of a large modern freight terminal station on a British railway, with a large equipment of freight handling cranes, are given in Appendix E.

Freight Handling and Conveying Machinery.

Your committee's inquiries in this direction have been mainly barren of practical results, and there appear to be no conveyors in use in ordinary freight houses.

For handling heavy or bulky freight at yards, cranes are very generally used. These may be fixed jib cranes, or overhead cranes of different classes.

For handling freight in a warehouse, pier shed or freight house, the following systems may be used: (1) Conveyors (roller, chain, belt, platform, etc.); (2) overhead traveling cranes; (3) carrier systems. Freight handling in railway storage warehouses was described in our 1908 report, and particulars of the extensive crane equipment in a British railway freight warehouse are given in Appendix E.

Freight handling by machinery may be divided into two classes: (1) In warehouses and steamship piers, where the movement is mainly longitudinal. (2) In freight houses, where there are numerous movements in different directions. The former case is much the simpler, but it may be found practicable to introduce mechanical handling, so as to reduce the amount of trucking in the latter case.

Cranes are used in some warehouses, but as a rule the height of the ordinary freight house is not sufficient to permit the use of an overhead traveling crane. A railway warehouse in Scotland has revolving cranes (with horizontal booms) suspended from runways. These give greater flexibility and capacity than an overhead traveling crane with hoisting trolley.

Traveling hoist installations have been planned. One manufacturer states that he has figured on several such installations, but that with enough trackage to cover the floors satis-

factorily the cost is so high that the proposition is usually dropped.

The general opinion seems to be that there is no machinery or conveyor equipment that can successfully handle freight in ordinary freight houses, and that it would be difficult to devise a satisfactory equipment for such service. The special difficulties are: (1) The great variety in shape, size and weight of the packages; (2) the fact that packages delivered by teams at the various doors have to be distributed to cars at various points on the other side of the house. Ordinary conveyors are not adapted to this service, being more suitable for carrying packages between fixed points of receipt and delivery.

Two possible methods of handling freight between variable points are movable platforms for the packages, or means of moving the trucks by mechancial power so as to reduce the time and labor involved in moving them by hand over long distances. A traveling platform level with the floor has been devised, moving at slow speed, so that men, trucks and teams can cross it. As proposed for an inbound freight house of the Baltimore & Ohio, the moving platform would form a belt line; one side would be near the track side and the other near the team delivery side. Packages (or trucks) from the cars would be dropped on the moving platform. The house would be divided into sections, with a man to each, and each man would pull off of the platform the freight for his section as it passed him. In another system, the platform would be a single line only, the return side being underground. This was designed more particularly for steamship piers, where freight delivered at the end or from a ship has to be transferred for a considerable part of the length of the pier.

For handling the trucks, the committee presents information as to two systems: (1) An overhead runway system; (2) an underground cable system.

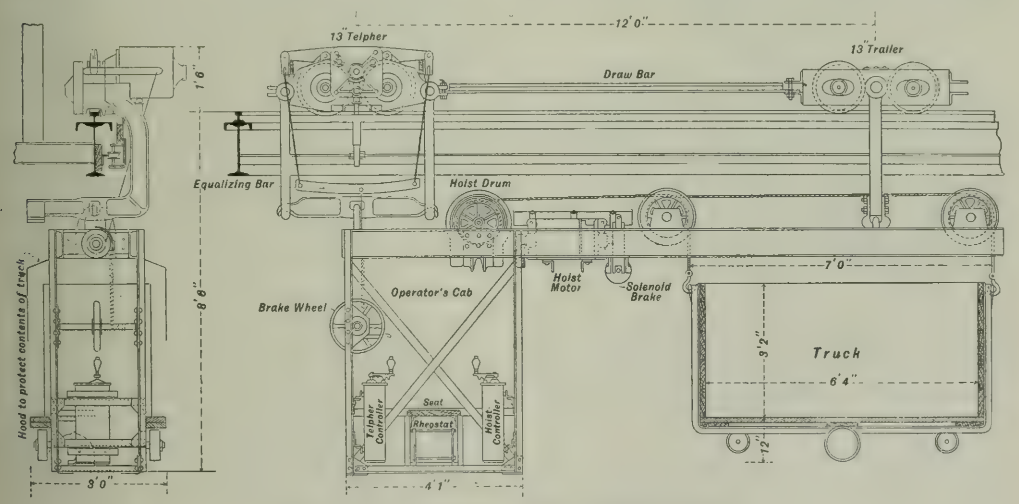
(1) The first is described as it is in use at a steamship pier, and is to be used by the Baltimore & Ohio Railroad. It is the Dodge system. A pair of trolleys riding on an elevated runway carry a frame with hoists for raising and lowering trucks or wheeled platforms. Current for electric traction is taken from an overhead wire, and an attendant riding with the machine controls the traveling and hoisting movements. This system has been in operation for about four years on the pier of the Old Dominion Steamship Co., at Richmond, Va. It handles 3-ton loads between the wharf and the railway warehouse and cars. It is said to show a great saving in cost over the old hand-truck method, besides being able to handle freight more rapidly and with much greater ease.

A telpherage installation has been designed for the Bergen (N. J.) freight house of the Erie Railroad. This house has three platforms, each 1,400 ft. long, and three telpher tracks (one over the center of each platform) connected by loops at the ends. Ten telpher machines operating at one time on the three tracks, all machines following each other in the same direction around the loop, would provide for a movement of 1,000 tons of freight per day of 20 hours. Each machine is required to make one round trip of 3,000 ft. in six minutes (at the rate of 10 trips per hour). The average speed would therefore be 500 ft. per minute, including all stops and slow downs, and the maximum speed of traveling will be 1,500 ft. per minute.

The cost of handling freight in the above manner has been figured at 5 cents per ton. This is based on carrying an average load of only 1,000 lbs. at each trip, although the machines are to have a maximum capacity of 2,000 lbs., which seems sufficient to handle the bulk of the freight. This cost per ton is also based on electric power supplied at 4 cents per k. w. hour, and a telpher rider at 20 cents per hour. This does not include the labor for loading the freight onto the trucks and placing them beneath the telpher runway, nor for unloading the trucks and replacing them under the runway. These figures are from the manufacturers of this system.

The Memphis Warehouse Co. has overhead trolley tracks (Breck system) for handling cotton. The trolleys are not motor-driven, but the tracks have a slight grade so that the load moves by gravity. The grade begins at the beginning of the inbound platform and extends through the plant to the end of the outbound platform, a distance of about 1¼ miles. The arrangement permits of placing four (or even six) trains of 25 cars each at the inbound platforms at one time, without "spotting." This makes it possible for one switching engine and crew to do the work, while ordinarily three or four engines would be required. There are about three miles of the trolley runway and six miles of railway tracks. The cost of handling by the telpherage system is said to be only about one-eighth of the cost of teaming. The company has an extensive cotton warehouse and compress plant, with storage capacity under cover for about 125,000 bales.

(2) A system of handling freight trucks by a traveling chain, has been patented by a firm of conveyor manufacturers, and is intended to reduce the labor of the trucking in a longitudinal direction. The idea was to devise a system that would provide for taking freight from any car along the platform and deliver it to any other car, as conditions require. In order to accomplish this, it was found desirable to use the ordinary hand-truck, with slight modifications, so that it can readily be wheeled around from one place to another by manual labor when desired. The truck travels upon a narrow-gage track, and is provided with special attachments to engage an endless chain set underneath the track. This driving chain lies entirely beneath the floor, and



Carrier for Telepherage Freight Handling System.
(Bergen Freight House of Erie R. R.)

is out of the way. As there is only a groove 1 in. wide in the floor, there is no danger of accidents, and the floor is left entirely clear to truck across or walk upon at any time.

Another method proposed is a slow-moving platform, flush with the floor. It is intended more particularly for piers and transfer stations.

Appendices.

As indicated in the foregoing, there are five appendices to the report. Appendix A gives details of operations of hump yards of the Baltimore & Ohio; Canadian Pacific; Chicago & Eastern Illinois; Chicago, Burlington & Quincy; Chicago, Indiana & Southern; Delaware & Hudson; Erie; Lake Shore & Michigan Southern; Lehigh Valley; Michigan Central; Missouri Pacific; New York Central; Norfolk & Western; Pennsylvania; Philadelphia & Reading; Pittsburg & Lake Erie; Southern; Terminal Association of St. Louis; Vandalia, and Washington Southern. Information is given on the following points: Maximum number of trains entering receiving yard in one hour; average number of cars per train; average train pushed over hump; average number of cuts per train; number of cars passing over hump that are weighed; whether cars are uncoupled to be weighed; location of scales; whether or not scales should be on hump; number of switching engines in hump service; whether the engine keeps the train moving continuously over the hump; average classifying capacity of hump; time allowed engine crews for meals, cleaning fires, etc.; time hump is actually in operation; number of car riders per hump and method of return; method of determining number of car riders needed; method of operating switches; cost per car for yard handling.

Appendix B is a description of the operation of the Galesburg yard of the Burlington.

Appendix C is a list of the freight yards in America on the hump system.

Appendix D is a description of the inclined planes used in Pennsylvania for handling freight traffic.

Appendix E is a description of the freight handling equipment of the new terminal freight station and warehouse of the North British Ry. at Glasgow, Scotland.

Conclusions.

The committee had no conclusions to present. It recommended that consideration be given to the practicability of applying freight-handling machinery in individual cases.

The report is signed by F. S. Stevens (P. & R.), Chairman; E. E. R. Tratman (Eng. News), Vice-Chairman; Hadley Baldwin (C., C., C. & St. L.), G. H. Burgess (Erie), L. G. Curtis (B. & O.), A. H. Dakin, Jr. (Mil. Term.), H. T. Douglas, Jr. (W. & L. E.), A. C. Everham (Det. Riv. Tun. Co.), A. P. Greensfelder, F. G. Jonah (N. O. Term'l Co.), B. H. Mann (Mo. P.), J. D. Mason, A. Montzheimer (E., J. & E.), G. F. Morse (C. R. R. of N. J.), Samuel Rockwell (L. S. & M. S.), C. S. Sims (D. & H.), C. H. Spencer (Wash. Term'l Co.), C. H. Stein (C. R. R. of N. J.).

Discussion.

Mr. Stevens: We present for your consideration a supplement to our preceding report. We have no additional conclusions to present. Our report of last year treated largely on the construction of hump yards. This year we present some facts bearing on the operation of such yards. The report, as a whole, is a report of information and we ask that it be adopted as submitted.

The report was adopted.

L. C. Fritch (I. C.): I would suggest to the committee that next year they submit to us a typical design for various classes of hump yards, yards where the majority of the cars are empty cars, and yards where heavily loaded cars are in the majority, also typical yards under various climatic conditions. I think that is something we lack.

The President: The secretary suggests that the chairman of the committee indicate some of the paragraphs which should be taken up by the members during the year, in order that the members may be prepared at the next meeting to discuss them in detail.

Mr. Stevens: The matter of transfer stations was reassigned last year, but inasmuch as the convention did not appear to wish to consider the suggestions that were made on points on which there were no installations to which we could refer, I will say the matter is in precisely the same condition it was left in then, because there are still no installations of which we have knowledge to which we could refer for further light on the subject.

The matter of freight handling machinery has been a live question with this committee for several years. We have made numerous investigations, and have had a great deal of correspondence with people who have manufactured appliances of this kind and those who thought it desirable to install them, but have not yet found anyone who has been able to recommend a telpherage system or transfer system of any kind as applicable to the transfer of miscellaneous freight.

RAIL.

The Board of Direction instructed the committee as follows:

(1) Continue the investigation of the breakage and failure of rails and present summary of conclusions drawn from reports received.

(2) Report on the results obtained from the use of open-hearth steel rails and the chemical composition of such rails.

(3) Report on any recommended changes in specifications for Bessemer steel rails as heretofore adopted by this association.

(4) Present recommendations as to standard rail sections.

(5) Present report showing diagrams or photographs of typical characteristic rail failures corresponding to the classification as given in old form M.W. 1200 (new form M.W. 2002-A), "Report of Rail Failures in Main Tracks."

(6) Joints considered as a whole. Recommended design and specifications.

The committee of the American Railway Association on Standard Rail and Wheel Sections in its report of March 23, 1908, recommended the following, which was adopted at the meeting held in New York, April 22, 1908:

> "Your committee respectfully recomends that the series of sections of types 'A' and 'B,' and the specifications for Bessemer and open-hearth steel rails, submitted with this report, be adopted as the recommended practice of the association, and that the sections and specifications be referred to the American Railway Engineering and Maintenance of Way Association, with the request that they follow up the question of determining the details as to drop test, etc., by observing the actual results of rails rolled under the new sections, and that they also arrange to collect from the different members and tabulate all information as to comparative wear of rails rolled from the different parts of the ingot, and all other information necessary to a proper study of the problem. That they be further requested to keep careful record of the comparative results in service of rails of types 'A' and 'B,' and to prepare and submit to this association a single type of section which will embody their ideas as to the best type that can be designed for use as a single standard to be adopted by this association, giving due weight to every factor entering into the problem."

This action was conveyed to your committee and was considered as a part of its instructions.

Your committee, fully recognizing the great importance of the work assigned to it, thought it wise to proceed with deliberation. At the first meeting of the committee it was decided that on account of the large field to be covered and the size of the committee it would be advisable to subdivide the work, and therefore one of the essential matters for attention was the adoption of a proper organization to carry on the work. (This organization, comprising three sub-committees, was given in the *Railroad Age Gazette*, June 19, 1908, page 175.)

Referring to the instruction in regard to the investigation of rail breakage and failures, your committee has recognized the necessity of securing accurate data in order that proper deductions and conclusions may be drawn, and it considers it necessary that reports of all kinds should be on a uniform basis for reporting on the manufacture of the rail as well as its behavior afterward in the track; therefore we have devoted considerable time to the preparation and consideration of a proper scheme of blanks for reporting rail failures. The blanks recommended were submitted to the association for letter-ballot (see Bulletin No. 102) in order to get them into use as early as possible, without waiting for action at the annual meeting. (These blanks are practically the same as those of the Pennsylvania Railroad given in the *Railroad Age Gazette*, January 1, 1909, page 14.)

Your committee understands that the main part of its work, in this connection, is to study rail failures quantitatively, and the blanks have been drawn up with that end in view. A quantitative tabulation of rail failures, from year to year, ought, ultimately, to give valuable information to the association by serving as an index, by numbers, whether the results obtained from the new patterns of rail rolled under the specifications are coming up to the expectations. The way has already been paved for such information by the classification of rail failures on the back of the track foreman's report blank, M.W. 2002-A, which was adopted by the association at the last annual meeting.

Although the rail committee recommends this series of blanks to the members of the association as suitable for keeping rail service records, it will itself only need three for

receiving the quantitative reports of failures from the members. These three forms, 2004-A, 2004-D and 2005-D, will be supplied and sent out to the members by the committee to be filled out for the six months' period ending October 31, 1908, and similar information will therefore be regularly requested for six months' periods, viz.: April 30 and October 31, this division being intended to give winter and summer periods, in order to study the effect of each.

Your committee feels that the study of individual rails can only be taken up in part, as it is impossible for the committee to consider the individual rail failures on all the railroads in our membership. It is, therefore, assumed that each member of the association will make the study of individual rails for his own system, digest the information as much as possible, and furnish the committee with accurate informtaion which may be of value to all the members and enable them to draw proper conclusions.

The following resolutions were submitted to the association for letter-ballot and were adopted:

"Resolved, That the complete set of rail statistics blanks previously described be used by the members of the association for reporting and compiling information relative to rail failures and rail service.

"Resolved, That form 2004-A, Summary of Steel Rail Failures for Six Months, Compared with the Same Period of Previous Year; form 2004-D, Position in Ingot of Steel Rails Which Failed, and form 2005-D, Record of Comparative Wear of Special Rail, be adopted by the association as approved forms for receiving statistics for the quantitative study of rail failures.

"Resolved, That the members of the association furnish the rail committee with reports of studies of individual rail failures or rail service, from time to time, as soon as such studies have been made.

"Resolved, That these recommendations be accepted and put into effect at once by the members of the association, subject to revision at the annual meeting."

The committee recommended that the blanks be added to the Manual of Recommended Practice. The committee arranged to have forms 2004-A, 2004-D and 2005-D, for report of rail failures for six months ending October 31, 1908, sent to the railroads of the country through the American Railway Association.

The quantitative statistics will show whether rail failures are increasing or decreasing, from year to year, and what particular kinds of failures are the most numerous, but it will be necessary also to have the information to be derived from the study of individual rails in order to determine, as nearly as possible, the cause or causes for the different kinds of failures, so that we may apply our knowledge to the correction of the troubles. The following plan is, therefore, suggested for each official charged with the study of rail failures for use both for his own benefit and for the benefit of the Rail committee:

(1) Four rails of every hundred which have failed in service should be selected for investigation and analysis.

(2) As the track foreman's reports on form M. W. 2002-A come from the division officers, the chief engineer, or chief engineer of maintenance of way, should select four cases out of every hundred which, in his judgment, will furnish valuable information upon being investigated. If he desires he may leave this selection to the division officer, as it may happen that the division officer may have a better opportunity for selecting good samples than his superior. As soon as the selections have been made blank M. W. 2002-A, for the special rail in question, should be checked by an engineer by a visit to the place where the rail was found, and he should also inspect the rail.

(3) The selected rail or piece of it should be sent forward to the laboratory where it is to be examined and a copy of the checked track foreman's report, M. W. 2002-A, should be sent to the laboratory, and the chief engineer or chief engineer of maintenance of way should also retain a checked copy.

(4) At the laboratory there should be made:

- (a) Photographs of the defective or broken rails.
- (b) A chemical analysis.
- (c) A physical test, such as tensile strength, elastic limit, elongation, etc.
- (d) Micro-photographs showing the structure of the material.

The chemical and physical results should be reported to the chief engineer or chief engineer of maintenance of way on form M. W. 2003-A, and the photographs and micro-photographs, made on the same size sheet, should be pinned to it. If the place for remarks on the form is not sufficient to explain the results of the examination, further explanation can be given in a letter.

Upon receipt of this report, the chief engineer or chief engineer of maintenance of way can, if desirable, add the chemical analysis originally obtained from the mill, and also the drop test. The complete report would then consist of:

- (a) Copy of the track foreman's report on form M. W. 2002-A, after being checked by an engineer.
- (b) Results of chemical analysis and physical test on form M. W. 2003-A.
- (c) Photographs of the defect or fracture and micro-photographs of the interior structure.
- (d) A complete written analysis or deduction from the study of the above information.

The rail committee should receive a copy of such a study or else a report by the chief engineer or chief engineer of maintenance of way, giving the results of a collection of similar studies.

Recommendations.

Your committee offers the following recommendations for approval:

1. That Form M. W. 2003-A, heretofore submitted (see Bulletin 102), be approved as a standard form of the American Railway Engineering and Maintenance of Way Association for receiving reports of the chemical analysis and physical tests of individual rails.

2. That a complete report of the study of an individual rail should consist of:

(a) Copy of the track foreman's report on Form M. W. 2002-A, after being checked by an engineer.

(b) Results of chemical analysis and physical test on Form M. W. 2003-A.

(c) Photographs of the defect or fracture and micro-photographs of the interior structure.

(d) A complete written analysis or deduction from the study of the above information.

We further recommend that blank No. 2003-A be incorporated in the Manual of Recommended Practice.

Drop Testing Machine.

Your committee considers that a uniform system of testing at the mills is essential. The following specifications for a standard drop testing machine were submitted by letter-ballot to this association:

SPECIFICATIONS FOR DROP TESTING MACHINE.

A drop testing machine conforming essentially to the manufacturers' plans and specifications and in general accord with the following requirements will give satisfactory results:

1. The machine shall be arranged to allow a 2,000-lb. tup to fall freely at least 25 ft. on the center of a rail resting on supports that can be adjusted to spans varying from 3 ft. to 4 ft. 6 in.

2. The anvil shall be a solid casting, weighing, with the attachments that move with it, 20,000 lbs. It shall be free to move vertically independently of the lead columns and shall be supported on 20 springs known as the standard "C" spring, without center coil, as employed by the Master Car Builders' Association (their figure 5614). This spring has a free length of 8¼ in., an outside diameter of 5 7-16 in., and is made from a bar having a diameter of 1 3-16 in. These springs are to be arranged in groups of five at each corner of the anvil and are to be held in place by hubs raised on the top of the base plate and by circular pockets on the underside of the anvil. Removable finished steel wearing strips shall be secured to the anvil and the lead supports for guiding the vertical movement of the anvil.

3. The base plate shall be of cast-iron or cast steel 8 in. thick in the area covered by the anvil. It shall be firmly secured to the substructure by four bolts 2 in. in diameter.

4. The substructure shall consist of a timber grillage resting on a masonry foundation. The grillage shall project 9 in. beyond the ends of the base plate, and clear the columns at the side. It shall consist of one course of 12 in. by 12 in. sound oak or southern yellow pine, preferably creosoted, laid close and well bolted together. The masonry, preferably concrete, shall be not less than 5 ft. deep below the grillage and be suitably supported on the subsoil.

5. The pedestals for supporting the test rail shall be substantial castings. The rail supports shall be removable pieces of steel, securely held in the pedestals, having an upper cylindrical bearing surface, with a radius of 5 in. The pedestals shall be adjustable to spans varying from 3 ft. minimum to 4 ft. 6 in. maximum between centers. They shall be securely held together, and so fixed to the anvil as to

insure that the center of span shall always coincide with the center between leads.

6. The leads shall be firmly connected to the base plate and well braced. They shall be long enough to provide the prescribed free fall of the tup. They shall be provided with a convenient ladder and a plainly marked gage, divided into one-foot intervals. The zero of this gage shall be 5¼ in. above the top of the rail supports, and the specified height of drop shall be measured from this zero irrespective of the height of rail being tested. One of the guides shall have a removable section 6 ft. long at the bottom, so that the tup or tripping block can be readily removed.

7. The tup shall weigh, with the accessories that drop with it, 2,000 lbs. The striking die shall be steel, having a cylindrical striking face, with radius of 5 in. and a length of 12 in. The guide grooves shall have finished surfaces. The tripping head shall allow a grip of the tongs that will release at the exact height for which the tripping device is set, and that will be safe from accidental release while the test piece is being shifted.

8. The tongs and tripping device shall be arranged to release the tup automatically only; no manual releasing will be allowed. The tripping device shall be easily adjustable at 1 ft. intervals.

The resolution accompanying the specifications (see Bulletin 102) is as follows:

"Resolved, That a copy of the report of Sub-Committee No. A, on Drop Testing Machine, be sent to the secretary of the American Railway Engineering and Maintenance of Way Association, with request that the matter be presented to the board of direction with request that the same be acted upon promptly and placed before the association in proper form by letter-ballot for approval, after which it is to be referred to the American Railway Association for approval."

The association approved the specifications by letter-ballot.

Use of Open-Hearth Steel Rails and their Chemical Composition.

Referring to the second instruction, we can only report that we have the matter in mind. Owing to the financial conditions existing during the past year, very little rail has been bought by the railroads of the country. The committee will secure statistics in the future for rails of special manufacture wherever possible. During the past year a number of roads purchased open-hearth rail, but sufficient time has not elapsed for the committee to secure the data necessary for a report.

Recommended Changes in Specifications for Bessemer Steel Rails as Heretofore Adopted by the Association.

In view of the fact that the American Railway Association has adopted a specification which has been referred to our association and that we have been asked to observe the action of rails rolled under the new specifications, it will be some time before definite results and recommendations can be given.

Referring to Instruction No. 4, "Present Recommendations as to Standard Rail Sections;" Instruction No. 5, "Present Diagrams or Photographs of Typical Characteristic Rail Failures," and Instruction No. 6, "Joints," we can only report progress on these instructions. We have arranged for a series of tests at the Watertown Arsenal of a number of types of rail joints from which we expect to derive some valuable information.

Canted Rail.

We have been looking into the matter of canted rail and have reports from 190 railways, members of your association. One hundred and seventy-four roads report no experience, 14 roads are trying canted rails with varying success, and one road is in favor of the plan. Three roads get the cant in the tie plates; the others adze the ties. One road has recently issued instructions for tracklaying and proposes to cant all its rail.

Appendix.

We submit as an appendix to this report a discussion on blanks for reporting rail failures, furnished by Mr. John D. Isaacs, a member of the committee, in which he outlines the method followed in reporting and studying failed rails on the Harriman Lines. (This was published in the *Railroad Age Gazette*, November 13, 1908.)

Conclusions.

The following conclusions are submitted for your approval:

(1) That the complete set of rail statistics blanks, previously described and approved by letter-ballot, be used by the members of the association for reporting and compiling information relative to rail failures and rail service.

(2) That Form 2004-A, Summary of Steel Rail Failures for Six Months, Compared with the Same Period of Previous Year; Form 2004-D, Position in Ingot of Steel Rails Which Failed, and Form 2005-D, Record of Comparative Wear of Special Rail, be adopted by the association as approved forms for receiving statistics for the quantitative study of rail failures.

(3) That the members of the association furnish the Rail Committee with reports of studies of individual rail failures or rail service, from time to time, as soon as such studies have been made.

(4) That Form M. W. 2003-A, heretofore submitted, be adopted as a standard form of the association for receiving reports of the chemical analysis and physical tests of individual rails.

(5) That a complete report of the study of an individual rail should consist of—

(a) Copy of the track foreman's report on Form M. W. 2002-A, after being checked by an engineer.

(b) Results of chemical analysis and physical test on Form M. W. 2003-A.

(c) Photographs of the defect or fracture and micro-photographs of the interior structure.

(d) A complete written analysis or deduction from the study of the above information.

(6) That the blanks described above and approved by your association by letter-ballot, also blank 2003-A, be added to the Manual of Recommended Practice.

(7) That the specifications and plan for drop testing machine, herewith submitted to the association for letter-ballot, be adopted as standard.

(8) That the specifications and plan for drop testing machine be added to the Manual of Recommended Practice.

(9) That the specifications for Bessemer steel rail, as presented in the Manual of Recommended Practice, be allowed to remain in the Manual as now printed.

(10) That the following note be added to the specifications in the Manual: "The Committee on Rail has under consideration the matter of revised specifications."

The report is signed by D. D. Carothers (B. & O.), Chairman; R. Montfort (L. & N.), Vice-Chairman; Robert Trimble (Penn. Lines), Secretary; E. B. Ashby (L. V.), J. A. Atwood (P. & L. E.), A. S. Baldwin (I. C.), J. B. Berry (Rock Island), Chas. S. Churchill (N. & W.), W. C. Cushing (Penn. Lines), F. A. Delano (Wabash), Dr. P. H. Dudley (N. Y. C. Lines), C. H. Ewing (P. & R.), J. F. Hinckley (Cons. Engr.), John D. Isaacs (Har. Lines), Thos. H. Johnson (Penn. Lines), Howard G. Kelley (G. T.), J. W. Kendrick (A., T. & S. F.), George W. Kittredge (N. Y. C.), D. W. Lum (Southern), Jos. T. Richards (P. R. R.), and J. P. Snow (B. & M.).

Discussion.

Mr. Churchill: The progress of the work of the committee has been as rapid as possible, considering the difficulties that confronted the committee. These difficulties, briefly, are that no systematic method was being followed by different railroad companies reporting breakage of rail, no uniform method was followed by different railroads in keeping track of rails in the track and the service given by rails. Railroads would report they had a rail in the track so many years. That statement was of no value unless we knew how much traffic the rail had carried. We had no record of what part of the ingot the rail was taken from, we had no record as to what kind of a drop test had been made at the mills. Then the drop test machines themselves at the various mills vary so much in their construction that no accurate results could be secured, so the result of the work has been, first, to adopt a series of forms on which to make reports of the records of rails from the very beginning and a uniform drop testing machine to be used at all mills. The conclusions, many of them, have already been acted upon, but we want a reaffirmation of them in order that they may go in the Manual.

The secretary read the conclusions.

C. E. Lindsay (N. Y. C.): Do I understand that paragraph (a) in conclusion 5 has been adopted?

The President: Yes.

Mr. Lindsay: We have it in use on the New York Central Lines, and in practice we found it would be desirable to have the gage line of the rail indicated in some way, so that the defect in the rail could be referred to in its relation to the gage line. In some cases you cannot tell it is the gage inside of the rail, from the picture or description in the report.

Mr. Churchill: The committee will take note of that and see if it can be introduced later on.

Hunter McDonald (N. C. & St. L.): I wish to refer to paragraph (d) in conclusion 5, as to what constitutes a complete report. As I understand it, the different railroads are asked to transmit to the committee interesting features of cases of rail failure. It is not within the power of a good many railroads to furnish the information that is called for here. For instance, there are quite a number of roads that do not maintain a laboratory for the purpose of making chemical anlyses, nor have they the facilities or money to spare for the purpose of having photographs made of broken rails, etc. Am I to understand that the committee does not want any report except those that are complete as defined in this conclusion?

Mr. Churchill: The committee desires that reports be made as fully as the conclusions specify, but where railroads are not equipped to furnish the report in such detail, they should say so. We want all the available information that can be furnished, and desire to have it as complete as possible to cover all questions that may arise.

Mr. Cushing: Conclusion 5 says that this is a study of an individual rail, and it refers only to the study of the individual rail. If any company has any additional information to give about any particular rail that it has studied, we recommend that it be furnished the committee in that form. It has nothing to do with the filling out of these blanks which were sent around to the various members of the association some time ago for the general information as to the number of different kinds of rail failures. If a rail has failed under peculiar circumstances, because of a wreck possibly, a pretty thorough investigation of that rail is made, and this simply takes care of how the committee would like to have the report made in such case.

Mr. Churchill: On behalf of the committee I move the adoption of the conclusions as read.

The motion was carried.

The President: The chairman of the committee has a statement to make.

Mr. Churchill: Sub-committee A made a number of tests at Sparrow's Point mill, in the presence of the full committee and of the manufacturers' committee, of a number of rails of different sections, including "A" sections and "B" sections of the new form, as well as the American Society section, and that compilation is about completed.

The sub-committee who have charge of testing rail joints as a whole are following that up. It took quite a long time to get from the different railroads samples of joints. They have all gone forward to the Watertown arsenal, and tests on joints are now in progress under the auspices of the Government, overlooked by two committees—the committee representing this association and the committee for the Testing Materials Association.

TRACK.

Sub-committees were appointed as follows:

(A) To revise the frog table submitted in 1908 and to extend the table to make it more nearly universal and to present a definite recommendation for the length of switch for each frog.

(B) To prepare specifications for switch points to be used on Class A track.

(C) To prepare specifications for standard spring frogs for Class A track.

(D) To prepare specifications for switchstands.

(E) To confer with American Railway Master Mechanics' Association on the subject of widening of gage on curves, and to present report on throat clearance and guard rail clearance.

(F) To adapt formulas and tables on spirals for publication in the Manual.

The following outline of work was given by the Board of Direction:

(1) Review and revise the committee's report presented at the ninth annual convention, covering the following subjects:

(a) Report on the subject of turnouts and turnout material, including the best types of switchstands, switchpoints, frogs, guard rails and throat clearance, bearing in mind the possibility of an increase of the thickness of wheel flanges and the effect of worn tires and wheels upon the various parts of turnouts, frogs and crossings.

The committee presents in Appendix A its report on the foregoing subjects.

(b) Report on facing point switches for high speeds with a continuous main line rail.

Your committee reaffirms its report of last year on the subject of facing point switches with main line rail.

(c) Confer with committee on signaling relative to switch stands.

Your committee reports progress on this subject, and requests further time.

(2) Continue investigations in connection with a sub-committee of the American Railway Master Mechanics' Association upon the subject of widening the gage on curves and spacing of guard rails, as affected by the different lengths of engine wheel base, arrangement of flanged wheels and wheel wear.

Your committee has held conferences with joint committees of the American Railway Master Mechanics' and Master Car Builders' Associations during the year and as a result begs to recommend the following resolution:

Resolved, That the clear width of standard flangeway for all frogs and between main rails and guard rails be 1¾ in., measured at the gage line, for all tracks of standard gage.

A drawing shows position of wheels with maximum and standard flanges with reference to 1⅞ in. throatway and for 1¾ in. throatway. The meeting with the Wheel Committee of the Master Car Builders' Association brought out the fact that some changes were necessary in the M. C. B. standard reference gage as used for mounting. The corrected gage is shown on the drawing.

Your committee requests further time in which to prepare its report on widening of gage.

(3) Report on whether wide gage, which is due to worn rail, should be corrected by closing in or replacing the rail.

After careful consideration of the above subject, your committee begs to report as follows:

Wide gage, due to worn rail, within the safe limits of wear, need not be corrected until the excess over the gage is equal to or exceeds ½ in., and should then be corrected by closing in.

(4) Report on the extent rail should be worn before it becomes unsafe.

Your committee is not in position to make a definite recommendation upon the extent rail should be worn before it becomes unsafe.

(5) Consider revision of paragraph (3), under "Proper Method of Spiking," Manual, 1907, p. 64, and report recommendation as to extent gage on curves should be worn open before closing in is necessary.

Your committee recommends that the following paragraph be substituted for the one now appearing in the Manual (the change consisting of the substitution of "½ in." for "⅜ in."):

(3) Within proper limits a slight variation of the gage from standard is not seriously objectionable, provided the variation is uniform and constant over long distances. Under ordinary conditions it is not necessary to regage track if the increase in gage has not amounted to more than ½ in., provided such increase is uniform.

Under special instructions, your committee took up the question of easement curve formula and has done considerable work upon it in order to get this formula in shape for the Manual. In order to settle upon lengths of spiral a circular was sent to the members and a tabulated list of replies is presented.

It was found necessary, in order to determine the easement curve formula, to have a definition for "degree of curve." The committee presents tabulated replies to Circular No. 110 on this subject, and a discussion of the question by Prof. C. Frank Allen, Prof. Wm. G. Raymond, and others, which will be of benefit to the association and may help solve this problem. (Appendix B.)

MAINTENANCE OF LINE AND ALINEMENT—RECOMMENDED PRACTICE.

Adjustment of Curves with consideration as to Easement Curves:

Easement curves should be used on all curves requiring an elevation of 2 in. or more.

The choice of easement curves should be governed by the ultimate possibilities as to speed, with consideration as to probable revision of the worst features of alinement, rather than by existing schedule speed.

On curves of 6 deg. and over, which are limiting curves as to speed, easement curves not less than 240 ft. long should be used.

On curves of less than 6 deg. which are limiting curves as to speed, easement curves should be used whose length in feet is not less than 5 1-3 times the speed in miles per hour calculated for an elevation of 8 in.

On curves which are not limiting curves as to speed, easement curves should be used whose length in feet, when the rail is elevated for the ultimate speed, will be not less than 30 times the elevation in inches nor less than two-thirds the

ultimate speed in miles per hour times the elevation in inches.

Longer easement curves than the minimum lengths recommended may be used to advantage and often with increased convenience in their application, but any considerable increase in length is wholly unnecessary and should never be made without careful consideration as to the effect on cost. The minimum length should be used in all cases where a greater length would adversely affect the degree of curve.

Easement curves should be used between curves of different degree in the same way that they are used between curves and tangents.

The curve elevation should be run out in the same distance as the length of easement curve, with no elevation on tangent and full elevation on the circular curve.

Any form of easement curve is satisfactory in which the degree of curve increases with the distance; in which the rate of increase in degree of curve can readily be changed to suit each particular case, so that the length of easement curve shall be the same as the distance in which the outer rail is raised from zero to full elevation; which can be run in by deflection or offset, with chords of any desired length, and which is of the general type of Searles, Crandall, Holbrook, Talbot or cubic parabola.

Properties of the Split Switch.

This sub-committee submits:

(1) Revised formulas for determining the properties of the modern split switch.

(2) A table of the properties of frogs and switch rails for use on roads using rail weighing 80 lbs. per yard or less.

(3) A similar table for roads using rail weighing more than 80 lbs. per yard.

Until all of the above points are definitely determined, we feel it would be of no avail to figure the leads and other functions of the entire turnout.

In the tables submitted, the dimensions of the frogs are so computed that—

(1) A 36-in. angle-bar splice may be applied, without clipping, to a frog made of 80-lb. rail.

(2) A 36-in. angle-bar splice may be applied, without clipping, to a frog made of 110-lb. rail.

In both tables the frogs from No. 9 to No. 15, inclusive, have been made of sufficient length from point to toe to permit of being made spring frogs, if so desired.

The switch angles are chosen arbitrarily, after some trial, and are kept as small as seems consistent and of as nearly the same angle for the same number of frog as practicable; the committee having found from comparison of the results of various computations that for any given frog, whether the heel distance remains constant and the switch angle varies or the switch angle remains constant and the heel distance varies, the change in the degree of the lead curve is practically the same for equal changes in the length of the switch rail. So that, considering the switch angle constant and knowing the length of the lead and radius of the lead curve for any given length of switch rail and number of frog, the length of lead and radius of lead curve for any other length of switch rail with the same frog may be much more easily computed than when different switch angles are used with the same number of frog.

Conclusions.

Your committee recommends the adoption of the following conclusions:

(1) That the formulas for the functions of the split switch proposed be approved as good practice.

(2) That the properties of the frogs and switch rails given in the accompanying tables be approved as good practice.

(3) That the degree of curve be defined as the angle subtended by a 100 ft. chord.

(4) That all curves be spiraled which would require 2 in. elevation for the highest possible speed.

(5) That wide gage, due to worn rail, within the safe limits of wear, need not be corrected until the excess over the gage is equal to or exceeds ½ in., and that it should then be corrected by closing in.

(6) That paragraph (b), page 60, of the Manual, under the heading of Maintenance of Line and Alinement, be withdrawn and the version submitted in the body of this report substituted.

The report is signed by L. S. Rose (C., C., C. & St. L.), Chairman; C. E. Knickerbocker (N. Y., O. & W.), Vice-Chairman; E. C. Blundell (C., St. P., M. & O.), Garrett Davis (C., R. I. & P.), T. C. Hickey (M. C.), C. B. Hoyt (N. Y., C. & St. L.), J. B. Jenkins (B. & O.), C. E. Lindsay (N. Y. C.), G. J. Ray (D., L. & W.), S. S. Roberts (Univ. of Ill.), R. O. Rote Jr. (L. S. & M. S.), John C. Sesser (Cont.), F. A. Smith (Cons. Engr.), R. D. Sarbuck (M. C.), R. A. Van Houten (L. V.), W. D. Wheeler (M. & St. L.), A. A. Wirth (Penn. Lines).

Discussion.

Mr. Rose: In order to get the report before the convention, I think it would be well to have the conclusions read. I move that conclusion No. 1 be adopted.

This conclusion was adopted without discussion.

Mr. Rose: Referring to conclusion 2, it was the intention of the committee to prepare tables for frogs and switches which would meet the varied experience—which would be good for any railroad, and could be used by all. For that reason the different lengths shown here were given.

A long discussion followed, many members objecting to the adoption of the tables as given because of the great number of lengths included. They thought the number should be reduced to as few as possible.

Mr. Cushing (Penna.): At present we get along with two lengths of switches, 18 and 30 ft. I do not mean to argue those are the only and best lengths to use, but I believe that all of us can get along with at least three lengths of switches, and I do not think they need to differ by 2 ft. all the way up.

Mr. Rose: It is not the intention of the committee to recommend that all of these shall be used, but in canvassing the question we found it would be impossible to get all the members of this association to agree on three lengths of switches. Any three we might take would not suit everybody and the table can be used by any road that wants to use it after it is adopted.

A. W. Thompson (B. & O.): The figures as worked out are not theoretical all the way through?

Mr. S. S. Roberts (Univ. of Ill.): Not entirely. If you have them theoretical all the way through, you will have fractions of inches and every particular frog would be different, but we have tried to get something, after considerable thought, that might, if possible, be reconciled to the various practices. Not the practices of any one road, but something if any road did use it would not go very far wrong. The purpose of submitting this table of frogs and switch points was simply to get an exact basis from which to revise the functions of turnouts that were submitted last year.

Mr. Cushing: One of the great results to be accomplished by this association is the reduction of the large differences in practice and in material used on the different railroads. It not only helps the railroad company, but it helps the supply man. If this table goes out in this way, one road picks one thing and another picks another and we are as widely apart as we are at the present time. Even on a large railroad system the engineers don't agree on these matters. Even on our own system we would probably have as much of a table as this is if we were not required to come together and agree on something, and I think this committee can do the same thing and, working from proper principles, establish what seems to be a good length for these switches and say that that is what they recommend.

Mr. Wendt: Mr. Chairman, it seems to me that the tables are hardly in proper form to be printed as part of the Manual, because they involve a number of assumptions on which this association has never taken action. These tables involve switch angles, lengths of frogs and lengths of switches and the association has not placed its stamp of approval as yet on any standards for any of these features.

Hunter McDonald (N. C. & St. L.): Referred to the instructions of the Board of Direction to this committee, and said if the committee had not complied with that instruction, he did not know how else they could do it.

Mr. Roberts: One of the criticisms of this committee last year was that the lengths of switch rails as recommended could not be cut from commercial lengths of rail without waste. We have tried to get a lead that would contain between the heel of the switch point and the point of the frog, the commercial lengths of rail, or such fraction thereof that the piece cut would not be wasted. We selected 18 and 22 ft. so that in cutting the rail we could use the piece for another point.

C. C. Wentworth (N. & W.): I move that the sense of the committee as a whole be given to the effect that there be three lengths of switches and three lengths of frogs.

J. V. Hanna (K. C. Ter.): I don't know that the recommendation of a large number of switch points obligates any railroad to adopt all of them for its standards, and I can see considerable help to the engineers figuring these things out in having these things before them.

T. H. Gatlin (So. Ry.): Within the last year our road has used the lead curve and the formulas for the functions o

the switches worked up by the committee, and in special work the formulas for the functions made a very beautiful fit in actual work in the field.

A. S. Baldwin (I. C.): This motion is not apropos to the question before the house. This committee has given a table and furnished a resolution to the effect that the properties of frogs and switch rails given be approved as good practice. They have established in these tables a ratio between the angle and the length of frog and the switch point to be used with it. The question for us to decide now, is this ratio correct? There isn't a question before the house as to whether we should be restricted to certain lengths of frogs, properly speaking.

J. B. Jenkins (B. & O.): The motion is to have three lengths of switches and also three lengths for all frogs. It seems to me the expense of having three lengths of switches is somewhat different from having three lengths of frogs. While it may be possible for any road to limit itself to three lengths for the switch points, yet there are certain physical difficulties in the way of restricting the lengths of all frogs to three. I would, therefore, offer an amendment to the motion to eliminate the reference to the length of frogs, so that the two things can be considered separately.

Mr. Wentworth: I did not mean to make only two frogs 20 ft. long; I meant to start with No. 2 frog, 15 ft. long and increase the length as required in order to get the angle.

L. C. Fritch: This discussion only shows how impracticable it would be to select any number of switch rails and frogs that would be acceptable to all roads. Personally, I think the table of the committee should stand, and let each road adopt as its standard the number of switch lengths and frog lengths it desires.

J. A. Atwood (P. & L. E.): In order to bring this discussion to a conclusion I move an amendment to the motion, that conclusion No. 2 be made to read as follows: "That the properties of the frogs and switch rails given in accompanying tables be approved as good information," and that the following also be added:

"2 (a): That the number of switch points and frogs used in general practice be reduced to as small a number as possible."

This motion, as well as Mr. Wentworth's to instruct the committee to have in their tables only three lengths of frogs and only three lengths of switch points, was lost.

Conclusion No. 2 was then adopted.

The secretary read conclusions 3 and 4.

A. L. Kuehn (Amer. Creo. Co.): I want to ask the committee how the 2 in. elevation was arrived at.

Mr. Jenkins: This was arrived at in connection with the proposition to spiral the curve, not so much for schedule speed as for the degree of curve itself; that is to say, a 4 deg. curve is good for a certain speed with 8 in. super-elevation. If you put a shorter spiral in that curve, that spiral will limit the speed to something lower than the limits set by the degree of curve itself, and if we make spirals part of the permanent alinement, which seems to be the practice of the majority of the roads, then by putting in a shorter spiral, you would put a permanent reduction of speed on that part of the line, which is not called for by the maximum load. The 2 in. elevation is arrived at in connection with the rate of runoff. With the rate of runoff proposed, the 2 in. elevation would give speeds of over 45 miles an hour, and a uniform offset between the tangent and circular curve of ½ in. The offset of the spiral at the middle point would be only ¼ in., and at the end of the spiral 2 in.; on other words, the engine will travel over considerably more than half the spiral before the flanges of the wheel will strike the rail, and a spiral much shorter than that would be, you might say, an imaginary spiral, and not one that would have any direct influence on the qualities of the track.

Mr. Kuehn: It seems to me before adopting this conclusion we should determine on the proper length of spiral for different curves and different speeds.

Mr. Ewing (P. & R.): I move the adoption of the committee's conclusion 4, with the change of the word "possible" to "permissible."

Mr. Fritch: The spiral should not be specified. It is impracticable to specify any uniformity as to the application of the spiral, because the location of the curve governs largely. A curve at the foot of the grade will require a spiral of different character from one at the top of the grade. Therefore, I think it would be impracticable to specify any uniformity in regard to the use of the spiral.

Mr. Ewing's motion was put to vote and carried.

The secretary read conclusions 5 and 6, which were adopted.

The secretary read the matter on "Maintenance of Line and Alinement—Recommended Practice."

Mr. Rose: I move the adoption of conclusion 6 carries with it the adoption of the matter just read by the secretary. (Motion carried.)

Mr. Rose: I move the adoption of the resolution on the clear width of standard flangeway.

This precipitated a discussion on the question of an increase in the width of wheel flanges by the Master Car Builders' Association, and also as to whether or not the American Railway Association had passed on this question of the standard width of flangeway.

Mr. Rose: The question of the thickness of the flange is a pretty serious one. You cannot make it any thicker without striking the point of the frog. The M. C. B. Association recommends a 1⅞ in. flangeway, but with a 1⅞ guard rail distance you cannot guard the frog point. They have not only drawn the flange high, but made it thicker, and the only way we can help them is to maintain the 1¾ in. flangeway at the guard rail.

Mr. Ewing: The committee has illustrated this matter very correctly and stated the facts. As I understand it, the M. C. B. Association did, within the past year, increase slightly the thickness of the flange. They concluded that greater strength was needed at a point slightly above the tread of the wheel. They have taken into consideration a 1¾ in. tread and reinforced their flangeway to meet that condition. I also believe that the American Railway Association at its last meeting definitely decided that 1¾ in. was the proper flangeway.

Mr. Churchill (N. & W.): I wish to amend the resolution of the committee to this effect: That the clear width of standard flangeway used for all frogs be 1¾ in., and between rails and guard rails be 1⅞ in.

Mr. Wentworth: The reason for holding to 1¾ in. through the frog is in order to lessen the jump which the wheel has to make over the flangeway going through the frog. That should be 1¾, if we can make it; I think after awhile we can. Just now we cannot, and I am sure that 1⅞ on the guard rail is in line with what we will have to do pretty soon.

Mr. Cushing (Penna.): After thorough investigation the American Railway Association adopted a 1¾ in. flangeway, but on their attention being called to it they were not satisfied with the language in which it was expressed and they have asked this association to formulate a recommendation in better language and that communication was turned over to the chairman of his committee, and he had that before him in making this recommendation.

Mr. Churchill's amendment was put to vote and lost.

The Vice-President then put the question on the adoption of the resolution, which was carried.

Conclusions 5 and 6 were adopted without discussion and the specifications for frogs and switches received as a progress report.

T. H. Gatlin (So.): I move, in the first paragraph where it provides that the company shall be notified of any omissions in the drawings or specifications, that the following be added at the end of the sentence: "Before proceeding further with the construction of the work."

The Vice-President: The committee will consider that in their revision of the specifications for final presentation.

Paragraph 1 (b) on facing point switches was accepted and the subject considered closed.

Mr. Roberts: In regard to completing the table of switch lengths, I ask how we should do that. In figuring in accordance with any exact formulae you obtain leads which will give such lengths of rail between the toe of the frog and the heel of the switch rail that it will be necessary to cut the rail. By modifying the theoretical lead very slightly—by making it a fraction shorter or longer than the absolutely theoretical lead—you can obtain a lead which differs in curvature and length only slightly from the theoretical lead and obtain one in which you can use commercial lengths of rail, or use both pieces if you cut the rail. The opinions advanced to us in regard to such leads are varying—some insist we shall stick absolutely to the theoretical lead, and some that we should adopt the practice where you will not have to cut the rail, or if you do, you can use both pieces. Before figuring out these tables and completing them, the committee would like to know what is the wish of the association. Shall we use the absolutely correct theoretical lead, or shall we use the practical lead?

Mr. Ewing: I move the committee prepare a table of practical leads conforming closely to the theoretical.

Motion carried.

TIES.

The following subjects were assigned to your committee by the Board of Direction:

(1) Continue the compilation of statistics upon the life of ties, both treated and untreated, and the causes of failure. Present summary compilation of reports received and draw such conclusions therefrom as the statistics warrant at the present time.

(2) Prepare critical review of the general question of the present and future status of the tie supply, the various methods heretofore adopted for reducing the yearly demands on the timber supply, and what general lines of investigation and change in existing methods may seem most desirable to be followed so as to secure the best results in the future.

(3) Collect statistics on the extent of the use and the life of metal or composite ties up to the present time, with illustrations and descriptions of the most successful designs, and draw such conclusions as the conditions may warrant.

Each subject was assigned to a sub-committee.

Compilation of Statistics.

The association adopted at the 1902 convention certain forms to be used in the compilation of statistics. It is now deemed advisable to make some changes in these blanks in order that the destruction between so-called long and short lived, treated and untreated ties may be clearly brought out, together with further information it is thought desirable to collect.

The committee enumerates the changes in the new blanks and gives the reasons therefor.

Timber Supply.

The sub-committee on Forest Supplies has during the past year devoted its attention principally to investigating policies which could be followed at this time to encourage the more economical uses of the timber supplies still on hand. This problem is such a large one that it has not been thought desirable to make more than a progress report.

It has been found that the most important need for most of the railroads at this time is definite technical information. It is not sufficient to know that timber supplies are being exhausted, but one should also know exactly what these supplies are, and what the rate of exhaustion is, and what the probable rate of re-growth is in any particular region upon which that particular road is depending. Your committee feels very strongly that one of the most important steps which the various individual roads could take would consist in the appointment of technical men in connection with their timber departments to study this problem with the greatest care.

The committee then refers to the two meetings on conservation of natural resources held at Washington during the past year, and in conclusion repeats some of the recommendations in last year's reports, urging their immediate consideration:

(1) Use chemically treated ties wherever possible.

(2) Protect such treated ties against mechanical wear by means of tie plates, screw-spikes, etc.

(3) Enforce the tie specifications rigidly with particular reference to the rigid exclusion of small ties.

(4) Co-operation among the roads in any given territory, looking toward the adoption of standard tie specifications, with particular reference to making it impossible for contractors to furnish ties cut from small trees, which would naturally form sources for future tie supplies.

(5) Adopt measures for reducing forest fires.

(6) Encourage the owners to re-forest their lands either by re-planting or natural reproduction.

(7) Use the proper means to aid and assist in the investigation of tax laws as far as they pertain to forest lands with a view to having legislation enacted which would make it possible to hold lands with growing timber for the purpose of future tie production.

Metal and Composite Ties.

The sub-committee inspected a large number of such ties and show numerous illustrations of them, both in detail and in the track.

Carnegie steel ties were reported on from the Buffalo, Rochester & Pittsburgh; Bessemer & Lake Erie; New York Central; Pittsburg & Lake Erie; Union R. R.; and the Baltimore & Ohio. Other metal ties reported on were the Seitz, laid in the Pennsylvania Lines West in 1904, but removed in 1905; the Hansen, laid in the Pennsylvania Lines, main track, in 1905, but removed shortly to a side track, where they remain; the Bouton, laid in the B. & O., and reported to be giving good service; and the Snyder tie, which is a steel shell, filled with asphalt and crushed stone. A number have been in Pennsylvania track (not main track) for about a year and have given satisfactory service.

Some Buhrer combined wood and steel ties have been in a freight track of the Lake Shore for two years and the track is in good condition.

The concrete ties include the Buhrer, laid at various places on the Lake Shore, on the Pennsylvania Lines, the Chicago & North-Western, the Lake Erie & Western and the Chicago Junction. They were removed from the last-named after a few months on account of breaking. The Kimball tie, laid in the Chicago & Alton, where there was trouble due to improper spiking, injuring the concrete and causing cracking; and in the New York, Chicago & St. Louis, where they have given good service. Percival ties laid in the Pittsburgh & Lake Erie and removed on account of failure; and Affleck, Chenoweth, Keefer, Hickey and Alfred ties, all of which failed in experimental application.

The committee concluded that an improved form of steel tie of the Carnegie type, with metal plate over the insulating fiber and with the wedge-clip rail fastenings, seems to be very promising. Experiments with the same should be extended, and results carefully watched and reported to the association.

No form of reinforced concrete tie has been made which is suitable for heavy and high-speed traffic, but the committee believes a properly reinforced concrete tie, with proper fastenings, may be found economical in places where speed is slow, and where conditions are especially adverse to life of wood or metal.

Conclusions.

Your committee recommends the adoption of the following conclusions:

(1) That Forms 1, 1-A, 1-B, 1-C and 1-D be withdrawn from the Manual and Forms M. W. 301, M. W. 302, M. W. 303, M. W. 304 and M. W. 305 be substituted.

(2) That the conclusions in reference to Timber Supply be approved.

(3) That the conclusions of the committee in reference to metal and concrete ties be endorsed.

The report is signed by E. B. Cushing, (S. P.), Chairman; E. G. Ericson, (Penn. Lines), Vice-Chairman; J. B. Austin, Jr., (L. I.); W. F. H. Finke, (S. R.); E. E. Hart, (N. Y., C. & St. L.); E. D. Jackson, (B. & O.); F. B. Oren, (I. C.); H. J. Simmons, (E. P. & S.W.); A. W. Thompson, (B. & O.); Hermann von Schrenk, (R. I.-Frisco).

Discussion.

The secretary read conclusion 1 of the report of the committee.

L. C. Fritch (I. C.): I suggest that in Form M. W., 303, the column heading "siding" be made "side." Siding usually means a parallel track to the main track, used as a passing track. Side would conform to the other forms.

The President: The committee accept that suggestion.

Mr. Thompson: I would like to suggest to the convention that these forms be carefully considered. These forms, if they are adopted, should stand for a long time, as the data will be collected in accordance with the forms. If the forms are changed later it will mean going back over the record and doing a great deal of work.

Mr. Fritch: I notice in form 304, statistics of treated ties, that there is no column provided for oak.

Mr. Thompson: The two blank columns were left for that purpose. We had in mind first putting in one of the columns inferior oaks, having in mind red oak and some of that class. We thought that the two extra columns and the columns headed as shown on this form would cover all the timber that would be treated.

The secretary read, one at a time, the seven paragraphs of the Timber Supply conclusions referred to in conclusion 2.

W. C. Cushing (Penna.): I suggest that the word "possible," in the first paragraph, be changed to "practicable." The matter of cost enters into the subject as to whether ties should be treated or not.

The committee accepted the change.

The secretary read paragraph 2.

Mr. Fritch: I suggest that all ties should be protected in the same way; that the word "treated" ought to be omitted—"protect ties against mechanical wear, by means of tie plates, etc."

The President: You would omit the two words "screw spikes?"

Mr. Fritch: Yes.

Mr. Thompson: Treated ties were specified there because it was thought that after putting your money into treatment you should do everything possible to further the life of the ties. Where timber is cheap it would not pay to put on tie plates, particularly on lines with light traffic.

Hunter McDonald (N. C. & St. L.): Do I understand that the adoption of this paragraph carries with it the recom

mendation of this association that all ties are to be treated with tie plates and screw spikes and that screw spikes will take the place of ordinary spikes? It seems to me that this is rather a radical departure and ought not to be passed over without some discussion.

Mr. Thompson: I was not on the sub-committee on this subject. I would like to mention that the committee here are agreeing to some changes that came up in discussion, and it is the minority part of the committee that are agreeing to some of these changes. There was considerable discussion in regard to placing tie plates on all treated ties.

Mr. Cushing: I offer the following substitute:

"Protect all ties which wear out by mechanical wear with tie plates. In the case of treated ties the use of screw spikes should be considered as being possibly preferable to the common track spike."

Mr. Thompson: If you can get additional life in the treated tie by using tie plates to offset the mechanical wear, it should be done. That was the idea of the committee in putting it that way.

Mr. Cushing: That is very true, but it also applies to other ties which are destroyed by mechanical wear, as well as to treated ties. It is a case of figuring out the relative cost to ascertain whether it is practicable to do so.

After some discussion, Mr. Cushing's motion was altered so as to make paragraph 2 read: "Protect all ties against mechanical wear."

Mr. McDonald: I prefer screw spikes wherever expense has been incurred for treating the ties, but I have heard a number of objections to their use on account of the fact that they necessarily attach the tie to the rail. In case there is any lack of sufficient ballast underneath, the tie follows the rail up and down. An ordinary spike, on the other hand, pulls out of the tie slightly, allowing the rail to move. Does the committee think screw spikes have been used on American roads to such an extent that they are warranted in recommending their use at this time?

Mr. Thompson: No.

Mr. Cushing: I agree with Mr. McDonald. I don't think we should now commit ourselves to an expression of an opinion so radical. Screw spikes are being tried in this country in more or less large quantities and that investigation should continue.

M. L. Byers (Mo. P.): All ties are subject to mechanical wear, and if we attempt to protect all ties against mechanical wear we will be protecting ties which actually fail by decay. It seems to me that the motion should read "protect all ties against failure from mechanical wear."

Mr. Cushing: That is right.

J. A. Atwood (P. & L. E.): I think the force of the second paragraph will be lost if Mr. Cushing's motion is carried. The purpose, it seems to me, is to call attention to the absolute necessity of protecting treated ties against mechanical wear, if you are going to get the value of the treatment.

Paragraph 2, in the final form as suggested by Mr. Byers, was adopted.

E. F. Wendt (P. & L. E.): Conclusion No. 6 is eminently proper, but how can we encourage owners to re-forest their land? There are no taxes in certain small cities in Germany, because the city owning the forest nearby derives a sufficient revenue from the matured timber to pay the entire expenses of the city. Paragraph 6, it seems to me, should be dwelt upon at some future time in order to inform us just in what way re-forestry can be encouraged.

Mr. Fritch: It seems to me these suggestions properly belong to the committee that is co-operating with the National Conservation Committee, and, going a little ahead, I think that 7 rather goes into the domain of politics. It seems to me the province of this committee is to treat of the technical side of the question and devise ways and means for extending the life of ties. This question of re-forestration and assisting in securing favorable tax laws, is a subject that should be referred to the other committee.

The President: You do not mean No. 6? You are referring to No. 7?

Mr. Fritch: 6 and 7 both.

Prof. S. N. Williams spoke of the need of fire protection, and continued: Paragraph 6 is very important, but I do not see how this association can do much except by co-operation with state or national government. Japan and Russia, I understand, are not only protecting their forest, but are exporting large amounts. European governments are making a specialty of reforestration.

W. H. Hoyt (D. M. & N.): We spent a good many thousands of dollars and a good deal of time in fighting forest fires last summer. We had 75 to 300 men fighting fire two or three weeks. I know that the other railways in the northern part of Minnesota did a great deal in the same line. In regard to paragraph 6, in our district there is at the present time one firm putting out 6,000 acres of Scotch spruce, replanting the land. They are importing these young trees from the old country, getting them in here in about their second year growth, just started, and are hand-planting them in the country. The railways are encouraging this by making a special effort to see that they are protected from fire. We keep our rights of way cut once or twice every year, mowed down and burned, and if there is any sign of fire anywhere in the country our section gangs and bridge foremen get after it without any delay, whether it is on the right of way or anywhere near the right of way, started by the railway or from any other cause. A number of times, we have sent crews of men a mile or two into the country to take citizens and farmers out from their homes and bring them into the open country to help out and keep the trees from burning up. I think the recommendation made in paragraph 6 should stand as a proper encouragement to taking measure along that line.

Mr. Hall (Forest Service): It seems to me that paragraphs 5, 6 and 7 are virtually three sides of the same question. We are not to have effective measures of reducing forest fires unless at the same time we solve the question of forest land taxation; we are not to have effective re-forestration of lands, either by planting or by natural reproduction, unless we also solve the tax question and the fire question.

C. S. Churchill (N. & W.): I think there is some specific work that this association can do in reference to paragraph 5, that follows out the practice that we find in Europe and also in some sections of this country, namely, cutting ditches alongside of the right of way, and even outside of the right of way. It is kept clean of all undergrowth, in order that fire may not spread beyond the limits of control of the railway. And another feature that railways can encourage is the sale for the small timber that is left lying in the forests. You never see small timber lying around in the forests in Europe; it is always cut up and taken out of the forests and sold.

Prof. W. D. Pence (Univ. of Wis.): E. M. Griffith, state forester of Wisconsin, some months ago solicited co-operation between the track forces of the various railways and the state fire wardens. He gave illustrated lectures to employes of the track departments. It is quite evident that the principal railways in Wisconsin are in the future to give more attention to the prevention of forest fires. Among these things is the adoption of special spark arresters and experiments are in progress along that particular line. Large territory in Wisconsin is being re-forested.

J. B. Berry (C., R. I. & P.): For the benefit of the committee and quoting Mr. Thompson's remarks in regard to the failure of screw spikes, we made frequent examinations of their use and in every case where it was reported that they did not do their work, we found it was because they were not put in in accordance with instructions. When we fixed them as they should have been in the first place, they did their work under very trying conditions in first-class manner.

Attention was called to the fact that zinc or lead treated ties seriously interfere with track circuits for automatic signals. Several members gave their experiences.

The conclusions of the Timber Supply section of the committee, as amended, were adopted.

Conclusion 3 referred to the two paragraphs which, in the above abstract of the report, immediately precede the conclusions. The first paragraph was read.

Robert Trimble (Penna.): I understand that one of the things we are trying to steer clear of is being an advertising medium. I do not believe it is policy to adopt this as it is worded. I suggest this modification: "An improved form of steel tie, as shown by Fig. 1, of the I-beam type, with metal plate over the insulating fibre, and with the wedge clip rail fastenings, seems to be promising. Experiments should be extended and results carefully watched and reported to the association."

J. O. Osgood (C. of N. J.): I would suggest that it read, "an improved form of steel tie of the general type shown by Fig. 1, with metal plate," etc.

A. H. Rudd (Penna.): We still have our old friend, the track circuit, with us. That fibre insulation, as shown in Fig. 1, will last long enough to get it in—perhaps a few months longer to take it out. I believe that we should add to the instructions that if experiments are made with these they should be made with the track circuit also, because the track circuit, with automatic signals is going to be increased in this country very appreciably, and it cannot be neglected and it cannot be worked successfully under any known conditions at the present time, where the track circuit is so arranged that the signal will assume a stop position when the track is

short circuited by the wheels, if you also short circuit it at every tie.

Mr. Atwood: The Pittsburgh & Lake Erie has 3,000 I-beam steel ties in service. They have been in there nearly two years. They are insulated, and up to the present time there has been no difficulty. They are as easily maintained as the wooden ties and at no greater expense.

Mr. Rudd: We installed, on the Pennsylvania a section three-quarters of a mile long, and the first train that went over it cut out the insulations on some 40 or 50 ties, and we maintained this experimental track some six months, with the signals removed, and orders out that there was no automatic block on those tracks.

Mr. Thompson: The experience of the B. & O. in the use of steel ties of the I-beam type, has not been as successful as that quoted by Mr. Atwood. One of the points I would like to bring out forcibly is the movement of the steel ties of the I-beam type in the ballast. They skew around very badly, and in a mild section of this type of tie, compared with a mild section of the wooden tie, the cost of maintenance was very much in excess of the wooden tie. Also there must be taken into consideration the additional quantity of ballast necessary with the I-beam tie. That is a very large factor where stone ballast is used. No mention is made in the report of the damage occasioned steel ties by derailment. On coal carrying railroads, where there are steel cars of large capacity, broken flanges contribute to a large percentage of the derailments. On the B. & O., where a derailment occurred from a broken flange, nearly all the ties in that immediate section were either destroyed or so badly damaged they had to be taken out of the track. Another thing is the damage to the equipment. The flanges on all the wheels are either broken or chipped so badly that they have to be removed.

Mr. Trimble: Our trackmen were continually complaining about our steel ties moving in stone ballast. We would have them lined up square with the rail, but inside of a week they would be out of line and irregular. Finally the trackmen had so much trouble with them that they took them out, really against the protest of the department.

Mr. Wendt: We are conducting an experiment on our four-track road, we laid about one mile of steel ties and a mile with new wood ties, at the same time, on adjacent tracks. New rails were laid at the same time, and the track completely ballasted with 12 in. of stone. Track circuits are maintained within the limit. The speed of trains will average 20 miles per hour at this point. For the first 16 months trackmen were instructed to do no surfacing on either the steel or wood ties. At the end of 16 months both sections were resurfaced and a record made of the later expense. The expense for the 16 months was simply for patrolling and general supervision. The results of the experiments are reassuring, and the labor expense is rather significant, so that we feel that the committee is taking the right stand when it states in the last clause that experiments in steel ties should be extended and results carefully watched and reported to this association.

E. R. Lewis (M. C.): The experience with steel ties is that they work very much better in fine ballast than in coarse, and better in sand than in ballast.

Prof. Dufour (Univ. of Ill.): Any tie which has a smooth surface throughout its entire length will shift. In Europe I saw them taking up miles and miles of this very same general form—the channel form—and the foreman told me they shifted, they could not hold them in the ballast, and in case of a derailment they were very poor.

Mr. Thompson (B. & O.): I move that the first paragraph be received as information.

Mr. Fritch: I suggest to the committee that one of the important elements of this investigation is the traffic condition, both with regard to speed and the amount of traffic. A steel tie may perform very satisfactorily under slow speeds, but it may be a different question under high speed, and, therefore, it should be one of the elements to be considered in each case.

Mr. Cushing: I offer an amendment that the first sentence be stricken out, leaving the recommendation that experiments with the steel tie should be extended and results carefully watched and reported to the association.

The amended motion was carried.

The second paragraph was adopted.

Mr. Fritch: I move that conclusion 3 be changed to read: That the conclusions of the committee in reference to metal and concrete ties be received as information.

The motion was carried.

WOODEN BRIDGES AND TRESTLES.

The work assigned by the Board of Direction was as follows:

1. Continue the revision of the specifications for structural timbers, co-operating with Committee Q of the American Society for Testing Materials and other committees on the subject, with a view, if possible, of preparing a uniform standard specification.
2. Prepare a list of recommended safe unit stresses for structural timbers.
3. Revise the report on standard names for structural timbers.
4. Study the principles and methods of pile-driving, and collect data relating to the current practice.
5. Report on best method for classification of pine timber for structural purposes in place of classification by botanical names.

The committee was divided into the following sub-committees:

A. To consider Items 1, 3 and 5.
B. To consider Item 2.
C. To consider Item 4.

Standard Specifications for Bridge and Trestle Timbers.

The specifications as revised and adjusted by joint action of Sub-Committee A and committees from the American Society for Testing Materials and the Yellow Pine Manufacturers' Association are presented for adoption.

The specifications for timber piles have also been revised by Sub-Committee A to conform to the other specifications for timber, and have been materially simplified and condensed. They are also presented for adoption.

Safe Unit Stresses.

The report includes a large number of diagrams showing the relation of lower to higher groups in the results of tests for various timbers, a comparison of certain older tests, mainly on full-size sticks, referred to in the bibliography published in 1907, and a table of safe unit stresses which are recommended for adoption by the association. The principles relating to the determination of these unit stresses, various details connected with the tests on which they are based, and references to the unit stresses employed in practice are given in the body of the report.

Piles and Pile Driving.

Two circulars were prepared by Sub-Committee C and sent in July to members of the association and a selected list of other engineers and contractors. An analysis of the 47 replies received relating to a part of the questions is presented in this report, the data relating to the remaining questions being reserved for further study.

The only topic discussed is "Overdriving Piles." The committee regrets that it failed to receive a larger number of photographs or descriptions of overdriven piles where such have been found by later excavation or when withdrawn at the time of construction. It is to be hoped that anyone who sees this report and can thus render a real service to the profession will send the desired information to the committee.

As an important aid to the thorough study of the subject of piles and pile-driving much time was spent in preparing a bibliography which is printed as an appendix to the report. The references were selected from a larger number as containing information of value, and for convenient use are classified under suitable heads. A series of definitions and a brief historical sketch of the subject are presented as an introduction.

Appendix A.

STANDARD SPECIFICATIONS FOR BRIDGE AND TRESTLE TIMBERS.

(To be applied to solid sticks and not to composite members.)

1. Except as noted, all timber shall be cut from sound trees, true and straight, and sawed standard size; shall be square edged, close grained, solid and out of wind; free from defects such as injurious ring shakes and crooked grain, unsound or loose knots, knots in groups, decay, large pitch pockets, or other defects that will materially impair its strength.

2. Rough timbers sawed to standard size means that they shall not be over ¼ in. scant from the actual size specified. For instance, a 12 in. by 12 in. timber shall measure not less than 11¾ in. by 11¾ in.

3. Standard dressing means that not more than ¼ in. shall be allowed for dressing each surface. For instance, a 12 in. by 12 in. timber after being dressed on four sides shall measure not less than 11½ in. by 11½ in.

No. 1 R. R. Grade. Longleaf Yellow Pine and Douglas Fir.

4. Stringers.—Longleaf pine shall show not less than 85 per cent heart on the girth anywhere in the length of the piece; provided, however, that if the maximum amount of sap is shown on either narrow face of the stringer, the average depth of sap shall not exceed ½ in. Douglas fir shall show not less than 90 per cent heart as measured above. Knots greater than 1½ in. in diameter will not be permitted at any section within 4 in. of the edge of the piece.

5. Caps and Sills.—Shall show not less than 85 per cent heart on each of the four sides, measured across the sides anywhere in the length of the piece; to be free from knots over 2½ in. in diameter.

6. Posts.—Shall show not less than 75 per cent heart on each of the four sides, measured across the sides anywhere in the length of the piece, and to be free from knots over 2½ in. in diameter.

7. Longitudinal Struts or Girts.—One face shall show all heart; the other face and two sides shall show not less than 85 per cent heart, measured across the face or sides anywhere in the length of the piece, and shall be free from knots 1½ in. in diameter and over.

8. Longitudinal X Braces, Sash Braces and Sway Braces.—Shall show four square edges and not less than 80 per cent heart on two faces, and shall be free from knots over 1½ in. in diameter and over.

9. Ties and Guard Rails.—Shall show one face all heart; the other face and two sides shall show not less than 75 per cent heart, measured across the face or side anywhere in the length of the piece; shall be free from knots over 2½ in. in diameter and where surfaced the remaining rough face shall show all heart.

No. 2 R. R. Grade. Longleaf and Shortleaf Yellow Pine, Douglas Fir and Western Hemlock.

10. Stringers.—Shall be square-edged, except that it may have 1 in. wane on one corner. Knots shall not exceed in their largest diameter one-fourth the width of the face of the stick in which they occur, and shall in no case exceed 4 in. Ring shakes shall not extend over one-eighth of the length of the piece.

11. Caps and Sills.—Shall be square edged with the exception of 1 in. wane on one corner, or ½ in. wane on two corners. Knots shall not exceed in their largest diameter one-fourth of the width of the face of the stick in which they occur, and in no case shall exceed 4 in. Ring shakes shall not extend over one-eighth of the length of the piece.

12. Posts.—Shall be square-edged, with the exception of 1 in. wane on one corner, or ½ in. wane on two corners. Knots must not exceed, in their largest diameter, one-fourth of the width of the face of the stick in which they occur, and shall in no case exceed 4 in. Ring shakes shall not extend over one-eighth of the length of the piece.

13. Longitudinal Struts or Girts.—Shall be square-edged and sound and shall be free from knots 1½ in. in diameter and over.

14. Longitudinal X Braces, Sash Braces and Sway Braces.—Shall be square-edged and sound; and shall be free from knots 2½ in. in diameter and over.

SPECIFICATIONS FOR TIMBER PILES.

No. 1 R. R. Grade.

1. This grade includes white, burr and post oak, longleaf pine, Douglas fir, tamarack, eastern white and red cedar, western cedar, redwood and cypress.

2. Piles shall be cut from sound trees; shall be close-grained and solid, free from defects, such as injurious ring shakes, large and unsound or loose knots, decay or other defects which may materially impair their strength or durability. In eastern red or white cedar a small amount of heart rot at the butt, which does not materially injure the strength of the pile, will be allowed.

3. All piles must be butt-cut above the ground swell and have a uniform taper from butt to tip. Short bends will not be allowed. A line drawn from the center of the butt to the center of the tip shall lie within the body of the pile.

4. Unless otherwise allowed, all piles must be cut when sap is down. All piles must be peeled soon after cutting. All knots shall be trimmed close to the body of the pile.

5. For round piles the minimum diameter at the tip shall be 9 in. for length not exceeding 30 ft.; 8 in. for lengths over 30 ft. but not exceeding 50 ft., and 7 in. for lengths over 50 ft. The minimum diameter at one-quarter of the length from the butt shall be 12 in. and the maximum diameter at the butt 20 in.

6. For square piles the minimum width of any side at the tip shall be 9 in. for lengths not exceeding 30 ft.; 8 in. for lengths over 30 ft. but not exceeding 50 ft., and 7 in. for lengths over 50 ft. The minimum width of any side at one-quarter of the length from the butt shall be 12 in.

7. Square piles shall show at least 80 per cent heart on each side at any cross-section of the stick, and all round piles shall show at least 10½ in. diameter of heart at the butt.

No. 2 R. R. Grade.

8. This grade includes red and all other oaks not included in No. 1 R. R. grade, sycamore, sweet, black and tupelo gum, maple, elm, hickory, Norway pine, or any sound timber that will stand driving.

9. The requirements for size of tip and butt, taper and lateral curvature are the same as for grade No. 1.

10. Unless otherwise specified piles need not be peeled.

11. No limits are specified as to the diameter or proportion of heart.

12. Piles which meet the requirements of grade No. 1 except the proportion of heart specified will be classed as No. 2.

Appendix B.

SAFE UNIT STRESSES.

Diagrams shown on six sheets accompanying this report give a summary of the average results for tests on full-size sticks of seven kinds of timber made during the past six years by the United States Forest Service. Notes relating to the number of tests and the sizes of the sticks are given on each sheet. The results are classified to give the averages of groups of 10, 10, 30, 30, 10 and 10 per cent respectively, and show their relation from the lowest to the highest group.

The relation of the average value for the lowest 10 per cent group to that of the general average for the entire series, expressed as a percentage for each kind of timber is as follows: Douglas fir, 62.8; western hemlock, 80.3; western larch, 71.8; Norway pine, 72.2; tamarack, 62.0; shortleaf yellow pine, 69.1; loblolly pine, 63.3; and the average for all the timbers is 68.2. When arranged according to the kinds of test the corresponding relations are as follows: Modulus of rupture, 61.2; modulus of elasticity, 69.3; shear parallel to the grain, 67.8; compression perpendicular to the grain, 69.3; and compression parallel to the grain, 74.9. The difference between the radial and the tangential shear is not large enough to require special consideration in determining safe unit stresses.

To facilitate comparison between average values and to indicate the range in some cases, the modulus of rupture, modulus of elasticity, and compression parallel to the grain, according to various authorities, are plotted on 11 additional sheets.

Sheet No. 39, reproduced herewith, contains the table of ultimate and safe unit stresses recommended by the committee. Unless otherwise stated the ultimate stresses are the average values for green timber. In cases where it was not possible to secure results for green timber in large sizes, those for partially air-dry timber are inserted in the table.

The average ultimate values for Douglas fir, shortleaf pine, Norway pine, tamarack, and western hemlock were furnished by the U. S. Forest Service. As no recent tests on green longleaf pine in large sticks have been made, the Forest Service gave the following average values, expressed in pounds per square inch, for longleaf pine and Douglas fir, both being partially air-dry:

	Longleaf pine.	Douglas fir.
Modulus of rupture	7,160	6,876
Modulus of elasticity	1,560,000	1,597,000
Shear parallel to the grain	(973)	770
Longitudinal shear in beams	335	313
Compression perpendicular to grain at the elastic limit	572	651
Compression parallel to grain	(4,800)	4,406

It was stated that "since Georgia material, as shown in Circular 115, was of very excellent quality, being almost clear material, the fiber stresses are considerably above the average. The South Carolina material was of a good merchantable quality, and the values shown for it may be considered very good averages." In the above table the values enclosed in parentheses are for the Georgia material (the corresponding ones for the South Carolina material not being given in Circular 115), and therefore require some reduction.

[The committee explains in detail how the different values in the table, sheet 30, were obtained, and gives advice about their use. Space is lacking to reproduce these statements here.]

Appendix C.

PILES AND PILE DRIVING.

Circular letters were sent to the members of the association and to a large number of outside engineers and contractors, and replies, giving the views of 47 railroad engineers (representing 37 roads) and 14 other engineers and contractors, were received:

Kind of Hammer	Weight of Hammer.	Water Driver, Character of Driving: Soft	Med.	Hard	Not Given	Land Driver, Character of Driving: Soft	Med.	Hard	Not Given	Track Driver, Character of Driving: Soft	Med.	Hard	Not Given	Remarks
Drop	6,000				1									The allowable heights of drop were generally stated as being varied to suit level conditions.
Drop	5,000-4,000	1	1	1	2			1					1	
Drop	4,500				1									
Drop	4,500-3,200			1										
Drop	3,500				2				2				3	
Drop	3,500-3,000		1	1		1				1				
Drop	3,200				1				2				2	
Drop	3,200-2,800												1	
Drop	3,000	2	1	2	3	2	4	5	2	2	4	3	5	
Drop	3,200-2,200								1					
Drop	3,000-2,500	1	1	1	1				1				1	
Drop	3,000-2,200									1	1	1		
Drop	3,000-2,000	1	1	1		1	1	1	1	1	1	1	1	
Drop	2,800	1	1	1		1	2	2		1	2	2		
Drop	2,700												1	
Drop	2,600								1					
Drop	2,500	1	1	1	1	4	4	3	3	3	3	3	1	
Drop	2,500-2,200								1					
Drop	2,400												1	
Drop	2,500-2,000					2	2	1						
Drop	2,200												1	
Drop	2,000					3	2		5				2	
Drop	2,000-1,600								1					
Drop	2,000-1,500					1								
Drop	1,800								1					
Steam		1	3	3	7	2	5	8	6		2	2	8	
Steam	No 2 Vulcan	1	2	1			2	2			1	1		
Steam	No 1 Vulcan				2									

Abstract of Replies on Piles and Pile Driving.

Give the weight of hammer and height of drop and whether you recommend steam or drop hammer for various combinations of the following conditions: (a) water driver, (b) land driver, (c) track driver, (d) soft driving, (e) medium driving, (f) hard driving, (g) foundation piling, (h) trestle piling, (i) sheet piling, (j) timber piling, (k) concrete piling.

of pile driving, although their investigation showed comparatively few steam hammers in use on railroad work.

In both of the above investigations the preponderence of replies in favor of drop hammers is undoubtedly due in part to relative unfamiliarity with the actual use of steam hammers.

When do you recommend using rings?

When do you recommend using followers or caps?

Caps.—
For general use....22
Except in soft driving....1

Rings.—
For general use....5
Except in soft driving....12
In hard driving only....12

Total replies....52

Follower.—
If necessary to drive below bottom of leads....18
To drive below ground surface....4
To reduce the amount of cut-off of valuable timber (creosoted)....5
Undesirable, avoid if possible....6

Total replies....33

When do you recommend using shoes?

In one or more of the following: Boulders, rip rap, coarse gravel, shale, slate, hard pan, buried timber, very hard clay....40
In cemented material only....1
To obtain a toe hold in rock, etc....8
Are of little value....4
Never....5

Total replies....58

Have you ever used a water jet? If so, under what conditions?

In sand, quicksand, gravel, etc....40
To loosen piles which are being pulled....3
Have never used a water jet....14
Unsatisfactory in clay....3
Do not approve of use, cannot estimate safe load....1

Total replies....61

SHEET No. 30

Am Ry. Eng & M. W Assn
Convention of 1909
Com VII. Wooden Bridges and Trestles

UNIT STRESSES FOR STRUCTURAL TIMBER EXPRESSED IN POUNDS PER SQUARE INCH
RECOMMENDED BY THE COMMITTEE ON WOODEN BRIDGES AND TRESTLES

Kind of Timber	Bending: Extreme Fiber Stress, Average Ultimate	Bending: Extreme Fiber Stress, Safe Stress	Bending: Modulus of Elasticity, Average	Shearing: Parallel to Grain, Average Ultimate	Shearing: Parallel to Grain, Safe Stress	Shearing: Longitudinal Shear in Beams, Average Ultimate	Shearing: Longitudinal Shear in Beams, Safe Stress	Compression: Perpendicular to Grain, Elastic Limit	Compression: Perpendicular to Grain, Safe Stress	Compression: Parallel to Grain, Average Ultimate	Compression: Parallel to Grain, Safe Stress	For Columns under 15 Diams. Safe Stress	Formulas for Safe Stress in Long Columns over 15 Diams.	Ratio of Length of Stringer to Depth
Douglas Fir	6100	1200	1,510,000	690	170	270	110	630	310	3600	1200	900	$1200(1-\frac{L}{60D})$	10
Longleaf Pine	6500	1300	1,610,000	720	180	300	120	520	260	3800	1300	980	$1300(1-\frac{L}{60D})$	10
Shortleaf Pine	5600	1100	1,480,000	710	170	330	130	340	170	3400	1100	830	$1100(1-\frac{L}{60D})$	10
White Pine	4400	900	1,130,000	400	100	180	70	290	150	3000	1000	750	$1000(1-\frac{L}{60D})$	10
Spruce	4800	1000	1,310,000	600	150	170	70	370	180	3200	1100	830	$1100(1-\frac{L}{60D})$	—
Norway Pine	4200	800	1,190,000	590	130	250	100	—	150	2600*	800	600	$800(1-\frac{L}{60D})$	—
Tamarack	4000	900	1,220,000	670	170	260	100	—	220	3200*	1000	750	$1000(1-\frac{L}{60D})$	—
Western Hemlock	5800	1100	1,480,000	630	160	270*	100	440	220	3500	1200	900	$1200(1-\frac{L}{60D})$	—
Redwood	5000	900	800,000	300	80	—	—	400	150	3300	900	680	$900(1-\frac{L}{60D})$	—
Bald Cypress	4800	900	1,150,000	500	120	—	—	340	170	3900	1100	830	$1100(1-\frac{L}{60D})$	—
Red Cedar	4200	800	860,000	—	—	—	—	470	230	2800	900	680	$900(1-\frac{L}{60D})$	—
White Oak	5700	1100	1,150,000	840	210	270	110	920	450	3500	1300	980	$1300(1-\frac{L}{60D})$	12

Note:- These unit stresses are for a green condition of timber and are to be used without increasing the live load stresses for impact. *Partially air-dry. L = length in inches. D = least side in inches.

As a railroad tool for miscellaneous work, do you prefer a drop or a steam hammer?

Steam hammer....9
Drop hammer....43

A committee of the Superintendents of Bridges and Buildings in 1904 reported in favor of steam hammers for all kinds

Have you driven "butt down"? If so under what conditions?

Of 52 replies, only 11 had, for such reasons as: In sand or loam, using a water jet; in soft driving; in sand on account of the pulling action of ice; in rock overlaid with mud; when splicing is necessary; for ferry slips; when butts were too large to enter leads; for tests only; when piles were very long and also when rock was close to the surface; in quicksand and also for falsework.

OVERDRIVING PILES.

The most prevalent bad practice in pile driving is overdriving, i. e., injuring the material of a pile by too violent or too continued hammering. When such injury occurs above ground, in the form of brooming or splitting, and can be prevented by the use of rings or caps, it is regarded as an indication of overdriving. The use of such protective appliances as rings, caps, or shoes is a legitimate means for securing the necessary penetration of softwood timber and of even hardwood timber in difficult ground. When, however, the resulting injury occurs below the surface of the ground, and, therefore in that portion of the pile which will be a part of the finished structure, the pile may be said to be overdriven. Injuries of this nature may consist of a slight brooming of the foot of the pile and so be negligible, or they may be of sufficient importance to imperil the stability of the structure.

It is frequently claimed by contractors and their foremen, and with apparent reason, that engineers specify conditions regarding penetration due to the last blows which are too severe. Pile driving can never be an exact science, and the "practical man" seems to have some reasons for his poor opinion of a specification which applies with equal force to every known and unknown condition of the ground. Unfortunately, it is sometimes difficult to distinguish between the action of an overdriven pile and that of a perfectly sound pile in certain ground. Practice in the art and some investigation of the underlying conditions are perhaps the surest guides to success.

In general, overdriving may be due to one or more of the following causes: (1) The use of the word "refusal" in the specifications. (2) A belief in the prevalence of intermediate or floating hard strata. (3) The use of a light hammer and a long drop. (4) Attempting to force aside mythical small boulders. (5) An unnecessary effort to make the pile-driving record suit a formula which was not intended by the proposer thereof to apply to such cases.

It is usually claimed, in cases of overdriving, that no evidence of injury was shown during the driving. This claim is open to considerable doubt, and a more careful examination of the underlying strata should prevent many failures.

A pile passing through soft material and bringing up on rock cannot be driven into the rock. This condition indicates that another type of foundation may be needed. Pile foundations in ground hard enough to broom and split hardwood piles can often be otherwise designed with advantage. Many kinds of ground, easily penetrated under continual driving, develop a skin friction in excess of the probable requirements. Short, quick blows of a heavy hammer produce the best results. A sudden change in the amount of penetration should be considered a suspicious occurrence. Finally, pile driving is a means, not an end, and a whole pile in almost any ground is better than pieces of a pile in good ground.

Appendix D.

This appendix is an abstract of the results of a valuable series of tests of full-size stringers made by Prof. A. N. Talbot of the University of Illinois. Prof. Talbot permitted this publication by the committee in advance of the regular publication of the tests in a bulletin of the Engineering Experiment Station of the University of Illinois. These tests give important new information of the relation of longitudinal shear in beams to direct shear parallel to the grain in short blocks, and an interesting analysis of the influence of defects upon the stresses in the outer fibers as well as on the horizontal shear of the neutral surface.

Conclusions.

The committee recommends the adoption of the following conclusions:

(1) That the Standard Specifications for Bridge and Trestle Timbers be approved as good practice.

(2) That it is preferable to make the inspection of bridge and trestle timbers at the mills.

(3) That the Revised Specifications for Timber Piles be approved.

(4) That the list of Safe Unit Stresses for Structural Timber be approved.

The report is signed by Henry S. Jacoby (Cornell Univ.), Chairman; James Keys (U. P.), Vice-Chairman; F. H. Bainbridge (C. & N. W.), F. E. Bissell (Con. Eng.), A. L. Bowman (Con. Eng.), R. D. Coombs (Penn. T. & T.), William Graham (N. Y., N. H. & H.), Hans Ibsen (M. C.), F. B. Scheetz (Mo. P.), W. F. Steffens (C., C. & O.), B. A. Wood (M. & O.).

The undersigned endorses the report with the exception of the safe unit stresses, which, it is believed, should be reduced 10 per cent, since they are to be used without increasing the live load stresses for impact.

L. J. Hotchkiss (C., B. & Q.)

The undersigned endorses the report, except as to specifications for longleaf yellow pine.

C. C. Wentworth (N. & W.)

Discussion.

Prof. Jacoby: The committee received instructions to hold a conference with the corresponding committees of the Yellow Pine Manufacturers' Association and the American Society for Testing Materials, and I have requested Mr. Bainbridge, who is the chairman of the sub-committee of conference, to make the statement concerning this part of the work.

Mr. Bainbridge (C. & N. W.): The matters to be decided on, on which there was a disagreement, were considered by Committee Q of the American Society for Testing Materials, and the sub-committee of this association. Committee Q allowed dead timber to be used. This was discussed at the meeting of Committee Q, the sub-committee of this association and committee of the Yellow Pine Manufacturers' Association in Chicago last June. On this matter we agreed to give in, on the ground that in the present state of our knowledge dead timber—meaning timber which had been burned over—was good if it was sound. The word "sound" of course covers the timber that is decayed or worm-eaten. Committee Q had specifications regarding wind. At that meeting it was agreed to include the wind. Committee Q allowed sawing ¼ in., scantling size, and that was agreed to. Committee Q permitted loose knots except within 4 in. of the edges of the stringers. Our position forbidding any loose knots was agreed to by all. Committee Q permitted loose knots in corners of posts, which was agreed to. In grade No. 1, Committee Q permits 5 per cent loose heart in stringers. In that respect the entire specification was changed at the request of the Yellow Pine Manufacturers' Association and a specification adopted on the basis of the girth of the stringer. This was for the reason that in a long stringer, on one of the narrow faces there might be a thin sliver of sap running out which would be of no particular objection, could be adzed off, and the stick would be as good as it was before.

After these specifications had been agreed on and the parties began to think it over, each one wanted to change something, so that we are still quite as far from an agreement as we were in the first place. But we have been getting close to the Yellow Pine Manufacturers' Association. The committee had a meeting with a representative of that association last night, and we disagreed in comparatively unimportant matters, in some respects, but the items of difference are these: In the first place they object to our grading and we wish to stick to it. We have No. 1 R. R., and No. 2 R. R. They want to call the first grade "heart," and the other grade No. 1. Then they object to the terms "straight and true," true referring to a uniform cross-section and straight to a straight axis in the stick. We are willing to cut out the "true" on the ground that "standard sawing" covers that close enough, but we wish to retain "straight."

The others was as to "knots" in paragraphs 7, 8, 9, 13 and 14, in which our committee was willing to meet them. Beginning at paragraph 1, the committee would ask that the word "trees" be eliminated, as that word was put in there because we originally had live trees and the matter was overlooked. Then there is an obvious omission in the specification that all parties have agreed to change. Paragraph 4 had in it "all knots shall in no case exceed 4 in. in their largest diameter." That was a specification for the second grade, but overlooked in the first grade. We add it to the first grade. One member of the association, who is very well informed in the matter, is of the opinion that the specifications for fir should be separated from the specifications for yellow pine. That has always been my own idea of the matter, as well, and the committee have all agreed to that.

It is the intention of the committee to ask the approval of these specifications as submitted for yellow pine and withdraw the specifications as far as they refer to Douglas fir, and that the specifications for the latter be left for a following year.

Prof. Jacoby: The first conclusion under No. 1 R. R. Grade will be considered with the Douglas fir cut out entirely.

The secretary read the standard specifications for bridge and trestle timbers.

Prof. Jacoby: In paragraph 4 an addition is to be made as follows: "But knots in no case shall exceed 4 in. in their largest diameter."

C. F. Loweth (C. M. & St. P.): The committee proposes to

drop out all reference to Douglas fir. I suggest that, since the title of the specification is "long-leaf yellow pine," these words be left out of article 4.

The secretary read paragraphs 5, 6 and 7.

Prof. Jacoby: The proposed change is that in paragraph 7, as well as in several others that will follow, after the words "shall be free from" in next to the last line we substitute "any large knots or other defects that will materially injure its strength."

C. P. Howard (L. S. & M. S.): I ask what is the idea in cutting out these figures that give the size of the knots, and describing the objectionable knots as any knot that will impair the strength of the material. We have something here which is definite to go by and it would seem the other way would leave it open to dispute.

Mr. Bainbridge: The matter was contained in our original agreement with the Yellow Pine Manufacturers' Association. They claim there are certain positions in a stick in which almost any knot could be allowed. For instance, you could take the extreme end of a girt and plaster it with knots and it would not do any harm. They felt it was a matter that could well be left to the inspector in cases of certain material. We have met them half way and do not specify the sizes of knots any more and leave the question to be decided according to the new definition.

The secretary read paragraph 1 under "specifications for timber piles."

J. B. Berry (C. R. I. & P.): Does the committee propose to make a specification for timber that is to be creosoted?

Mr. Bainbridge: We thought that matter had better be left in the hands of the special committee looking after the matter of creosoting, to make a report on that.

Prof. Jacoby: It is proposed to eliminate the words "Douglas fir" and "western hemlock" from the title of Grade No. 2.

Conclusion No. 1 was adopted as amended, and conclusion No. 2 was adopted.

The secretary read the revised specifications for timber piles.

J. C. Nelson (S. A.): We should specify more clearly what is meant by cypress. We have a number of different kinds of cypress. Some good and some not good.

Mr. Bainbridge: It was our intention to retain the Douglas fir in the piling.

J. O. Osgood (C. of N. J.): I notice that the specification No. 1 R. R. Grade, does not include chestnut, neither does it include spruce. Spruce is not a suitable timber, as I understand, for working away from the water, but it is used in Eastern waters for a first-class pile. It probably stands as well in docks in New York City as yellow pines and at times is more expensive. Chestnut is used a great deal in the East and makes an excellent pile. It is durable as regards decay, and strong enough for all practical purposes.

Mr. Howard: Is "cypress" intended to include all kinds of cypress? Mr. Nelson said there is a good deal of difference in cypress, red cypress perhaps being all right and others no good at all.

Mr. Nelson: I would move that after the word "and" in the last line of paragraph 1, we make it read "red or black" cypress. Red seems to be the one which is good, and all others bad, but that is not the local understanding in Florida and Louisiana, where most of the cypress comes from. In the Carolinas they have all kinds, yellow, red, white, blue and some black, and even green cypress, and none of it seems to be any good except that which is designated as red or black.

J. P. Snow (B. & M.): I second the motion, and ask if the committee will not insert chestnut in the list of timbers that are specified?

L. A. Downs (I. C.): I amend it to read "red, black or yellow cypress." Nine-tenths of the cypress the Illinois Central uses is yellow cypress and we find it satisfactory indeed. That is the kind we get in Mississippi, and not much else in Louisiana.

The President: The chair suggests that one motion be made to include the cypress change. The committee does not feel they can accept that, but would accept the insertion of chestnut. The motion that paragraph 1 be amended by inserting the words "red, black or yellow" before the word "cypress" is in order.

The motion was lost.

The secretary read paragraph 3.

Mr. Snell: I think that is an impossible specification to have, that a line drawn from the center of the butt to the center of the tip shall lie within the body of the pile. The Lackawanna is trying to buy oak piles under the specification allowing 1 in. clearance, and we have not been able to have orders filled. I believe that should read that the length of the pile shall govern the crook allowed. It should not apply on a 60 ft. stick and 30 ft. stick alike.

Mr. Bainbridge: The question was very carefully considered, and it was considered that more of a crook could be allowed in a short pile, which was heavier, than in a long pile. As a matter of fact, the strength of the long pile is much more essential than that of the short pile. It will get harder driving. This is an old specification, has been here many years. Before including it in the report, I went over 1,000 piles and had a couple of young men go over about 1,000 others that were nothing but second class piles, very cheap, and there were not over 25 or 50 of these piles that would not fulfill the specification. They were maple, Norway, tamarack, red oak, and there was hardly any of them that would not fill the specification, and they were not bought with the intention of filling an original specification.

Mr. Fritch: I move that conclusion 3, relating to the revised specifications for timber piles, be approved as amended. (Motion carried.)

Prof. Jacoby: There was referred back to the committee last year the question of standard names for structural timbers, and as this matter is directly related to just what has been passed on, the committee reports conclusion 5 and asks that this be taken up at this time. It reads: "That the standard names for structural timbers be approved." They are published in the Proceedings, volume 9, page 358.

The conclusion was adopted.

Prof. Jacoby: I move the adoption of conclusion No. 4, that the list of safe unit stresses for structural timber be approved.

C. F. Loweth (C., M. & St. P.): I think it would be desirable to change the heading in the third column from "safe stresses" to "working stresses." "Safe stresses" would lead to an inference that anything in excess of the stresses indicated might be unsafe.

Prof. Jacoby: The committee will accept that.

When this table is published in the Manual a note should accompany it calling attention to the points which the committee wishes to present in this report, so that they will not be used in a manner different from what was intended. The note reads as follows:

NOTE—The working unit streses given in this table are intended for railroad bridges and trestles. For highway bridges and trestles the unit stresses may be increased 25 per cent. For buildings and similar structures in which the timber is protected from the weather and practically free from impact, the unit stresses may be increased 50 per cent. To compute the deflection if a beam under long continued loading instead of that when the load is first applied, only 50 per cent of the corresponding modulus of elasticity given in the table is to be employed.

The President: The suggestion of Prof. Jacoby will be received for information, and the question now is upon the adoption of this conclusion as amended. (Motion carried.)

WOOD PRESERVATION.

The instructions to the committee were:

1. To cover in general the investigating and reporting on the preservation of wood used for ties and for railroad structures and buildings, confining the work of the committee more particularly to processes, methods and results obtained.
2. To present a recommendation as to outline of work for the committee, with suggestions for classification to be followed.
3. Continue the work done heretofore by the committees on Ties and on Wooden Bridges and Trestles relating to the special subjects of processes and methods of wood preservation.

The sub-committees determined on were as follows: (A) Statistics and economics; (B) preservatives; (C) adaptability of woods and their preparation; (D) treating processes.

[An introductory section explains in detail the reasons for the appointment of these sub-committees.]

Statistics.

Thirty-nine members of this association were selected who were likely to possess information. The committee received 36 answers. These are summarily abstracted in Table 1. This table simply gives information so far obtained. It is not conclusive and will in the future be revised and enlarged.

Preservatives.

It was determined to limit the work this year to coal-tar creosote and chloride of zinc. The chief requisite for a successful coal-tar creosote, i. e., one which shall preserve wood for an indefinite period of time, should be that the oil be com-

posed of compounds which, because of their high-boiling points, will guarantee the greatest possible stability. Taking the oils as they are now manufactured, the endeavor should be to reduce the low-boiling fractions as far as possible, consistent with obtaining an oil which shall be fluid enough at all working temperatures to obtain a thorough and equal penetration throughout the mass of the wood cells. This means that it is found advisable to omit any definite reference to individual compounds in any specification for creosote oil. The correctness of this conclusion is sufficiently demonstrated by the fact that there appears to be no agreement among those who have used creosote oil for a long period of years as to which compound or compounds are to be considered as specifically important in increasing the preservative value of coal-tar creosote. With this end in view the following specification, which was given last year in Appendix F to the report of the Tie

TABLE I.

No.	Name.	Date of Letter.	Road, Etc.	Yr.	Process.	What Treated.	Kind of Wood.	Lbs. per Cu. Foot.	Results.	Mode of Failure.	No.
1	C. H. Ewing	7-20-08	Phila. & Read.	1851	Kyanizing	Track ties	Not stat'd		Wood preserved	Strength reduced	1
1	C. H. Ewing	7-20-08	Phila. & Read.	1852	Tar Treatment	Track ties	Not stat'd		Not preserved	Caused dry rot	1
1	C. H. Ewing	7-20-08	Phila. & Read.	1867	Burnettizing	305,107 track ties	Not stat'd		Partly preserved.	Brittle and broke	1
2	W. H. Courtenay	6-2-08	L. & N.	1876	Creosoting	Stringers	L. L. Pine	16 lbs	Sound after 24 yr	Some washed away	2
2	W. H. Courtenay	6-23-08	L. & N.	1876	Creosoting	50,000 piles	L. L. Pine		25 years life	Some washed away	2
2	W. H. Courtenay	6-23-08	L. & N.	1878	Creosoting	15,000 bridge ties	Pine	12-18 lbs.	45% to 55% still in 1896	Some washed away	2
2	W. H. Courtenay	6-23-08	Pensacola Dock	1882	Creosoting	Wharf timber	Pine	16-18 lbs.	Attacked by toredo	Some still in use 1908	2
2	W. H. Courtenay	7-16-08	L. & N.	1879	Creosoting	1893 bridge ties	Pine	20-22 lbs.	533 in June, 1905 28%	Rail cut and spike killed	2
3	J. O. Osgood	7-3-08	C. of N. J.	1876	Creosoting	5,000 track ties	Hemlock	12 lbs	Life 15½ years	Cut by rail	3
3	J. O. Osgood	7-3-08	C. of N. J.	1896	Creosoting	50,000 track ties	Y. Pine	12 lbs	Life not stated	Cut by rail	3
3	J. O. Osgood	7-3-08	C. of N. J.	1892	Creosoting	Piles and timber	Y. Pine		Life 20 years		3
4	J. P. Snow	7-7-08	B. & M.	1884	Kyanizing	100,000 ties	Hemlock	Varied	Life 10-14 years	Splinter and sliver	4
5	E. B. Cushing	6-21-06	H. & T. C. Ry.	1880	Creosoting	150,000 ties	Pine	10 lbs	Life 19 years	11,282 in track in 1906. Railworn	5
6	E. B. Cushing	10-1-08	Galveston Bay	1875	Creosoting	4,000 piles or more	Pine	8 lbs	No record of life	Destroyed by teredo	6
6	E. B. Cushing	10-1-08	Galveston Bay	1875	Creosoting	150 piles or more.	Pine	24 lbs	Life 20 years or more	17 lbs. oil per cu. ft. found by Alleman 1904.	6
7	D. K. Colburn.	8-25-08	Texas & N. O	1888	Burnettizing	10,500,000 ties	Pine	0.25 lbs.	Life 10-11 years.	Decay	7
7	D. K. Colburn.	8-25-08	Texas & N. O.	1888	Creosoting	77,500,000 F B M	Pine	2½ gal	For piles, 25 yrs.	Occasional bad treatment	7
7	D. K. Colburn.	8-25-08	Texas & N. O.	1888	Creosoting	Piles and timber.	Pine	1½ gal	For timber, 25 years	Occasional bad timber	7
8	E. O. Faulkner	8-18-08	A. T. & S. F.	1885	Burnettizing	15,096,561 ties	Pine	.25 to .5 lb.	Life 10.55 years.	10.8 to 14.9 in dry regions	8
8	E. O. Faulkner	8-18-08	A. T. & S. F.	1906	Rueping	2,176,417 ties	Pine	4¼ to 5 lb.	Too recent		8
9	R. L. Huntley.	7-14-08	Union Pac	1886	Zinc-Tannin	150,000 ties	Hemlock	0.30 lb.	Life 12-15 years.	Rail worn	9
10	O. Chanute	8-8-08	C. R. I. & P.	1886	Zinc-Tannin	5,641,731 ties	Hemlock	.25 to .5 lb.	10¾ years east of Missouri River 11.7 yrs. west.	Decay and rail cutting.	10
11	J. H. Wallace	6-27-08	So. Pac.	1889	Creosoting	70,000,000 feet piles and ties	Pine	10 lbs	Life 20 years	Few failures	11
11	J. H. Wallace	6-27-08	So. Pac.	1895	Burnettizing	12,000,000 ties	Pine-Fir	.27 lb	Life 10-12 years.	Checking and dry rot	11
12	R. Angst	10-19-06	D. & I. R.	1891	Zinc-Tannin	256 ties	Various	.50 lb	74% in after 15 years	Rail cutting	12
13	T. E. Calvert	7-29-08	C. B. & Q.	1869	Creosoting (Seeley)	25,000 ties	Hemlock	1-inch	Life 5 to 12 years	Dry rot	13
13	T. E. Calvert	7-8-08	C. B. & Q.	1899	Burnettizing	4,836,668 ties	Pine-Fir	.35 to .5 lb	Est. life 10-12 yr.	Rot when covered with earth	13
14	R. H. Howard.	1-31-08	C. & E. I.	1899	Zinc-Tannin	1,929,855 ties	Oak	.50 lb.	Est. life 14 yrs.	See detail	14
15A	R. Trimble	7-3-08	Penna. Lines	1896	Zinc-Tannin	63,187 ties	Various	.50 lb.		Decay	15A
15B	W. C. Cushing.	7-6-08	Penna. Lines	1897	Zinc-Tannin	126,973 ties	Various	.50 lb.	Est. life 12 years.	Decay and rail cutting	15B
16	S. B. Fisher	6-29-08	M. K. & T.	1901	Zinc-Tannin	1,300,612 ties	Sap pine		22% out in 6 yrs.	Changed to Burnettizing	16
16	S. B. Fisher	6-29-08	M. K. & T.	1903	Burnettizing	1,844,759 ties	Sap pine.		3.4% out in 4 yr.	Changed to Rueping	16
17	A. H. Hogeland	12-16-08	Gr. Nor.	1901	Zinc-Tannin	Cross ties	Tamarack-Spruce	.78 lb	Too recent	No failures	17
17	A. H. Hogeland	12-16-08	Gr. Nor	1904	Burnettizing	Cross ties	Pine-Fir.	.78 lb	Too recent	No failures	17
18	E. O. Faulkner		Exper in Texas								18
19	J. B. Berry	11-9-08	C. R. I. & P.	1886	Zinc-Tannin	Cross ties	Hemlock	.50 lb	11 years life		19
19	J. B. Berry	11-9-08	C. R. I. & P.	1907	Creosote	Timber and ties	Gum-Beech	6.80 lbs	Too recent		19
20	G. M. Davidson.	8-5-08	C. & N. W.	1903	Burnettizing	2,184,336 ties	Hemlock	.50 lb	Too recent		20
20	G. M. Davidson.	8-5-08	C. & N. W.	1908	Zinc-Creosote	Ties	Various		Too recent		20
21	C. W. Berry to	7-14-08	Union Pac	1902	Zinc-Chloride	Ties	Pine-Fir	.25 lb	10-12 years life.	See No. 9	21
	R. L. Huntley	7-14-08	Union Pac	1902	Creosoting	Piles	Pine-Fir				21
22	H. R. Safford	8-22-08	Ill. Central	1903	Zinc-Chloride	5,876,173 ties	Oak and beech	.50 lb	8-10 years life est		22
22	H. R. Safford	8-22-08	Ill. Central	1903	Creosoting	Piles and timber.	Pine	14-18 lbs.	25-30 yrs. life est.	Favors Rueping	22
23	C. F. Loweth	9-5-08	C. M. & St. P.	1904	Creosoting	Piles and timber.	Pine	12-16 lbs.	Too recent		23
23	C. F. Loweth	9-5-08	C. M. & St. P.	1902	Burnettizing	Ties	Pine	.30 lb	Too recent		23
23	C. F. Loweth	9-5-08	C. M. & St. P.	1905	Rueping	Ties	Pine	5 lbs	Too recent		23
24	W. D. Taylor	11-5-08	T. St. L. & W.	1905	Burnettizing	500,000 ties	Various	.50 lb	Too recent		24
25	G. W. Boschke	7-2-08	Ore. Ry. & Nav.	1904	Burnettizing	Piles, timber, ties	Douglas Fir	.25 lb	Too recent		25
25	G. W. Boschke	7-2-08	Ore. Ry. & Nav.	1906	Creosoting	1,395,975 ties 212,006 FBM.	Douglas Fir	8-10	Too recent	Caps weakened	25
26	A. L. Kuehn	6-27-08	C. C. C. & St. L.	1904	Zinc-Creosote	693,324 ties	Oak and gum	.50 lb	Too recent, est. 11-12 years		26
26	A. L. Kuehn	6-27-08	C. C. C. & St. L.	1904	Lowry Process	1,650,000 ties	Oak and gum	6.3 lbs	Too recent, est. 16 years		26
27	W. D. Taylor	8-13-08	C. & A.	1900	Burnettizing	450,000 ties	Various		Some decayed in 3 or 4 years		27
27	W. D. Taylor	8-13-08	C. & A.	1900	Creosoting	Piles and timber.	Y. Pine		Good after 8 yrs		27
28	M. L. Lynch	7-7-08	St. L. & S. W.	1905	Zinc-Creosote	Ties	S. L. Pine.	.24 lb zinc 3 lbs creo	Too recent		28
28	M. L. Lynch	7-7-08	St. L. & S. W.	1905	Creosoting	Piles and timber.	S. L. Pine.	12 lbs	Too recent		28
29	L. Bush	7-9-08	D. L. & W.	1905	Creosoting	12,080 bridgeties	Y. Pine	12 lbs	Too recent		29
29	L. Bush	7-9-08	D. L. & W.	1907	Creosoting	8,000 track ties	Y. Pine	12 lbs	Too recent		29
30	Wm. McNab	7-29-08	Grand Trunk	1903	Burnettizing	255,574 ties	Red Oak		Too recent, 10 yr.		30
31	W. L. Darling	9-5-08	Nor. Pac.	1907	Creosoting	94,694 ties	Various	7 lbs	Too recent		31
31	W. L. Darling	9-5-08	Nor. Pac.	1907	Creosoting	Timber	Various	15 lbs	Too recent		31
32	J. M. Meriditb.	6-29-08	Flor. E. Coast	1907	Creosoting	16,000 ties	Pine		Too recent		32
33	W. H. Moore		N. Y. N. H. & H.								33
34	J. F. Hinckley.	11-7-08	St. L. & S. F.	1905	Rueping	332 ties	Red Oak	5 lbs	Too recent		34
34	J. F. Hinckley.	11-7-08	St. L. & S. F.	1906	Rueping	1,107 ties	R. Oak and gum.	4 lbs	Too recent		34
35	A. F. Rust	8-29-08	K. C. Southern	1904	Creosoting		Pine	12 lbs	Too recent		35
36	E. B. Ashby	8-7-08	Lehigh Valley	1886	Creosoting	Piles, timber, ties	Oak and pine	8-12 lb	Over double life		36
37	A. O. Cunningham	10-17-08	Wabash	1903	Burnettizing	Ties	Red Oak	.513 lb.	Life 5 to 6 years	Rail cuts — are brittle	37
38	T. E. Calvert	9-18-08	C. B. & Q.	1902	Hasselman	37,999 ties	Pine		Dead failure		38
38	T. E. Calvert	9-18-08	C. B. & Q.	1902	Hasselman	15,597 ties	Fir		Dead failure		38

Summary of Statistical Information on Treated Ties Received from Members.

Committee, is recommended. The principal points in connection with this specification are that it leaves out of consideration the question of relative properties of compounds and dwells essentially upon the necessity of obtaining fractions of a high-boiling character, as determined by fractional distillation:

STANDARD SPECIFICATION FOR COAL-TAR CREOSOTE.

The oil used shall be the best obtainable grade of coal-tar creosote; that is, it must be a pure product of coal-tar distillation and must be free from admixture of oils, other tars or substances foreign to pure coal tar; it must be completely liquid at 38 deg. C., and must be free from suspended matter; the specific gravity of the oil at 38 deg. C. must be at least 1.03. When distilled according to the common method, that is, using an 8 oz. retort, asbestos covered, with standard thermometers, bulb ½ in. above the surface of the oil, the creosote, calculated on the basis of the dry oil, shall give no distillate below 200 deg. C., not more than 5 per cent. below 210 deg. C., not more than 25 per cent. below 235 deg. C., and the residue above 355 deg. C., if it exceeds 5 per cent. in quantity, must be soft. The oil shall not contain more than 3 per cent. water.

SPECIFICATION FOR ZINC-CHLORIDE.

The zinc-chloride used shall be as free from any impurities of any kind as is practicable, being slightly basic and free from free acid.

Methods for Measuring Coal-Tar Creosote.

The committee recommends that the standard temperature at which oil should be stated be 100 deg. F. At this temperature practically all creosote oils in common use are liquid and can therefore be readily measured. In view of the fact that coal-tar creosote is used at temperatures other than 100 deg. F., it is necessary to reduce the volume at any observed temperature to the standard volume at 100 deg. F. The factor which is almost universally in use at the present time for making volume corrections is 1 per cent. expansion or contraction in volume for every 22½ deg.

In making corrections for volume it is exceedingly important to state a volume at a standard temperature as indicating 100 per cent., i. e., a unit volume. If this be taken at 100 deg. F., this will mean that oil at a temperature of 122½ deg. F. will be 101 per cent. of the volume at 100 deg. F.; and oil at 77½ deg. F. will be 99 per cent. of the volume at 100 deg. Bearing this in mind and taking the temperature at 100 deg. as the standard, the following table is submitted to be used in converting the volume at any of the temperatures ordinarily obtained to the standard volume at 100 deg. F.:

Table II.

FACTORS TO BE USED FOR DETERMINING THE VOLUME OF CREOSOTE OIL AT 100 DEGREES F., WHEN THE OIL IS AT TEMPERATURES RANGING BETWEEN 60 TO 225 DEGREES F.

Temp Fahr.	Factor.	Temp. Fahr.	Factor.	Temp. Fahr.	Temp	Temp. Fahr.	Factor.
60	0 9822	102	1 0009	144	1 0196	186	1 0382
1	0 9827	3	1 0013	5	1 0200	7	1 0387
2	0 9831	4	1 0018	6	1 0204	8	1.0391
3	0 9836	5	1 0022	7	1 0209	9	1 0396
4	0 9840	6	1 0027	8	1 0213	190	1 0400
5	0 9845	7	1 0031	9	1 0218	1	1 0404
6	0 9849	8	1 0036	150	1 0222	2	1 0409
7	0 9853	9	1 0040	1	1 0227	3	1 0413
8	0 9858	110	1 0045	2	1 0231	4	1 0418
9	0 9862	1	1 0049	3	1 0236	5	1 0422
70	0 9867	2	1 0053	4	1 0240	6	1 0427
1	0 9871	3	1 0058	5	1 0245	7	1 0431
2	0 9876	4	1 0062	6	1 0249	8	1 0436
3	0 9880	5	1 0067	7	1 0253	9	1 0440
4	0 9885	6	1 0071	8	1 0258	200	1 0445
5	0 9889	7	1 0076	9	1 0262	1	1 0449
6	0 9894	8	1 0080	160	1 0267	2	1 0453
7	0 9898	9	1 0085	1	1 0271	3	1 0458
8	0 9902	120	1 0089	2	1 0276	4	1 0462
9	0 9907	1	1.0094	3	1 0280	5	1 0467
80	0 9911	2	1.0098	4	1 0285	6	1 0471
1	0 9916	3	1 0102	5	1 0289	7	1 0476
2	0 9920	4	1 0107	6	1 0294	8	1 0480
3	0 9925	5	1 0111	7	1 0298	9	1 0485
4	0 9929	6	1 0116	8	1 0302	210	1 0489
5	0 9934	7	1 0120	9	1 0307	1	1 0494
6	0 9938	8	1 0125	170	1 0311	2	1 0498
7	0 9943	9	1 0129	1	1 0316	3	1 0502
8	0.9947	130	1 0134	2	1 0320	4	1 0507
9	0 9951	1	1 0138	3	1 0325	5	1 0511
90	0 9956	2	1 0143	4	1 0329	6	1 0516
1	0 9960	3	1.0147	5	1 0334	7	1 0520
2	0 9965	4	1 0151	6	1 0338	8	1 0525
3	0 9969	5	1 0156	7	1 0343	9	1 0529
4	0.9974	6	1 0160	8	1 0347	220	1 0533
5	0.9978	7	1 0165	9	1 0351	1	1 0538
6	0 9983	8	1 0169	180	1 0355	2	1 0542
7	0 9987	9	1 0174	1	1 0360	3	1 0547
8	0 9992	140	1 0178	2	1 0365	4	1 0551
9	0 9996	1	1 0183	3	1 0369	5	1 0556
100	1 0000	2	1 0187	4	1 0373	. . .	. .
1	1 0004	3	1 0192	5	1 0378	. .	.

Explanation. To determine the volume at 100 degrees Fahrenheit, divide the volume at any temperature by the factor corresponding to that temperature in the above table.

MEASUREMENT BY WEIGHT.

The measurement of creosote by volume is always subject to more or less variation, owing to errors obtained in measuring large quantities, and in converting volumes as measured at a given temperature to the standard at 100 deg. F. It is suggested, therefore, that wherever possible oil quantities be measured by weight. If desired, the volume can then be determined by ascertaining the specific gravity.

Adaptability of Woods.

The committee limited itself in the work on the adaptability of woods and their preparation to the grouping of species and the strength of treated timber.

(1) Grouping of Species; (a) controlling factors; (b) wood structure; [H. D. Tiemann, of Yale University, has prepared a clear statement of the elements of wood structure that affect this problem, which is published in full as an appendix.]. (c) present practice. [A circular letter was sent to treating plants, railroad engineers and others likely to have had experience in grouping species of timber for treatment under practical conditions and the results have been abstracted in Appendix D].

(2) Strength of Treated Timber: An examination of all available records of tests of treated timber, published and unpublished, has been made and the nature of the experiments and the conclusions abstracted. The abstract of the data will be published in a later Bulletin. In addition the committee arranged a series of tests, which were being carried on at the time the report was written.

GROUPING OF SPECIES.

The various species, and, indeed, any one species, in its differing conditions of seasoning and habit of growth take treatment unequally when exposed to given retort conditions. For example, dry sapwood of the pines treats easily, but the heart is mainly impenetrable to creosote. Some dry red oak sticks take creosote in certain processes clear through the heart, while beech under the same conditions is very refractory. It is evident that if two woods like red oak and hickory, or loblolly pine and longleaf pine, or heart loblolly and sap loblolly, are placed in the same charge and the average absorption secured, one class will be over-treated and the other under-treated. Interests of economy and proper preservation demand that the various species should be segregated into different groups.

It might seem at first that a suitable grouping could be predicated upon the known structural characteristics of the various species. The arrangement and means of communication between wood cells, the contents of these cells, the size and arrangement of pores and ducts are known and some of the laws of molecular physics controlling the movement of solutions are understood.

The various factors that enter into the problem may be listed as follows: (a) Condition of timber with respect to seasoning; (b) proportion of heartwood or of sapwood; (c) characteristic micro-structure; (d) per cent. of summer wood and spring wood and position in trunk, if readily distinguishable; (e) geographical location of species, elevation, soil and other site conditions as affecting (a), (b) and (c), if ascertained; (f) mutual interaction between the various species when treated in the same cylinder.

It might seem that the experience of treating plants would furnish satisfactory empirical rules for grouping applicable to the treating process used. However, most plants have treated but few species and there seems to have been but little detailed and careful examination of the actual results of the cylinder process upon individual sticks. Conflicting reports are made as to the ease of treatment of a given species, as, for instance, ash and white pine. These are due in part to a confusion of species, or a difference of species grown under different site conditions or latitude.

It appears in general that:

(1) In practice the southern pines are separated on the basis of amount of sapwood.

(2) That green and seasoned timbers are treated separately.

(3) That Douglas fir requires separate and special treatment.

(4) That there is no well-authorized grouping of the various hardwoods, and that this should be a matter of further study.

STRENGTH OF TREATED TIMBER.

As stated, the committee has in progress a series of tests of treated timber which are not yet (November 30, 1908)

complete. The committee presented a compilation of available reports on strength of treated timber. These include: (1) Tests on creosoted and untreated Douglas fir beams made by the Southern Pacific Creosoting Company at Sacramento, Cal., July, 1895, and May, 1906. (2) Tests of creosoted, burnettized and untreated Douglas fir beams made at the University of California in April, 1898. (3) Circular 39, Forest Service, "Experiments on the Strength of Treated Timber." (4) Bulletin No. 18, University of Illinois Engineering Experiment Station, R. I. Webber, "Holding Power of Railroad Spikes." (5) Circular 46, Forest Service, "Holding Force of Railroad Spikes in Wooden Ties." (6) Thesis by F. E. Osborne, School of Civil Engineering, Purdue University, 1901, "Effect of Preservatives on the Strength of Treated Timber." (7) Tests of creosoted Southern pine bridge stringers by the Forest Service at Purdue University, 1908. (8) The tests of Douglas fir bridge stringers treated by the boiling process at Seattle, tested by Forest Service at University of Washington, Seattle. (9) Tests on creosoted ties by Prof. A. N. Talbot, of the University of Illinois.

Experiments are under way at Purdue University for the committee to determine the comparative resistance of railway ties, natural and treated, to the action of the rail.

Treating Processes.

It was concluded to present general matter bringing out general principles observed in the application of wood preservatives. The discussion may be subdivided as follows:

(1) Pressure process.
 (a) Full cell; (b) empty or partly filled cell.
(2) Open tank process.

GENERAL PRINCIPLES TO BE OBSERVED IN APPLYING PRESERVATIVES.

Certain essentials must be observed to make the application of preservatives successful. First: The timber must be seasoned. It must be known to be of such character that it can be treated in the manner prescribed. Second: The element of heat is vital. Temperatures of the process must not be such as to be injurious to the wood. They must also be such that no change or injury will occur to the preservative itself. It is vital, however, that the temperature of treating be as high as possible, because this will either increase the fluidity of the preservative or tend to open the wood cells, or both. The maximum limiting temperature, however, is about 225 deg. F. It is essential in order to produce economical results in the cost of treatment that tanks, retorts or reservoirs, or whatever the vessel in which the timber is treated, be provided with sufficient means of heating, so that the heating may be done quickly and may be easily and surely controlled. Third: In order that there may be minimum cost of application it is necessary to have proper speed of treatment. This involves the entire design of the apparatus for the application. It must be possible to perform every step quickly and accurately, but at the same time thoroughly. Fourth: It must be possible to apply the preservatives uniformly to all pieces of timber in any one charge; that is, each particular piece must have its full quota; this, too, means that the timber in any one charge must be alike in character so far as its ability to absorb is concerned.

THE PRESSURE PROCESS.

The essentials of the apparatus of the process are the sealed retort and the pressure pump. The particular things which govern the apparatus are: (1) The character of the timber to be treated. (2) The character and amount of the preservatives used and the desired methods of application. (3) The desired capacity per day or per hour.

The pressure which must be maintained and the pressure which is the economical one depends on all the four essentials enumerated under the head of "general principles to be observed in applying preservatives." For refractory woods and heavy preservatives, as creosote, it must be possible to produce a pressure of 175 lbs. per sq. in. to obtain economic speed of treatment. For light wood a pressure of 75 lbs. per sq. in. may be ample. These pressures, 175 lbs. per sq. in. and 75 lbs. per sq. in., are in general the upper and lower limits used. If the timber to be treated is limited entirely to refractory woods as the red oaks, it must be possible to obtain the pressure of 175 lbs. per sq. in. When only light woods, as sap pine, are used, a pressure of 75 lbs. per sq. in. may suffice, as stated.

The more fluid a preservative the more easily it can be injected and the lower will be the desirable pressures. High fluidity is valuable. The higher the amount of preservative to be used per unit of timber, the greater will be the necessary pressure.

The desired capacity determines volumes and size of apparatus. A plant which will serve general requirements of the larger railroads will have a capacity of about 1,000 cu. ft. of timber per hour.

In the specifications for treatment adopted by the association it is proposed to steam the ties unless they are thoroughly air seasoned, in which case it may be omitted, at the option of the purchaser. It is to be emphasized, however, that this scheme should at all times be omitted when the ties are thoroughly air seasoned and are to be treated with oils.

It is to be emphasized that in the pressure process it is vital that the sealed vessel or retort must be provided with accurate measuring devices both for measuring volumes and temperatures. It must be possible to determine closely the actions within the retort.

OPEN TANK PROCESS.

The open tank process is the simplest form for applying a preservative. As its name indicates, it consists in dipping the wood in open tanks or vessels filled with the preservative to be used. It necessarily follows that this is an absorption, rather than an injection, of the preserving fluid. It also follows that the depth of penetration obtained is small, except for particularly open or porous woods, such as sap pine, where a penetration of 1½ in. has been obtained.

Recommendations for Future Work.

The necessity for accurate records of results in American practice is urgent in order to furnish sound facts on which to base conclusions. It is found that the value of many experiments in the use of preserved timber has not been productive of knowledge to any proper extent, because of improper records. The committee should go into this matter thoroughly and report on it next year. It should continue the gathering of statistics, co-operating with the Tie Committee and other committees in the gathering of statistics. This co-operation is necessary to avoid duplications. The Forest Service of the Government is doing considerable work on wood preservation and the committee should make free use of this source of information. Statistics to be gathered in the future should be added on the report given in Table I, enlarging and extending it.

It has been found that coal-tar creosote and chloride of zinc will preserve timber when used under the proper conditions and when the proper quantity and quality of preservatives are used. The determination of the conditions should constitute a part of the committee's work together with work on other preservatives. Crude petroleum is at present being used to such an extent that work in this direction is warranted.

The necessity of work upon an improved rail fastening in connection with the use of treated ties is so urgent that the work should be assigned to either this committee or some other for definite report. It is evident from present results that economic life of treated ties cannot be obtained without an improved rail fastening.

The committee should continue work in the determination of proper grouping of timber, working toward the end that some proper grouping may be determined upon. The preparation of the timber for treatment—seasoning, in other words—needs consideration. Some very serious questions in the deterioration of timber while undergoing seasoning now confront railroads which have adopted tie treatment. The proper handling of ties and timber prior to the injection of preservatives should have immediate attention. There is found to be no sound knowledge as yet on the effect of treatments on the strength of timber. As stated, the committee has experiments under way which will be of value in determining this question. These experiments should without question be continued and if possible enlarged.

Appendices.

Appendix A records the experience on the Louisville & Nashville R. R. with creosoted piles and timber.

Appendix B is a list of precautions to be observed in burnettizing ties, prepared by O. Chanute.

Appendix C is an article on the microscopical structure and physical condition of wood as affects penetration by preservatives, prepared by H. D. Tiemann, of the Yale Forest School.

Appendix D gives abstracts of replies received by the committee to its circular letter regarding practice in grouping species. These are summarized in a table included in the appendix.

Conclusions.

(1) Coal-tar creosote and zinc chloride are efficient preservatives when properly applied and when used under proper conditions.

(2) It is necessary to keep better records than have been kept so far in order to form proper conclusions as to the merit of different methods and processes.

(3) Preserved wood may be destroyed by mechanical action long before it is decayed.

(4) The specification as given for coal-tar creosote is good practice and should be adopted.

(5) There should be a standard temperature at which coal-tar creosote is measured. The temperature of 100 deg. F. as given in the report is recommended.

(6) It is essential that timber should be properly grouped in order that a successful treatment may be obtained. The species, proportion of heartwood and sapwood, condition of the timber with respect to its moisture content, and the wood structure, will in general determine this grouping.

(7) It is desirable to air-season timber in order to prepare it for treatment. Most woods can be best treated after being air-seasoned.

The report is signed by A. L. Kuehn, (Amer. Creo. Co.), Chairman; Carl G. Crawford, (Amer. Creo. Co.), Vice-Chairman; R. N. Begien, (B. & Q.); Lincoln Bush, (Cons. Engr.); T. E. Calvert, (C., B. & Q.); O. Chanute, (Cons. Engr.); C. K. Conard, (Erie); W. H. Courtenay, (L. & N.); W. W. Curtis, (Cons. Engr.); E. B. Cushing, (S. P.); Geo. M. Davidson, (C. & N. W.); E. O. Faulkner, (A., T. & S. F.); W. K. Hatt, (Purdue Univ.); V. K. Hendricks, (St. L. & S. F.); S. M. Rowe, (Cons. Engr.); Earl Stimson, (B. & O.); Hermann von Schrenk, (R. I.-Frisco).

Discussion.

Mr. Kuehn: The report is intended to be an introduction of the subject, rather than an exhaustive investigation. A full, conclusive statement of results obtained on a large scale in America will require a number of years. It will be the work of several years, more so, perhaps, than the reports of other committees.

The conclusions were read in order.

Mr. Curtis: I want to call attention to one feature in connection with the specification for coal-tar creosote, as referred to in conclusion 4. I regard the specification as one which, if adopted and live up to, would give us a better article of creosote than we have generally had in past years. But practically all of the oil upon which we are basing our conclusions of the efficiency of creosoted material today are based upon material which would not meet the proposed specifications. They would bar nearly all the oil made in this country and in Great Britain, although the German oil would comply with them. Also, we are confronted, and have been for the last five years, with the difficulty not only of getting the oil which we might want, but of getting any oil at all.

The secretary of the association some months ago sent out a circular to nearly all of the timber treating plants in this country, which were using oil. The specification was given in that circular. Of about 20 replies there are three instances where the reply was that none of the oil which they had been using would be excluded under this specification. Of the other replies, five replied that all the oil they had been using would be excluded. Two reported that all of the oil they had had during the two preceding years would be covered by this specification. The others gave various figures as the proportions that would be excluded, in most cases the amount being over 50 per cent.

I wrote to a number, I think all, of the manufacturing plants in this country where this creosoted oil is made, asking them what percentage of their oil would be eliminated by this specification. I did not receive a single reply. That may be either they are perfectly willing to comply with this specification, or they do not care what we specify and think we have to take their oil. I am sure that this specification, if adopted, will give us a better oil but I doubt the wisdom at present of adopting a specification which will rule out so much oil and which will also rule out a considerable part of the British oil, in view of the shortness of the supply.

The association already has adopted a specification for zinc chloride, which, in my judgment, is a much better specification than the one in the present report. I think the new specification for zinc chloride is worthless as printed.

Mr. Kuehn: I will answer for the remainder of the committee why they voted to adopt the specifications for coal-tar creosote. The supply of creosote oil, being a by-product, is dependent entirely on the demand for pitch. The demand for pitch in this country is limited to roofing, caulking purposes, etc. The demand for creosote oil in America is much in excess of the production. Only about 30 per cent of the creosote oil used in the United States is produced here, the rest is imported. There is a demand for pitch in foreign countries greater than there is in the United States; one demand is for coal briquettes. This foreign demand for pitch produces an over production of creosote oil abroad. Since the demand here exceeds the supply, the manufacturers tell us to take what we can get. But we cannot afford to take everything that is produced and spend money and time in attempting to bring about a long life timber. We can get more oil in England to back up the oil that is being cut out in this country, and we can get such oil as was used 75 years ago, to make timbers last from 35 to 40 years. The association, in adopting that specification, is adopting a specification which is not rigid, not as rigid as it eventually will be, when we treat all of our timber with creosote, and we want to get now as good creosote oil as can be obtained—we do not want to take too many chances. I do not think there will be any mistake made in adopting this comparatively lenient specification.

A. L. Kammerer (Rock Island): Mr. Curtis said that of the plants replying to the circular, only three said their oil would fall completely within these specifications. It seems to me that it would be much fairer, instead of saying three of the total number, to express it in terms of gallons. These three particular plants he mentions represent almost one-half of the total oil consumption of this country. The roads that I am connected with—Rock Island, Frisco, C. & E. I. and Santa Fe—have no great difficulty in getting their supply of oil under specifications practically the same as this one. These four railways consume, annually, about 20,000,000 gallons, representing a large proportion of the oil consumption of this country. Messrs. Von Shrenk, Fulls and myself in our laboratory at St. Louis have conducted extensive experiments to ascertain whether or not these low boiling constituents remain in the treated timber after exposure. We have examined a great number of creosoted specimens both in this country and in Europe which have given service 25 years or more. The analysis of all the oil extracted from these samples shows a total absence of the low boiling constituent, and a natural conclusion is that the long life of these old timbers is due to the presence of the very high boiling constituents of the original oil which are at present found in them.

About two years ago we took an oil having the following analysis:

Specific gravity at 38 degrees C.	1.045
Fractions distilling below 210 to 235 degrees	23.3
Fractions distilling below 235 to 270 degrees	24.1
Fractions distilling below 270 to 315 degrees	17.5
Fractions distilling below 315 to 355 degrees	17.1
Residue	15.5

A considerable portion of this oil was exposed in a vessel in the open air. After one year, it was found that 41½ per cent had disappeared, 90 per cent of which was the portion boiling below 235 degrees. Several ties were treated with this same oil and exposed to the weather for one year. The oil remaining was extracted and examined, with the result that 25 per cent was found to have disappeared. At the same time we conducted another experiment to determine the disappearance of the low boiling oil.

The American Telegraph & Telephone Co. removed five telegraph poles from its lines in the neighborhood of Norfolk, Va., and sent them to our laboratories. These poles were treated and placed in position in 1897. They had been in service about nine years when we examined them. The original oil with which they were treated was an oil very high in low boiling constituents. It had 50 per cent boiling below 235 degrees. Our examination of the oil extracted from these poles showed that 57.1 per cent had disappeared from the tops and 35.5 from the butts.

These experiments conclusively prove that nearly all of the low boiling oil is used in the treatment of timbers, and a very large per cent of the portion boiling below 270 degrees, disappears. The present specification was drawn up having these facts in mind. While it may appear somewhat rigid and American manufacturers may claim that they cannot live up to it, there is no doubt that with a little pressure the present American product can be made to closely approximate the requirements of this specification.

Mr. Curtis: I have no objection to the specification whatever as submitted. I see the possibility of some commercial difficulty for you if it is adopted. I hope to see that specification ultimately adopted. My judgment is it is not wise to adopt it this year.

It was moved and seconded that the specification as reported by the committee be adopted.

The point was then raised in connection with these percentages that the kind of apparatus used in making the tests or analyses should be defined, results differing with 8-oz. retorts, Hemphill tubes or three-bulb tubes, as well as the method of conducting the test. It was also suggested that the specifications should be increased to read that not more than 30 per cent, instead of 25 per cent, distillate will be given off below 235 degrees centigrade.

E. H. Bowser (I. C.): In most oil we do not get a distillation of more than 35 per cent, more often it comes several degrees under. In the older specifications for oil, it is almost invariably the custom to allow 45 per cent of naptha. That would mean 50 to 55 per cent of distillation of 235. The L. & N. specifications at one time allowed as much as 35 per cent. I move that the specifications be changed to read 30 per cent of oil distillate up to 235 degrees centigrade, instead of 25 per cent.

Mr. Fritch: I would like to ask the committee how much difference in price this would make in the cost of creosote oil?

Mr. Kuehn: I am not able to answer that absolutely, but I am of the firm belief it will not make any difference.

The motion by Mr. Bowser was lost.

The specification as given in the report was adopted.

The conclusions of the committee as a whole were adopted.

RECORDS, REPORTS AND ACCOUNTS.

The committee was assigned the following work:

(1) Revise the Track Chart (form M. W. 1016) so that the chart will show the conventional signs as adopted by the association.

(2) Recommends any desirable changes in the conventional signs heretofore adopted.

(3) Review the subject of Time Books and consider a revision of form M. W. 1008, with a view to preparing a form that may be uniformly used by all maintenance of way departments, offering a check against irregular practices, and allowing the use of a daily time report.

(4) Recommends forms for use of the maintenance of way department for preparing detailed estimates of contemplated construction work, this form to be used preliminary to and form the basis for the summary estimate data embodied in forms M. W. 1017, 1018 and 1019.

In addition the committee makes definite recommendations as to the use of single or double lines of track maps.

The organization for sub-committee work was as follows:

(A) Conventional Signs; Track Chart; Single or Double Lines.

(B) Time-Books.

(C) Estimate Forms.

Conventional Signs, Etc.

Instructions given this sub-committee were:

(1) To discuss with the sub-committee of the committee on Signaling and Interlocking the subject of conventional signs indicating signals and features in connection therewith, with a view to harmonizing the symbols recommended in the conventional signs (forms M. W. 1020 and 1021), with the symbols used by the Signaling and Interlocking committee in their work.

(2) Review the whole subject of conventional signs after agreeing with the Signaling and Interlocking committee to determine what, if any, changes should be recommended in forms M. W. 1020 and 1021, adopted by the association in 1907.

(3) Amend the track chart, form M. W. 1016, so that it will conform to the conventional signs heretofore adopted and revised by the committee.

(4) Call for a free expression of opinion of the membership with regard to the use of single or double lines on track maps and formulate a definite recommendation therefor.

SIGNAL FEATURES.

An agreement was reached with the Signaling and Interlocking committee covering the indications for the following signal features: Battery box; train-order signal; home automatic block signal; distant automatic block signal; home interlocking signal; distant interlocking signal; home disk signal; distant disk signal; signal bridge; interlocked switch; interlocking tower; automatic bell; derail.

The joint committee recommended changing the symbols for train-order signal, automatic bell, and derail.

Additions are recommended to the conventional signs to cover: Battery box; automatic block signal; home interlocking signal; distant interlocking signal; distant disk signal.

CHANGES RECOMMENDED IN CONVENTIONAL SIGNS.

The committee discussed the whole subject of conventional signs, and recommended 29 changes, the reasons for which are given in detail.

RECOMMENDED ADDITIONS TO LIST OF CONVENTIONAL SIGNS.

The committee recommends the adoption of symbols to indicate common drain tile, concrete pipe, ground wire conduit, track pans and tunnels.

TRACK CHART.

In 1905 the association adopted a track chart, but this adoption was provisional in character, depending on the conventional signs which were to be considered and recommended afterward.

The track chart, as revised by the committee, includes some additional symbols, as well as some changes, the principal features of which are as follows:

(1) The scales have been enlarged to 1 in. = 4,000 ft. for horizontal and 1 in. = 120 ft. for vertical scale, the reason for this being that it was found that this horizontal scale enabled more information of value to be shown in a much clearer manner, and this vertical scale minimized the breaks in the continuous line of the grade.

(2) Space has been allotted to show the weight of and date when rail was laid and the kind of ballast used in the main track; and in connection with this an alternative color scheme is proposed to be used, where it is desired, to more readily indicate the character of rail in the main track.

(3) The symbols for signals have been changed so as to conform to the revised conventional signs (form M. W. 1025), it being assumed that it is not necessary to show any more details in the way of signal features on the track chart than provided for by the conventional signs.

(4) The section post symbol has been revised to agree with the one shown in the list of conventional signs.

(5) A symbol for water column has been added.

(6) A symbol for water tank has been added.

(7) The symbols for bridges and culverts have been omitted and in lieu thereof a brief description of the structure is to be given

(8) Ruling gradients are indicated by an extra thickness of line.

(9) Special symbols are used to indicate fuel stations, roundhouses, turntables, section headquarters, telegraph offices, etc., the idea being to use a symbol that would more readily indicate to the operating man the location of these important features.

USE OF SINGLE OR DOUBLE LINES.

A circular was sent out with the following questions:

(1) Is it your opinion that double lines should be used exclusively on maps of a scale of 1 in. = 50 ft. or less?

(2) Is it your opinion that single lines should be used exclusively on maps of 1 in. = 200 ft. or more?

(3) (a) On maps of a scale of 1 in. = 100 ft., representing preliminary studies and designs for proposed track layouts, should tracks be represented by single lines?

(b) On maps, of a scale of 1 in. = 100 ft., of completed work, station plats and permanent records, should tracks be represented by double lines?

The replies indicate that the members are strongly in favor of the committee's recommendations on questions 1, 2 and 3-a, but are not quite so harmonious in regard to No. 3-b.

The following advantages are claimed by those who advocate the use of single lines on record maps:

(1) Single lines are more easily drawn by the average draftsman, thus saving time and expense.

(2) Single lines show actual location of center line of track as staked out by the engineer.

(3) Lateral distance is more easily and clearly indicated.

(4) Single line representation of tracks is less confusing to the eye.

The following advantages are claimed by those who advocate the use of double lines:

(1) Double lines show actual location of rails, single lines show imaginary center lines. The fundamental idea of a track plan is to show the physical conditions as they exist on the ground, and a double line drawing is the only way in which this can be done.

(2) Turnouts clearly indicated and location of frogs, derails, crossings, clearance points, etc., accurately shown.

(3) Track plans for interlocking and signal work are always made with double lines.

(4) It is very difficult for a young draftsman to learn the proper method of handling switch work by single line method.

(5) Double line representation is easiest for construction men. The more complicated the layout the more clearly is it shown by double lines and more easily comprehended by the field men

TIME BOOKS.

Inquiries showed that an exceedingly small percentage of the membership use the time book adopted by the association. The committee believes this book deficient in the matter of distribution, where the daily time report is not used. It therefore recommends the adoption of two forms of time books, one to be used where it is practicable to use the daily time report, and the other where this is impracticable. For the first form the committee recommends the use of form M. W. 1008 with the addition of two columns, the purpose of which is indicated, and for the second the committee proposes a book which is exhibited in detail and which is in two forms, one for the track department and the other for the distribution of time of structural gangs, with a page for each man.

The committee recommends the adoption of a daily form for reporting time, believing it will be of great value in helping to a more prompt compilation of accounts and in enabling supervising officers to keep in close touch with expenditures and guard against irregular practice. The committee recommends as an adjunct to the daily time report, a sheet representing a compilation of the information shown on the daily report, this sheet to be kept in the office of the supervising officer or of the accountant.

Estimate Forms.

It is the opinion of the committee that much good can result from the adoption of a uniform method of preparing estimates. Too often such estimates are prepared according to the notions of the individual engineer, and in many instances a failure to have before him in printed form the items that are usually found in work of that character causes him to make omissions. It is, of course, understood that there cannot be a form which would be uniformly applicable to all of the branches of the maintenance of way department, and consideration should be given to the preparation of forms for the following work:

(1) Bridge work, including trestles, pipes or masonry. (2) Building work. (3) Water service. (4) Signal and interlocking work. (5) Telegraph lines. (6) Track work. (7) Scale work.

Circulars were sent to the members and replies were quite full and complete, 85 per cent. recommending the use of printed forms. The committee submits with this report a form for estimates ordinarily handled by the engineer maintenance of way for track work. This form includes a number of items that are not purely track work, because they are items that are frequently incidental to the preparation of track estimates.

Conclusions.

(1) The committee recommends the adoption of the revised list of conventional signs.

(2) The committee recommends the adoption of form M. W. 1016 as revised.

(3) On track maps drawn to a scale of 1 in. equals 50 ft. or less, tracks should be represented exclusively by double lines.

(4) On track maps drawn to a scale of 1 in. equals 200 ft. or more, tracks should be represented exclusively by single lines.

(5) On track maps drawn to a scale of 1 in. equals 100 ft.

(a) On maps representing preliminary studies and designs of proposed track layouts, tracks should be represented by single lines, except that double lines may be used where considered necessary to show turnout details.

(b) On maps representing completed work, station plats and permanent records, tracks should be represented by double lines.

(6) The use of form M. W. 1008, with the additional columns as shown for reporting time where it is practicable to use a daily time report.

(7) A change in the cover page of form M. W. 1008 to permit the signature of the foreman and his supervising officer.

(8) The use, wherever possible, of a daily time report for all departments.

(9) The use of the form recommended for time book where the daily report is not used. (Forms M. W. 1109 and 1110.)

(10) The use of the form to represent a compilation of the record and distribution of time. (Form M. W. 1111.)

(11) The use of a system of time checking to guard against errors and fraud.

The report is signed by H. R. Safford (I. C.), Chairman; William Archer (B. & O. S.W.), Vice-Chairman; A. L. Davis (I. C.), Edward Gray (Sou.), E. E. Hanna (Mo. P.), Paul Jones (C. & M. V.), Henry Lehn (N. Y. C.), J. H. Milburn (B. & O.), J. W. Orrock (C. P. R.), H. J. Pfeifer (St. L. Term.), C. W. Pifer (I. C.), V. D. Simar (D., S. S. & A.), J. E. Turk (P. & R.), R. W. Willis (C., B. & Q.).

Discussion.

Mr. Safford: I would suggest a discussion of the subject of the track chart, and briefly I would say the work of the committee this year in connection with the conventional signs was an attempt to make some of the signs more consistent with the subject they represented and to attempt to group them in some systematic order. A few new signs have been added, and some material changes were made in the signal indications which were recommended after the discussion of the report of the Signal committee. That committee agreed as to the signs shown in our list. Of course we do not attempt to show all the signal details. We only considered those things which would be ordinarily used.

The secretary read conclusion 1, in regard to conventional signs, which was adopted.

The secretary read the conclusions with reference to track maps, which were adopted.

Mr. Safford: I move the adoption of the track chart, Form 1016.

Mr. Ferriday (Big Four): I was in some doubts as to what was meant by section house. I find it means section dwelling. I suggest that the explanation of house be changed to "dwelling."

The President: The committee will accept that suggestion.

Mr. Lindsay: The committee shows a line to indicate the alinement. When a curve is below that line, does that mean the curve to the right, or the curve to the left, or is that the actual picture of the curve and the way it would look on the ground? It seems to me the picture should be made as if the curve was hinged at the ends, and the line simply straightened out, so that the direction of the curve actually showed as it would lie on the ground.

Mr. Safford: The reason the committee used that communication was to show exactly the location of the curve, that is, the center. The curvature on the chart shows the relative position of the curvature of the rail.

Mr. Hanna (Mo. P.): In order to make this matter perfectly clear, I move that under the head of "Explanation" a small diagram with this alinement be placed with a note.

Mr. Safford: That is acceptable.

Mr. C. P. Howard: There is no sign for the freight station.

Mr. Safford: I presume that is because there did not happen to be a separate freight station in the territory from which this chart was made. That should be shown the same as the passenger station. I move the adoption of the form of track chart as submitted.

(The motion was carried.)

The President: We will now take up time books.

Mr. Safford: I move the adoption of the forms of time books indicated as M. W., 1008, 1109 and 1110.

Mr. Ewing: I should say it would be a little clearer if we would leave out the word "daily" on form 1008 and make it "record of time for the month of ——."

The President: The committee accepts the suggestion of Mr. Ewing. The question now is upon the adoption of these forms, with that amendment.

The forms were adopted.

The President: Now the estimate form will be considered.

Mr. Gray (Sou.): This form was gotten up with the idea of covering, to as great an extent as possible, all of the different items which would be used in the construction of track and in roadway material, including railroad crossings, grading, ballasting, etc. The list covers nearly everything that is used in construction and maintenance work, the purpose of which is to assist the memory of the estimator or the compiler.

Mr. Lindsay: This is a very valuable form, and we could probably use it, but we would require additional columns on the right hand side of the page in which to show divisions of cost—for instance between the railroad company and a private individual or between two railroad companies. I think the blank could be approved if it provided additional space for such purposes.

Mr. Safford: That can be very easily added to this form if it is acceptable to the association. I wanted to make it clear that we propose to prepare additional forms for bridge work, signals, etc. I move that the association adopt this form with the amendment proposed by Mr. Lindsay.

A. Montzheimer: It seems to me the blank ought to show what a turnout consists of, and that it doesn't include rail between the split switch and the frog. That has been a source of trouble to us.

Mr. Safford: Wouldn't that be in the nature of a detail that could be used in the preparation of any estimate? All the items that go to make a turnout are contained here and it would be pretty hard to omit any of them if you followed the design.

Mr. Montzheimer: I think there ought to be a note at the

bottom that the turnout consists of everything except the rail in the turnout.

The President: That is acceptable to the committee.

The form was adopted as amended.

BALLASTING.

Sub-committees were appointed to gather data and prepare a report on customary recommended practice for preparation and delivery of various kinds of ballast; also advantages and disadvantages of various types of ballast. These sub-committees were as follows: (A) Crushed Rock; (B) Slag; (C) Gravel (Bank and Washed); (D) Chats; (E) Cementing Gravel and Chert; (F) Disintegrated Granite.

The committee submits new definitions for gravel and sand, to take the place of those heretofore recommended and published in the Manual.

The definitions adopted state that gravel is coarser than sand and that sand is finer than gravel, but fail to establish any limit of size, below which worn fragments of rock cease to be gravel and become sand. Therefore your committee recommends the substitution of the following definitions:

Gravel.—Small worn fragments of rock occurring in natural deposits that will pass through a 2½-in. ring and be retained upon a No. 10 screen.

Sand.—Any hard granular comminuted rock material, finer than gravel, which will be retained upon a No. 50 screen.

Preparation and Delivery of Ballast.

CRUSHED ROCK.

Under this head the committee gives a description of the Hog Mountain crushing plant of the Delaware, Lackawanna & Western, prepared by L. Bush, former Chief Engineer. It describes the equipment, method and cost of operation, and methods and cost of handling the ballast.

PIT GRAVEL.

Stripping.—In general, the best method for removing the waste material is to use a steam shovel. When the depth of stripping is too shallow to permit the economical use of a steam shovel, teams with scrapers can be used to windrow the strippings, using a steam shovel to load the windrows. The cost of stripping a gravel pit with a steam shovel, using the material to widen embankments, when the haul does not exceed 20 miles, should not be more than 15 cents per yard.

Loading.—A heavy steam shovel with a dipper holding from 2½ to 3½ yds. makes a most efficient machine for loading gravel. Too great stress cannot be laid upon the advisability of having a shovel which has a large surplus of strength in all its parts, as economy in maintenance and in the operation, resulting from lessening the loss of time occasioned by stopping for repairs, is very great. Center-dump cars, which deposit the material where it can be used without any casting with shovels, are most economical; the larger the capacity of the cars the better.

In connection with the center-dump cars, ballast spreaders mounted under a flat car are a necessity. The practice of placing a tie or like obstacle in front of the wheels, allowing them to skid while the ballast is being pushed out of the way, is bad, resulting in flat wheels, as well as loss of time in distribution of the ballast. Where only a small amount of ballast is to be handled, a device which will be mounted by the wheels and will itself slide on the rails can be used to good advantage. Where only a very small lift or none at all is to be made, a great saving in time of applying the ballast can be made by the use of a distributing plow, which plows out the ballast close to the tops of the ties.

Cost.—It is impractical to give any approximation of the cost of preparing the gravel pit for operation, as local conditions will govern entirely. The cost of loading the gravel depends upon three conditions: (1) The size and efficiency of the shovel. (2) The depth of the bank from which gravel is being loaded. (3) The supply of cars maintained under the shovel dipper.

Where the bank is 10 ft. or more in depth the greatest efficiency of the shovel should be obtained. Not less than four pitmen should be used, that no time may be lost in shifting. Where the bank is less than 10 ft. in depth it will generally be found that the frequent shifting of the shovel will materially reduce the output of gravel. It is assumed that the train service is sufficient to keep the shovel supplied with cars in order to make use of its full efficiency. With these conditions obtaining, from 2,000 to 2,500 cu. yds. per day on an average can be handled, the cost of which will be approximately $0.025 per yard.

Distribution.—The length of haul regulates entirely the question of the number of trains and the number of cars to a train which should be used. The one hard and fast rule should be that the best of motive power be furnished for this service. Generally speaking, for hauls less than 10 miles, one train in addition to the train at the pit is sufficient. Above 10 miles and under 30, two trains on the road will be sufficient. The only rule that can be stated is that, to get the most economical handling of ballast, train service enough should be provided to keep the shovel well supplied with empties at all times. Where the haul is short the best practice is to put into one train only so many cars as can be handled readily by the engines which are assigned to that service. There is a decided loss on short-haul work where more cars are put into a train than can be dumped without difficulty by the engine.

When the haul is long all the cars should be given to a train that can be moved over the division, and enough set off on the siding nearest the distributing point to reduce the train to such size that the engine can readily handle it while dumping. This applies to center-dump cars, where the movement of the train when being unloaded is very much harder than when on the road. In some cases it will be found economical to provide a train for the purpose of taking the loaded cars at the end of a long haul and unload them. It frequently happens that unforeseen delays occur during the unloading which will seriously cripple the through movement of the gravel trains, and on very long hauls the unloading train can be economically employed.

The cost of movement from the pit and of distributing on the track depends wholly upon the length of the haul and congestion of traffic. The actual time consumed in distribution with center-dump cars is immaterial, 30 minutes being sufficient time for the unloading of a train of from 400 to 500 cu. yds.

WASHED OR SCREENED GRAVEL.

The essential features of a plant for this purpose are:

(1) Positive separation of material into definite grades.

(2) Capacity to furnish gravel in quantities sufficient for economical use as ballast.

(3) Economical operation.

(4) Economical disposition of the refuse, both boulders and fine material.

To fulfill the first requirement a plant must be so designed as to separate the material handled into dust, sand, gravel and cobbles or boulders. If these grades are not separated the proper proportion of sand and gravel necessary for the best results cannot be obtained.

In distributing ballast on track it is obviously necessary to produce the gravel in large enough quantities to permit the organization of the track forces on an economical basis. A plant which will produce gravel at a cost which would make it commercially profitable may be too small to produce ballast economically.

In the preparation of quantities of ballast there is necessarily produced a large amount of mud, sand and boulders or cobbles. To work successfully, a plant must be so devised as to dispose of this rejected material. The stones should be run through a crusher and returned to the gravel for ballast, not only increasing the output, but improving the quality.

Plants for the washing or screening of gravel naturally divide into two types: (1) Those for handling material from submerged beds of gravel. (2) Those for handling material from upland gravel banks.

The plant of the Union Sand & Material Co., South Memphis, Tenn., is a typical submerged gravel-bed washer, and the Lake Shore & Michigan Southern plant at Pleasant Lake, Ind., is typical of the upland washer.

[Descriptions of both of these plants are given. The Pleasant Lake plant was described in the *Railroad Gazette*, September 14, 1906.]

CEMENTING GRAVEL.

There are two principal points in the territory east of Memphis where cementing gravel is worked for the purpose of supplying ballast to railroads; one at Iuka, Miss., on the Southern Railway, known as the Tishomingo gravel pit, owned and operated by the Tishomingo Gravel Co., of Memphis, and one at Perryville, Tenn., on the Memphis & Paducah division of the Nashville, Chattanooga & St. Louis Railway, owned and operated by the Perryville Gravel and Ballast Co., of Memphis.

Tishomingo gravel is a water-worn gravel lying in a compact mass requiring blasting before it can be handled with a steam shovel. It is composed of 20 per cent. clay, 5 per cent. sand, and 75 per cent. gravel. The cost in track is 47 cents a yard. The advantages of its use are: Small cost; quick cementing qualities; holds track in line and surface well under

fairly heavy traffic; does not churn; very little dust, and has great resistance to erosion by water. Considered an excellent ballasting material. Has the disadvantage of growing prolific crops of weeds and grass, making it costly to keep clean.

Perryville gravel is an angular gravel lying in a compact mass requiring blasting before it can be handled. It is composed of 10 per cent. clay and 90 per cent. gravel, with chemical analysis of 97 per cent. silica, 2.5 per cent. alumina, and .5 per cent iron. There is found in this pit considerable large stone, which has to be crushed before suitable for use. The cost of this gravel per yard in track is 71½ cents.

BURNT CLAY BALLAST.

Under this head the committee describes in detail the making of burnt clay ballast, including selection of pit site, method of operation, conditions producing best product, loading, desirable size and capacity of pit, and other practical points. They also give the following table showing the cost of burnt clay ballast on several railways:

Railway.	Land.	Fuel	Contract price.	Loading.	Train service-hauling.	Putting under.	Total per yard.
A. T. & S. F.	....	0.100	0.200	0.058	0.237	0.140	73.5
C. & E. I.	....	....	...	...	....	....	25-30
C. B. & Q.	0.45	0.135	0.17	0.06	....	....	41
C. M. & St. P.	....	....	...	...	....	....	38-40
C. R. I. & P.	....	....	17-30	...	....	....	37-40
Union Pacific.	....	....	...	0.201	0.091	0.234	52.6
Wabash	....	0.038	0.240	0.040	....	....	31.8

CHATS.

Chats are tailings from lead and zinc concentrators. The rock in which the lead and zinc occur is run through crushers and separators and thoroughly washed, after which it is discharged by means of elevators and troughs, forming huge piles. The desire of the lead and zinc operators to extract every ounce of ore from the rock has led to finer and finer crushing, so that chats coarse enough to make good ballast are becoming less easy to obtain each year.

A great deal of loading is done by hand under contract. The material is, however, most excellent for easy steam shovel handling, and much is loaded that way. Cost of loading is now about 16 cents per yard in the Joplin district, having been 14 cents for some years and at one time even cheaper.

Advantages and Disadvantages of Various Types of Ballast.

Under this head the committee first enumerates the functions of good ballast preliminary to discussing the extent to which the different materials perform these functions.

CRUSHED ROCK.

After naming the advantages claimed for crushed rock by its advocates, the committee says: Users of large quantities of gravel ballast, however, do not admit all of these claims, particularly that of better riding track. It is said that when track is to be raised only a very small amount, it is difficult to do this on stone ballast and to properly tamp the tie to an even and uniform bearing. For this reason it is claimed that gravel makes a more smooth riding track. Likewise, it is more difficult and costs more to renew ties in stone, owing to the handling of the material. We have also heard it stated by foremen that it is harder to make and maintain very small adjustments of line and surface in rock than in other materials, but its good qualities far outbalance its poorer ones, and its use shows a material economic saving.

The best size for crushed rock is an unsettled question. Tests made on the Baltimore & Potomac Railroad indicate that there is a slight economy in the use of 2½-in. stone over 1½-in., and a decided saving over ¾-in.

A statement of results of physical tests of ballast stone is given in Appendix A to the report. This appendix also contains descriptions of the various tests, geological descriptions of the rocks examined and a study of the costs and comparative economy of some of the stones, as they apply to conditions on the Baltimore & Ohio.

"Characteristics of Stone Ballast" on the Cleveland, Cincinnati, Chicago & St. Louis are shown in Appendix B, which also contains some interesting comparisons of cost of stone and gravel ballast.

GRAVEL BALLAST.

Following an enumeration of the advantages and disadvantages of gravel ballast the report says: These disadvantages however, exist in greatly varying degrees, and in carefully prepared gravel ballast disappear altogether. While it is true that some of the users of crushed rock maintain that it is superior to the best gravel, your committee feels that the evidence is not sufficient to warrant them in making an unqualified statement to that effect. Under extremely heavy traffic the indications are that crushed rock will stand better than the best gravel, but some of the best riding track in the country, with fast passenger service over it, and with reasonable maintenance expense, is put up on gravel.

Some physical tests of pit gravel on the Big Four have thrown light on the question of effect of sand and dust in gravel ballast, and the result of the tests is accordingly given here. These tests were made on small sieves by hand and must therefore be regarded as laboratory tests, rather than working tests under everyday conditions:

PERCENTAGE OF GRAVEL, SAND AND DUST BY VOLUME.

(Compared to Original Volume.)

Pit.	Gravel.	Sand.	Dust.	Remarks.
Lafayette, Ind.	81.6	27.0	1.3	Very good.
Mechanicsburg, Ohio	61.3	50.9	2.8	Fair.
Mound City, Ill.	68.0	44.1	2.9	Good.
Savona, Ohio	86.0	12.5	6.5	Poor—Cementing nature.
Terre Haute, Ind.	56.0	62.0	2.0	Too recent to determine.
Valley Junction, Ohio	59.6	55.4	3.6	Good but dusty and excess of sand increases track labor.
West York, Ill.	58.7	49.1	12.9	Very poor. Only fit for sub-ballast.

In what follows the term "dust" is applied to that material which is finer than sand under the new definition recommended by the committee. All proportions have reference to the bulk.

Gravel having 3 per cent. or less of dust has been found to drain very freely, while gravel having an excess of 3 per cent. of dust is found to hold water to such an extent as to interfere with its thorough efficiency as ballast.

Gravel containing 2 per cent. of dust will make a fairly dustless roadbed, but after being disturbed by track work it will cause considerable dirt until washed by a heavy rain.

It has been found necessary to have about 30 per cent. sand to partially fill the voids in the gravel. Lack of at least 20 per cent. of sand permits the pebbles to shift under the load and an excess of 50 per cent. of sand prevents the ballast from becoming firm. In dry weather "pumping" or "blowing" takes place.

Your committee recommends, as a good practice, the following proportions:

For Class A Roads: Ten parts gravel and three parts sand. Where bank gravel contains more than 2 per cent. dust or 40 per cent. sand it should be screened or washed.

For Class B Roads: Ten parts gravel and six parts sand. Where bank gravel contains more than 3 per cent. dust or 60 per cent. sand it should be screened or washed.

For Class C Roads: Ten parts gravel and ten parts sand. Any bank gravel which does not contain an excess of 6 per cent. dust may be economically used.

CHATS.

The principal advantage of chats is low first cost, although it has some very excellent qualities as ballast in addition to this. It provides as good drainage as the best gravel, the coarser chats giving better drainage than the finer. It is very low in cementing qualities and there are therefore fewer pumping ties than in gravel. It is fine enough for ties to be tamped with a shovel or end tamper, permitting a fine surface with a light raise. Weeds do not grow in the chats and they will not grow in the ballast until sufficient dirt to support them has been collected.

The specific gravity of chats varies from 2.54 to 2.66, and the weight of a yard varies from 2,100 to 2,400 lbs., averaging about 2,300 lbs. Recently the ore has been ground finer in order to get out more of the lead and zinc, which makes a less desirable ballast than when it is coarser.

Some of the disadvantages of chats are that they sink into clay soil, blow out under heavy joints and do not keep tracks in good line and surface under heavy traffic. The better grades of chats, those made of the harder rocks and more coarsely crushed, have always been somewhat dusty under high speeds, say about 45 miles per hour. This objectionable feature has grown worse with the tendency to finer grinding, mentioned above, until it has reached the point where some chats piles are entirely unfit for ballast purposes. Some of the ore-bearing rock, also, is comparatively soft by nature, and, with clay which sometimes occurs in the interstices of the rock, makes a material which does not drain nor support track satisfactorily and which, therefore, should not be used except for sub-ballast.

Conclusion.

Your committee asks that the definitions for sand and gravel be approved by the convention and that the percentages of sand and dust in gravel ballast given above be approved as good practice.

The report is signed by John V. Hanna (K. C. T. Ry.), Chairman; C. A. Paquette (C., C., C. & St. L.), Vice-Chairman; Willard Beahan (L. S. & M. S.); W. J. Bergen (N. Y., C. & St. L.); J. B. Dickson (Erie); H. O. Garman (Purdue Univ.); H. E. Hale (Mo. P.); G. D. Hicks (N., C. & St. L.); B. C. Milner; A. F. Rust (K. C. S.); W. C. Smith (N. P.); F. J. Stimson (G. R. & I.); A. W. Thompson (B. & O.); G. M. Walker, Jr. (A., T. & S. F.).

Discussion.

Mr. Hanna: The vice-chairman of our committee made some actual separations with screens of different sizes and the result was to offer a definite line that should be drawn between those two classes of material. As he is not here, we cannot give the explanation of the work done in arriving at these screen sizes.

C. E. Lindsay (N. Y. C.): I would request that we have the definition for gravel, as given in the Manual, read to us.

The secretary read it.

L. C. Fritch (I. C.): It seems to me the percentage of sand in the gravel for Class A roads is a little high. It strikes me that 30 per cent would be better.

Mr. Lindsay: I hope the definitions of the committee will not be adopted, changing the Manual. It seems to me that gravel is as it occurs naturally. Just last month I was attending upon a lawsuit where the question of the character of the ballast was in dispute and around which the question centered, and it was a question whether it was a gravelly sand or a sandy gravel. We claimed that it was the best that could be obtained in that locality in its natural condition. If this association goes on record as saying that a gravel ballast is a mixture of a certain definite quantity of sand and gravel, it seems to me we are going along the wrong lines.

Mr. Hanna: The idea of the committee was to draw a definite line between sand, gravel and dust. It is true that gravel is a natural deposit; so is sand a natural deposit. Ordinarily there is not any confusion in anybody's mind as to what these things are; but when it came to a discussion of them for ballast purposes it seemed to the committee that there was an advantage in having some definite test that the material could be put to, which would determine which class it would go into. That would have been clearer, I think, if we had here the samples of the material itself, that would show just exactly what is got by making the separation by the use of these screens that we have named in these definitions. I think in the absence of the actual material before you to see what it means to draw this line, that it is very difficult to convey to anyone else the right impression about it. The report gives the proportion of parts of gravel and sand. I am not able myself to say just what led to these particular proportions. They were determined by Mr. Paquette, who is chairman of the sub-committee, and they are the results of his work in using these different sizes of screens. The idea was that the proportion of sand should be as large as possible, keeping in mind the desirability of filling the voids between the stones of the gravel, and that the sand should not be in a large enough proportion to permit dust, or permit the sand to be drawn out by the air going along with a moving train. At high speed the trains would naturally pick up particles of a larger size than slower trains, and the idea was that for first-class roads there would not be enough sand to be at the surface of the gravel. Naturally the finer stuff works down through.

Maurice Coburn (Van.): I think that the percentage of sand suggested is too high. The larger the amount of sand the more dust we are going to have and the less the life of the gravel is going to be and the poorer the drainage. The reason for washing gravel is to minimize all those results. With our present gravel, the dust is a very serious matter in the summer time. I am very glad to read what the committee has had to say about the comparison between gravel and stone, because it agrees with my own conclusions. Gravel ballast will give us first class track for considerably less than we can have with stone, and we have stone and gravel both on our line.

Mr. Fritch: Our road has had considerable experience in river gravel, where we could get any desired quantity of sand, and our practice has been to limit the quantity of sand to from 30 to 35 per cent, which gave very good results. I think, for high speed track, anything in excess of that would make a dusty track.

Willard Beahan (L. S. & M. S.): There is more sand in gravel than you would think. If you would screen it you would be surprised at the result. I did not suppose I would ever advocate 40 per cent sand, but in the way we arrived at it we mixed it up, and considered how that compared with the results from our washers and our pits, and that percentage represents simply the practical judgment of the gravel men on your committee. It is not the sand that has so much damaged our gravel. It is a little film of clay that surrounds each particle of gravel.

Mr. Lindsay: In regard to the committee's recommendation to substitute the definition in the report for the one in the Manual: let us determine what will be called gravel, then we can determine what kind of gravel to use for the different classes of track. I move that the definition for gravel be rejected and that the definition in the Manual be retained.

There was no second to this motion.

Mr. Lindsay: With regard to the definition for sand, I move to omit the words "finer than gravel" and substitute the words "passing through a No. 10 screen."

W. M. Camp: I am in favor of drawing a line between gravel and sand, and when we define it as passing a No. 10 screen and being retained on a No. 50 screen, it seems to me that does draw a line. When you speak about ballast containing so many parts gravel and so many parts sand the association is compelled to define what sand is and what gravel is.

H. McDonald: There is another committee which will probably consider the definition of sand, and it is possible they may have already recorded themselves in the Manual, and that is the committee on Masonry. Are we to understand that this definition of sand applies to ballast only, or if we adopt it today will it be applicable to sand for use in concrete and masonry also? For my own part I would be perfectly willing to see it stand for both uses, as amended by Mr. Lindsay.

Mr. Hanna: Our committee looked at this from the ballast point of view only.

Mr. McDonald: Then they should define sand for ballast?

The President: The question is on the definition of sand. Mr. Lindsay's amendment is to eliminate the words "finer than gravel" and to add "will pass through a No. 10 screen," so that the amended definition would read: "Any hard granular comminuted rock which will pass through a No. 10 screen and be retained upon a No. 50 screen."

The amendment was adopted.

Mr. Camp: I move that the definition of gravel be adopted as it stands.

Mr. Hanna: I move that the recommendations on proportions of gravel ballast be adopted.

Mr. Osgood (C. of N. J.): I would like to ask why, in stating proportions of gravel and sand, it is thought best to make them specific and not to state that the amount of sand shall not exceed a certain percentage? It would naturally occur to me that in specifying gravel it would be desirable to have it as near gravel as possible, and limit the amount of sand, and certainly it would be so in regard to some gravels, even under the specification of the committee. It might be wiser to say the proportion of sand shall not exceed a certain amount; then say it shall be such an amount, as is specified here.

Mr. Fritch: I would like to amend the motion by changing class A to read, instead of 40 per cent, a maximum of 35 per cent; for class B a maximum of 50 per cent, instead of 60 per cent.

Mr. Coburn: I agree with this recommendation. On our road we pick up with our fast trains a very large part of the material which is classed as sand by the committee.

Mr. Hanna: I believe that Mr. Fritch is under a misapprehension with regard to the committee's proportions. Ten parts of gravel and three parts of sand would make 13 parts in all, and the three parts sand is little less than 25 per cent. I confess I think it would be better to put it in the shape of percentages.

Mr. Byers: In regard to washed river gravel there should be a minimum. The river gravel, with insufficient sand in it, acts a good bit like shelled corn, and it is impossible to keep the track in proper shape. We have had some experience with that, with some gravel, that I think contained about 15, or possibly 20 per cent sand, but we have had a good deal of trouble to maintain the track with that material. Since that we have increased the percentage of sand and find the result very much better.

The President: The question is on the amendment to change the percentage on the class A roads from 40 to 35 per cent and on class B roads from 60 to 50 per cent maximum.

Mr. Hanna: I would not like to see it go through in exactly that form. I think in view of what Mr. Byers has said about his experience—and others have had the same—that we ought to have a maximum and minimum limit, and before the convention finally settles on this, we ought to have the

experience of other roads and know what their minimum limit has been, what has proved to be a good minimum limit. Then I think we would better rewrite this, so that the whole recommendation will be expressed in percentages and not in parts. The committee will do that.

H. R. Safford (I. C.): My experience in Mississippi river gravel has taught me that a maximum of 35 and a minimum of 28 per cent are proper limits. We started out with a specification 25 per cent, and found that was not sufficient, and gradually increased it to 30, to 35, and with that character of gravel we find no trouble with the sand being picked up by moving trains. Our recommendation would be, minimum 28, maximum 35.

The amendment offered by Mr. Fritch was voted upon and was defeated.

Mr. Hanna: I would like to get a more definite expression of the convention on the maximum and minimum question. I would like to have some sort of a vote that will fix those two limits.

Mr. Fritch: I move that the recommendations of the committee for ballast for the different classes of roads be referred back to the committee for further recommendations.

Motion carried.

WATER SERVICE.

The work assigned to the committee by the Board covers:

(1) The relative economy of different fuels used in pumping water, with the relative desirability of each.

(2) General principles of water supply service (water treatment not considered) and typical installations for various conditions.

(3) Report on various types of track tanks with designs of typical installations and critical review.

Relative Economy of Different Fuels.

The different fuels used by railroads in pumping water are: coal, gasolene, kerosene, distillate, fuel oil, artificial gas (from municipal plants or gas producers), natural gas. Compressed air and electric power are also used where obtainable from other plants or where duty is great enough and conditions favorable to their use.

Circulars were sent to members of the association requesting reports on the relative merits of the different fuels. Twenty-four replies were received; of these, ten were considered of sufficient reliability to warrant tabulation. From these reports, which are given in Appendix A, deductions were arrived at as follows:

(1) That gasolene and coal are the only fuels that are in common enough use at the present time to enable a report on their relative economy for railroad pumping plants to be made by the committee.

(2) That the reported actual consumption of fuel by the average railroad pumping plant is larger by several times than it should be according to the tests of machinery on the testing floor. This is due to the small size of plant, causing the percentage of efficiency to decrease; careless and inefficient employees; careless and inefficient manner in which accounts are kept.

(3) That the actual fuel consumption per effective horsepower per hour is as follows:

Number and description of tests.	Amounts per effective horse-power per hour. Up to 50 E. H. P. *Coal used, pounds. 10 tests effective h. p. from 1.37 to 4.61	Gasolene used, gallons. 24 tests effective h. p. from 0.51 to 4.67.
Maximum	67.	0.98
Minimum	30.	0.24
Averages of all tests	50.	0.50

*Coal ran from 14,000 to 10,000 B. t. u. per lb.

On larger plants, for which only a few tests have been received, the amounts per e. h. p. are considerably less, although the ratio remains about the same.

An article on the relative value of coal and gasolene as a fuel for railroad water stations, by A. K. Shurtleff (C., R. I. & P.), is published as Appendix H of the report. This article has been used as a basis by the commitee in the calculations for size of pumping plants.

The conclusion is reached that 100 lbs. of coal will do the same work as 1 gallon of gasolene; or coal at $3 per ton unloaded in the pumphouse bin is equivalent to gasolene at 15 cents per gallon delivered in the gasolene storage tank.

The relative cost of repairs and depreciation of steam and gasolene plants is a question on which the committee has not been able to get very definite figures. The figures in Appendix B indicate that there is not a great deal of difference. Appendix B-1 shows the actual cost of repairs to gasolene plants per 1,000 gals. pumped.

It is difficult to arrive at a definite conclusion as to the question of labor. Local conditions govern largely and the committee believes that with plants of the same capacity the labor charge would be the same with coal as with gasolene. This conclusion is arrived at for the reason that the committee does not wish to recommend that a gasolene engine be left to run itself without intelligent supervision, and it should have nearly as much as a steam plant has to have.

In conclusion, the committee would recommend that the selection of steam as a motive power be made in accordance with the following conditions:

(A) Where 100 lbs. of coal unloaded into a pumphouse is cheaper than 1 gal. of gasolene delivered in gasolene storage tank, taking into consideration the number of hours the plant is to be operated and the location of plant as regards delivery of fuel; special attention also being paid to the proper design of pump as regards size of steam and water cylinders on large plants.

(B) Where a steam plant is maintained for other purposes, as at terminals where shops are run by steam.

(C) Where interest charge on plant is less than it would be on a gasolene plant.

The selection of gasolene as a motive power should be made in accordance with the following conditions:

(A) Where 1 gal. of gasolene delivered in gasolene storage tank is cheaper than 100 lbs. of coal unloaded into the pumphouse, special consideration being given to locations remote from trackage and isolated stations where train service is such that pumper can, by pumping the whole of his time between trains, do the pumping at two or three stations.

(B) Where the quality of the water is such that it will necessitate heavy boiler repairs, provided boiler compounds cannot be successfully used.

(C) Where interest charge on plant is less than it would be on a steam plant.

General Principles of Water Supply Service and Typical Installations for Various Conditions (Water Treatment Not Considered).

The general principles of water supply service are considered under the following subdivisions: (1) Quantity of water required. (2) Sources of supply. (3) Method of gathering supply. (4) Pumping plants. (5) Method of delivery to locomotives. (6) Typical installations. (7) Methods of operation.

QUANTITY OF WATER REQUIRED.

This should be carefully considered in accordance with the following subdivisions: (A) Amount at terminals. (B) Amount per train mile. (C) Capacity of tanks.

The committee recommends that further investigation be made as to the quantities of water required under the above headings for the various classes of traffic recognized by the association.

SOURCES OF SUPPLY.

All waters should be chemically analyzed and this analysis considered in connection with the decision on source.

The committee recommends that a supply be obtained, if possible within economical limits, sufficiently large so that the total amount of water likely to be required during the average volume of business in 24 hours can be drawn from the source in four hours at intermediate stations and in seven hours at terminal stations.

[The committee then enumerates the various sources of supply, commenting on the suitability of each. These include city water; springs; lakes, natural ponds, creeks or rivers; surface-pumped wells; artesian wells; deep wells pumped. Where city water can be bought at an economical figure, and in sufficient amount and of suitable quality, the committee recommends this source of supply above all others.]

METHOD OF GATHERING SUPPLY.

Springs.—The style of construction of reservoir or intake is largely a matter for local consideration. Springs should be covered so as to keep out organic matter. If the spring is at a suitable elevation, so that a gravity supply can be arranged, and there is no danger of shutting off the supply, and the character of the ground will permit, it is well to excavate and wall the spring to serve as a collecting reservoir.

Lakes, Natural Ponds, Creeks or Rivers.—These sources require special investigation for each case. In making this investigation special consideration should be given to future pollution, sediment and riparian rights. The existence of organic matter in excess will cause foaming and is to be avoided, as it cannot be removed by any practical process. The existence of

sediment involves the construction of a filter or a settling basin. The question of filters is a problem in itself and the committee recommends that it be taken up as a separate subject in later reports. The size of settling basins is the principal thing to be determined and the following data are required:

(1) How long does the water have to stand at different depths at the time of year when it contains the most sediment in order to clarify. (2) Maximum quantity of water to be used in 24 hours. (3) Topography and character of soil at proposed location to determine whether basin can be on top of ground or submerged.

Dug Wells.—No dug well should be started until careful tests have been made at the proposed site with an auger to determine probable depth and character of water-bearing strata. The size of the well required will depend upon the porosity and thickness of the water-bearing strata, no definite rule for which can be given. For locomotive service the minimum inside diameter should be 8 ft., with 18-in. walls, and the maximum diameter should be 30 ft., with 30-in. walls.

Surface Pipe Wells.—A drawing in Appendix F shows the style of pipe wells recommended and gives the details of construction. These can be located close to the pump, or each other, or at some distance and scattered over a large area where necessary, in order to get a sufficient supply of water.

Deep Wells.—The construction of artesian deep wells and pumped deep wells is the same, with the addition to the latter of working or pump barrel, drop pipe and pump rods, and is shown in Appendix G. It is recommended that where the depth is expected to reach 50 ft. or more and no reliable data are on hand in regard to the strata to be passed through, that a start be made with 12-in. pipe. In the completion of a pumped deep well it is recommended that the drop pipe be first lowered so that the cylinder is just submerged and then tested for capacity of well. If this proves insufficient, lower another length and retest, and continue this until the desired supply is obtained. In this way the size of the pumping plant can be more readily determined.

PUMPING PLANTS.

The size of plant is the first question to be considered. The committee recommends that if sufficient water is obtainable the plant should be of such size that the amounts of water as shown by the accompanying table can be pumped:

Quantity per 24 Hrs. in Gallons.	Terminal Stations		Intermediate Stations	
	Time Pump to Run in 24 Hrs.	Gallons per Minute.	Time Pump to Run in 24 Hrs.	Gallons per Minute.
2,000,000	20 Hours	1,666	20 Hours	1,666
1,750,000	20 Hours	1,458	20 Hours	1,458
1,500,000	20 Hours	1,250	20 Hours	1,250
1,250,000	20 Hours	1,042	20 Hours	1,042
1,000,000	20 Hours	833	20 Hours	833
900,000	20 Hours	733	20 Hours	733
800,000	20 Hours	666	20 Hours	666
700,000	20 Hours	583	20 Hours	583
600,000	20 Hours	500		
			10 Hours	1,000
500,000	7 Hours	1,189	10 Hours	833
450,000	7 Hours	1,071	10 Hours	750
4000,00	7 Hours	928	10 Hours	666
350,000	7 Hours	838	10 Hours	583
[illegible]	7 Hours	714	10 Hours	500
250,000	7 Hours	595		
200,000	7 Hours	476	4 Hours	1,041
150,000	7 Hours	357	4 Hours	833
100,000	7 Hours	238	4 Hours	625
50,000	7 Hours	119	4 Hours	416
25,000	7 Hours	60	4 Hours	208
			4 Hours	104

Table of Amounts of Water to be Pumped.

At plants where it is necessary to run 20 hours, duplicate machinery should be provided.

The quantity of water to be delivered having been decided upon, the next question is the size of the discharge pipe. The following formula is submitted for this determination. The constants given will vary slightly with local prices, but the percentage will be so small that this feature can be neglected:

C = Cost of main per lin. ft. laid, assumed as follows, with pipe at $25 per net ton: 4 in. at 65c, 6 in. at 80c, 8 in. at 95c, 10 in. at $1.20, 12 in. at $1.50, 14 in. at $2.15.

I = Interest on one dollar for one day at 6 per cent per annum = $0.000164.

P = Cost of fuel only to raise 1,000 gals. of water 1 ft., assumed at $0.0003 per 1,000 gals., on a basis of coal at $2 per ton, or gasolene at 15c per gal. (from actual tests).

Qd = Average quantity of water to be pumped per 24 hours in 1,000 gals.

Qm = Gallons per minute plant is to handle.

H = Friction head in feet for 1 ft. of pipe for quantity of water plant is to handle per minute.

D = Inside diameter, cast-iron main.

D is economically proportioned where the interest cost of pipe investment per day = daily cost of fuel overcoming the friction head, or:

$$I \times C = P \times Qd \times H.$$

Substituting for C, I and P the values assumed above and solving for Qd and H for different sized pipes, the following is obtained:

Use 4 in. cast-iron pipe where $Qd \times H = 0.355$
Use 6 in. cast-iron pipe where $Qd \times H = 0.437$
Use 8 in. cast-iron pipe where $Qd \times H = 0.519$
Use 10 in. cast-iron pipe where $Qd \times H = 0.656$
Use 12 in. cast-iron pipe where $Qd \times H = 0.820$
Use 14 in. cast-iron pipe where $Qd \times H = 1.162$

The number of gallons per minute, size of discharge pipe, and static head being known, we can determine the *effective horsepower*. The various tables for friction in water pipes can be used in substituting in the above formula and in determining the friction head. It is well to add about 50 per cent. to the friction head, as per tables, in calculating the friction head for the proposed plant to provide for incrustation of pipe lines, especially if the water to be pumped has been treated.

The following formula is a short method of obtaining the effective horsepower (E. H.P.):

$$\text{E. H.P.} = \frac{\text{Gals. per Min.} \times \text{Static Head and Friction Head in Ft.}}{4{,}000}$$

BOILERS.

Where steam is used as power the question of the most economical boiler must be considered. This is a question which the committee has not been able to analyze as thoroughly as it should be, and it is recommended that this question be gone into more thoroughly by future committees, especially for small plants, 5 to 25 h.p. The types which seem to find the most favor are the locomotive type, manufactured in sizes 15 to 25 h.p., and the vertical submerged flue type, manufactured in sizes 5 to 50 h.p.

The following items should be taken into consideration in the selection of a boiler: Kind of water, kind of fuel, location of plant as regards availability of labor for repairs, and size of plant. Boilers should carry 100 lbs. pressure for railroad pumping plants.

[Taking this boiler pressure the committee works out in detail the method for finding the number of square feet of heating surface required for the boiler. The usual commercial rating is 10 sq. ft. of heating surface per boiler horsepower.]

Appendix I gives in tabular form the boiler horsepower required for assumed conditions per effective horsepower from 1 to 15 for vertical and locomotive type boilers.

Gasolene Engines.—Where gasolene is used as power, on account of the high speed of gasolene engines, it is always necessary to reduce this speed by means of geared or belted connections for the operation of the pump. The committee recommends that gearing having cut teeth be used in preference to belting and that a friction clutch be introduced in order to be able to start the engine with no load; all of this machinery to be mounted on one substantial base and foundation with the engine, so as to prevent same getting out of line. The power should then be transmitted to the pump by a shaft making the same speed as the pump. In this way the pump can be set some distance from the engine, this generally being desirable on account of location of pumps in pits. This layout avoids the troubles incident to a high-speed shaft getting out of line.

Gasolene engines are usually sold on a brake horsepower basis. In order to obtain the proper size add 100 per cent. to the e. h.p. for friction in pump and for a safety factor. This is based on 66⅔ per cent. efficiency in the pump and gearing, and using 75 per cent. of the power of the engine.

SURFACE PUMPING PLANTS.

These are plants where the suction lift is such that the pump cylinder can be placed at the surface of ground or in a pit of moderate depth.

Surface Steam Pumps.—[The duplex, single-expansion, double-acting pump was the only one considered. Explanation was given for finding the cylinder sizes.]

Power Pumps.—In the case of gasolene, where pump and engine can be placed on the same level, the triple single-acting, duplex double-acting, and for small plants the combined engines and pumps, are very desirable devices. Where the pump must be at a lower level than the engine the double-acting, single-cylinder, connected to shaft by means of face plate and pitman, should be used. This face plate should be provided with several different wrist pin poles so as to vary the length of stroke. The following lengths of pitman and strokes per minute are recommended, based on the stroke length as four times the length of the stroke with a minimum length of 6 ft. and a piston speed of 70 ft. per minute:

For stroke 12 in., pitman length 6 ft., strokes per minute, 70
" " 18 in. " " 6 ft., " " " 46
" " 24 in. " " 8 ft., " " " 35
" " 30 in. " " 10 ft., " " " 28
" " 36 in. " " 12 ft., " " " 23

DEEP WELL PUMPING PLANTS.

These are plants where the suction lift is such that the pump cylinder or working barrel has to be placed inside of pipe well at a considerable distance below the surface of the ground, rendering the construction of a pump pit impracticable.

Appendix G shows the layout below the floor of pumphouse, and this is analyzed under the head of "Deep Wells." The steam pumping plant seems to give the best satisfaction for this class of well.

The steam head, or artesian well pumping engine, is made in various sizes. The stroke varies from 18 in. to 36 in. The 36 in. stroke is the one generally used where water supply is sufficient. These engines should be provided with displacement plungers in order to keep flow of water uniform and prevent shock. They should also be so designed that the engine can easily be removed and disconnected from the pump rod to facilitate barrel repairs.

PUMPHOUSES.

Pumphouses should be built of concrete, stone or brick. Pump pits should be made waterproof, if possible. For steam plants a coal bin should be provided that will hold at least a car and one-half of coal. Gasolene storage tanks should be located in a fireproof pit at least 25 ft. from the engine. In no case should gasolene engines be placed below surface of ground.

In the case of deep wells the pumphouse should be so designed that the portion over the well can be removed or opened sufficiently to allow a well machine to be set over it for use when repairs are necessary.

PIPING.

Discharge from pump should always be provided with an air chamber and check valves if same are not on the pump itself. Connections should be made below frost line with check and waste valve for boiler feed or gasolene engine jacket. In surface pumped plants a by-pass, or priming pipe, from discharge to suction should be provided. In open wells the bottom of suction pipe should have a combination strainer and foot valve. Where pump pits are not waterproof or water is likely to come up over pump at times, a branch suction pipe with a valve having a long valve stem extending above high water should be provided in order to pump down the water in pit.

Water Stations.

SUBSTRUCTURE.

Most plans for timber substructures of 50,000-gal. tubs call for 12 posts which require 12 foundations, while on the other hand a number of steel substructures have been built with but four posts and foundations. The life of a steel substructure is easily four times that of timber at about the cost for maintenance. The scrap value of a timber substructure is very small, while that of steel is large.

The height of substructures in early days, and still to a large extent, has been such as to place the tub just a sufficient distance above the rail to accommodate locomotives taking water. The use of water columns and larger locomotive tenders resulted in many substructures being made about twice the former height to reduce the time of taking water; and while that was accomplished, it might have been done in another way without increasing the head on the pump, for the required discharge "q" is the product of the area "a" of the pipe, and the velocity of whater "V" ($q = aV$), or the discharge varies directly with both "a" and "V." The velocity for head "h" is $V = \sqrt{2gh}$, in which "g" is the acceleration of gravity. The velocity therefore varies only as the square root of the head. For 16-ft. head $V=4\sqrt{2g}$; for 32-ft. head $V = 5.6\sqrt{2g}$. Hence doubling the head only increases the theoretic velocity 40 per cent., which in fact is not obtained, since the friction in column supply line, which must be necessarily considered, increases nearly with the square of the velocity. The other factor "a" varies as the square of the radius ($a = \pi R^2$), while the perimeter varies only directly as twice the radius ($p = 2\pi R$), or doubling the radius quadruples the area, but only doubles the perimeter or weight of pipe required. When friction is considered the theoretic discharge is further increased, since the friction decreases as the diameter increases. Therefore, increasing the height of substructure increases the discharge by less than the ratio between the square roots of the two heads; increasing the radius of the pipe increases the discharge by more than the ratio between the squares of the two radii.

This theorem, with the friction factors involved, when applied to any situation will enable estimates to be made comparing the construction costs of securing the required discharge, but ultimate economy requires consideration of operating costs, which influence heavily on account of their cumulative effect. The operating factor to be considered is the increased head against which the pump acts when the tub is raised, the work performed being directly proportional to the head, and the fuel consumption likewise.

With regard to actual delivering capacities of water columns under ordinary heads, your committee have report of careful test of 12-in. column supplied by 14-in. main, which delivered 5,000 gals. per minute under 20-ft. head above column, and have measured the capacity of same size water column and supply line under 40-ft. head. The time of opening and closing automatic column valve was not included and the tests lasted 45 secs. The water was delivered at a rate of 6,200 gals. per minute. The conditions surrounding these two tests were not identical, but the latter had double the head and should therefore have had a theoretic discharge of 7,000 gals.; failure to do so is because of increased loss in friction due to increased velocity before mentioned and perhaps to a difference in the friction factors of the columns. With these discharging capacities we have data for comparing the time required to take water. Assuming 7,000 gals. as the capacity of tender tank and 6,500 gals. as the average quantity taken, the time required would be 1 min. 18 secs. under 20-ft. head, and 1 min. 3 secs. under 40-ft. head, or the increased height, 20 ft., of tub saves 15 secs. The time of swinging column and opening and closing valve is not included. Where the demand for prompt movement requires consideration of items as small as 15 sec. while taking water, the traffic is beyond water columns and calls for track pans.

The economical arrangement of tank and column ordinarily, is a height of substructure which places the tub 15 to 20 ft. above the rail, using a column of such size as will furnish the desired discharge.

DESIGN OF SUBSTRUCTURE.

The number of posts should be as small as consistent and composed of one or two simple, stout shapes rather than of small thin angles latticed together. This will result in fewer foundations, cheaper painting, less surface exposed to corrosion, if neglected, hence less danger in that event with simple, stout shapes than with complex posts of thin angles. This also holds true with the design of the remainder of the substructure.

TUB.

Kind of Material.—[The committee discusses the several woods used for tubs, including white pine, cypress, redwood and fir. A tub manufacturer says:] "The length of life of a tub depends almost entirely on local conditions. The lumber and hoops are affected by the water, the tub rots more rapidly if not kept filled and the outside decays and the hoops corrode if not kept painted. We have known pine tubs to last six years and we have known them to last 30. It would seem to us that a first-class pine tub, well hooped, should last 20 years if kept painted on the outside and reasonably full of water." A Southern manufacturer places the life of cypress tubs at 25 years, if properly cared for. Cypress tubs cost about 25 per cent. more than pine.

The use of a water table, band or finish at the bottom of the tub is disapproved, as it fosters decay. The usual thickness of staves and bottom is 3-in. material surfaced to about 2¾ in. This size does not appear too thick, and on the other hand it is doubtful if thicker sizes would be justified, as decay, when thoroughly started, would allow of but little longer life due to thicker material.

Specifications for white pine tubs are given in the conclusions.

HOOPS.

It has been the practice to make hoops thin, increasing the section as necessary by making them wider, with slight increase in thickness. The thicker hoops, still being thin and spread out, offer greater surface for corrosion behind the hoops. Thin hoops are used because they fit the staves better, but no matter how close the fit, it is not close enough to exclude the water entirely, and corrosion of wide thin hoops results in materially affecting the strength before the tub has served its life. This results in broken hoops, involving the expense and danger of replacement and, not infrequently, collapsed tubs. The hoops classed as thin are $\frac{3}{16}$-in. and ⅛-in. thick, the cross-section of which consist of mere threads of unattacked metal when removed. Most manufacturers place the maximum thickness at $\frac{5}{16}$ in. Your committee believes

the advantage of thicker hoops offsets the merit claimed for thin hoops, particularly as neither will fit into depression unless hammered, in which event there is not much difference in the contact. No manufacturer has used semi-elliptical hoops.

The wider the hoop, the better the condition for decay behind it; the narrower the hoop the more expensive on account of more lugs and handling. Four-inch hoops are narrow enough to allow of lugs having but one bolt, which is generally recommended, since with two bolts there is no certainty regarding the strain in either. Pressed steel lugs are considered best by the manufacturers. The selection of the uniform size, 4 in. x $\frac{5}{16}$ in., for all hoops, which is desirable for the sake of reducing the number of sizes, also commends itself for the above reasons. The spacing shown on the recommended plan is based on a wrought-iron hoop with working area of 4 in. x $\frac{5}{16}$ in., safety factor of 4 and allowable working stress of 12,500 lbs.

Steel Tanks.

A manufacturer of steel tanks gives as a conservative estimate of the life, five times that of wood, which he places at 10 or 15 years.

The types include the hemispherical bottom tank supported by a steel tower, the flat bottom tub, the hemi-ellipsoidal bottom tub, and the standpipe tub.

[Figures on costs are given. Some flat bottom tubs built in the Nevada desert, ranging from 65,000 to 350,000 gals. in capacity and with varying heights of substructure, cost from $3,252 to $6,722. The cost of hemi-ellipsoidal bottom tubs, which are patented, are given by the manufacturer as about $1,800 for a 50,000 gal. tank, and $3,000 for a 100,000 gal. tank, exclusive of foundation, roof and freight. Costs on the standpipe type as built by two western roads range from $2,000 to $5,000 for a 24 ft. tank, depending on height and character of foundation. A 50,000 gal. storage tub on timber substructure and concrete foundation costs somewhere about $1,800. The cost on steel substructure varies largely with the design of substructure, but $1,800 is an approximate figure.]

Delivery Lines from Tubs.

TANK SPOUT AND COLUMN SUPPLY LINE.

When the cost is not of first importance, or when the objections to tank spout are not nullified by local conditions in special cases, the use of water columns instead of tank spouts is recommended as good practice.

The committee did not make tests to determine the losses in the column supply line, but presented a discussion of same from data in its possession. A 12-in. water column and 14-in. supply line delivered 5,000 gals. per minute under a head of 20 ft. above the column nozzle; the pressure head in the 14-in. main just before entering column was 12.25 ft. above the same datum. A formula was worked out from which the total head was found to be expended as follows: .8 ft. lost at entrance; 5.3 ft. lost in friction between column and tank; 10.9 ft. lost in column valve and column; 3.0 ft. effective velocity head of issuing stream. This indicates that an increase in the discharge from a tank might be obtained through improved design in the column valve rather than by increasing the size of the supply line.

Methods of Operation.

The committee recommends that it is much more economical, from a maintenance standpoint, to hire regular pumpers to do the pumping at both steam and gasolene plants rather than depend upon some other employee.

The committee recommends that accurate record be kept of the cost of pumping water per effective horsepower and comparisons be made of the different plants. This record will frequently develop some weak spot in the plant on which a few dollars spent would mean a large saving in operation.

Appendix C gives "Pumping Report" recommended.

Appendix D gives "Monthly Record of Cost of Water Supply."

Appendix E gives "Water Station Record." In using this it is designed to have one page for each water station and have the sheets bound in loose leaf so that additions as made can be added after a page is full.

Conclusions.

Your committee desires to submit the following conclusions in regard to the general principles of water supply:

Supply Quantity.—If possible within economical limits supply should be obtained sufficiently large so that the total amount of water likely to be required during the average volume of business in 24 hours can be drawn from the source in 7 hours at terminal stations and in 4 hours at intermediate stations.

Supply Source.—Where water of suitable quality, and in sufficient quantity, can be purchased at a reasonable figure, it is recommended above all other sources.

Springs should be carefully gaged for a period of at least one year and the possibility of future pollution and increased demands for supply therefrom carefully considered before their adoption as a permanent source. Reservoir should be constructed at spring where conditions will permit.

Lakes, natural ponds, creeks or rivers require special investigation in each case. Points to be considered are quantity, quality as regards chemical impurities and amount of sediment carried, future pollution and riparian rights. Style of intake will depend on local conditions entirely. No definite rules can be given.

Dug well construction should always be preceded by a careful auger test to determine strata to be encountered. Size and construction depend on strata to be passed through, and no definite rule can be given.

Surface pipe wells are very satisfactory where local conditions permit of their use. The system is one which can be extended to collect a large volume of ground waters.

Artesian deep wells, where obtainable, are very satisfactory source. Their flow is liable to constantly decrease and finally stop altogether.

Deep wells requiring pumping are only recommended as a last resort.

All waters should have chemical analysis made and the question of cost of treatment if required thoroughly investigated, as previously outlined in the Manual.

Pumping Plants.—Size of plant should be in accordance with table given under that heading.

Static head should be obtained. Friction head should be calculated in accordance with friction tables and 50 per cent. added thereto for the ageing of the piping system.

Steam should be selected for power for plants up to 5 e. h.p. (in accordance with formula given) when most of the conditions recommended in this connection in the report obtain.

Adoption of the recommendations for boiler size and for steam pump is asked.

Gasolene engine selected should have a commercial brake horsepower rating of twice the effective horsepower. Engine and gearing for reduction of speed should be all on one base, with friction clutch connection to pump shaft.

Adoption of the recommendations as to power pumps, deep well pumping plants and pump houses is asked.

WATER STATIONS.

Where the topography will permit full elevation the arrangement may consist of an elevated reservoir, excavated in the ground, with pipe line and water column.

Where only partial elevation can be secured it may consist of a tub resting on the surface, with pipe line and water column.

Where the topography will not offer even partial elevation, same must be secured by artificial means, permitting of choice in location of the supply, which is done by placing same (a) near the track, reducing the cost of delivery line, and (b) distant from the track, although at increased cost of delivery line.

The prevailing topography makes artificial elevation necessary at a large majority of water stations, resulting in the structure known as a storage tank.

STORAGE TANKS.

The foundation should be made of any good masonry locally available, provided it also withstands the disintegrating action of water.

It should be carried below frost line and as much deeper as necessary to reach firm bearing, unless piles or other subfoundations are used.

For substructure and joists the use of steel is recommended. Increasing the height of the substructure increases the discharge by less than the ratio between the square roots of the two heads. Increasing the size of the column supply line increases the discharge by more than the ratio between the squares of the two radii. The work of pumping, hence fuel consumption, is directly proportional to the head pumped against.

Twelve-inch columns are practicable and in most cases sufficient with tub 15 to 20 ft. above the rail, which is recommended as the most economical height.

In special cases it may be more economical to use substructures higher than 15 to 20 ft. on account of the length of column supply line or because the source of supply is elevated, particularly when from a municipal plant.

Tub.—The life of white pine tubs used in the past does not exceed 20 years, the quality used at present is inferior and will have a life of less than 20 years, the price has been increasing rapidly, even with the use of inferior lumber. The life of cypress used in the past does not exceed 25 years, the quality at present is as good as in the past, the price has been rapidly increasing. Further increase in the price of wood tubs is to be expected in view of the rapid depletion of forests. The use of wood in tubs limits the capacity of same.

SPECIFICATIONS FOR 50,000-GAL. WHITE PINE TUBS.

(1) (a) The inside diameters shall be 24 ft. at the botton and 23 ft. at the top. The staves shall be 16 ft. long. The tub shall be made of carefully selected white pine lumber, surfaced to $2\frac{3}{4}$ in., which is free from sap, shakes, unsound knots, or other imperfections which can cause leaks or will impair the durability of the tub. (All small black knots extending entirely through the plank shall be carefully bored and thoroughly plugged.)* All staves shall be full length without splicing. Every joint shall be machine-made and perfect, and the stave joints sawed on true radial lines, with due regard to top and bottom diameter of tub.

(b) The crozing of bottom of staves shall be cut with proper regard for pitch of stave when in position, and circular in shape, so as to be completely filled by tub bottom when staves are driven up.

(c) The outside of staves shall be surfaced convex so as to give a full bearing to hoop throughout the width of each stave.

(d) The tub shall be provided with hoops, as shown on plan, with single bolt pressed steel draw lugs and bolts for tightening.

(e) One extra stave and dowel pins shall be furnished with each tub. Every tub shall be set up at the factory and the bottom and corresponding stave marked and numbered before being knocked down for shipment. The location of the hoops shall also be marked on the staves.

(f) Hoops should be of muck bar iron, 4 in. wide by 5-16 in. thick, spaced as shown on plan, furnished in three sections and equipped with one-bolt pressed steel lugs and bolts.

(2) Roof may be of material and design to conform with available markets and other structures.

(3) Wooden Storage Tanks.—The plan submitted in Appendix K is recommended as good practice.

STEEL STORAGE TANKS.

Steel tanks are recommended as good practice unless the character of water prevents their use. They have a life more than double that of wood and larger scrap value when dismantled; the first cost is not much greater than wood, while the cost for proper maintenance of either is about the same. Provision for increased storage can be made with steel tanks when first erected, the additional capacity to be obtained by making tank higher whenever necessary at small cost compared with that of an additional wooden tank. Further merit of steel tanks is reflected in conclusion under "Tub—kind of material," stated earlier. The hemispherical bottom steel tank with steel substructure is not used ordinarily except at terminals. Three types of steel tanks are used at intermediate water stations, viz., flat-bottom tub on steel substructure, hemi-ellipsoidal bottom tub, supported by steel posts around the outside, and a cylinder or mud-drum 5 or 6 ft. in diameter at the center of the bottom, the mud-drum serving as frost-proofing for the tank and column supply lines, and as a settling basin for sediment which is washed out through blow-off valve.

Standpipe tub, consisting of a tub imposed directly on the foundation, the substructure being omitted. The portion below the water column nozzle acts as a settling basin for sediment, which can be readily washed out. This type may be used as a combined storage tank and water softener, the raw water and chemicals being introduced at the bottom, the treated water being drawn from upper portion by means of a floating intake.

TUB UNIT CAPACITY.

(1) The tub unit capacity at intermediate water stations depends on the relation of consumption, cost of installation and operation. It is recommended that the unit be at least 50 per cent greater than the maximum daily consumption when erected.

(2) The tub unit capacity at terminals also depends on the relation of consumption, cost of installation and operation. The unit capacity in this case is particularly subject to local conditions and no general relation obtains between it and the consumption. Ordinarily the tub serves as an equalizer to take care of heavy and light periods during the 24 hours, and the unit is generally less than the consumption.

*When cypress is used, omit sentence about small black knots.

WATER COLUMNS.

When the cost is not of first importance, or when the objections to tank spouts are not nullified by local conditions in special cases, the use of water columns is recommended as good practice.

Supply line should be same size as column where distance to storage tank is not over 100 ft.; where distance is greater, one size larger is recommended.

Column pit should be waterproof and drained.

Column valve should operate from locomotive tender only, and should be water-cushioned and provided with automatic drain for part of column above freezing line in cold climates.

Turning device should operate from tender or ground and have automatic lock to keep horizontal part of column parallel to track.

Horizontal pipe, when flexible joints are used, should have vertical movement sufficient to accommodate high and low engine tenders.

All moving parts of column for operating same should be easy of access.

OPERATION.

Regular employees should be kept in the service whose principal business is the operation of the pumping plant. A traveling repairman should visit each plant periodically and attend to all repairs, which cannot be made when plant is running.

Accurate records should be at hand in the office of the official having charge of this branch of the service, as indicated by Appendix E.

Accurate reports of pumping service should be kept, as indicated in Appendices C. and D.

The report is signed by C. L. Ransom (C. & N.W.), Chairman; M. H. Wickhorst (C. B. & Q.), Vice-Chairman; J. L. Campbell (E. P. & S. W.), J. P. Congdon (O. S. L.), Robert Ferriday (C. C. C. & St. L.), G. H. Herrold (C. G. W.), E. G. Lane (B. & O.), L. B. Merriam (G. T. P.), C. A. Morse (A .T. & S. F.), L. P. Rossiter (B. & O.).

Discussion.

Mr. Ransom: The committee presents for publication in the Manual the elementary principles, so that more elaborate work can be done a little later.

The secretary read the first conclusion.

C. E. Lindsay (N. Y. C.): I think the word "maximum" instead of "average" would be better.

Mr. Ransom: The word "average" was used because the committee thought we needed a little room to go there on account of the excessive volume of business at certain times of the year.

C. F. Loweth (C., M. & St. P.): Why should the entire supply for 24 hours be pumped in 4 hours? In case of a steam pump, if we have a pumper and the water supply is so situated that the pumper will do nothing else, it will require a larger plant to pump it for 24 hours than it would if it were supplied for longer hours.

Mr. Ransom: That recommendation was made so that a regular pumper would have a chance to pump one station and then go to another.

Mr. Loweth: Where water stations are far apart and train service frequent, one pumper cannot do more than attend to one station.

Referring to the table of number of strokes per minute, etc., for power pumps, Mr. Ransom said that since this report was made up, there had been some criticism of the speed. The table was a recommendation from a man who has been in the pumping business a good many years, and the committee felt possibly it was a little too conservative. It was also felt that a similar table regarding deep well plants required more investigation before being published in the Manual. The two tables were therefore referred back to the committee for further report next year.

The paragraph concerning pump houses was read.

Mr. Lindsay: I suggest this be altered to read: "stoves and lights shall not be permitted in the house," and also that a statement be inserted that the gasoline supply shall be kept out of the house.

Mr. Ransom: If a man has to run his engine at night he has to have some light, to see whether his oil cups are full.

Mr. Lindsay: We put our lamp outside so that it throws the rays of light inside.

Mr. Ransom: The committee will accept that.

L. C. Fritch (I. C.): A fireproof pumping house should be

isolated and not incorporated with another plant. If it is incorporated with some other plant the moment the other plant catches on fire the pumping house may be destroyed.

Mr. Ransom: The thought of the committee was that where you have a steam plant, and already have steam in your shop, in order to prevent loss by condensation you would want the pumping plant as near the steam supply as possible. You would not want to maintain separate boilers for the pumping plant.

Maurice Coburn (Vandalia): It seems to me that the question of steam turbine with centrifugal pumps, should be considered.

Mr. Ransom: The steam turbine question has not come up at all. We have no knowledge where any plant of that character is located for railway use.

The specifications for 50,000 gallon tubs were read.

Mr. Ferriday: Since the report was published, we have looked further into the question of the measurements and would like to substitute the word "outside" for "inside." The conclusion would then read: "The outside diameters shall be 24 ft. at the bottom and 23 ft. 4 in. at the top. The staves shall be 15 ft. 11 in. long." We are also going to change the specifications to show specifications for about a 48,000 gallon white pine tub. They are spoken of as 50,000 gallon tubs, but the capacity is really less.

A. K. Shurtleff (C., R. I. & P.): Why is there a different diameter for the bottom and top of the tub? I have known for a number of years of tubs being successfully used of the same diameter throughout.

Mr. Ferriday: These dimensions conform with the majority of tubs as built. The tubs are tapered because hoops were originally driven on.

Mr. Shurtleff: I have found the manufacturers are willing to bid on a straight tub. There is no trouble about getting competition, and I cannot see why we should bind ourselves to what the manufacturer might wish to deliver.

J. P. Berry (C., R. I. & P.): We have been building water tanks with straight staves for twenty years. It does not cost much more money to increase the capacity of the tub. Simply because some man has been doing something for a number of years back, does not compel us in a modern plant to adopt these ideas, because a manufacturer wants it so.

Mr. Ferriday: We shall be glad to have recommendations to change that. The majority of the tubs, I believe, that are being furnished are in accordance with the dimensions. That was the reason they were selected, not to recommend something different from those usually furnished.

Mr. Shurtleff: I move that the specification for 50,000 gallon white pine tubs be changed to read "the inside diameters shall be 24 ft.," leaving out the question of bottom and top.

W. F. Steffens (C. C. & O.): I hope we may open the argument as to the relative merits between a 50,000 gallon tank and a 60,000 gallon tank. A 60,000 capacity tank is secured by increasing the height of the staves 4 ft.; in other words, we add 20 per cent capacity at a relatively small cost.

Mr. Ferriday: It was not recommended that this size be used, but it was recommended that those specifications be used for that size tub. Nor was it intended to recommend white pine tubs, but it was intended to recommend for 50,000 gallons white pine tubs these specifications be used.

Mr. Shurtleff's amendment was adopted.

J. P. Snow (B. & M.): Paragraph "d" says that the hoops shall be provided with pressed steel lugs. I think this would require flat hoops, and if so, it should be modified so that either flat or round hoops could be used.

Mr. Ferriday: The hoops on the recommended plan are flat. The committee in their report state that the use of the half-round or semi-elliptic hoop might be considered special shapes that were not ordinarily obtainable, and they felt by recommending the use of the muck bar wrought iron hoop, together with heavier hoops, that a sufficiently strong hoop would be provided. The lugs were recommended in connection with these flat hoops.

Mr. Loweth: I think this association ought not to go on record as approving flat steel hoops, or flat iron hoops, as against round hoops. For four or five years past we have been making more or less extensive use of round hoops on our tanks and the round hoops are now standard. Our experience in the past has shown it has many points of advantage over the flat hoop.

J. O. Osgood (C. of N. J.): We have also been using round hoops as standard for several years.

C. H. Ewing (P. & R.): We have adopted the round iron hoops as standard and do not consider it safe to continue to use the old flat hoops, in view of the failures we have had on that account.

Mr. Lindsay: I move the subject of tank hoops be referred back to the committee for further consideration.

The motion was carried.

Mr. Fritch: It seems that paragraph "f" should go back to the committee with paragraph "d."

Mr. Shurtleff: I move that the entire specification for white pine tubs be referred back to the committee with the idea of leaving the dimensions blank in such way that the specification will cover any dimension of white pine tub that is used in practice.

M. L. Byers (Mo. P.): I move to amend it by asking the committee to also prepare specifications for a 100,000 gallon tank.

Mr. Shurtleff: I think my motion would cover the 100,000 gallon tanks as well as the 60,000, if the committee eliminate dimensions, covering the specific points for wood tubs of any capacity.

Mr. Loweth: I should be sorry to see Mr. Byers' amendment carried, because I feel that a wooden tub of 100,000 gallons capacity is too large. When we want such a large capacity tank, we should go to steel.

Mr. Byers' amendment was lost.

The motion of Mr. Shurtleff was carried.

Mr. Lindsay: I think after tub unit capacity would be a good place to put in that the tub capacity for 24 hours should be of such capacity as to be pumped by the day or night shift. We find we can effect considerable economy by increasing our tub capacity, so that one pumper can pump enough to last through the night.

Mr. Ferriday: We say that the tub unit capacity at terminals depends on the relation of consumption, cost of installation and operation, and it seems to me this covers that feature. If, from the operating cost standpoint, it is more economical to make the tub unit capacity large enough to avoid pumping at night, then the capacity should be large enough for that purpose.

Mr. Osgood: I notice the following: "It is recommended that the unit be at least 50 per cent greater than the maximum daily consumption when erected." In the case of a consumption of 500,000 gallons a day or more, that is a little severe.

Mr. Ferriday: I think that for intermediate water stations, to which that section applies that consumption would not very often occur. The idea of the committee is that in a large consumption of that kind it would probably be at a terminal station.

Mr. Osgood: I have in mind a case where about 700,000 gallons daily are taken. I think the phraseology might be more elastic, so as not to seem to require for good practice so large an excess over the daily consumption.

Mr. Loweth: In line with what Mr. Osgood has suggested, I suggest that the last sentence of the first paragraph be made to read: "It is recommended that the probable future requirements shall be considered." That is a caution against putting in a station that is too small, and avoids being so definite as to state that not less than 50 per cent reserve capacity shall be provided.

Mr. Lindsay: We have a track tank which furnishes in the neighborhood of 900,000 gallons of water. It is a 50,000 gallon tank and supplied by a duplicate system of pumps, so that if we followed the committee's rule we would have a pretty large storage capacity.

Mr. Ferriday: Mr. Loweth's suggestion will be accepted. We had in mind an intermediate water station consuming from 50,000 to 100,000 gallons a day. We withdraw the entire second sentence in paragraph 2, relating to tub unit capacity at terminals. The sentence begins "The unit capacity in this case," etc.

Mr. Osgood: Under Water Columns, it is stated that "Supply line should be same size as column where distance to storage tank is not over 100 feet; where distance is greater, one size larger is recommended." We have found it good practice in our case to do away with 12 in. spouts and substitute 10 in., using a 12 in. supply line. The 12 in. spout is very heavy to handle and the delivery is practically the same with the 10 in. spout, provided the supply line is kept at 12 in.

Mr. Ferriday: Do you do that where the distance is 100 feet?

Mr. Osgood: We always put a 12 in. line from the tub to the stand pipe, and now use a 10 in. stand pipe.

Mr. Byers: In connection with Tub Unit Capacity, I would like to suggest to the committee the value of a table which would show the comparative cost of securing tub unit capacity by sizes of tub as compared with number of tubs. I think any of us who have not figured that out would be surprised

at the slight increase of cost of the 100,000 capacity tank over the smaller tanks.

The President: The committee will take cognizance of that.

Mr. Lindsay: It is stated under Operation that "a traveling repair man should visit each plant periodically and attend to all repairs which cannot be made when plant is running." Does that mean "which cannot be made by pumper or man in charge?"

Mr. Ferriday: Yes.

Mr. Osgood: Has the point of duplicate pumping machinery been considered?

Mr. Ferriday: A recommendation is in the body of the report, but does not appear in the conclusions. We recommend where a pump has to run twenty hours in order to supply the quantity of water desired, that duplicate machinery should be added. I think that should be added in the conclusions.

Mr. Loweth: What is to be gained by the association committing itself to the first sentence of the first paragraph under Operation? We have many water stations on the St. Paul which are taken care of by men whose principal business it is to do something else; they may be helpers about the station. Many of our gasoline pumping plants are taken care of by the station force, and although the plants run for long hours the amount of care and attention given to them by the station force is relatively small as compared with their other duties. This is also true in some of the larger terminals.

Mr. Ferriday: Has Mr. Loweth kept a correct record of the repairs on the line?

Mr. Loweth: Yes.

Mr. Ferriday: We have found from what information we can get on that subject from members that the repairs would run up pretty heavily where the men had some other duties to perform.

Mr. Byers: I agree with Mr. Loweth, but would add the second sentence also. I think it is desirable to have the pumpers who are regular men make all the repairs they possibly can. Further, there are many repairs that cannot be made by traveling repair men. We must send the boiler to the shop to have it repaired. I would prefer to see both sentences stricken out and will make a motion to that effect.

Mr. Ferriday: The idea of the first part of the conclusion is this:—in a great many cases the men who want to sell the gasoline pumping engines tell about how little the labor cost will be, and the pump is purchased and put into operation and it runs for awhile and then it commences to go all to pieces. I know from the operation of gasoline engines in running dynamos at electric interlockings that the attendance of a man is necessary, because if anything goes wrong the engine runs away with itself. It makes it expensive to repair it, and it also interferes with the supply which is very important to be continuous.

The idea of putting in the second sentence was that repair men should visit the plants periodically, not that he should make all of the repairs, but that periodical visits should be made by expert repairmen and in that way the maintenance of the plant will be kept to a high standard.

Mr. Lindsay: I think it is a mistake to put a steam plant in the hands of a baggage man or station attendant, who is not qualified to operate it. I think the recommendations are proper and this association should go on record as being opposed to having a pumping plant in charge of a man who is not competent to run it and whose chief business is not the operation of the plant.

Mr. Ferriday: The idea was that the pumper should be put on this work and his spare time put on other work.

Mr. Loweth: It doubtless costs more for maintenance in a pumping plant if it is taken care of by a man whose particular business may be something else, but it costs a great deal to take care of a pumping plant, taken care of by an incompetent man, whether he puts part or all of his time on it. On the St. Paul, many pumping plants are taken care of by station helpers, for which they are paid from $7.50 to $10.50 a month, that amounts to from $90 to $120 a year. Our pumping plants are occasionally expensive to maintain on account of the inefficiency of these men, but such plants could be renewed, so far as the engine is concerned, entire, for something like $500 or $600 and the repairs needed are nearly as great as the economy by having the men do the pumping in addition to other duties.

L. R. Clausen (C., M. & St. P.): I object to that paragraph, for the reason that it lays down principles for operations for all conditions. The principle may be perfectly proper for a road with congested traffic where your pumping stations furnish a large amount of water, but does not apply on a road where there is thin traffic and the stations are not required to furnish a great amount of water. I do not think it good policy for the association to advance or define a particular principle to cover all conditions. If you want to define a policy, make some distinction in the conditions. If I followed the policy outlined here, it would make an addition to our operating expenses which is not justified, because we are furnishing water satisfactorily by using employes whose principal duties are other than that of pumping.

The first section under Operation was stricken out.

M. J. Henoch (L. & N.): Has the subject of reinforced concrete tanks been considered? If not, I move that the committee be requested to investigate and report on the subject.

Mr. Ransom: The subject has not been considered, because we have not been able to find any that have been built.

Mr. Hanna: I have not any particular information on the subject, but I have noticed reports at different times in engineering periodicals of reinforced concrete tanks that have been built at various points.

The committee's report, as amended, was adopted.

SIGNS, FENCES, CROSSINGS AND CATTLE-GUARDS.

The following subjects were assigned by the Board of Direction:

(1) Present such additional recommendations and conclusions covering the various subjects reported on in the previous reports of the committee as may be considered desirable.

(2) Report on snow fences, snow sheds and other means to prevent snow accumulating and best methods of clearing tracks and snow removal.

(3) Report on the use of concrete fence posts, results obtained so far in actual service, designs and cost.

The first subject was assigned to the entire committee; and the second and third to sub-committees.

Additions to the Manual of Recommended Practice.

Your committee submits the following for approval and addition to the Manual of Recommended Practice under the head of "Gates for Right-of-Way Fences":

The width of farm gates should be from 12 to 16 ft., depending upon the size of agricultural machinery in use in the vicinity. The minimum height of farm gates should be 4 ft. 6 in. from the surface of the roadway.

Farm gates should be hung so as to open away from the track, and, if hinged, to swing shut by gravity.

The Proper Construction of Grade Crossings.

Owing to the well-known difficulty of maintaining the track in proper surface through and adjacent to grade crossings, a form of construction should be adopted that will tend to remedy this trouble by requiring a minimum amount of labor and material to be expended in repairs or renewals.

This construction will necessarily vary with conditions, but can be divided into the following general classes:

(1) Crossings where paving is required to conform to street specifications. (2) Crossings of streets where no paving is required. (3) Crossings of public roads or highways outside of towns or cities. (4) Crossings of private or farm roads.

(1) For crossings where paving is required to conform to street specifications, cross-ties should be treated chemically to prolong their life to the greatest limit possible, and laid on a bed of stone or slag ballast, not less than 12 in. in depth, placed in 3 in. layers, each thoroughly rammed so as to prevent settlage. An 8-in. bed of Portland concrete mixed 1-3-6 can be substituted for the ballast if desired.

With the ballast and outside of the tracks, porous tile drains not less than 6 in. should be placed at intervals, leading to the nearest point from which efficient drainage can be obtained.

The support of the rail on the ties will vary with the character of paving used.

If stone blocks are used, a substantial cast or malleable steel chair, with a base of not less than 48 sq. in., should be provided, fastened to the tie with suitable lag-screws, the rail fastenings to be a hook-headed bolt secured with nuts. Ties should be spaced so as to allow the joints to be supported by these chairs.

On long stretches of track laid in streets paved with stone blocks, the use of a special rail section, not less than 9 in. in depth, is advisable, to avoid the use of the chairs mentioned; with such a rail, heavy tie-plates should be used as a protection.

On the outside of the rail, the block paving should be laid up to the rail-head, but left slightly below it on the inside. An old rail or a suitable form of rolled filler should be placed to provide a flangeway, this to be fitted into the space between the head and base of the track rail; if an old rail is used the flange should be placed as nearly vertical as possible, the paving between the rails to be limited by the flanges or fillers. The flangeway should be supported by the same chairs carrying the track rail, with a clear opening of not less than 2 in.

Where a special rail section is used, the flangeway should be rolled as a part of it.

With vitrified or paving brick, the ties should be similar and have the same foundation as described above, except that with rails of high section the use of the cast chairs is unnecessary.

A heavy tie-plate should be placed on each tie where the ordinary track rail is used.

A strip of treated timber 4 in. x 6 in., fitted to the rail and placed so as to expose 3 in. of surface next to the rail-head, should be used next to the outside rail, and this should be paved against; the strip should be ¼ in. below the rail-head.

Metal flangeways should be provided as described above, and paved against in like manner.

With asphalt paving a similar construction as for vitrified brick is recommended.

Paving between and outside of the rails should be laid in the most approved and workmanlike manner.

(2) Street crossings where no paving is required should be divided into two classes—those with plank laid the entire width and length and those with plank only next the rails and at the ends and filled between with suitable material.

For the first style, the plank should be of such timber as can be most economically obtained, not less than 3 in. in thickness, the outside planks to be shimmed, so as to be ¼ in. below the rail-head, and those inside similarly shimmed when necessary.

An old rail laid on the side of some suitable form of rolled metal shape should be used as a flangeway, its ends to be slightly bent inward, so as to give an opening of not less than 4 in. at the ends, the flangeway through the balance of the crossing to be not less than 2 in.

The intermediate planking should be closely fitted to the base of the old rails or other metal forming the flangeway, so as to avoid the necessity of further securing them to the ties.

For fastening the planking to the ties, ⅜ in. x 8 in. cut spikes should be used for rails 5 in. in height and under.

The ends of the planking should be beveled both between and outside the rails to a thickness of 1 in., commencing at a point 10 in. from the end.

One plank not less than 10 in. in width should be used on the outside of the track rails, and the total length of the planking should conform to the required street width.

Concrete, slag or other suitable material should be used from the plank outside of the rails to such distance necessary to properly complete the crossing.

Where the requirements do not call for continuous planking over the tracks, one plank should be placed each side of each rail, with the flangeway rails or metal shapes as described above and similar in other details, with the exception that a filling of concrete, slag, gravel or other suitable material should be used between the planks, the material to be filled in level with the top of the planking after a thorough compacting.

In the description of street crossings for cities and towns, no limits as to approach grades are given, such physical characteristics being governed by local laws and conditions. The width of the street crossings are also governed by local requirements.

(3) For public roads and highways outside of towns and cities, the crossing construction should be similar to that described for streets which have the minimum amount of planking and ballast filling between them. Such crossings should be level for a distance of 5 ft. on each side of the outside planks; on a fill, the approach grade should not exceed 6 per cent.

Where the crossings are in a cut, the ditch drainage should be provided for by the use of terra cotta pipe where feasible, but if the volume of water is too great, box culverts or bridges of similar width to the crossing should be provided.

The width of highway crossings should be not less than 16 ft.

(4) Crossings of farm or private roads should be constructed by filling with ballast or other suitable material level with the rail-head, on the outside and inside, leaving a proper flangeway inside the rails. Such crossings should be level for not less than 3 ft. each side of the rails, and the approach grades should not exceed 8 per cent.

In cuts, proper provision should be made for drainage as for highway crossings.

The width of farm or private road crossings should be not less than 12 ft.

Protection Against and Removal of Snow.

SNOW FENCES.

[The committee briefly described and showed plans of various devices for protection against snow, received in response to a circular letter. These include permanent snow fence, portable snow fence, hedge fences, stone walls, earth mounds, and old tie fences.]

It is the common practice on many railways to give shallow cuttings a very flat slope, usually 1 to 4; in several cases as flat as 1 to 10 slopes are used. These snow slopes have the effect of allowing the wind carrying the drifting snow to pass through the cutting and over the tracks without causing an eddy in the wind, and prevent accumulation of snow on the track.

WIDENED CUTTINGS.

A very successful method has been adopted on many railways to escape snow accumulating in deep cuttings by borrowing material which they require for widening banks, filling trestles, etc., from the sides of cuttings into which snow had been drifting. A steam shovel cut on the windward side has been sufficient to give ample space for the drifting snow to accumulate and keep clear of the tracks. In this connection it is interesting to note that snow seldom accumulates in rock cuttings that are 25 ft. or more in depth. In these cases the precipitating snow seems to be blown out of the cuttings by deflected air currents.

SNOW PLOWS.

Rotary and wedge or push plows are in general use. The latter placed ahead of the locomotive are effective in removing snow up to 6 ft. or 8 ft. in depth when the drifts are not too long. The number of locomotives required to operate a wedge or push plow depends upon the condition of the snow, its depth, and the grade and curvature of the railway. On some railways, where the amount of snow to be handled is not great, efficient service is secured by means of a snow plow on the pilot of the engine. They vary in height from 2 ft. to 6 ft.

A flanger is a small snow plow arranged to raise and lower mechanically. When used on locomotives they are operated from the engine cab by air or steam, and are very effective in countries of light snowfall when used in conjunction with the pilot plow. Flangers are also constructed on freight train cabooses and are operated by the trainmen.

Some roads have special flanger cars which are run on the rear of trains, operated by special crews. This method is probably less dangerous than in the case of flangers on the locomotive.

SALT AT SWITCHES.

Most railways use salt to keep ice from forming at switches. The use of salt at interlocking plants, however, is usually prohibited. The method usually adopted of clearing snow from yards is by means of shoveling into cars and dumping at convenient points. The Canadian Pacific reports the removal of snow from divisional yards by means of wing plows, whereby the snow is thrown from track to track until it is clear of the entire yard. Ballast spreaders and rotary snow plows are frequently used for this purpose. The New York Central reports one division using compressed air from the locomotive to clean switches of snow.

Experiments are being made for the melting of snow by means of steam pipes in the valleys of train sheds and shop buildings, but thus far the process has proven slow and expensive.

In the colder countries considerable difficulty has been encountered from the formation of ice along the eaves of flat-roofed engine houses. This difficulty is being overcome on the Canadian Pacific by an air space on top of the masonry wall and the eaves sloped at an angle of one to one.

At wayside water tanks the accumulation of ice on the track is prevented on the Canadian Pacific by the extension of the exhaust pipe from the pump, whenever it is located within or near the tank.

SNOW SHEDS.

Snow sheds are used by a number of railways where they cross the mountains in the West. Most of these sheds are designed to carry snow slides over the tracks without blocking them, and a few to protect against the level fall of snow. These sheds are usually made of heavy timbers. They are generally effective, the only objection being their cost of construction and maintenance and the liability of being destroyed by fire.

RAILWAY LOCATION.

In the location and construction of railways through snow country special attention is given by the locating and construction engineers to provide against difficulties in the operation of the railway on account of snow. An embankment 2 ft. above the surface of the ground is generally sufficient.

Snow slides in mountainous country are given full consideration and, if possible, the railway is located either to avoid them or to provide for an economical snow shed construction. In some cases the railway has been carried over snow slides, which occur in ravines, by means of spans. This method, however, proved disastrous in a number of cases, as the spans were carried out or wrecked by the large trees that were brought down with the slide.

CONCLUSIONS AND RECOMMENDATIONS.

Snow Fence.

Snow is carried by the wind close to the surface of the ground and is deposited in railways cuts on account of the eddies which these cuttings cause in the wind. The function of the snow fence is to form artificial eddies on the windward side of the cut at sufficient distance to cause the snow to deposit between the snow fence and the cut.

The location of the drift or eddy depends upon the form of the fence. A tight fence of sufficient height will cause the snow to accumulate on the windward side of the fence; an open fence causes the snow to accumulate principally on the leeward side. The distance between the fence and the drift depends upon the height of the fence, the width of the openings between the boards, the velocity of the wind and the character of the snow.

The character of the snow fence and its location for the protection of a given point depends largely upon local conditions, some of which can only be determined by experiment, and for this purpose portable snow fence is recommended. Where local conditions admit, a permanent snow fence located on the right-of-way fence line is most economical.

If permanent wooden fences are used, the boards should be laid close, where the right-of-way is 50 ft. or less from the center of the track; for greater distances space should be provided between the boards, and at 100 ft. distance, 50 per cent of the fence should be open space. The height of permanent board fence depends upon the probable amount of snow. The maximum height, however, should be 10 ft.

In most cases local conditions require the use of a portable snow

fence. These fences are usually erected in the fields adjoining the right-of-way. They should be set on the windward side of the track at right angles to the prevailing winds and, to provide for variations in the direction of the wind, it is sometimes necessary to set the panels in crescent form. For ordinary conditions one line of fence is sufficient. The quantity of snow sometimes requires the use of three or four lines of portable snow fences set parallel and spaced about 100 ft. apart. These fences should be removed in the spring so as not to interfere with farming operations.

Hedge fences should be used where the quantity of snow is not too great, and where local conditions, including the economic feature, admit. Properly maintained hedge fences are effective in beautifying the right-of-way.

Stone walls should be used for snow fences where suitable stones for dry masonry walls are delivered free to the railway company by the adjoining property owners.

Temporary snow fences should be constructed of ties, laid in the form of worm fences.

Miscellaneous Methods.

Railways constructed in Northern countries should have the track raised about 2 ft. above the general level of the ground, and for cuttings less than 4 ft. A flat slope of 4 to 1 should be given to both sides of the cutting.

In construction of new railways, or in grade revision, or trestle filling on existing railways in snow districts, the material should be taken from the sides of the cuttings. A steam shovel cut on each side is most effective in providing a place for snow to accumulate for ordinary snow conditions for cuttings up to 20 ft. in depth.

Salt should be used on switches only during that portion of the winter when the snow melts in daytime and freezes at night.

Where exhaust steam is available it should be carried about 12 in. beneath the surface of the ground at points where the accumulation of the ice requires frequent removal during the winter.

Snow Plows.

Rotary snow plows are necessary for quick removal of snow where the depth of the drift exceeds 6 ft. and its length exceeds 30 ft., or where the natural snowfall has filled deep cuttings which the push plow cannot remove. Rotary snow plows are sometimes used to advantage in the removal of snow slides in mountain districts.

Push plows should be used for a level fall of snow and minor drifts, whenever the depth is too great to be removed by snow flangers. Snow flangers should be used for the removal of snow whose depth is less than 6 in. over the top of the rail.

Snow Sheds.

Snow sheds are expensive to construct and expensive to maintain, and the railway should be located, if possible, so as to prevent the necessity of their construction. Their use should be confined to localities which require protection from mountain snow slides, and then they should be constructed of more permanent material than is now ordinarily used.

Concrete Fence Posts.

From observation of concrete fence posts your committee considers that the concrete post will heave very little or not at all, as posts set from two to five years ago are at present in almost perfect alinement, and not a loose or broken post was found. They appear sufficiently strong for all practical purposes after being properly cured and set. The claim that concrete posts reinforced with steel form lightning protectors appears reasonable. They will, of course, resist the action of fire and decay. They will not float and cannot be displaced so easily as wood posts. On the other hand, concrete posts must be carefully handled in loading and unloading and well cured before using. Fence wire in contact with their surfaces should be well galvanized. The concrete post is much heavier than the wood post and the cost of distributing and setting is about 25 per cent greater.

It would seem that the concrete post is particularly adapted to railroad use. Most of the post machines are cheap and portable and the materials used are in daily use on all roads using concrete; the materials are cheap and easily obtained.

Your committee corresponded with over 20 manufacturers of posts and postmaking machinery in the United States and Canada. A majority of these firms use or advise the use of Portland cement and gravel varying from the size of sand to pebbles which will pass a wire screen having meshes of from ½ to 1 in. sq. The ratio of cement and gravel is as 1 to 4. The methods of reinforcing and tamping concrete posts vary almost as much as those of fastening the fence wire to the posts. The machines are of various capacities and design—from the one-post hand mold to the "post per minute" power machine with continuous mixer attachment. The average total cubic content of the 7-ft. post is 0.825 cu. ft.; of the 8-ft. post, 0.95 cu. ft. The weights vary from 65 lbs. to 95 lbs., according to methods of manufacture and reinforcement used. Concrete posts retail for from 25 to 35 cents per post. End and gate posts are of about three times the volume and cost of intermediate posts. In section, concrete posts vary from square or rectangular to triangular, half-round and circular. Reinforcements are of wire, wood, strap steel, steel and wire truss, wood and wire truss, chain scrap strips and expanded metal. Fence wire fastenings are also of various forms—from the wire loop around the post to the patent staple encasement. All the posts observed taper from a smaller top to a larger base. Some have very wide concrete block bases.

In response to invitations sent to all manufacturers four concrete post machine firms demonstrated their machines at Bay City, Mich., making 12 reinforced concrete posts each, which were tested at the Michigan Agricultural College.

These posts were tested for tensile strength; panels were erected to test the holding power of the fence in place as well as give the set posts impact tests and, if possible, to compare their strength of resistance to impact with wooden posts. They were tested in a machine of large capacity, 42-in. span, both ends supported, load applied in center. The following results were obtained at an average of seven to twelve posts of each sort so tested:

Name of Mfr.	First crack.	Maximum wt. post broken.	Deflection in inches.
D	458 lbs.	1,090 lbs.	0.68
B	648 lbs.	1,071 lbs.	0.70
A	564 lbs.	1,020 lbs.	0.53
C	927 lbs.	1,356 lbs.	0.66

The comparative results show the importance of thorough tamping and stiff reinforcement near the surface of the post. A cedar post of dimensions identical with the average of these concrete posts would weigh about one-fourth as much and be four times as strong. The results in practice show that the wood posts used are much stronger than necessary rather than that concrete posts are not strong enough.

Conclusions.

Your committee recommends the adoption of the following conclusions for publication in the Manual of Recommended Practice:

(1) That the recommendations under Farm Gates be approved as good practice.

(2) That the recommendations as to Construction of Highway Grade Crossings be approved as good practice.

(3) That the recommendations as to Snow Fences, Snow Sheds, Flangers, Snow Plows, etc., be approved as good practice.

(4) That the recommendations as to Concrete Fence Posts be approved as good practice.

The report is signed by W. D. Williams (C. N.), Chairman; F. P. Gutelius (C. P. R.), Vice-Chairman; A. G. Boughner (B. & O.); A. E. Doucet (Trans. Ry.); A. M. Funk (B. & O.); Paul Hamilton (C., C., C. & St. L.); C. W. Johns (C. & O.); S. A. Jordan (B. & O.); H. L. Laughlin (M., St. P. & S. S. M.); E. R. Lewis (M. C.); M. A. Neville (P. & E.); P. Petri (B. & O.); K. J. C. Zinck (G. T. P.).

Discussion.

L. C. Fritch (I. C.): In fixing the height of farm gates, did the committee take into consideration the laws in various states with respect to what constitutes the legal fence?

Mr. Williams: They did, and we consider that height will come nearer with complying with the laws of all the states than any other.

The secretary then read conclusions 1 and 2.

C. H. Ewing (P. & R.): In the recommendation as to highway crossings, I notice the flangeway at the crossings is given as 2 inches. It is our practice to use 2½ inches.

Mr. Williams: The committee considered 2 inches about the proper clearance. We make it 1¾ for our guard rails, and there is no reason why the crossing should be wider, but there was a good reason why they should be as close to the rail as practicable on account of keeping animals from getting caught in the rail in the crossing.

Mr. Ewing: Where we have trolley crossings at grade with a flangeway necessary for the crossing frogs, we have been forced to narrow it from 2½ inches to 1¾ inches to conform to our standard crossing. During the past winter there have been several accidents on the crossing where there was a 1¾-inch flangeway, particularly when the horses are shod with very long corks. The corks become wedged under the rail. In one case, even with cast iron fillers in the crossing, an animal was wedged so that it was necessary to get a bar to pry it loose. We do not have that trouble to a very great extent where the flangeway is 2½ inches.

E. F. Wendt (P. & L. E.): I move that the four conclusions of the committee be approved by the convention, with the understanding that the detailed recommendations referred to by the conclusions be reduced to a statement of principles.

G. A. Mountain (Can. Ry. Comm.): I notice that the conclusion states that farm gates shall be 12 to 16 feet. The law in Canada is that no farm gates shall be less than 14 feet, and in the prairie 16 feet. We find farm implements used in the eastern provinces that will not go through a 12-foot gate.

C. S. Churchill (N. & W.): Since the conclusions include the point Mr. Mountain raised as to farm gates, it seems to me it would be well to add a clause in the recommendations,

namely, "or as required by the laws of the states through which the railway may pass."

Mr. Williams: The committee will accept Mr. Churchill's recommendation.

C. H. Stein (C. of N. J.): I have in mind a point where the flangeway is 1⅞ inches, which approximates the 2 inches you have specified in your report. I know of at least 25 accidents that have occurred at that crossing, where animals shod with what they call the "never-slip toe piece" have become wedged, resulting in considerable damage costs. I think there ought to be some latitude for railways to use 2½ inches opening if they find it expedient. I offer as an amendment to the report that it be made not less than 2 inches and not more than 2½ inches.

Mr. Fritch: Some lawyer in a suit might get hold of these proceedings and would point to the fact that "here is an association that points out that 2½ inches is the maximum width allowable." We might get into serious trouble. It seems to me the committee has put this in a very safe way in saying not less than 2 inches.

W. M. Camp (Ry. & Eng. Rev.): I think if the space beneath the head of rail is blocked solidly accidents would be avoided.

Mr. Ewing: At the place where the accidents to which I referred occurred, there was a steel filler the entire length. The width of the flangeway is an important matter and might lead us into considerable trouble. We have been called upon twice this past winter to get testimony from other railways as to their width of flangeway. The question has been raised in court in two of our suits, and we had to produce evidence in support of the width which we maintained. The Pennsylvania Railroad, I understand, are using the same width of 2½ inches.

Mr. Stein's amendment was defeated.

Mr. Wendt's motion that the conclusions be adopted, with the understanding that the details to which they refer be modified, was carried.

ROADWAY.

The following sub-committees were appointed:

(A) Track Elevation and Depression. (B) Waterways. (C) Washouts, Drainage and Curing of Slides. (D) Surface and Sub-Surface Drainage and Tiling of Wet Cuts. (E) Special Sub-Committee to Report on Use of Specifications.

The Board of Direction assigned the following subjects:

(1) Continue the consideration of track elevation and depression inside of cities, and grade and curve improvement work outside of cities, and submit recommendations covering more particularly questions of detail relative to the handling of the work.

Supplementing its last report on the subject of track elevation work inside cities, your committee presents in Appendix A some further discussion on this question.

In connection with the subject of track elevation and depression, it has seemed desirable to your committee to make a compilation of the laws of the several states relating to the question of separation of grades. This compilation will appear in a future Bulletin and in the Proceedings. A summary of the laws is given in Appendix A.

(2) Report on the best method for determining the size of waterways.

In Appendix B your committee submits the result of its labors on this question.

(3) Report on the protection of the roadbed in embankment and excavation from the action of water, more particularly with reference to protection from washouts or overflows and from slides, whether caused by surface or underground water.

On the subject of slides and washouts, your committee presents in Appendix C a digest of interesting and instructive replies to a circular of inquiry, treating of various phases of the subject, from members of the association and others, in the graphic language of their authors, who include 25 engineers from as many different roads.

(4) Report on the surface and sub-surface drainage of embankments and excavations.

(5) Report on the tiling of wet cuts and the curing of slides.

The report on these subjects is given in Appendix D.

Track Elevation and Depression.

The committee presented a description of a typical organization and method of handling track elevation work, prepared by F. L. Stone, Engineer of Track Elevation of the Chicago, Burlington & Quincy.

In addition to the summary of the compilation of laws of the several states relating to grade separation, there is a summary of grade crossing elimination work done or under way in the United States, arranged by cities.

Best Method for Determining Size of Waterways.

Following quotations from Wellington and Myers regarding the economic basis of culverts in this appendix, there is a comprehensive statement relative to the several ways in general use for determining the proper size of waterways, prepared by the late Walter G. Berg.

There is a discussion of the several formulas in use—the Myers, Talbot, Dun and others, including the Burkli and McMath. Following this is a digest of current practice made up from replies to a circular of inquiry sent by the committee to members of the association, 27 writers being quoted at greater or less length.

Surface and Sub-Surface Drainage of Embankments and Excavations, and Tiling of Wet Cuts and Curing of Slides.

To attain efficient surface drainage:

(a) Surface intercepting ditches should be constructed on the up-hill side of all cuts where ditches may be opened without becoming the proximate cause of slides to the track.

(b) Open ditches should be constructed along and near the toes of the slopes of such embankments as rest upon soils which may become unstable if saturated for the purpose of intercepting and diverting from the surface upon which the embankment rests the water flowing toward the embankments.

(c) Occasionally drain pipe may be constructed along and near the toe of slopes of such embankments as rest upon soil which is unstable on account of saturation and where the open ditch of (b) will endanger the embankment.

(d) Open side ditches should be constructed in all cuts.

Your committee recommends that the minimum intercepting ditch be 1 ft. deep and 1 ft. wide on the bottom, with slope to suit the soil.

The minimum grade for intercepting ditches should be 0.30 per cent. If the grade of any ditch necessarily be so great that water flowing through it threatens quick destruction, paving may be necessary.

Side ditches should be provided in cuts whether the subgrade be in rock or earth. The minimum side ditch should be 1 ft. wide on the bottom and 1 ft. deep below subgrade, with slopes as adopted in article 5 of the standard specifications.

The minimum grade for side ditches should be 0.30 per cent. If the rate of grade of the track in any through cut is less than 0.30 per cent., the cut may be widened to permit side ditches to be constructed on 0.30 per cent grades, or drain pipes may be laid to proper grades below the ditches and to any available outlet.

Your committee does not favor open side ditches in tunnels, but suggests some method of pipe drainage.

Your committee regards the cleaning out and repair of intercepting ditches and side ditches in cuts as a necessary feature of the maintenance of way.

The roadbed when made of clay in embankment should often be altered when reballasting by cutting the shoulder down outside the ties to allow thorough drainage of the depressed ballast and a new shoulder formed of porous material.

Efficient sub-drainage of wet cuts and of saturated soil upon which embankments rest may be attained by the use of pipe drains.

Pipe drains should be constructed for the quick discharge of such surface and underground water as it may not be practical to intercept. The pipe should be laid with the track and immediately below the center of the side ditch in cuts and about ten feet from the toe of slopes of embankments, and on grades of not less than 0.20 per cent.

Care should be taken to locate the pipe at such depths that no displacement will be made in the alinement of the tile by the subsidence of the roadway under traffic. To this end the trench in which the tile is to be laid should be dug down into a motionless strata underlying the saturated material which it is desired to drain. The trench above the pipe should be completely filled with cinders or other porous material which filters the water and aids its passage to the pipe and prevents the intrusion of the saturated material under pressure of traffic.

A water pocket beneath track may be drained by small cross drains laid in cinder-filled trenches, or by trenches filled with cinders, gravel or similar material.

Your committee recommends that no pipe be used with an inside diameter of less than 6 in., except for cross drains.

It will rarely be necessary to use sizes larger than 12 in. inside diameter. The pipe should be hard burned, but not necessarily salt glazed. The trench into which the pipe is laid should not be made larger than necessary for the economical digging of the trench and laying of the pipe.

Conclusions.

Your committee recommends the adoption of the following conclusions as recommended practice:

WATERWAYS.

(1) In determining the size of a given waterway, careful consideration should be given to local conditions, including flood height and flow, size and behavior of other openings in the vicinity carrying the same stream, characteristics of the channel and of the watershed area, climatic conditions, extent and character of traffic on the given line of road and probable consequences of interruptions to same, and any other elements likely to affect the safety or economy of the culvert or opening.

(2) (a) The practice of using a formula to assist in fixing the proper size of the waterway in a given case is warranted to the extent that the formula and the values of the terms substituted therein are known to fit local conditions.

(b) Waterway formulas are also useful as a guide in fixing or verifying culvert areas where only general information as to the local conditions is at hand.

(c) The use of such formulas should not displace careful field observation and the exercise of intelligent judgment on the part of the engineer.

(d) No single waterway formula can be recommended as fitting all conditions of practice.

SLIDES.

(1) Every slide should be considered as a problem by itself.

(2) The cause of the slide should be sought. The removal or prevention of the cause is as important as the restoration of the roadway.

(3) Piles or retaining walls for the prevention and cure of slides are not recommended; but their use is permissible for temporary repairs and in special cases.

(4) Underground water if present should be drained away or intercepted before it reaches the slide.

(5) The surface of the slide and the restored roadway should be graded so water will run off and not lie in pools. The surfaces may be compacted or sodded.

(6) The flattening of the slope is the most economical and permanent method of curing a sliding embankment.

(7) The removal of the material is nearly always the most economical and permanent method of curing a slide in excavation.

(8) A relocation of the line is sometimes necessary where the slide takes the proportions of an avalanche.

WASHOUTS.

(1) The ends of trestles and bridges should be protected with riprap or by other efficient means.

(2) Main track should be raised above height of flood waters and carried on strong and stable roadbed, so that it will not be subject to overflow.

(3) The track on an embankment subject to overflow should be ballasted with heavy angular ballast and anchored, and the lower slope of the embankment is sufficient to carry protected with riprap.

(4) On bridges subject to overflow the track should be anchored.

(5) If the velocity of the water carries away the riprap or other protection against scour, the width of the opening should be increased.

(6) If track is washed out temporary repairs should be made by filing in, cribbing or driving piles, to be followed by the permanent restoration of the roadway.

SURFACE AND SUB-SURFACE DRAINAGE AND TILING OF WET CUTS.

(1) All the water possible should be kept off the roadbed.

(2) Surface intercepting ditches should be constructed for the protection of cuts.

(3) Intercepting ditches or pipe drains should be provided for the protection of banks built on saturated soils.

(4) Side ditches should be constructed in cuts through all classes of materials.

(5) Pipe drains should be provided for the drainage of wet cuts.

The report is signed by Geo. H. Bremner, (C., B. & Q.), Chairman; S. B. Fisher, (M., K. & T., Vice-Chairman; John C. Beye, (C., R. I. & P.); D. J. Brumley, (I. C.); Moses Burpee, (B. & A.); W. C. Curd, (Mo. P.); W. M. Dawley, (Erie); Paul Didier, (B. & O.); C. Dougherty, (Cons. Engr.); A. M. Kinsman, (B. & O.); Duncan MacPherson, (N. T. R.); W. D. Pence, (Univ. of Wis.); H. J. Slifer, (Pan. R. R.); J. A. Spielmann, (B. & O.); J. G. Sullivan, (C. P. R.); J. E. Willoughby, (L. & N.); R. C. Young, (L. S. & I.).

Discussion.

J. P. Snow (B. & M.): In connection with waterways, is there a formula given to determine the size of waterway? I assume that is not eliminated by the insertion of these conclusions in this report.

Mr. Bremner: It was not the intention of the committee to burden the book of Recommended Practice with any long list of formulae and rules for determining the size of waterways. We expected that would be published in the proceedings, and be available of access to anybody who wished to study the subject. The sub-committee under Prof. Pence has given us some very valuable formulae and conclusions on this subject, and if I understand the gentleman's question, we have not thought of putting it in the book of Recommended Practice.

C. S. Churchill (N. & W.): In connection with paragraphs c and d, I wish to recommend that this committee shall continue further investigation of a comparison of formulae with the idea of putting them alongside each other in such way as to show wherein they harmonize and wherein they do not. The formulae are published now by the committee in such a way that it is not easy to make such a comparison, and I think that there will be found, through the information that will be furnished to the committee by the sub-committee, a means of making such a comparison and bringing out the conclusions next year.

Hunter McDonald (N. C. & St. L.): I do not find that the committee has taken notice of the Chamier formula, which was promulgated about five years ago in a paper before the Institute of Engineers in London, and extracted in the Engineering News shortly after. It takes into consideration the shape of the drainage way and I think should be given consideration by the committee.

Mr. Bremner: The committee asked for information from the association in regard to formulae, and it would have been very glad to consider this formula if it had been presented, and we would be very glad to consider it in the future.

Mr. Bremner: Does that suggestion imply that we should recommend some formula to this association? We have considered that subject very fully and we recommend that no one formula be considered as the standard formula.

Mr. Churchill: I believe we are not prepared at present to recommend any one formula, but the first step is the adoption of such necessary standard formulae as may be desirable to make a comparison of them in considering the different characteristics of this country. I am certain there is one formula presented by the committee that would apply to the middle section of this country, the foothills and mountains of the Appalachian system running up into New England. I am certain that another formula may apply to the middle west section. If we arrange them for comparison, and consider the section of the country for which the formula was originally prepared, we will get valuable information that will be useful to every railway in the United States.

J. B. Jenkins (B. & O.): I suggest that the words "if present" in paragraph 4 under Slides are unnecessary to the sense.

Mr. Bremner: The committee will take that into consideration.

C. H. Miller (Mo. Pa.): Under paragraph 6, I suggest that we make it read "is nearly always most economical." I believe that statement "most economical" is a little too broad.

J. A. Atwood (P. & L. E.): In these conclusions I suppose it is the object of the committee to call attention to the fundamental principles in treating slides. It seems to me they have failed to call attention to one principle, which it is very desirable to bear in mind. Where an embankment supporting a track is sliding, and the cause of it is a washing away, it is very necessary to prevent the toe of the slide from being interfered with, because if the toe is removed the equilibrium of the slide is injured, and sliding results. I think that fundamental principle should be stated by the committee.

Mr. Bremner: The committee considers that that is covered in paragraph 3, taken in connection with paragraphs 1 and 2.

A. W. Thompson (B. & O.): I do not think that paragraph 3 covers the point brought up. I think Mr. Atwood refers particularly to places along rivers where the bank is of such

a nature that in washing away it leaves a slope less than one which that material will stand on.

Mr. Bremner: Perhaps that would come under Washouts.

F. N. Patterson (C., B. & Q.): It seems to me it is fully covered by paragraph 3. In these cases what is wanted is a retaining wall to prevent the toe of the slope from being washed away.

J. B. Berry (C., R. I. & P.): If I may go back to section b under Waterways, I would like to insert the words "bridges and" before "culvert areas." With most roads, the line is drawn at about 25 feet, as between a culvert and a bridge.

Mr. Bremner: The committee will accept that.

Mr. Churchill: Following the suggestion of Mr. Atwood and Mr. Thompson, I find that their point might be covered by adding to paragraph 3 these words: "the object being to restore the equilibrium." That would follow after the words "special cases."

Mr. Atwood: I was just drawing a recommendation to offer as an added section under Slides. The gist of it is something like this: "Where embankments are caused to slide on account of their equilibrium being disturbed by the removal of the toe of the embankment, steps should be taken to prevent the removal of the toe of the slope."

The President: That is covered by Mr. Churchill's suggestion?

Mr. Atwood: I do not think it is; his suggestion is under the head of "piles or retaining walls" which are not sufficient for the purpose I have in mind. I intended to recommend that proper steps shall be taken for the restoration of the equilibrium of the embankment and the prevention of the equilibrium being disturbed.

Mr. Churchill: I think Mr. Atwood's clause covers the matter better than my wording.

Mr. Bremner: The committee seems to think that will merely confuse our conclusions. It seems to be covered in paragraph 2 where we say: "the removal or prevention of the cause is as important as the restoration of the roadway." These two taken together pretty well cover the point.

Mr. Atwood framed his suggestion in writing and later presented it in the form of a motion.

S. E. Coombs (N. Y. C.): Is paragraph 3, under Surface and Sub-Surface Drainage and Tiling of Wet Cuts, intended to apply to bogs?

Mr. Bremner: It can apply to bogs.

Mr. Coombs: Do you think that it would work?

Mr. Bremner: It would depend altogether on the nature of the bog. I hardly think that in most bogs it would work very well.

J. G. Sullivan (Can. P.): In several cases where the embankment is from 3 to 4 feet high, we have had trouble with the tracks sinking in the muskeg. We have been able to eliminate that by grading bogs to a depth of 3 or 4 feet below the general surface of the water.

Mr. McDonald: I find no reference to the method of curing slides by filling the ditches with wood and burning it.

Mr. Bremner: I do not think that method has been brought to the attention of the committee. Mr. Fisher says it is found in some of the letters which have been published in the back part of the appendix.

The President: There is a reference to such conditions in the first volume of the Proceedings, a discussion by H. G. Kelley.

E. F. Wendt (P. & L. E.): I suggest that a plan should be prepared for the Manual to accompany these recommended principles of practice. The Manual already contains diagrams of roadbed for various classes of track, but it seems to me that a plan should accompany the principles in this case as an illustration.

M. L. Byers (Mo. Pac.): I would like to go back to paragraph 2 under Slides for a moment. There is one point which, although it is covered indirectly in almost every recommendation of the committee, it seems to me should be emphasized somewhat. The cause of slides is almost invariably the presence of water, and that is a thing which is frequently not properly recognized. I have had my attention called a good many times to slides that have been making trouble, and the statement has been made that for years they have been trying to correct the slide. When I have asked what has been done, I found that the looking for the cause of the trouble is about the last thing that was done—they had added ballast and additional material, but had not taken the necessary steps to find the location of water and get rid of it. I suggest the addition of this to the first sentence: "and will be usually found in the presence of water." The sentence will then read: "the cause of the slide should be sought and will be usually found in the presence of water."

Mr. Bremner: The greater portion of the committee's report this year is devoted to the considering of water in one form or another—in slides, waterways, washouts and tiling—and we have emphasized the water part of the matter pretty strongly. The first conclusion under "surface and sub-surface drainage and tiling of wet cuts" says: "All the water possible should be kept off the roadbed." As far as slides are concerned, while not always the case, 99 per cent of the cause of slides will be found in the existence of water. It is so self-evident that it is hardly necessary to give it a separate conclusion.

Mr. Coburn (Vand.): If that is the case paragraph 6 is put a little strongly. I have had some trouble during the past year where the cheapest thing was not the flattening of the slope, but taking care of the water.

W. P. Steffens (C. C. & O.): Mr. Byers mentioned the presence of water as always causing the difficulty. There is one other condition that has not been stated and possibly not called attention to heretofore, and that is the presence of mica in large quantities in soil. The mica acts as a lubricator. The natural slope of such material is not 1½ to 1, but possibly as flat as 3 to 1. Our company has been constructing a line south of the Blue Ridge mountains in North Carolina and has been experiencing unusual difficulties in holding embankments due to the presence of this mica material. The embankments in question are naturally made from the material obtained from the adjacent cuts. In many cases the material is of rock, but in other cases it is of this mica clay or earth. The presence of rock on top of the softer material forces out the toe of the slope to an angle at least as flat as between 2½ or 3 to 1.

M. J. Henoch (L. & N.): I would go back to paragraph 6, under Slides. It seems to me it is a very broad statement to say that flattening of the slope is the most economical method of curing a sliding embankment. It seems to me it may in certain cases be very uneconomical and anything but permanent. Therefore, I move that paragraph 6 be amended to read: "The flattening of the slope is recommended as a permanent method of curing a sliding embankment, in cases where natural conditions permit."

Mr. Steffens: In relation to paragraph 6, we have met during the last two years material that will have to be flattened to a slope of 2 deg., if it is to stand. They call it in the vicinity loblolly mud, a sort of clay.

W. L. Webb (Con. Eng.): In illustration of the case mentioned by the gentleman to the left, I will say that the road I was constructing in West Virginia had exactly that same condition of a thin layer of micacious material, and a shallow cut had been made through it. That embankment was on a very flat slope, and yet in the course of two or three days after the side of the cut had been carefully finished off, the whole slope of the hill had been started so that it projected 1½ in. just in a day or two, and it was a case where an extreme flattening of the slope was the only thing that could possibly prevent it.

Mr. Atwood: I wish to offer an additional paragraph to the matter under Slides, as follows:

"Where embankments are caused to slide on account of the equilibrium being disturbed by the removal of the toe of the embankment, proper action should be taken to prevent such removal and to restore the equilibrium."

Any amount of money that you may spend to stop the slide will not stop it if you do not stop the removal of the material which is at the toe of the slope. It is particularly to call attention to the necessity of preventing removal of material at the toe of the slope that I wish to make this addition. In the case of an embankment which is washed by a stream it is particularly applicable.

The President: Does the committee consider that this is covered in any of the clauses?

Mr. Bremner: Paragraph 2 provides that the cause of the slide should be sought, whether caused by washout along the side of the foot of the embankment, by the chemical constituents of the soil, or by water in the embankment. Then the removal or prevention of the cause is as important as the restoration of the roadway. The committee would consider that this clause covers not only the case which is provided for in this motion, but also a number of other cases.

Mr. Byers: It seems to me that the argument of the chairman could be applied with equal force to almost all the paragraphs that follow No. 2. The object of Mr. Atwood's motion is to call attention to a special case, just as several of the other paragraphs call attention to special cases.

Mr. Ewing: I think the committee's recommendation should stand and not go into too much detail. Another point I have in mind is that it is necessary to put a ditch on top of the

cut as it is to protect the bottom, to prevent the slides from washing.

Mr. Churchill: The one point that has, in my estimation, been omitted by the committee is that of restoring equilibrium. Of course all railway people understand that in a general way, but still it is not stated in the conclusions, and that is why, primarily, I favor the addition of the clause. There was brought to my attention a few days ago a statement from one of the oldest railroad men in the United States, in connection with the oldest portion of our road, built in 1850, and this old gentleman stated we had great difficulty at that point. Our construction began to slide out,, and we immediately began to determine how we should prevent it. We made an investigation and found that the only way to prevent it was to restore the equilibrium, which we did by using a very heavy granite rock around the toe. If you cannot restore equilibrium, you must carry out the measures the committee have recommended. If you can restore the equilibrium, it is right to do so. I think the word "equilibrium" is an important word to consider.

The President: The question is upon the motion of Mr. Atwood to supplement the conclusions with another paragraph, to be known as No. 9, which you have heard read.

The motion was lost.

Mr. Thompson: It seems to me that the committee have considered here that every slide should be corrected. There are some cases where it is not economy to remove the cause of the slide. The interest on the cost of permanently removing the cause of the slide is greater than the annual maintenance charges of keeping embankment.

Mr. Bremner: The committee would not consider that any one of these recommendations are absolute. There are bound to be exceptions to every one.

Mr. Churchill: You might stop there, leaving the whole thing alone.

Mr. Bremner: We wanted to emphasize that particular form of slide. Every regulation we might make would be subject to exception.

L. S. Rose (Big Four): I move the adoption of all the conclusions.

Mr. Coburn: I move as an amendment that sections 6 and 7 be changed by substituting the word "frequently" instead of "nearly all." I think it would make a vital change in the recommendations.

Mr. Bremner: I think the words "nearly all" give a better meaning.

The motion was defeated.

Mr. Wendt: In former years the committee submitted the definition for the term "waterways," which now appears in the Manual. I suggest that next year they submit definitions for the two terms "slides" and "washouts," in order that the Manual may be complete.

The President: The committee will take notice of that. It has been moved and seconded that the conclusions as amended be adopted.

Motion carried.

BUILDINGS.

The Board of Direction assigned the following topics for consideration:

(1) Reconsider amended conclusion No. 5 (1908) relative to locomotive coaling stations.

(2) Report on the use of reinforced concrete for coaling stations and storage bins.

(3) Collect data as to the actual use of reinforced concrete roofs for roundhouses, where located, life to date, results so far obtained, and critical analysis of advantages or possible defects; also diagrams of typical designs.

(4) Report on the best method for smoke removal, ventilation and heating of roundhouses.

(5) Report on the design and detail arrangement of oil houses at terminals.

The committee considered it unwise at the present time to reopen the question in Topic 1. The developments of the next few years may make it desirable to take the matter up at some future time.

The sub-committees and division of the work was as follows:

(A) Topic 4; (B) Topics 2 and 5; (C) Topic 3.

Reinforced Concrete for Coaling Stations and Storage Bins.

An exhaustive search was made of the coaling stations and storage bins already erected, but comparatively few plants of this character are in use. Railroad engineers who have constructed such plants generally regard this type as satisfactory, but are not yet prepared to recommend its general use, because of the increased cost.

Figures from the builders of reinforced concrete coaling stations indicate that they cost 50 per cent. more than timber.

Reinforced Concrete Roofs for Roundhouses.

In referring to "reinforced concrete roof" we mean one which is also supported by reinforced concrete beams and which fully conforms to the definition of reinforced concrete.

A reinforced concrete roof, properly constructed, is not porous enough to allow leaks or to permit gases and moisture to corrode the reinforcement except as it may crack. The cracks can be kept at a minimum, and, it is believed by some engineers, so prevented that the roof shall stay waterproof without any covering by reinforcing it against all the tension stresses due to expansion and contraction. During the past two years some large buildings have been erected on this theory, and so far they are giving excellent results, but the committee feels that until these buildings have had a longer test it should retain the position it held last year. It cannot recommend a concrete roof for a roundhouse without a roof covering on top of the concrete, although in a roundhouse where a leak cannot do serious damage, more risks can be run than with some other buildings.

We are also not sure that we were justified in recommending a cheaper roofing for the concrete, as was done last year, and have revised our table of costs, given in that report, in that respect.

The committee is of the opinion that, unless the roof leaks badly, any pores in the concrete will be closed up by the cementwash or whitewash put on after the house is completed, or else by soot, and that the chance of any damage from corrosive gases is practically nothing. Some elaborate experiments made in Germany in 1907, by E. Probst, had this subject under consideration. These tests subjected concrete beams under load to a highly concentrated mixture of steam, oxygen and carbon dioxide, which entirely corroded unprotected bars in 24 hours. Some of the beams were loaded up to nearly the elastic limit of the steel, and no rust resulted after the beams had been subjected to the gases for over 12 days. However, when the beams were so loaded as to exceed the elastic limit of the steel, cracks were found which caused considerable corrosion. In a building properly constructed such cracks could not occur. The atmosphere in a modern roundhouse is such that a long time must elapse before enough corrosion can occur to equal the severity of the action of a few hours under the tests quoted.

As to excessive condensation on the underside of the roof during cold weather, this does not take place with a concrete roof when the house is properly heated, and in any event there is no more condensation than with a wooden roof.

But few roundhouse roofs have been built exclusively of reinforced concrete, none of which has been in use much over two years. As far as we can learn, the results have so far been entirely satisfactory. Those of which we know are as follows:

Grand Trunk ....Mimico, near Toronto, Can.
Detroit & Toledo Shore Line..........................Toledo, O.
Denver & Rio Grande..................................Pueblo, Colo.
Denver & Rio Grande.............Burnham, Colo., near Denver.
A., T. & S. F. Ry. Coast Lines.................Bakersfield, Cal.
A., T. & S. F. Ry. Coast Lines.............San Bernardino, Cal.
A., T. & S. F. Ry. Coast Lines...................Richmond, Cal.
A., T. & S. F. Ry. Coast Lines....................Williams, Ariz.
Union Railroad...................Oak Hill, Pa., near Pittsburgh.

The recommendations included in this report concerning ventilation can be carried out with reinforced concrete.

In revising the table of comparative costs the committee has been conservative by endeavoring to avoid any chance of favoring the concrete roof in the costs of labor and material and in all items where there is any doubt.

In figuring insurance on the structure, we have included that to be carried on the entire building and its equipment, and not alone on those parts of construction included in the table.

There has been ample demonstration of the fireproof qualities of reinforced concrete. It is well adapted for a roundhouse, and the demands upon it there are not essentially different from those it receives in other buildings. We would, therefore, recommend the following to replace conclusion (2):

"Under ordinary conditions the reinforced concrete roof is the most desirable for a roundhouse, because of the greater security afforded by it against interruption to traffic through damage to the roundhouse and its contents and because of its economy."

We would recommend the revision of conclusion (3) to read as follows:

"When the roof is of reinforced concrete the columns and roof beams should be of the same material."

We would recommend the revision of conclusion (4) by the addition of the word "considerably" after the word "cost" in the second line, making it read as follows:

"Reinforced concrete should be used for the walls only where special conditions reduce its cost considerably below that of brick or plain concrete and where plaster is not considered satisfactory."

Smoke Removal, Ventilation and Heating of Roundhouses.

The following questions were submitted to a large number of roads:

(1) What system of heating do you employ in your standard engine houses?
 (a) How long has it been in use?
 (b) Are results satisfactory?
(2) What cross-section engine house do you use?
 (a) Has your experience with this section shown any modifications of it advisable?
(3) Do you employ auxiliary mechanical ventilating appliances or have you ever considered the advisability of doing so?
(4) What type of smokejack do you use?
 (a) What are the general dimensions and of what material is it composed?

Replies were received from 32 roads, the answers being carefully studied and tabulated. From them the committee presents the following arguments leading to conclusions which are borne out by experience and usage of the roads replying to the inquiries:

HEATING.

The primary consideration being to thaw out engines, the heat should be concentrated at the pits. There is no need to have the house very warm as the men are warmly dressed and will work faster if not too warm.

Good results are obtained by the use of steam heat coils in the pits. Positive circulation is required, the vacuum return system seeming to be the best. Where steam coils are used, care must be taken to prevent water from splashing on the pipes, which forms a fog in the house, and also tends to crack the pipes, causing leaks; also special care must be taken to insure sufficient ventilation on account of the lack of a positive air change. While steam heat is cheaper than hot-air, the maintenance cost is larger.

Your committee recommends the adoption of the following conclusions as a substitute for recommendation No. 11, page 68, in the Manual:

Conclusions.

(1) Heat should be concentrated at pits.

(2) General temperature of the engine house should be kept between 50 and 60 deg.

(3) The best method for heating engine houses is by hot air driven by fans through permanent ducts (under the floor where practicable). The supply should be taken from the exterior of the building (no recirculation should be allowed). The air should be delivered to the pits under the engine portion of the locomotive. Air to be heated as far as may be by exhaust steam, supplemented as required by live steam.

VENTILATION.

A continuous upward movement must be secured, best accomplished by designing the roof so that "slope-up" is given to a continuous opening around the house and by the use of annular openings around the jacks. The purlins and rafters must be arranged so that they will guide the air currents up to the openings instead of obstructing them. The replacement by fresh air is most surely accomplished by hot-air heating. Where no heating is needed, openings can be provided of such size that no mechanical ventilation will be required.

SMOKE REMOVAL.

Ventilation and smoke removal are dependent upon a correct design of the house and of the jacks. Smoke removal can be accomplished by efficient jacks of smooth material and of adequate size and length.

Conclusions.

Smoke removal should be separately provided for by the use of jacks, and the currents produced in the jacks should be utilized for aiding ventilation in the house by drawing air from the top of the house through annular openings leading into the top of the jack. Jacks should be without dampers, fixed, and built of non-corrosive material with cross-section not less than 30 in. in diameter. They should be of smooth material, circular in section above the hood, and extending well above the roof line; care in design should be taken to avoid any corners. The hood of a jack should have a minimum length of 10 ft. so as to permit variation of location of an engine on the pit. The bottom of the jack should be as low as the engines served will allow and it should be furnished with a drip trough; the slope upward should be gradual to the flue.

We recommend that our conclusion in regard to jacks be substituted for recommendation No. 8, page 68, in the Manual, and that the paragraph on Smoke Jacks, page 70, of the Manual, be stricken out.

Design and Detail Arrangement of Oil Houses at Terminals.

When conditions permit an oil house should be located a sufficient distance from other buildings to prevent the spread of fire. This, however, is not always practicable and, in fact, it is usually convenient, or necessary, to have the oil storage adjacent to the storehouse or some other building.

The danger from fire, which existed under the old methods of distributing oil for use directly from the barrels, has been greatly reduced by modern methods of storing the oil in tanks usually under ground, or in a basement, and this improved method also results in an important saving by elimination of waste of the oil.

Quantities of oil, either at large terminals or at isolated points, should be kept in tanks located either underground or in buildings properly designed for the purpose.

At isolated points it is usually feasible to have the oil storage tank underground at a considerable distance from combustible buildings, but at terminal points it is usually necessary or convenient to have the tanks close to the point where the oil is to be drawn for use. In either case the piping can be arranged to draw the oil by hand pump, with proper arrangements for taking care of the dripping, or by the more modern systems which, if desired, can be arranged to measure accurately the quantity drawn, practically eliminate dripping, permit of locking and which are susceptible of other modifications and additions if desired.

A cross-section of a typical oil house 20x40 ft., is submitted. The construction features are adapted principally from two or three of the designs which were among the best received.

On the main floor should be the pumps or faucets by which the oil is drawn for use. This floor would also be used for unloading barrels of oil for filling the tanks by means of pipe connections through the floor, for storage of waste in metal receptacles and for such other purposes as would be convenient and proper. Oil which comes in tank cars would be piped direct to the tanks in the basement; or these tanks could be located underground outside of the building and the basement used for other purposes, but the storage tanks should be in a place where they are easily accessible.

Compressed air has been used instead of hand pumps for delivering the oil, but as the mixture of air with the oil interferes with the delivery at the faucet, besides causing deterioration in the oil itself, it has not been an entire success. The use of compressed air for this purpose is not necessary, as the modern systems on the market deliver the oil satisfactorily and measure it accurately, even when the point of delivery is at a considerable height above the storage tanks.

Conclusions.

(1) When practicable, oil houses should be isolated from the other buildings at a terminal.

(2) Oil houses should be fireproof and the storage should be either underground or in the basement.

(3) Oils that are stored in sufficient quantities should be delivered to the tanks in the house direct from tank cars. For oils that are stored only in small quantities provision should be made for delivery to storage tanks from barrels by pipes through the floor.

(4) The delivery system from the storage tanks to the faucets should be such that the oil can be delivered quickly and measured. The delivery should also be such that there will be a minimum of dripping at the faucet and that the drippings be drained back to the storage tanks.

The report is signed by O. P. Chamberlain, (C. & I. W.), Chairman; Maurice Coburn, (Vand.), Vice-Chairman; Geo. W. Andrews, (B. & O.); S. D. Brady, (L. K.); A. C. Butterworth, (Mo. P.); H. M. Cryder; Wm. T. Dorrance, (N. Y. C.); C. H. Fake, (M. R. & B. T.); P. F. Gentine, (Mo. P.); E. N. Layfield, (C. T. T.); M. A. Long, (B. & O.); John S. Metcalf; W. H. Sellew, (M. C.); L. D. Smith, (S. P.); C. H. Stengel, (Vir.); E. W. Wiggin, (N. Y., N. H. & H.).

Discussion.

The clause recommended by the committee to replace conclusion 2 in the Manual, beginning "Under ordinary conditions the reinforced concrete roof is the most desirable for a roundhouse, etc.," was considered first.

C. F. Loweth (C., M. & St. P.): I am quite in accord with the committee to the extent of saying that a concrete roof for a roundhouse may be very desirable and that frequently it

will be economical compared with the ordinary timber construction that might be used, but I think it is going too far to say that under ordinary conditions all roundhouses should be built with reinforced concrete roof. I think the position that the convention took last year is going far enough, and I see nothing to be gained by going any farther. Last year we said that the security by having reinforced concrete roof warranted its consideration. I move that the conclusion of the committee be not concurred in.

W. B. Storey, Jr. (Santa Fe): The Santa Fe has probably a larger number of reinforced concrete roundhouse roofs than any other company in the association. As representing that company I wish to second Mr. Loweth's motion. I agree with the reasons advanced by him and believe that we should abide by the action taken last year and not adopt the present conclusion.

Mr. Coburn: The committee went over the Proceedings of last year pretty thoroughly before making the recommendations and endeavored to learn all we could about the subject. We were asked to present what additional information we could as to the houses already built and results obtained from them. From the information we could gather the results have uniformly been successful as to every point. We went into the question of the chance of corrosion of the steel in the concrete, and we found that the elaborate experiments made in Germany on this subject seemed very conclusive. The large number of reinforced concrete chimneys which were being built would seem to warrant the faith in reinforced concrete in places where corrosive gases are liable to be present. In chimneys conditions are so much worse than in a roundhouse, it seemed to us that the chance for corrosion in a roundhouse is nothing at all.

It seemed to us that the advantages to be gained by the construction of a concrete roundhouse are so great and the results so far obtained in this work, and the many uses to which it is being put, warrant us in adopting the conclusion which is recommended. Concrete buildings are being built all over the country, in places where they are subjected to much severer conditions than we have in a roundhouse, and we think it is no experiment; and above all is the avoidance of danger from fire and other external causes. The roundhouse fires are a good deal more numerous than one thinks until he goes into the subject and they are such a serious item when they do occur that anything we can do to avoid them is well worth while. A house with a concrete roof, in the long run, is going to take considerably less for repairs and be more economical.

L. C. Fritch (I. C.): It seems to me that the recommendation now in the Manual is much more to the point and covers exactly the ground Mr. Coburn has touched, the matter of fire protection. Personally, I would like to see Mr. Loweth's amendment carried.

J. O. Osgood (C. of N. J.): I agree with Mr. Loweth and the others that it is not wise to pass the recommendation as stated by the committee. Our company has a number of concrete roofs. We have used them in quite a number of places, and we have looked towards using them in roundhouses, but we have not yet been able to figure out that there was any real economy in doing so. There may be, under certain conditions, but the difficulties of protecting the steel, and at the same time keeping the cost of the roof within reasonable limits we find a difficult matter, and up to this time have not been able to use it. It seems to me it would be unwise to have any statement appear in the recommendations indicating that the roof is an economical one. We have not been able to figure out that it is economical.

C. H. Cartlidge (C. B. & Q.): I think we should either endorse using reinforced concrete or refuse to endorse it; say what we definitely recommend in the style of construction. I think most of us will agree that a reinforced concrete roof is desirable under a great many circumstances, but I think we ought not to agree to exclude every other sort of roof.

The President: The question is on Mr. Loweth's motion, that clause No. 2, as suggested by the committee, be not concurred in.

Motion carried.

The recommended revision of conclusion 3 was next considered.

Mr. Cartlidge: I move that the conclusion of the committee as presented be not concurred in.

Mr. Osgood: I object to that. I do not believe in undertaking to prescribe reinforced concrete columns. I think the objection to them is greater than to reinforced concrete beams. Reinforced concrete columns may occupy more space than cast iron or wrought iron columns, and the columns are not likely to suffer to any such extent as the roof from the action of the gases.

Mr. Cartlidge's motion was then carried.

The recommended revision of conclusion 4 was taken up.

Mr. Loweth: I would like to ask the committee, what is the reason for this change? It would appear on the face of it that they have experienced a change of heart since last year as to relative advantages of a reinforced concrete wall or plain brick wall.

Mr. Coburn: We have not really changed our mind, except that we think a brick wall is more satisfactory than a reinforced concrete wall, and unless you are going to save money by it, we do not recommend a reinforced concrete wall.

Prof. Allen: Would not the proper reading be "the cost" instead of "its cost"?

The President: Yes, the committee will accept that suggestion.

Upon vote the recommendation of the committee was adopted.

M. L. Byers (Mo. P.): I suggest that we adhere to the use of the word "enginehouse" instead of "roundhouse" throughout.

The President: The committee will take it under consideration.

The conclusion on smoke removal was next considered.

Mr. Chamberlain: The principal reason for the recommended changes is that there is already a conflict in the Manual, and going over this matter after the conclusions had been adopted by the committee and checking it up with the Manual, it seemed wise to try to get the matter in the Manual in such shape that that conflict would not exist.

Mr. Cartlidge: I move to amend the conclusion of the committee by the inclusion of the word "preferably" between the words "and" and "built" in the fifth line, so that it will read: "Jacks should be without dampers, fixed and preferably built of non-corrosive material."

The President: The committee will accept such an amendment.

Mr. Loweth: I would like to inquire what is meant by "non-corrosive" jacks. A large percentage of the roads throughout the country are using cast iron jacks. Cast iron is corrosive.

Mr. Osgood: That may refer to some of the asbestos materials. Recently we have had some experience with that class of material which indicates that if it is non-corrosive it is not lasting. Some that we put in a few years ago has already begun to fail. It failed as quickly as cast iron.

Mr. Coburn: The committee, by the use of the word "non-corrosive," meant a material that was not affected by gases escaping from the stack of the locomotive, so that the jacks would be practically permanent, at any rate as permanent as the enginehouse. The committee had no particular material in mind and simply intended to indicate that a permanent jack should be used.

G. H. Bremner (C., B. & Q.): I would like to ask if it is not a fact that most of the jacks at the present time are not being made square or rectangular?

Mr. Coburn: The committee believes that the function of the jack is to ventilate the house and that the circulation of air is better secured by circular opening, rather than by a square opening. The currents of air are freer to move and there is no retarding effect by currents in the corners, and a circular shape is, therefore, the ideal shape.

Mr. Loweth: I believe I am right in saying that there are a good many roads in the position of the road I represent that are getting good results from the type of smoke jack that differs in material from this recommended here, and I fail to see why we should put ourselves on record as being so definite about a detail which may have some advantages in it which are worth considering, but have no advantages over a good many other devices that are equally efficient and may cost less money. So I, therefore, move that this conclusion be not concurred in.

Mr. Chamberlain: I think the matter has not been brought as clearly before the convention as it might have been on account of not having read the conclusions for which we present this substitute. Outside of the fact that there are some changes in the recommendation, there also remains the condition that exists in the present Manual in which there are some inconsistencies; that is, there are two different things recommended, two pages apart, and that was one of the things which we wanted to get rid of; and while I concur in the recommendations of this committee, there is very little in the recommendations which differs from what is already in the Manual.

Mr. Fritch: I hope that Mr. Loweth's amendment will carry and that the present recommended practice stand. The committee, in its new conclusions, have left out a very essential element, and that is that the material from which the

jack should be built should be non-combustible. I think we should get away from the practice of wooden smoke jacks. It is one of the greatest sources of danger from fire that we have. I hope the old conclusions will stand.

Mr. Chamberlain: In regard to that portion of the conclusion, the committee would be very glad to accept, in the fifth line of the conclusion, a substitution to read: "Fixed, and built of non-combustible, and preferably non-corrosive, material." As the recommendations are in the Manual there is a clash. One recommendation calls for a 42-in. flue and the other for a 30. Those two recommendations should be harmonized in some way, and one of the objects of this change in the conclusion was to get rid of the discrepancies which are now in the Manual. I hope that Mr. Loweth's motion will not prevail.

The President: The chair will ask Mr. Loweth if the suggestion made by the chairman of the committee will meet his views?

Mr. Loweth: No, sir, it will not. We have a great many jacks that will not line up with this conclusion. I think the road jacks would not. I venture to say there are very many jacks in satisfactory use throughout the United States that would not conform to this conclusion.

Mr. Fritch: I would like to offer an amendment to Mr. Loweth's motion, to strike out from the Manual recommendation No. 8, page 68.

Mr. Loweth: I will accept that.

The President: The question is to strike out from the Manual conclusion No. 8. Are you ready for the question?

The question was then carried.

Mr. Chamberlain: I still think the conclusion on page 70, on smoke jacks, should be substituted for the recommendation which has been stricken out. That is to put the matter in an orderly manner in the Manual. I will make that as a motion.

Mr. Wendt: We intend to do that.

The President: The Board will see that the suggestion is carried out.

The conclusions on heating were next considered.

Mr. Loweth: Speaking with reference to conclusion No. 3, I would move to strike out the two clauses enclosed in brackets. The first is too sweeping as stated. It is always practicable to put the duct under the floor, but it may be exceedingly expensive, and in old roundhouses and in a new roundhouse it is cheaper, and in many cases at present we put the air duct up in the roof. With reference to the second bracketed paragraph, there are hours in the day when it is quite proper to allow a recirculation of the heated air. There are frequently times when the exhaust steam is not sufficient to furnish all the heat that is necessary and I think the parties in charge of the roundhouse should be privileged to exercise their judgment whether a recirculation of air is right or not.

Mr. Chamberlain: The recommendation is not different from the recommendation already in the Manual, that portion of it. I move the adoption of the conclusions as stated in the report.

The motion was carried.

The conclusions on oil houses were next considered.

Mr. Fritch: The typical oil house plan does not show any provision for ventilation. There is also no provision for taking care of waste.

Mr. Layfield: The intention was that this drawing should be corrected, and an opening left in the top of the wall just below the floor, to be properly screened so as to prevent access from outside, but to permit ventilation. Also there is no suggestion here as to heating. Of course, that should preferably be done by steam pipes. As to provision for waste. It is common in oil houses of that kind to have the waste kept in metal tanks on casters so that the tanks can be moved around. If the houses were large enough, and the quantity of waste greater, it could be kept in metal receptacles or reinforced receptacles.

Mr. Fritch: I move that this conclusion be received as information and the matter referred back to the committee for further report.

Mr. Chamberlain: I doubt very much the advisability of referring these conclusions back to the committee. I think the members of the convention will agree with most of these conclusions presented. Whether the committee has gone far enough, or whether the committee has omitted something which should have been considered, is another question. I would very much prefer that if the conclusions as presented meet with the approval of the association, even though the matter be referred back, that this portion of the conclusions be adopted and placed in the Manual.

The oil house plan does not go into the Manual. We have not recommended that the plan should go into the Manual. It is simply what we regard as typical, as Mr. Layfield told you, made up by careful investigation of many plans which we received from the roads. The matter of ventilation has not been gone into in that particular plan, but do not consider this a typical design so far as the building goes. We say in the report: "Modifications of this design can be made to apply to other sizes and arrangements of oil houses." Our object is to show what we consider the proper way of handling the oil portion of it. It would be almost unnecessary to state that the oil house should be ventilated, just so it should be unnecessary to state that any other building should be ventilated.

Mr. Wendt: I seconded the motion to refer the matter back to the committee, not because I do not agree with the conclusions, they are correct, I think, very largely as stated. It does seem to me, however, that the association is reaching a point where it would be necessary to guard the Manual of Recommended Practice by a rule which will require that we make no final conclusion until it has received a second presentation, and been read a second time, at a second convention of this association. Any careful and critical study of the Manual will lead to the conclusion that we are too hasty in adopting what is to go out to the world as permanent fixed recommended practice.

My thought was strongly in accordance with the statements of Mr. Chamberlain, that it probably was advisable to supplement and enlarge the report and make a recommendation which will be more extended and more comprehensive. That is my only reason for seconding the motion.

I hope that we will not take this matter under consideration too hastily, printing conclusions which may in a sense be incomplete, because our proceedings are now in use in Australia, New Zealand, India, China, Japan, and in every advanced country of the entire world.

Mr. Chamberlain: I think what Mr. Wendt has said in regard to the precaution which should be taken concerning the printing of material in the Manual has some merit. At the same time we are working under the present rules of the association. Under these rules, this matter if it meets with the approval of the association should go into the Manual. If further supplemental material is needed, refer the matter back to the committee and have it investigated further; but do not, just because this report possibly is not as complete as you would wish, turn it all back to the committee, if you approve of the recommendation. The committee can substitute something else, or make additions another year.

The point I desire to make is that if these recommendations conform with your opinion on the matter, they should go into the Manual under the present rules. If the present rules are changed later on, and these matters have to come up twice before the association, then we will work under those rules; but now we are working under another system.

Fred Lavis (P. T. & T.): The point was raised a short time ago by the chairman of this committee that certain matter was already in the Manual, and the change which was proposed in that connection was simply continuing what had already been approved in the Manual. It would seem to indicate that if the matter were once in the Manual a precedent was established. I, therefore, agree we should be careful indeed as to what is put in the Manual if that is to be the position that is taken.

Hunter McDonald (N. C. & St. L.): I make a point of order that Mr. Wendt's remarks in regard to the reconsideration of each clause at two meetings are not in order. The question now is on the adoption of the committee's report, which is submitted under the present rules of the Manual. I wish to call his attention to Clause 6 of the Rules for publication of the Manual, which reads as follows:

"The Board of Direction shall have authority to exclude from the Manual any matter which, in its judgment, it shall consider as not desirable to publish, or as not being in proper shape, or as not having received proper study and consideration."

Mr. Wendt has been delegated by the Board of Directors to pay especial attention to that particular thing, and it is up to him to keep out of the Manual anything that has not been properly considered.

The President: The point has been well taken.

Mr. Chamberlain: I do not want to take up too much of your time on this. There has been no objection presented by any member of the association to any one of these conclusions. Now, under these circumstances, why should those conclusions be referred back to the committee? I think the conclusions are approved by almost every member on the floor of this convention today.

Mr. Fritch: With the consent of my seconder I will withdraw the motion.

Motion withdrawn.

Mr. Loweth: If I understand the situation, these conclusions stand and an amendment to any one is in order.

The President: Yes.

Mr. Loweth: In that case I offer an amendment to conclusion 2, to make it read as follows: "Oil houses should be fireproof and a storage in large houses should be preferably either underground or in the basement." I propose that amendment because in small houses the expense of putting storage underground or in the basement is out of all proportion to the risk. In many cases it is unnecessary, and it is only in the larger houses that we are warranted in going to the expense of underground storage.

Mr. Chamberlain: The committee will accept that.

Mr. Layfield: As chairman of the sub-committee, I will say that in writing that conclusion I merely had in mind a house such as is shown in the drawing, which, of course, will not go into the Manual. Therefore, I see no objection to the change suggested.

The President: It has been moved and seconded that the committee's conclusions in regard to oil houses be adopted.

The motion was carried.

Mr. Chamberlain: On account of the changes in the proposed conclusion, and the fact that this matter was taken up a little out of the order in which it was presented in the report, I will take a few moments to call your attention again to three topics which have not been discussed. The Board of Direction in its instructions to the committee submitted as the first topic the following:

(1) Reconsider amended conclusion 5, relative to locomotive coaling stations (Bulletin 95, pp. 69-70).

The President: The secretary will read that conclusion, if it is desired.

Mr. Chamberlain: I do not think it is necessary to take the time of the convention in this matter. I will say the committee did not do any work on that recommendation. It will be the proper thing for the convention to refer it back for next year's report. In this connection I will read from our report: "Your committee, while not feeling that the subject had been exhausted at the last convention, considers that it is unwise at the present time to reopen the question. The developments of the next few years may make it desirable to take the matter up at some future time." If it be the will of the convention that we take this matter up next year, we will be glad to do it.

The second topic on which the committee was to report was: "The Use of Reinforced Concrete for Coaling Stations and Storage Bins." I will say that the committee did make quite an investigation of the use of reinforced concrete for coaling stations and storage bins. We found that some few had been built on some of the roads, but we did not make any recommendations in regard to them. Reinforced concrete for coaling stations and storage bins is a comparatively new proposition, and it is the feeling of the committee they are rather an expensive proposition at the present time for most roads. We have talked with some of the engineers of roads on which they have been constructed, and they are inclined to agree with us in this view. However, there are more and more of these buildings being constructed each year and it would be quite proper for that matter to go back to the committee for next year's work.

Mr. Wendt: I suggest that the committee consider the formulation of a few definitions, and that the present conflict in the Manual between the use of the words "roundhouse" and "engine house" be harmonized.

IRON AND STEEL STRUCTURES.

Your committee submits a progress report on impact tests, and a report on the maintenance of bridges, including protection of steel structures from corrosion.

Impact Tests.

The committee submits a simple statement of field work carried on during last summer. Thirteen instruments were available for use and were generally employed. These consisted of 12 extensometers and one deflectometer. The general method of conducting the work was the same as during the previous season, but the range of bridges upon which experiments were made was considerably greater. The committee endeavored to make the series fairly complete for plate girder spans of various lengths and for short riveted spans. Additional data were obtained also on pin-connected spans, the maximum length being 300 ft. Particular attention was also given to tests on bridges with ballasted floors. Twelve bridges of this type were included in the series.

A brief description of the several bridges tested, their location, number of records secured on each bridge and date of observations are given in a table, and information concerning the types and weights of locomotives is given in another table. Including last year's records, the total number of records secured amounts to some 15,000. Obviously the measurement, plotting and analysis of these records will take much time, and it has been impossible to prepare, in time for publication, such a synopsis of the results as would be of any practical value.

Maintenance of Bridges, Including Protection from Corrosion.

PART I.—MAINTENANCE.

(1) Debris, Dirt, Etc.—Debris should not be permitted to accumulate at bridges, and all parts of structures should be kept well drained, and free of dirt, cinders, etc.

(2) Substructures.—(a) When substructures show indications of movement or other weakness, they should be promptly protected by riprapping, piles, bracing or other work, until the permanent repairs are made.

(b) Cracked bridge seats or pedestals should receive necessary repairs or renewals.

(3) End Bearings.—(a) Roller bearings or sliding seats should be kept in good condition so that they may have the proper play or movement.

(b) Bed plates should be kept leveled up to give good bearing.

(c) Wooden wall plates should have sufficient bearing area between the flanges and the wood, to prevent crushing, which is liable to cause bending or splitting of the flanges.

(d) The superstructure should be kept clear of the masonry in order to prevent buckling of the metal work.

(4) Track.—(a) The track construction on bridges and approaches should be well maintained, with good joints, and well bedded or fitted ties in order to insure smooth running.

(b) Ties should be secured against bunching in case of derailment, be spaced sufficiently close to support derailed wheels, and generally should not be more than 6 in. apart in the clear. They should be sufficiently wide so that the intensity of pressure between the rails and the wood under the heaviest locomotives will not cause cutting into the wood. Tie plates should be used when necessary. Ties should be proportioned according to General Specification requirements.

(c) Both inside and outside guards should be used, the inner guard of steel, and the outer of wood, notched over and connected to ties so as to prevent bunching.

(d) Screw-spikes in bored holes, instead of driven spikes, may be used to increase the durability of ties and to insure good track.

(e) Defective or damaged timber should be promptly removed.

(5) Rivets.—(a) Good judgment should be used in dealing with loose rivets. They should be cut out and replaced with tight rivets except in cases of no importance, care being taken not to loosen adjoining rivets nor injure the material. When there are only a few rivets in a connection, it may be necessary to cut out all rivets to secure good work.

(b) In backing out rivets which offer great resistance to removal, a 3-in. round steel bar, with socket in the end of diameter and depth to receive the expelled rivet, is recommended as a good tool to facilitate removal and protect the surrounding work.

(c) After rivets are cut out, the holes should be carefully reamed when necessary to make them true, in which case a larger rivet should be used.

(d) In replacing loose rivets care should be taken to reduce the effective section as little as possible, especially in sections of small size.

(e) When the rivets in the top flanges of track stringers become loose and do not remain tight after re-driving, a reinforcement should be designed and applied under the direction of the engineer. When necessary, the flange angles may be supported by additional stiffeners tightly fitted under the top flanges, so that loads may be transferred more effectively to the web plates.

(f) Where stringer connections to cross floor beams, or cross floor beam connections to trusses or girders, show indications of overload, and the rivets cannot be kept tight, suitably designed reinforcement should be applied under the direction of the engineer.

(g) Where a portable air riveter is available its use is recommended when the number of rivets requiring removal and re-driving will not unduly increase the cost. Difficulty in driving, in cases where space for the swing of a hammer is limited so that good upsets are not obtained, may justify the use of a portable air riveter, even though the number of rivets may not be large.

(6) Bolts.—(a) Bolted connections should be kept tight, and where nuts are liable to get loose, threads should be burred. Where required, check nuts should be used, longer bolts being inserted when necessary to receive the extra nut.

(b) When bolts take shear and have become loose, a reamer should be used to true up holes, and the bolts replaced by others of larger size, making a driving fit. Unturned bolts may be used except in important connections, provided holes are reamed slightly smaller than the bolts.

(c) Reamers and bolts should be standardized and kept on hand, so that securing tight-fitting bolts, whether rough or turned, may be attained without delay and unnecessary expense.

(d) All bolts taking shear should have washers under the nuts. Washers should not be less than ⅜-in. thick, and from 2 to 2¼-in. in diameter, to insure the body of the bolt engaging the entire thickness of the metal connected.

(e) Care should be taken to have threads on bolts taking shear cut to the necessary length only, so that the body of the bolt will be effective, and the threads terminate in the washers.

(7) Adjustable Members.—(a) When counter rods with turnbuckles do not remain in adjustment, they should be treated in accordance with the advice of the engineer, since it may be necessary to replace or reinforce them on account of loads in excess of those for which they were designed.

(b) Adjustable lateral rods should be kept taut so as to keep lines true, and the connections should be maintained in good condition.

(8) Packing Pieces and Clamps.—(a) Loose eyebars should be prevented from rattling and wearing the pins and holes, by the use of packing pieces and clamps.

(b) Abrasion and cutting of rods or other members by rubbing contact caused by vibration should be prevented by the application of packings, clamps or stays.

(9) Pin nuts should be kept tight.

(10) Reinforcement.—(a) Each structure should be studied for the purpose of determining the amount of possible efficient reinforcement, consideration being given to the relative economy of its application and of the renewal of the structure.

(b) Partial renewal or local patching may be advisable, in which case all damaged or corroded parts should be restored as nearly as possible to not less than their original efficiency.

(c) All reinforcement or alterations of any kind should only be made under the direction of the engineer.

PART II.—PROTECTION FROM CORROSION.

(1) Protection Necessary.—A protective coating of paint on the structural steel and iron in bridges should be maintained in order to prevent corrosion which will impair the efficiency and endurance of the structure independently of the wear and strains produced by the traffic.

(2) Quality of Materials.—The constituents of paint should be of the best quality, since the cost of application far exceeds that of the materials and is the same for good and poor paints. The quality of the pigments, oil and dryers should therefore be covered by proper specifications and tests.

(3) Selection of Paints.—(a) The duty required should govern the selection of the materials for paint. Cognizance should be taken of weather conditions, since they differ widely in different localities in respect to humidity, rainfall and temperature. Consideration should be given to localities near and in cities, where the atmosphere contains the gaseous products of combustion, structures being frequently exposed to severe conditions in this respect. Special attention is required in the case of crossings, where overhead bridges are exposed to the gases and cinders expelled from locomotives on the tracks below. Special treatment should be given to coatings required to resist the drippings from refrigerator cars, or when the service is special in any respect.

(b) The selection of paint for any situation should be governed by previous duty performed by the various compounds in similar situations. Records should be kept of the various coatings used, accompanied by all particulars of their application and service necessary to determine properly their efficiency and durability. Such records when correctly kept are the best guide in the selection of materials.

(c) In repainting over old paint, consideration should be given to the character of the old paint, since imperfect adhesion of the new coating may result in injurious effects.

(4) Procuring Paints.—(a) Paints may be procured in several ways, as follows: (1) Compounds of standard commercial pigments and dryers may be made by the railroad company, the quality of the ingredients purchased being governed by proper specifications and tests. If this method is followed, all pigments except red lead should be purchased in paste form. Red lead paint should be mixed only in such quantities as are used on the day when mixed. (2) Compounds of standard commercial pigments, oils and dryers mixed ready for use may be purchased from reliable paint manufacturers, provided proper specifications and tests govern the quality of the paint furnished. (3) Proprietary paints may be purchased from reliable paint manufacturers. In this case care should be taken to purchase only those brands which have demonstrated their quality under service similar to that required.

(b) Methods (2) and (3) are advantageous in that the mixtures are made by grinding in mills, and are more uniform. Method (3) utilizes the skill and experience of specialists in making paint, and when the value of the products in service has been established, possesses advantages.

(c) The value of the standard commercial pigments and oils, when subjected to proper specifications and tests, should be known to competent master painters. No recommendations are made at this time as to particular paints or paint materials. In view of the tests and studies being made by a committee of the Society for Testing Materials, with the mutual co-operation of engineers, chemists and manufacturers, it is hoped that practice with respect to the materials of paint will be reduced to a more rational and satisfactory basis.

(5) Season for Painting.—Repainting should be done during seasons of the year when favorable weather conditions prevail, and should not be attempted in freezing or wet weather. It is preferable to permit the progress of rust for a limited time until favorable conditions obtain, rather than incur the risk of failure and loss of labor and materials liable to result when paint is applied under adverse conditions.

(6) Cleaning.—(a) Repainting should be preceded by thorough cleaning of the surface. It is not necessary in all cases to remove the old paint down to the naked metal unless corrosion is proceeding under the old coating. A considerable portion of the old coating often remains intact, though having scattered blisters, which may be removed with wire brushes and scrapers.

(b) In cases where corrosion is proceeding under the coating, or when the paint is of such a character as will not bond to the new paint, the old coating should be cleaned down to the naked metal. For example, a bituminous or asphaltic paint should be entirely removed when a linseed oil paint, or a paint with a vehicle principally of linseed oil, is to be used.

(c) The best results, in cases where the entire removal of an old paint is necessary, are obtained by the sand blast. Portable sand blast machines operated by gasoline engines are convenient for this purpose. The apparatus, when properly proportioned and provided with a suitable tank, would be available for operating a few pneumatic guns for driving rivets, and could be used for either one or the other of these purposes separately, as required. Where humidity prevails it is desirable to cover the sand-blasted surfaces without appreciable delay.

(d) Scrapers should be made of tempered steel, spring steel being convenient for this purpose. A good scraper may be made by grinding a chisel edge on one end and at the other end drawing the temper and bending to the form of a hook about 2 in. long and re-tempering. The end of the hook should be ground to a chisel edge, so that one end of the tool may be used for pushing and the other for pulling. The hook end may be used in striking where it is necessary to remove

(7) Wire Brushes.—Wire brushes for cleaning should have bristles about No. 11 gage and about 2 in. long, and should have reinforced backs.

(8) Workmanship.—Care should be taken to work the paint into all crevices, corners and joints and it should be scale or other adhering matter by blows.

well brushed out and spread evenly in order to expel moisture on the surface. All surfaces so close together as to prevent the insertion of paint brushes should be thoroughly coated by using pieces of cloth or other suitable material. The heads and nuts of new rivets and bolts should receive a coat of paint in advance of the general painting. Care should be taken not to brush out the paint too thin on corners and edges.

(9) Brushes.—Brushes should be of the best quality, and, when used by unskilled painters, should preferably be flat, and, when by skilled painters, should be round.

(10) Special Protection.—When floor systems are exposed to the action of corrosive liquids dripping from rolling stock, recourse may be had to a protecting shield, which may be made of duck and heavy canvas fabric, saturated with materials as nearly as possible immune from the corrosive effects of the drippings, or of wood, metal, concrete, mastics, etc. This subject is being investigated by a special committee (see report of special committee on Brine Drippings).

(11) Smoke Shields.—On the under side of bridges at

crossings over steam roads, when the head room is so low as to subject the metal to cutting by the cinders expelled from the locomotive exhaust, the paint is rapidly destroyed, and should receive the protection of a shield. Wooden shields made in removable sections to facilitate erection and removal for repairs have been found to resist the cutting action of the cinders for an indefinite time. Wood is better than mortar or concrete placed on a steel fabric, since in cases of low head room it will outlast the latter, and is much lighter in weight. The wood should be white pine or a wood of similar texture, capable of receiving and retaining paint. The shield should be made on 1-in. material, dressed all sides, and should receive at least three coats of paint on both sides. All parts to be in contact with other wood or metal should be painted two coats before assembling. A good iron oxide paint will answer this purpose.

(12) Troughs, Etc., Drained.—Troughs or pockets should be drained. Recesses which cannot be drained should be fitted with a waterproofing compound.

(13) Wood Surfaces in Contact.—Both surfaces of wood in contact should always be heavily coated with paint before being placed together. Surfaces of wood placed against metal should be similarly coated. The life of a guard timber, for example, is thereby prolonged.

Conclusion.

Your committee recommends the adoption of the report on Maintenance of Bridges, and its publication in the Manual of Recommended Practice.

The report is signed by J. E. Greiner, (B. & O.), Chairman; C. F. Loweth, (C., M. & St. P.), Vice-Chairman; J. C. Bland, (Penn. Lines); M. F. Brown, (Cons. Eng.); C. H. Cartlidge, (C., B. & Q.); C. L. Crandall, (Cornell Univ.); B. W. Guppy, (Me. C.); A. J. Himes, (N. Y., C. & St. L.); Chas. M. Mills, (Phil. El.); A. D. Page, (Cons. Engr.); C. D. Purdon, (St. L. & S. F.); A. F. Robinson, (S. Fe); C. C. Schneider, (Cons. Engr.); F. E. Turneaure, (Univ. of Wis.); Wm. R. Webster, (Cons. Engr.); J. R. Worcester, (Cons. Engr.).

Discussion.

Mr. Greiner: The committee submit for information only, and as a progress report, the subject of maintenance of bridges, including protection from corrosion. We invite written criticisms on this report, and it will be revised and resubmitted at some future date, in time for the next convention, when we expect to have it in shape for publication in the Manual of Recommended Practice.

A subject that is of the greatest importance, so far as this committee is concerned, is that bearing on impact tests. As you know, there has been a good appropriation made for the purpose of investigating the dynamic effects of trains on bridges. The committee has done a considerable amount of work in this line. Practically all of the tests have been completed, but they are not yet worked out, and I will ask Prof. Turneaure, who is the chairman of the subcommittee in charge of these tests, to outline to the association the work that has been done, what remains to be done and the additional amount of money that is required to bring the work to proper completion.

Prof. Turneaure: Mr. Chairman and gentlemen, it has not been possible to prepare a formal report for this meeting, but in the Bulletin is a brief statement of the work done during the past season, a brief description of the bridges upon which the experiments were made and some statements of the amount of work accomplished. The work has now been going on two seasons. During the summer of 1907 some five weeks were spent in the field and in the summer of 1908 some nine weeks; parties were made up of from six to eight men, Mr. Crandall and myself being in the field continuously, the other members of the parties consisting of assistants, bridge engineers and other engineers on the roads on which experiments were being made. Some forty bridges have been tested, spans being from 50 to 300 feet in length. On each of these structures runs were made with test trains using from two to four different types of locomotives and generally enough loaded cars to test the bridge fully. With these test trains, about 1,600 separate runs were made. During the first summer we had eight extensometers in use, and we obtained something like 1,200 records to tabulate, correlate and bring into final shape. The work has been done on eight different railways; the Nickel Plate, the Santa Fe, the Pennsylvania, the Norfolk & Western, the Northwestern, the St. Paul, the C., B. & Q. and the Rock Island. I may say on behalf of the committee that we are very grateful indeed for the courtesies of the various railway officials concerned and the very great pains that have been taken in every instance to render us every possible service. In many cases traffic has been shunted around our particular piece of track and the very best facilities have been given us in order that the tests could be conducted expeditiously. In working up this mass of material, we have taken up, first, the deflection records, these being somewhat simpler to work up and less likely to individual and erratic variations. The deflection records have been pretty thoroughly worked up, and the committee will determine upon the publication of these records as to facts. It has been impossible to meet and discuss these records as they should be before any conclusions can be drawn, but the records themselves will stand and it was thought they will be of very great value to those who are particularly interested in this subject; so that the deflection records, it is expected, will be published soon as a separate Bulletin. In general, from these deflection records we have found percentages of impact, so called cases of deflection over static deflection, ranging all the way from 15 to 20 per cent over the longer spans up to 80 or 90 or 100 per cent over the shorter spans.

One thing brought out by these tests which may be considered as definitely shown is that for all spans of considerable length, say, 75 or 80 ft. and over, the worst impact effect is produced when the train is going at such a speed that the rate of rotation of the drivers of the locomotive corresponds with the natural rate of vibration of the loaded structure, giving the cumulative effect due to these impulses from the excess balance on the locomotive drivers. That speed, which may be called the critical speed, is very well defined on the longer spans. On spans 200 or 300 ft. in length, that critical speed will be 30 to 35 miles an hour. A lower speed will give very much less vibration; a higher speed will also give less vibration than this critical speed. For shorter spans, less than 50 or 60 ft. in length, this critical speed is less than the ordinary maximum speed at which trains are run. Those facts will appear in the published Bulletin. The extensometer records involve a mass of data which have only been partially worked up, and the working up of the analysis and correlation will take considerable time. We expect to get all of this in form for final report next year, but it will take the greater part of the year to accomplish this work. It is quite likely that we should, in order to round up the work, make experiments on a few more bridges, probably some spans longer than those already tested. The longest span yet experimented upon is 300 ft. It will be of very material assistance to get a few points beyond that length, 400 and 500 ft. spans if possible.

Incidental to this main work, we have by means of the extensometers, got some interesting information on the secondary stresses, but that work has been purely incidental. It was thought best to confine ourselves to the main problem and not take time going into secondary stresses, although it is an important subject. The committee has spent practically all of the appropriation of $5,500 for the two years. The expenditures have been in general for the following purposes: The cost of the instruments, repairs, and so forth, has been about $2,500; about $1,000 has gone back to the railway companies for railway fare; the salaries of assistants in the field and in working up the data have amounted to about $1,800.

The work is not as complete as we hoped it might be at this time, but I think our field work has covered somewhat more ground than we expected to be able to cover when we started on the work. I think it is safe to say that the results, from all of the experiments, when brought together, will give information that will be very well worth the cost of the work. To complete the tabulation and digesting of data will require some additional expenditures, and if we could at the same time have some sufficient funds to make a few supplementary tests in the field, I am sure it would add to the value of the report very much more than the relative cost of the additional work. The matter was discussed at the meeting of the Iron and Steel Committee Tuesday afternoon. I take it from the suggestion of the chairman that I am expected to state to the convention the results of that discussion, as to what funds we thought we ought to have to complete this work in proper shape. The conclusion we reached was that we should have an appropriation of about $3,000 to get the work done in the best way and to make it of the most value to the association. The data that we have at hand now can be rounded up and presented by an expenditure of somewhat less than this, but I think the larger expenditure would be very amply justified and would enable the committee to present a much more satisfactory report. It is expected that the published data relative to deflections and impact as deduced from the tests will be gotten together promptly, so that we can have the use of the data. It is not expected to publish conclusions or discussions, but to

publish facts, which will remain facts no matter what the discussion may be later.

Hunter McDonald (N. C. & St. L.): In order to get the matter before the convention I desire to offer the following resolution:

"Resolved, That it is the sense of this association that the impact tests be pushed to a conclusion and that the matter be referred to the Board of Directors to find means for doing so."

In offering this resolution, I assume that the committee are of the opinion that these impact tests should be pushed further.

The Vice-President: I so understand the wish of the committee.

The motion was carried.

The Vice-President: The matter will be taken under consideration by the Board of Directors. The committee presents a conclusion in regard to the maintenance of bridges, but I understand from the preliminary remarks of the chairman that he presents this report for information only, as a progress report, designed to get written discussion from the members.

ALLOWABLE LENGTH OF FLAT SPOTS ON CAR WHEELS.

The Board of Directors instructed the committee to "continue investigations in regard to injury to bridges and railroad structures caused by flat spots on wheels, conferring with committees of other associations."

A meeting of the Arbitration Committee of the Master Car Builders' Association was held in Chicago April 29. Your sub-committee was invited to attend the meeting, but the chairman alone was able to be present. The immediate business before the meeting was supposed to be a discussion of the statistics of the renewal of car wheels which had been gathered at the request of the Arbitration Committee during the months of January and February. It appeared, however, that the Arbitration Committee had changed its attitude upon the subject since its last meeting and announced that the subject was not a question of economy at all; that if any given flat spot was dangerous it should not be permitted, and if not dangerous, there was no need to consider it, and that the committee had no jurisdiction in the matter and could take no cognizance of the subject except upon the presentation of specific evidence of such danger. This was truly an arbitrary position, especially as the Master Car Builders' Association had fixed the 2½-in. limit 30 years ago, with no specific data and would now volunteer no effort to determine the safety of that limit for high-capacity cars. It had been hoped that the statistics collected would shed some light upon the expense involved in a reduction of the limit, but the committee declared them to be of no value whatever and even misleading, and declined to permit their use in the discussion.

After this decision of the Arbitration Committee, the only course remaining was to gather such existing information as could be obtained from the membership of our association.

Accordingly a circular letter was sent out and 60 replies were received. Of these, 38 indicated no knowledge of any rail breakages due to flat spots on wheels, 11 indicated the possibility of such breakages and 11 recounted experiences more or less specific which, as a whole, indicate quite conclusively that rails have been broken by flat spots, although the spots were generally more than 2½ in. in length and under a locomotive or tender. Since the 11 replies last mentioned constitute the whole tangible evidence of injury by flat spots and are in themselves of much practical interest, extracts therefrom covering the desired information are appended to the report.

The letter of Mr. Purdon (Frisco) is reported in full because his investigation reveals a typical situation as to the state of knowledge of the effect of flat spots. Mr. Cushing contributed a mathematical discussion of the subject by his assistant, Mr. Stetson.

Some work on the measurement of the impact of flat wheels on bridge structures was done during the summer, and the results will probably appear in the report of the Sub-Committee on Impact Tests.

Inasmuch as the Arbitration Committee of the Master Car Builders' Association had disclaimed any jurisdiction in this matter, the Executive Committe of the Master Car Builders' Association referred the subject to the Committee on Car Wheels. This committee held a meeting in Buffalo, Nov. 7, at which your sub-committee was represented by its chairman. The subject of flat spots received a very thorough discussion at this meeting and the chairman agreed to furnish your sub-committee copies of the statistics relating to the renewal of wheels which were gathered in January and February, 1908. These statistics were collected by eight different railroads, namely: Michigan Central, Delaware, Lackawanna & Western; Nashville, Chattanooga & St. Louis; Southern Pacific; Union Pacific; Chicago, Milwaukee & St. Paul; New York, Chicago & St. Louis, and New York, Ontario & Western. They show the actual number of pairs of wheels renewed because of flat spots; also the number of pairs of wheels having flat spots 2 in. in length and over, but below 2½ in. and the number having flat spots 1¾ in. and over, but below 2 in.

These statistics have been combined in the following table:

Capacity of cars.	1¾ in. and over but below 2 in.	2 in. and over but below 2½ in	2½ in. and over.
40,000 lbs.	283	209	211
60,000 lbs.	1,159	1,244	957
80,000 lbs.	711	669	540
100,000 lbs.	573	525	304

Since we are concerned more particularly with cars of 100,000 lbs. capacity, if a limit of 1¾ in. had been in force, the number of pairs of wheels renewed under cars of this capacity would have been 1,402 instead of 304 with the 2½-in. limit, an increase of 362 per cent. It would be very interesting to know whether flat spots develop more rapidly under 100,000-lb. cars than under cars of lighter capacity, and the relative number of cars of each capacity in service. No such information is now available.

The Car Wheel Committee decided by unanimous vote that the present 2½-in. limit is entirely sufficient and that no measurements to determine the impact are necessary. The opinion was expressed that the evidence submitted was not sufficient to show that the 2½-in. limit was too high, and until that had been conclusively proven, the committee would give the matter no further consideration.

We repeat here what was said in the discussion at the last annual convention, that the energy expended in the blow from a flat spot can be measured, and by comparing it with the energy required to break a rail under the drop test a factor of safety may be determined that will afford an entirely rational means of selecting a limit for flat spots.

The report is signed by Albert J. Himes (N. Y., C. & St. L.), Chairman; A. D. Page (Cons. Eng.), and C. D. Purdon (St. L. & S. F.).

Discussion.

J. E. Greiner (B. & O.) spoke for the committee. He said: "This was a report that was continued over from the year before and it has been investigated as far as the members of this committee feel that they are justified in going. We think that it is properly a subject for investigation by the Rail Committee and have so recommended in this report. We recommend that the subject be referred to the Rail Committee and the investigations be continued on account of their importance."

L. C. Fritch (I. C.): It seems to me that the Rail Committee would not be exactly the committee to handle that subject, because injury is also done to structures and bridges. It seems to me it would be better handled by a special committee or possibly by a joint committee of the Rail Committee and the Iron and Steel Structures Committee.

The Vice-President: You would suggest that it be handled by a sub-committee, or by the Iron and Steel Structures Committee directly? What would be the opinion of the committee as to handling that matter themselves further?

Mr. Purdon: The chairman of the committee had several meetings with the M. C. B. Association, but could not reach any results and they finally turned it down cold, saying they were perfectly satisfied with 2½ in. flat spots. We then attempted to get data on what the additional cost would be of reducing the flat spots to 1¼. We have not succeeded in getting that yet, and all the information we can get from operating officials was generally more their judgment than accurate data, though we did secure a good many cases of broken rails that we actually traced to a flat spot on a wheel. The committee could continue to get the data, but I do not think it would be practicable for them to reach any result with the M. C. B. Association, as that association declined to have anything further to do with it. As the impact of the flat spot goes to the rail first, we are of the opinion that it ought to go to the Rail Committee first.

The Vice-President: Is there anyone here who can tell us whether the matter has ever been handled by the American Railway Association in any way? Do I understand that the committee on Iron and Steel Construction decline to handle the matter further? Of course, compilation of further data is not reaching a conclusion.

Mr. Greiner: The committee do not decline to handle the matter. We are perfectly willing to continue it as far as we

can go, but we feel that so far as working with the M. C. B. Association is concerned, nothing more can be done. We also feel that it could be more properly handled by the committee which is studying rails than by the committee on Iron and Steel Structures. If the association desires us to continue further, we are quite willing to do so. If the association is indifferent about the matter, we prefer them to let some other committee continue the investigations to a conclusion if they can.

Mr. Fritch: The circular issued to the Board of Directors was to the effect that these investigations be made in regard to injury to bridges and railroad structures caused by flat spots on wheels, conferring with committees of other associations. It seems to me that that is a very important branch of the subject and one which the Rail Committee could not properly handle. This might be a very live subject to be investigated with reference to impact on bridges, and it seems to me that at the same time they were making those tests they could make tests of wheels with different flat spots and determine the effect on the structures.

Mr. Greiner: We would be quite willing to make the experiments if we could find some railway that would furnish us with cars with flat wheels and allow us to run the cars over the bridges at any speed. That is the only way we can find out, unless we just happen to catch a car with a flat wheel when we have our instruments on the bridge; sometimes we do that.

Mr. Fritch: I think the railways are sufficiently interested to furnish cars with the flat spots. They have plenty of them. They furnish them now without any request.

C. H. Cartlidge (C., B. & Q.): It is true that it would be possible to investigate the subject from the point of view Mr. Fritch mentions, if the work did not preclude the doing of one in doing the other. We cannot carry out our impact work exactly at the same time we are making tests for impact of flat wheels. They are two different propositions. One should not be included in the other. The trials for the effect of flat spots will vitiate a good deal of the data for impact. They should be kept separate. It follows that in order to carry out such experiments we should have a double appropriation, to carry on a different series of tests. I think the committee will undertake the work if the association desires.

Prof. C. F. Allen (Mass. Inst. Tech.): It seems to me this work is a matter that can very properly be left to the Board of Directors, and I move that it be taken care of in that way

The motion was carried.

UNIFORM GENERAL CONTRACT FORMS.

The special committee presented a progress report.

The report enumerates the essential elements of a binding contract, as well as the components of a uniform general contract to be used with construction or engineering operations. The general conditions are grouped under 20 different headings, and these in turn are expanded into various sub-heads on which the committee asks discussion in the convention as a help in the final preparation of the "general conditions" form.

The committee presents a proposed uniform general contract form embodying the requirements established for the first component, the "agreement form." The report concludes with a list of marginal headings for the general contract form.

The report is signed by W. L. Breckinridge, (C., B. & Q.), Chairman; E. F. Ackerman, (L. V.), Vice-Chairman; J. C. Irwin, (N. Y. C.); W. S. Kinnear, (M. C.); E. H. Lee, (C. & W. I.); W. A. McGonagle, (D., M. & N.); W. F. Tye, (Con. Eng.).

Discussion.

Mr. Ackerman: In the absence of our chairman, Mr. Breckenridge, and a few others of the committee, I shall assume to take charge of the committee and present this report to the association. In presenting this report, it is with the understanding that it is only a progress report. At the outset the committee was unable to agree as to what form the information in hand should be put in. We finally came to the conclusion that we should start upon a fundamental basis. At this time, in presenting this report, the committee does not feel it has any conclusions to present, but the principal desire is to have expressions from the members so as to assist in future work. We have presented several definitions; for instance, a definition defining a contract; likewise a definition covering specifications. These were given some thought, but I would like to have this placed before the association and see whether these definitions are satisfactory to it.

L. C. Fritch (I. C.): I move that these definitions be approved.

Motion seconded.

A. S. Baldwin (I. C.): Before that motion is put to vote, I would suggest the elimination of the words "either written or printed." Of course we would wish that all contracts be written or printed, but a verbal contract that is proven is just as much a contract. I doubt the wisdom of excluding from the provision a verbal contract.

The Vice-President: You suggest omitting the words "written or printed?"

Mr. Baldwin: I suggest making it read: "A formal agreement, either verbal, written or printed." However, verbal would not be a formal agreement. Again, if you are going to specify a verbal contract it would be necessary to have it proven. It seems to me it would be better if "either written or printed" be omitted.

Mr. Ackerman: I do not consider that it is the desire of a railway corporation to have very many verbal contracts, but as this is a general definition defining a contract I would favor the acceptance of it by the committee.

The Vice-President: The motion is now before us as to the acceptance of these definitions as amended.

The motion was carried.

The Vice-President: The chairman will explain the features of the essential elements of a binding contract, found in the report.

Mr. Ackerman: Before proceeding with the development of a contract form, the committee thought well to know what the essential elements of a binding contract were. We referred to a number of sources on this subject and give the essential elements as expressed by John C. Waite and J. B. Johnson, and also the elements as reported on by the committee on Buildings, volume 5 of Proceedings, page 3762. The committee would like to have an expression from the association as to which of these three definitions, so to speak, cover the expression of a binding contract more properly. It should be clear and at the same time as brief as possible.

M. L. Byers (Mo. P.): There is one very important matter in connection with contracts that I imagine has caused all of us a good deal of trouble and thought. That is the liability clause in contracts. It is becoming possibly more important on account of the tendency to change the laws governing questions of liability and to increase the liability of employers for personal injury in particular. It seems to me it would be very advantageous if the committee would, in connection with its next year's work, take up the liability proposition and enunciate the principles governing the dividing of liability between the company and contractor, and also to keep in mind in that connection the possibility on the part of the contractor of securing insurance against the liability which he assumes under the contract.

Mr. Fritch: It seems to me we are getting outside of the province of engineering in discussing questions of this character. The essential elements of a binding contract are not the same in the various states of this country, and no matter what we may say here as to what should be the essential elements, they would still be subject to the approval of our respective legal departments. Therefore, it seems to me we are taking up a question that is outside of our jurisdiction. I think it is all right for us to specify as to technical details, but when it comes to a question of what is a legal and binding contract, that is a question of law.

Mr. Byers: I do not entirely agree with Mr. Fritch in regard to his conclusions, although I do in regard to the facts. It is a question of law in regard to the points which I brought up, but unfortunately it is a part of every contract, and this committee is endeavoring to aid the members in deciding on what should be a uniform contract form. As to the laws in different states, the committee might aid the association by doing some tabulating of those laws, but I don't know how far it would be advisable to go into that. The point I have specially in mind might be illustrated in this way: We had a contract recently in which the form was pretty stiff in regard to placing the responsibility on the contractor. The contractor said, "Well, we could resign this contract, possibly, because we don't think it is legal, but we don't think that is a very good plan. At the same time, we cannot afford to take risks which we cannot cover by insurance." The question is not entirely in that way a legal question. It is a question as to what extent the insurance on different classes of liability can be secured.

Prof. Dufour (Univ. of Ill.): It seems to me that the fact that "lawful subject matter" is given as an essential of a contract covers the question under consideration. It depends upon the existing circumstances as to whether the liability clause would be legal or not. Almost every state

would, in every case, look upon it under a different consideration.

Mr. Ackerman: I cannot quite agree with Mr. Fritch's remarks. I believe that the fundamental or essential elements of a binding contract are generally as stated and that they are the same in almost every contract. We must know along what lines we must work, and if we have not these the results might be at random. I appreciate that the legal departments of all railways will ultimately pass upon any contract turned out by the committee, but I believe in the elementary features. We can hew closely to the line and turn out something satisfactory.

Prof. Allen: The report mentions that one of the essentials of a contract is that there be competent parties. The definition we have passed specifies that it is between two or more parties. Possibly that is a slight inconsistency in wording that the committee take into consideration.

The Vice-President: We will pass on to the next: "Components of a Uniform General Contract Form."

Mr. Ackerman: With a view of preparing a uniform general contract form, the committee has thought well to determine the components of such a form. In a general way, there are two components, so far as we have been able to determine, one being indicated "A," which is a proper agreement form, and "B," a statement of general conditions applicable to all classes of construction operations. Our idea in separating these was to prepare the form "A" first and embody in it such wording, in the shape of an agreement form, as could be applicable to almost all kinds of agreements. Then, instead of having general conditions incorporated in that agreement form we have separated them from the usual agreement form and made a separate statement, which we will call a General Conditions form. That has been tried out, particularly so on the Lehigh Valley. We found it would cover many cases. The components of "A" and "B" we have further amplified as follows: First, an introductory or opening clause. Second, a complete statement and description of all parties to the agreement. Third, a concise description of the subject matter, in other words, a description covering the nature and the location of the work to be performed, or furnished, for a consideration. Fourth, a statement of when (sometimes under what conditions) the contract becomes operative and the limit, if any, for duration of the contract. Fifth, a statement of the documents accompanying the contract. Sixth, a clearly defined statement of the payment or consideration. Seventh, a proper form of attestation, which should cover the signatures of all the parties to the contract, etc.

The committee presents herewith for discussion such an agreement form. This form has been used in actual practice and is substantially the same form the Lehigh Valley used. It has been found quite flexible. Compared with other agreements or contract forms, the wording is substantially the same, but its general arrangement and shape in this form is presented and I should be glad to have it considered by the association.

The Vice-President: Any suggestions should be sent by the committee in writing.

Mr. Ackerman: The general conditions statement is intended to generally accompany agreement form "A" and covers the general conditions usually stipulated in contracts, which I have grouped under twenty headings. I believe that they cover pretty nearly everything that should, and usually does, enter into an agreement. I would say that it was the intention later on, after we are satisfied with this grouping and statement of headings, to amplify them to the general conditions statement. It is the intention also to exclude from the general conditions statement anything of a specific nature. The point raised heretofore by the gentleman on the liability will be included on this general conditions statement.

J. O. Osgood (C. of N. J.): I notice that in the contract blank prepared form, which is simply a skeleton, that reference is made, after the first long blank, to the plans. It says, "In accordance with the plans hereto attached, or as hereinafter described and forming part of this agreement." I notice there is no reference to the specifications. There is no attempt in this form to give the contract in full, but it occurs to me that the specifications should be referred to also. The specifications are usually an independent document attached to the contract and forming part of it.

Mr. Ackerman: You will find there a statement that the work shall be done under the direction of the engineer of the company and in accordance with the plans, the following conditions, requirements and specifications.

The Vice-President: Mr. Osgood would suggest that the specifications should be referred to at the same place the plans are referred to. The committee will take that under consideration.

W. G. Brimson (Q. O. & K. C.): I would like to inquire of the committee what their interpretation of the word "capacity" is, in the phrase "two parties of capacity to contract."

Mr. Ackerman: I understand legal capacity.

Mr. Brimson: I submit that the committee should take into consideration whether the parties are able to perform. A decision has lately been made, that where parties contracted to do certain work which it was obvious they could not perform, they would be relieved of that obligation. That is to say, if a party should contract to build a bridge, he could easily build a bridge by subcontracting or in some other way perform his obligation; but if he should contract to build a ladder to the moon, it was obvious he couldn't do it, and hence, however much he might contract, the contract would be void. I believe that should be taken into consideration.

Mr. Ackerman: There is another essential element comprising a binding contract, which, according to Mr. Waite, is "a lawful subject matter, whether it be a promise, an act or a material object." It doesn't seem to me that building a ladder to the moon would be a material object. However, that might better be covered by saying "a legal or possible subject matter."

Mr. Brimson: I believe that would be better. Of course my ladder to the moon was simply to show the extremity.

S. E. Coombs (N. Y. C.): I would like to inquire whether it is possible to have these forms on letter size sheets, or whether there has been any previous action that would prevent this.

Mr. Ackerman: I hardly think that that would be a desirable form in which to present the agreement form, the idea being mainly that this form will act as a cover to a contract in which sheets or letters can be incorporated. Likewise, in the case of a small agreement, where you have to use an agreement plan, that plan can be placed in the agreement and form a part of it.

Mr. Coombs: Isn't the usual small agreement plan of such a size that it will fold over once and be letter size?

Mr. Ackerman: As a general proposition, all of our specifications are not letter size. They are usually on legal size paper. Of course, there is no objection to any railway adopting any size to suit its own convenience.

E. F. Wendt (P. & L. E): I move that this report be heartily approved as good information.

Motion seconded.

Fred Lavis (P. T. & T.): I might say for the information of Mr. Coombs, that all the contracts of the Pennsylvania Railroad tunnel extension in New York city have been made on what is practically letter size.

Prof. Allen: There seem to be two very distinct ways of reaching the specifications as part of the contract, that is, in many contracts a reference is made to the specifications "which are hereby made part of this contract," but there are many engineers in lines of municipal work who much prefer to have specifications included as a part of the contract. There are certain agreements oftentimes in specifications that are in the nature of contracts, and I would like to suggest that the committee consider those two types of contract as they take the matter up during the coming year.

Mr. Ackerman: It is the purpose of the committee to further consider that matter and, in fact, the committee has given it some consideration already. As a general proposition, we will cover that by drawing up a special condition sheet, typewritten or printed sheet, to accompany the contract for concrete masonry, or reinforced concrete masonry, or something of that kind. If possible, a great deal of consideration will be given to that subject so as to get it in a sort of standard form.

C. P. Howard (L. S. & M. S.): In a recent form of contract, with which I have had something to do on the Lake Shore, in drawing up the contract I think these words in regard to the specifications were included in the title, speaking from memory: "The plan and specifications are hereby declared to be a part of this contract."

The President: The motion before the house is that this report of the committee be received as information.

Motion carried.

MASONRY.

Sub-committees were appointed as follows:

(A) To co-operate with the "Joint Committee on Concrete and Reinforced Concrete."

(B) Collect data upon the reported failure of concrete structures and the probable cause of same.

(C) Investigate and report upon the waterproofing of ma-

sonry, covering methods, results, cost and recommended practice.

(D) Report on the use of reinforced concrete trestles, typical designs, cost and recommended practice.

(E) Present typical plans of retaining walls and abutments, plain and reinforced, with comparison and recommended practice.

(F) Report on the desirability of all monolithic construction in arches or large abutments with wing walls.

(G) Submit specifications for reinforced concrete.

Monolithic Construction in Arches or Large Abutments with Wing Walls.

A circular containing the following questions was sent to members:

1. (a) Is it your practice to build abutments with wing walls as monolithic structures, and to what limits as to height, if any? (b) If you build abutments in sections, what would be your maximum length of section for plain concrete and for reinforced concrete?

2. (a) Is it your practice to build arches with wing walls as monolithic structures? (b) If you build arch abutments in sections, what is your maximum length of sections? (c) In plain concrete and in reinforced concrete?

3. (a) Is it your practice to build up arch rings parallel with the axis of the arch? (b) Is it your practice to build the arch ring transversely to the axis of the arch, making joints between separate sections? If so, what would be your length of section for (1) plain concrete and (2) for reinforced concrete?

4. Please describe any failures that may have come under your observation of abutments with wing walls as monolithic structures to retain that characteristic, i. e., have the wings cracked away from the body of the abutments, or the abutments cracked in any way? State height of abutment and approximate length of the top of wings on the abutments and type of wing wall.

5. Please describe any failures that you may have observed of arch rings built as monolithic structures to retain that characteristic, giving thickness of wings, length and, if possible, manner of construction.

A summary of the replies shows that for bridge and arch abutments the majority use monolithic construction. In reinforced concrete the maximum sections run from 30 to 300 ft. for bridge abutments and 50 to 300 ft. for arch abutments.

Sixteen roads build arches parallel with the axis and 15 at right angles to the axis.

Cracking of the concrete is, as a rule, due to settlement in the foundation. Several report cracking due to inferior quality of material, and several that the cracks were traceable to the lack of expansion joints.

Instances of failures of abutments are of interest. One pair, 176 ft. long and 56 ft. high, broke into about three equal parts, due to settlement. Some monolithic abutments on alluvial soil and pile foundation are subject to heavy freshets. One, 33 ft. high, was scoured to a depth of 10 ft. underneath. It moved forward 14 in. and settled about 2 in. without a crack. If it had been built in sections it would no doubt have failed. Another 22 ft. abutment on sandy soil without piling scoured underneath and the abutment settled 2 ft. without cracking. The girder was blocked up and trains continued running over the abutment.

In the case of arch abutments, cracking very often occurs where the foundation is on piling or on poor foundation on account of the earth pressure being much greater at the center than at the ends. These cracks may open up an inch or more. They are unsightly, but not dangerous, and are not often the cause of a failure.

Retaining Walls and Abutments.

Your committee has collected information bearing on the practice of railroad companies in retaining-wall design. Diagrams giving dimensions of a number of representative retaining walls are included in this report, together with some description and comment. The answers to the letter of inquiry show that the practice of using arbitrary ratios of width of base to height of walls is general. These ratios are very variable and generally no attempt is made to calculate the earth pressure back of the wall in order to determine the direction and position of the resultant pressure on the foundation. The term, "width of base," is used by some to designate the extreme width of the lowest footing of the wall and by others the "neat work" above the footing, a difference in usage which has been the cause of much confusion.

The use of a fixed ratio of width to height, which seems to be common practice, leads to a neglect of the study of the distribution of the pressure on the foundation. This is a question of great importance, since it is well established that movements from the original alinement, due to unequal settlement, form a defect more common than any other. The introduction of reinforced concrete retaining walls adds another reason for requiring an anlysis of the forces and pressures. The committee therefore feels that attention should be called to the importance of making a study of each case.

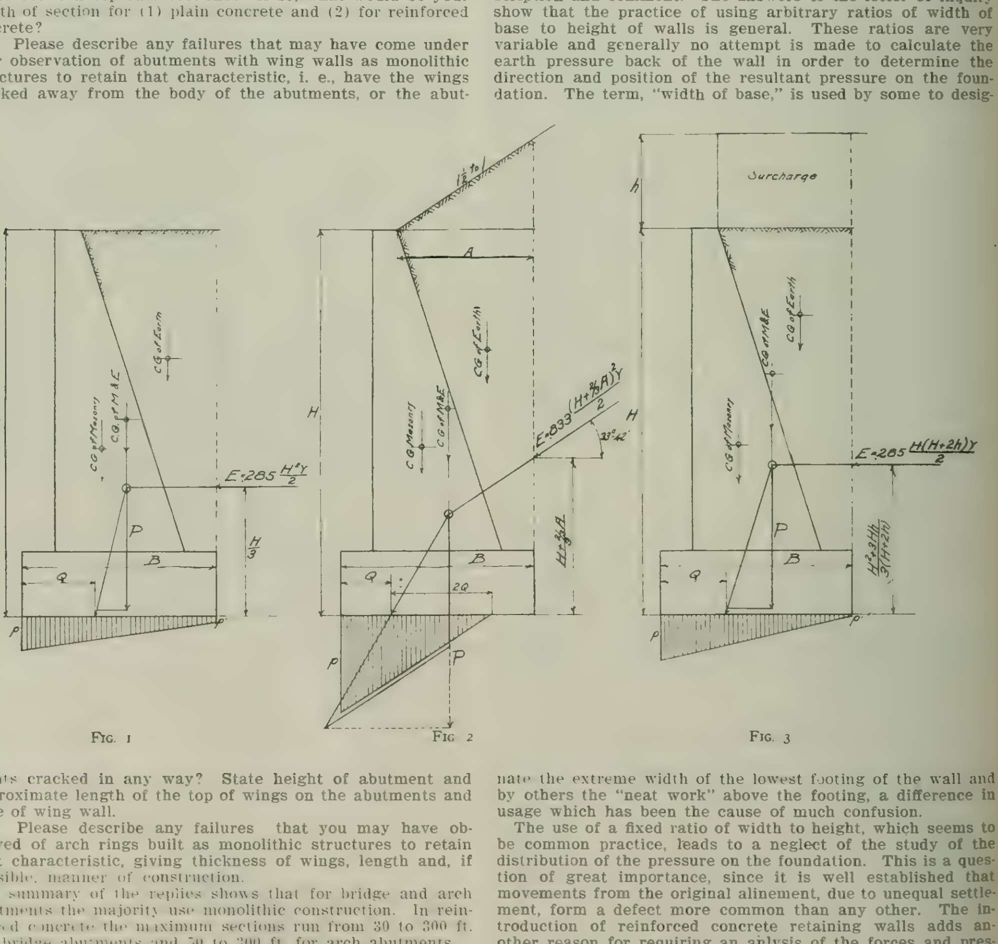


FIG. 1 FIG. 2 FIG. 3

and particularly of the amount and distribution of the pressure on the bed or foundation.

Notwithstanding the importance of an analytical treatment, the committee deems it proper to add a word of caution on the acceptance of existing formulas, with the constants usually quoted, without further investigation. There is a feeling in some quarters that the direction and amount of the resultant pressures and the distribution of the pressure over the bed are not well represented by some of these formulas. If these doubts have a sound basis, some of the present tendencies in retaining-wall design are open to criticism. The committee hopes to present a fuller discussion in a later report and possibly to obtain information on the pressures developed.

Meanwhile the committee submits the following method, which is widely published and frequently used for determining the pressures on the back and on the foundation of retaining walls. It is based on the well-known Rankine formulas, which consider that the earth is a granular mass with some assumed or determined angle of repose. In applying this method it is immaterial whether the force representing the earth pressure is considered as acting directly on the back of the wall or if it is considered as acting upon a vertical plane passing through the extreme back of the footing. In the latter case the force representing the lateral earth pressure must be combined with (1) the vertical force representing the weight of the earth prism between the back of the wall and the vertical plane considered, and (2) combined with the vertical force representing the weight of the wall itself.

If the angle of repose of the earth is assumed as 1½ to 1, the force per linear foot of wall, representing the resultant of the earth pressure back of the wall acting on the vertical plane referred to, will be as shown on the diagram Fig. 1 for the case of the top of the fill level with the top of the wall; and diagram 2 for the case of the fill sloping up from the top of the wall at an angle of 1½ to 1 indefinitely. In all cases y = the weight of a cubic foot of earth, H being taken in feet.

If, in addition to the weight of earth, the wall is to support a track load, then the earth pressure by this same method will be that indicated by the diagram Fig. 3.

In all cases the pressure on the foundation by this method will be determined by the following formulas:

When Q is equal to or greater than $\frac{B}{3}$.

$$\text{Pressure at the toe} = (4B - 6Q)\frac{P}{B^2}.$$

$$\text{Pressure at the heel} = (6Q - 2B)\frac{P}{B^2}.$$

When Q is less than $\frac{B}{3}$:

$$\text{Pressure at the toe} = \frac{2P}{3Q}.$$

Where P = the vertical component of the resultant pressure to the base.

B = the full width of the base at feet.

Q = the distance from the toe to where the force P cuts the base.

The above method seems to be as rational as any that the committee can present at this time. The constants given apply only to earth that will stand on a 1½ to 1 slope, and it must be borne in mind that the pressure on the foundation should never exceed the safe bearing pressure on the material considered.

Means should always be provided for draining the earth back of a wall, otherwise the wall will be subjected to hydrostatic pressure, which will greatly increase the lateral thrust.

The foundation for a wall should always be placed below frost. Usually a wall designed to resist overturning will be secure against sliding on its foundation, but this feature should receive careful attention. The frictional resistance on the base, combined with the abutting resistance of the earth in front of the wall, must be greater than the horizontal thrust of the earth back of the wall, in order to prevent sliding of the wall on its foundation.

A brief review of some of the wall sections reported to the committee follows. Cross-sections of these walls are shown, all drawn to the same scale, the ratio of the base to height (R) being given under each figure. Cross-sections of some designs that have failed are included and a large number of photographic illustrations of interesting walls and abutments.

Reinforced Concrete Trestles.

The Wabash Railroad has built nine of these structures, aggregating 640 linear feet. These have solid reinforced concrete decks (ballast floor) and thin piers, with relatively shallow foundations. The span is generally 16 ft. and the floor slab or deck 2 ft. 4 in. thick. The piers are 2 ft. thick at the top and have batter of ½ in 12 on each face. Vertical and horizontal reinforcement is placed near the faces. The end supports are in the form of abutments. Some of these bridges have been in place two years. No deterioration is apparent. Reinforced concrete trestles are used entirely by the Wabash to replace wooden trestles where an opening larger than can be served by a 4-ft. pipe is required.

The Burlington has over 2,000 ft. of reinforced concrete trestles in service. About 1,500 ft. are trestles built with reinforced concrete piers and slabs (ballast floor) with spans from 14 ft. to 25 ft., and about 600 ft. are trestles resting on concrete piles with spans from 14 ft. to 16 ft. and with the same type of deck. The piers are from 18 in. to 30 in. thick at the top and have the usual batter. In the pile trestles a double row of piles with a cap of extra width or a thin pier is placed at the end of every fifth span. The reinforced concrete piles used include one cast in forms in a horizontal position, and the Chenoweth rolled pile. The company is extending the use of both concrete pile trestles and pier trestles as rapidly as the wooden pile trestles on the main line require reconstruction. This type of construction is confined to places where the structures are free from excessive drift or ice.

The Big Four in 1906 built two reinforced concrete structures near Lawrenceville, Ill., one 419 ft. in length and the other 189 ft. The span is 20 ft. in the clear. [These were described in the *Railroad Age Gazette*, February 26, 1909.]

The following statements may be of value in forming a general idea of the cost of single-track structures. The Wabash states that in ordinary conditions their trestles cost about $20 per linear foot, plus $500 for the two abutments. If abutments are omitted and a free earth slope is allowed, two additional spans must be provided and the total cost will be increased. The Burlington estimates the cost of the pile trestle at from $30 to $35 per linear foot for ordinary heights The cost of the structures on thin piers and pile foundations is given as $40 per linear foot and upward. The Big Four gives the cost of their two structures as about $21 per linear foot.

The committee feels that experience with reinforced concrete trestles indicates that these structures will be a durable and satisfactory type for use in replacing wooden trestles of low and medium height under conditions which otherwise warrant the expenditure.

Specifications for Portland Cement Concrete and Reinforced Concrete.

1. Cement shall be Portland, and shall meet the requirements of the standard specifications. (See Manual.)

2. Fine aggregate shall consist of sand, crushed stone, or gravel screenings graded from fine to coarse, and passing when dry a screen having 1¼-in. diameter holes; it shall preferably be of siliceous material, clean, coarse, free from vegetable loam or other deleterious matter, and not more than 6 per cent. shall pass a sieve having 100 meshes per linear inch.

3. Mortars composed of one part Portland cement and three parts fine aggregate by weight when made into briquettes shall show a tensile strength of at least 70 per cent. of the strength of 1:3 mortar of the same consistency made with the same cement and standard Ottawa sand.

4. Coarse aggregate shall consist of crushed stone or gravel, graded in size, and which is retained on a screen having 1¼-in. diameter holes; it shall be clean, hard, durable and free from all deleterious material. Aggregates containing soft, flat or elongated particles shall not be used.

5. The maximum size of the coarse aggregate shall be such that it will not separate from the mortar in laying and will not prevent the concrete fully surrounding the reinforcement or filling all parts of the forms. Where concrete is used in mass the maximum size of the coarse aggregate may, at the option of the engineer, be such as to pass a 3-in. ring. For reinforced concrete, sizes usually are not to exceed 1 in. in any direction, but may be varied to suit the character of the reinforcement.

6. The water used in mixing concrete shall be free from oil, acid, alkalies, or vegetable matter.

7. The metal reinforcement steel shall be manufactured from new billets, and shall meet the requirements of the following specifications, and be free from rust, scale, or coatings of any character which would tend to reduce or destroy the bond.

SPECIFICATIONS FOR STEEL REINFORCEMENT.

8. Steel shall be made by the Bessemer or the open-hearth process.

9. The chemical and physical properties shall conform to the following limits:

Elements considered.	Structural steel.	High carbon steel.
Phosphorus, max..		
Basic..............	0.04 per cent	0.085 per cent
Acid...............	0.06 "	0.075 "
Sulphur, maximum	0.05 "	....
Ultimate tensile strength.	Desired	Desired
Pounds per square inch......	60,000	85,000‡
	1,500,000*	1,400,000
Elong., min. in 8".........		
	Ult. tensile str'gth	Ult. tensile str'gth
" " " 2".........	22	
Character of fracture.........	Silky	
Cold bends without fracture...	180° flat†	180° $d-4t$

*See paragraph 16. †See paragraphs 17, 18 and 19. ‡See paragraph 20.

10. The yield point, as indicated by the drop of beam, shall be not less than 60 per cent. of the ultimate.

11. If the ultimate strength varies more than 4,000 lbs. from that desired, a retest shall be made on the same gage, which, to be acceptable, shall be within 5,000 lbs. of the desired ultimate.

12. Chemical determinations of the percentages of carbon, phosphorus, sulphur and manganese shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector. Check analyses shall be made from finished material, if called for by the purchaser, in which case an excess of 25 per cent. above the required limits will be allowed.

13. Plates, Shapes and Bars: Specimens for tensile and bending tests for shapes and bars shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled; or with both edges parallel; or they may be turned to a diameter of ¾ in. with enlarged ends.

14. Bars shall be tested as rolled.

15. At least one tensile and one bending test shall be made from each melt of steel as rolled.

16. For material less than $\frac{5}{16}$ in. and more than ¾ in. in thickness the following modifications will be allowed in the requirements for elongation:

(a) For each $\frac{1}{16}$ in. in thickness below $\frac{5}{16}$ in., a deduction of 2½ will be allowed from the specified percentage.

(b) For each ⅛ in. in thickness above ¾ in., a deduction of 1 will be allowed from the specified percentage.

17. Bending tests may be made by pressure or by blows. Shapes and bars less than 1 in. thick shall bend as called for in paragraph 9.

18. Structural steel 1 in. thick and over, tested as rolled, shall bend cold 180 deg. around a pin, the diameter of which is equal to twice the thickness of the bar, without fracture on the outside of bend.

19. Finished material shall be free from injurious seams, flaws, cracks, defective edges or other defects, and have a smooth, uniform and workmanlike finish.

20. Every finished piece of steel shall have the melt number and the name of the manufacturer stamped or rolled upon it, except that bar steel and other small parts may be bundled with the above marks on an attached metal tag.

21. Material which, subsequent to the above tests at the mills, and its acceptance there, develops weak spots, brittleness, cracks or other imperfections, or is found to have injurious defects, will be rejected at the shop and shall be replaced by the manufacturer at his own cost.

PREPARATION AND PLACING OF MORTAR AND CONCRETE.

22. The materials to be used in concrete shall be of uniform quality and so proportioned as to secure as nearly as possible a maximum density.

23. The unit of measure shall be the barrel, which shall be taken as containing 3.8 cu. ft. Four bags containing 94 lbs. of cement each shall be considered the equivalent of one barrel. Fine and coarse aggregate shall be measured separately as loosely thrown into the measuring receptacle.

24. The fine and coarse aggregate shall be used in such relative proportions as will insure maximum density.

25. For reinforced concrete construction a density proportion based on 1:6 shall be used, i. e., one part of cement to a total of six parts of fine and coarse aggregates measured separately.

26. For massive masonry or rubble concrete a density proportion based on 1:9 shall be used.

27. The ingredients of concrete shall be thoroughly mixed to the desired consistency, and the mixing shall continue until the cement is uniformly distributed and the mass is uniform in color and homogeneous.

28. Methods of measurement of the proportions of the various ingredients, including the water, shall be used, which will secure separate uniform measurements at all times.

29. When the conditions will permit, a batch mixer of a type which insures uniform mixing of the materials throughout the mass shall be used.

30. When it is necessary to mix by hand, the mixing shall be on a water-tight platform and especial precautions shall be taken to turn the materials until they are homogenous in appearance and color.

a. Tight platforms shall be provided of sufficient size to accommodate men and materials for the progressive and rapid mixing of at least two batches of concrete at the same time. Batches shall not exceed one cubic yard each, and smaller batches are preferable, based upon a multiple of the number of sacks of cement to the barrel.

b. Spread the fine aggregates evenly upon the platform, then the cement upon the fine aggregates, and mix thoroughly until of an even color. Add all the water necessary to make a thin mortar and spread again; add the coarse aggregates, which, if dry, should first be thoroughly wet down. Turn the mass with shovels or hoes until thoroughly incorporated and all the aggregates are covered with mortar; this will probably require the mass to be turned four times.

c. Another approved method, which may be permitted at the option of the engineer in charge, is to spread the fine aggregates, then the cement, and mix dry, then the coarse aggregates; add water and mix thoroughly as above.

31. The materials shall be mixed wet enough to produce a concrete of such a consistency as will flow into the forms and about the metal reinforcement, and which, on the other hand, can be conveyed from the place of mixing to the forms without separation of the coarse aggregate from the mortar.

32. Retempering mortar or concrete, i. e., remixing with water after it has partially set, shall not be permitted.

33. Concrete after the addition of water to the mix shall be handled rapidly from the place of mixing to the place of final deposit, and under no circumstances shall concrete be used that has partially set before final placing.

34. The concrete shall be deposited in such a manner as will permit the most thorough compacting, such as can be obtained by working with a straight shovel or slicing tool kept moving up and down until all the ingredients have settled in their proper place by gravity and the surplus water forced to the surface.

35. In depositing the concrete under water, special care shall be exercised to prevent the cement from floating away, and to prevent the formation of laitance.

36. Before placing the concrete the forms shall be thoroughly wetted and the space to be occupied by the concrete free from debris.

37. When work is resumed, concrete previously placed shall be roughened, thoroughly cleansed of foreign material and laitance, drenched and slushed with a mortar consisting of one part Portland cement and not more than two parts fine aggregate.

38. The faces of concrete exposed to premature drying shall be kept wet for a period of at east seven days.

39. The concrete shall not be mixed or deposited at a freezing temperature, unless special precautions, approved by the engineer, are taken to avoid the use of materials containing frost or covered with ice crystals, and to provide means to prevent the concrete from freezing after being placed in position and until it has thoroughly hardened.

40. Where the concrete is to be deposited in massive work, clean stones thoroughly embedded in the concrete as near together as is possible and still entirely surrounded by concrete may be used at the option of the engineer.

41. Forms shall be substantial and unyielding and built so that the concrete shall conform to the designed dimensions and contours, and so constructed the leakage of mortar prevented.

42. The forms shall not be removed until authorized by the engineer.

43. For all important work, the lumber used for face work shall be dressed to a uniform thickness and width, and shall be sound and free from loose knots, secured to the studding or uprights in horizontal lines.

44. For backings and other rough work undressed lumber may be used.

45. Where corners of the masonry and other projections liable to injury occur, suitable moldings shall be placed in the angles of the forms to round or bevel them off.

46. Lumber once used in forms shall be cleaned before being used again.

47. In dry but not freezing weather the forms shall be drenched with water before the concrete is placed against them.

DETAILS OF CONSTRUCTION.

48. Wherever it is necessary to splice the reinforcement by lapping the length of lap will be decided by the engineer on the basis of the safe bond stress and the stress in the reinforcement at the point of splice. Splices shall not be made at points of maximum stress.

49. Concrete structures, wherever possible, shall be cast at one operation, but when this is not possible the work shall be stopped, so that the resulting joint will have the least effect on the strength of the structure.

50. Girders and slabs shall not be constructed over freshly formed wall or columns without permitting a period of at least two hours to elapse to provide for settlement or shrinkage in the supports. Before resuming work the top of the supports should be thoroughly cleansed of foreign matter and laitance.

51. In massive work, such as retaining walls, abutments, etc., built without reinforcement, joints shall be provided, approximately, every 50 feet throughout the length of the structure to take care of temperature changes. To provide against the structures being thrown out of line by unequal settlement, each section of the wall may be tongued and grooved into the adjoining section. To provide against unsightly cracks, due to unequal settlement, a joint shall be made at sharp angles.

52. The desired finish of the surface shall be determined by the engineer before the concrete is placed, and the work shall be so conducted as to make it possible to secure the finish desired. Plastering of surfaces will not be permitted.

Conclusions.

Your committee recommends the adoption of the following conclusions:

(1) The use of all monolithic construction in arches or large abutments with wing walls, where practicable.

(2) That the report on retaining walls and abutments be received as information.

(3) That the Specifications for Portland Cement Concrete and Reinforced Concrete be adopted as good practice, and substituted for the Portland Cement Concrete Specifications now appearing in the Manual.

The report is signed by A. O. Cunningham (Wabash), Chairman; W. H. Petersen (C., R. I. & P.), Vice-Chairman; W. P. Boright (N. Y., C. & St. L.), C. W. Boynton (Cons. Engr.), T. L. Condron (Cons. Engr.), Richard L. Humphrey (Cons. Engr.), H. H. Knowlton (C., C., C. & St. L.), J. M. Meade (A., T. & S. F.), C. H. Moore (Erie), R. K. Rochester (Van), F. E. Schall (L. V.), J. W. Schaub (Cons. Engr.), G. H. Scribner Jr. (Cont.), G. F. Swain (M. I. T.), A. N. Talbot (Univ. of Ill.), G. H. Tinker (N. Y., C. & St. L.), Job Tuthill (P. M.).

Discussion.

The President: In the absence of the chairman the vice-chairman, Mr. Petersen, will make the statement for the committee.

Mr. Petersen: The committee was assigned to work on seven subdivisions. The first subdivision was in connection with the joint report with the American Society of Civil Engineers, the American Society for Testing Materials, the Association of the American Portland Cement Manufacturers and this association. That committee made a progress report in the fall of 1908. It has taken that report and revised the concrete specifications and added to it specifications for reinforced concrete.

The sub-committee that was appointed to report on the failure of concrete structure collected various data in regard to a great number of failures, but it was not in such shape that we could make a report to the convention.

The report on waterproofing of masonry was a progress report, and that subject should be continued in the coming year.

As to the report on reinforced concrete trestles, the committee felt that there was not enough done by the different railroads of the country to make a definite report. But they have made a progress report showing how much has been done by the several roads which we have considered, and about what it has cost these roads to do the work.

As to the report on retaining walls and abutments, the committee has shown the various designs used by the different railroads in the country, and also shown a method of calculating the pressure upon the foundation. The committee does not feel that this is a concrete formula, and if we had sufficient data there is no question that this formula would be revised.

The report on the desirability of monolithic construction was made, as you will find in the conclusion, and the specifications for reinforced concrete had been revised and will be found in the conclusions.

The President: The chair will ask the secretary to read the conclusions in order.

The secretary read conclusion 1.

C. F. Loweth (C. M. & St. P.): I move that the recommendation of the committee be not concurred in. My reason is that the case does not seem to be conclusive. On the preceding page there are 37 railroads that report their practice, and only 17 of them are using monolithic construction. In the case of arch abutments, 34 railroads report their practice, and only 14 have a practice that conforms with the recommendations of the committee. The recommendation may be all right for certain kinds of structures, but it would be very much wrong for other designs of construction.

Mr. Petersen: The whole question hinges upon the definition of the word "monolithic." If you consider a monolithic construction as one that is continued over four or five days of work, and each portion as a part of that which was put in the day before, possibly we should change the definition; but the committee has considered that "monolithic" should really be the amount that is put in in any one operation. You could not very well, in an abutment or retaining wall, put in over 50 ft. in one continuous operation unless you were working day and night continuously, and in that event we felt that the word "practicable" would cover the case and would stop at a limit of about 50 ft.

C. P. Howard (L. S. & M. S.): I ask the committee whether this conclusion 1 means that concrete arches of large spans should be built in voussoir or not—along radial line in voussoir or not?

Mr. Petersen: I should say not, as a rule; one operation would mean one day's work, and you would have a definite separation at the end of each day.

Mr. Howard: My opinion is that it is generally considered better practice, with arches of large spans—over 15 ft.—to build the arches in pairs and along radial lines. I would like an expression of opinion from others in regard to that.

Mr. Petersen: The report shows the roads were about equally divided, that one-half built the arch ring with the concrete at right angles to the axis, each operation being a day's work, and the others laid the concrete parallel with the axis.

C. H. Cartlidge (C. B. & Q.): Inasmuch as the settlement of this question depends largely on the word "monolithic," I would urge that the motion be carried and the recommendation be not adopted until such a definition of the word "monolithic" can be set before us as will remove all doubt as to the meaning of the word.

The President: It is moved and seconded that conclusion 1 be stricken out.

(The motion was carried.)

The secretary read conclusion 2.

Mr. Cartlidge: I move that conclusion 2 be received and approved.

The President: It will be, if there is no objection.

The secretary read conclusion 3.

J. O. Osgood (C. of N. J.): I move that conclusion 3 be rejected and the matter be referred back to the committee.

The President: I think it will aid the committee considerably if there was a little discussion on the motion, giving the reasons for it.

T. L. Condron (Cons. Engr.): As the committee has spent quite a little time on that specification, and as the committee does not have in its membership some of the engineers that are deeply interested in this subject, I am sure that even without the adoption of this specification, it might be valuable for the association to give some consideration to the paragraphs of the specification at this time, not necessarily every paragraph, but some of the more important ones, for the guidance of the committee in any revision of the same.

R. L. Humphrey (Cons. Engr.): I would like to say in connection with the preparation of the present specification, that the Manual was followed as a guide and those portions of it which did not appear to be up to date were modified as they appear here. In some cases the paragraphs were not changed.

As far as the specifications relating to concrete are concerned, if the members of the association have any objection to them, we think it is due the committee that those objections be stated. The specifications as they exist and as they apply to Portland cement concrete I believe are good, and if they are not good, then it will not do any good to refer the matter back to the committee, and we, therefore, think that those who object to them should criticise them in detail; otherwise, how can the committee hope to make any

progress? If that is not done, we will come back next year with the same specification.

In the matter of the specification for steel, perhaps there may be also an equal chance for discussion and expression of opinion that will be a decided service to the committee as expressing the feelings of the members of the association on that important point. I hope the members will freely discuss these specifications in order that we may find out wherein there is objection to them.

L. C. Fritch (I. C.): In seconding the motion to refer this back, I do not wish that to be understood as any criticism on the committee's work, which is excellent, but this Bulletin containing the specifications was not in our hands in sufficient time for us to analyze the specification. I think we shall have time to thoroughly digest them. I think it would be a good idea to take up these important paragraphs and discuss them here, but I do think the association should have time to thoroughly digest these specifications before adopting them.

Mr. Osgood: In making the motion to refer the matter back, it was without any idea of showing any lack of appreciation of the work done by the committee, which has been excellent, but because it seemed to me that what was presented was not in shape to be adopted.

The President: Are there any questions the members would like to put to the committee in order to bring up discussion?

Mr. Cartlidge: I move to amend the motion before the house by asking that the whole specification be read paragraph by paragraph, so that the members can comment on such paragraphs as they desire.

Mr. Osgood withdrew his motion and the motion by Mr. Cartlidge was adopted.

The secretary read paragraphs 1, 2, 3.

B. Douglas (D. R. T.): I would like to know why the 70 per cent was put in the clause of the specification. I have tested a good many natural sands, and never yet found one that I thought in any way suitable for making concrete that did not show a strength greater than 70 per cent, and it seems to me that 70 per cent is too low.

Mr. Humphrey: This specification was taken from the recommendation of the joint committee on concrete. I take it that the gentleman does not object to a test of the material, but merely to the percentage, to show that it was up to the standard of Ottawa sand. The sands that come from all parts of the country vary in wide ranges and to start off with a specification too high would be, perhaps, bad, and for the purpose of having people test the sand and give the same careful consideration that they give cement—and in most concretes the sand itself is of as much importance as the cement which binds it together—we believe it is desirable to have that percentage not too high. It is probable that in many sands that might be raised, but I do not believe any one is prepared to say where it should be, and I believe that 70 per cent, as a starting point, is conservative.

Mr. Osgood: I ask why it is necessary to make any reference to Ottawa sand? Why should we not specify the mechanical strength? We do not know anything about Ottawa sand unless we secure a sample of it, but we do know about the sands we get and what we can get from them. I do not believe there is any difference in ordinary good sands in the strength of the product. I cannot see any good reason why we should make any reference to Ottawa sand.

Mr. Humphrey: The only reason is that in the standard specification for Portland cement, standard Ottawa sand is called for, and it seems desirable to adhere to that sand as a measure of standard. It is true you may be able to get a figure for your particular locality, but to make a broad general specification you cannot express it in figures, and there is a decided variation, as shown by many tests, in the quality of sands apparently of the same character in different parts of the country, and the only way the real Ottawa sand can be determined is by physical test and not by visual inspection.

Mr. Osgood: Would it not be well to specify so many pounds to the square inch?

Mr. Humphrey: The object of this is to correlate it with the test of cement, and to fix an arbitrary standard would not apply to all parts, but if you use as a basis the percentage of what you get with the cement and Ottawa sand, you get a definite basis.

Mr. Osgood: It seems possible to take neat cement and make a test of that kind which would give information as to the cement. I do not like the idea of lugging in some special sand, of which we must procure samples to test our cement.

Mr. Humphrey: I think perhaps the gentleman is somewhat confused in his ideas concerning the matter. The idea of this test is to get the strength from the mortar box, and the strength from the sand depends on the gradation, size of particles, surface coating, and a number of other elements, and the only way in which you can tell if the sand is suitable is to make mortar and see what strength you get, compared with your laboratory test of the same screenings of Ottawa sand.

Mr. Osgood: I still cannot see why we cannot be satisfied with our local sands if we know they will produce the results.

Mr. Humphrey: I feel in the matter of concrete, which is one of the materials that is coming into greater and greater use in railroad construction, that it is high time that we began to study some of the other materials that enter into its makeup and specify more rigidly as to the qualities of the materials that enter into the composition of concrete, besides the cement. Standard Ottawa sand seems to be, after many years of research by the committees of the American Societies of Civil Engineers, and the committees of this association and others, to be a good standard, and this committee is simply endorsing that standard and simply saying, to measure the value of the sand you are going to use with the concrete, you should compare its strength with Ottawa sand concrete made out of the same cement and same consistency of sand. You have to use it in testing your cement, and we do not know of any other standard which has received such general approval.

The President: There will be no vote taken on the paragraphs, but the discussion is for the information of the committee.

Mr. Condron: Possibly Mr. Osgood failed to take account of the fact that paragraph 1 of the specifications reads: "Cement shall be Portland, and shall meet the requirements of the standard specifications. (See Manual.)" Referring to the Manual, page 110, under "standard sand," it says: "For the present the committee recommends natural sand from Ottawa, Ill.," etc. We have not attempted to revise this portion of these specifications, but this is all a part of the recommended practice in the Manual.

The secretary read paragraph 4.

Mr. Loweth: I can say, without fear of contradiction, that good, clean crushed stone with the dust in it and fine particles due to the crushing, makes an excellent quality of concrete, and I see no reason why we should make a specification that excludes the fine screenings.

Mr. Humphrey: Would you prefer to have the crusher run?

Mr. Loweth: Yes.

Mr. Humphrey: The idea of the specification was to separate the coarse aggregates and the fine aggregates. The fine aggregates to which you refer can be used under paragraph 2. There is no attempt to rule out the crusher screenings.

Mr. Loweth: Do you mean they shall be handled separately?

Mr. Humphrey: Not necessarily, but we think it preferable to separate the two.

Mr. Loweth: We think it not preferable to separate screenings from crushed stone, because when they are separated it is harder to get a uniform mixture than when the screenings are left with the stone. We prefer in summer to have the stone dusts which come from the crusher.

F. Lavis (P. T. & T.): I think the recommendation of the committee is the better one in this case, on account of the difficulty in determining the amount of fine material in a crusher stone. I have had considerable experience in that line and if you use run-of-crusher stone it is undoubtedly difficult to get proper proportions of fine and crushed stone.

O. P. Chamberlain (C. & I. W.): In regard to the use of stone screenings, in speaking of the recommendations of the committee, I think the committee's recommendations are now in proper form. The commercial stone as it is sold by most of the concerns that handle that commodity is screened at the crusher. Those screenings are a simple product, and mixing it with concrete, you can use it in place of sand. While I believe as Mr. Loweth has said, that crusher run produces a very good concrete, there should be some means of determining the amount of screenings you are using in a concrete, and you cannot do that unless you have the screenings separated from the larger stones of the aggregate before the mix is made. It seems to me that No. 2 in the specifications covers the screenings proposition and should stand as it is.

The secretary read paragraph 5.

Mr. Cartlidge: I would suggest that the whole of the last sentence under paragraph 5 be left out. The question is entirely covered in the first sentence. I think the committee must have had in mind that reinforced concrete is made invariably in sections. There is no reason why reinforced slabs cannot be made with 3-in. stones. I do not think we should be limited to 1 in. stone.

The secretary read paragraphs 6 and 7.

Mr. Cartlidge: There is another statement in paragraph 7 which is apt to cost us some money. It is pretty well understood, I think, that rust in small amounts on reinforcing rods is not objectionable and that the rust is absorbed by the concrete soon after the rods are placed in position. I think the section should be modified by making it read, "and be free from injurious or excessive rust, scale or coatings of any kind."

Mr. Humphrey: I think the clause covers that. It does not say it shall be free from rust, but free from rust which will tend to reduce or destroy the bond.

The secretary read paragraph 8.

Mr. Humphrey: The committee strikes out "Bessemer or the" in paragraph 8.

The secretary read paragraph 9.

Mr. Petersen: The table in paragraph 9 was changed at a meeting of the committee, and the 0.085 in the high carbon steel was changed to 0.088, and the 1,400,000 was changed to 1,200,000.

Mr. Cartlidge: I wish to protest against the exclusion of Bessemer steel from use in reinforced concrete. It is true that in small pieces, certain variations will occur in the character of the material, but they are very readily taken care of in the large factors of safety which are used in designing reinforced concrete. I do not believe Bessemer steel should be omitted.

J. P. Snow (B. & M.): I assumed the omission was made in paragraph 8, to make it conform to the table of physical requirements. Bessemer steel could not be produced as it is now made in this country to conform to the limits shown in this table.

J. E. Greiner (B. & O.): I do not think the committee has fully considered the question of the character of steel to be used in reinforced concrete. I do not see why the steel used in the reinforced concrete should not be just as good as steel used in any other class of construction. The specifications that this association has adopted for bridges and structures of that character, call for a steel which is suitable for reinforced concrete. It is a good steel, and is recognized as a proper quality. They propose here to use a high carbon steel, the only result of which will be the skinning down of the amount of material that is used for reinforcing concrete to a degree that it will be made of inferior material, and it is doubtful if it can be obtained in accordance with the specifications.

Mr. Cartlidge: I am not prepared to state what limits should be placed on the requirements for Bessemer steel, but I take exception to the statement that low carbon is best fitted for use in reinforced concrete. I believe the contrary is true, and a high carbon steel should be specified; and as to that I think the committee has taken the proper stand, and I believe they have already changed the limits in such manner as will provide for the safeguarding of the material. I think the Bessemer should be included.

Mr. Greiner: I do not think Bessemer should be kept in. It is not used except for an inferior grade of work. You can get open-hearth steel of the same quality as Bessemer steel. It is recognized that open-hearth is better than Bessemer—more uniform and more desirable all the way through. If there is a choice between two materials at practically the same price, and one much better than the other, I do not see why we should use the Bessemer, and I think it should be eliminated.

The secretary read paragraphs 10 and 11.

Mr. Petersen: The committee has changed the wording of paragraph 11 to read as follows: The ultimate strength of structural steel shall not vary more than 5,000 lbs., and the high carbon steel more than 8,000 lbs. from the desired ultimate.

The secretary read paragraph 12.

Mr. Condron: We may save time if I mention that the next few paragraphs are copied directly without change from the specifications that have already been adopted by this association for structural steel, and as they just involve these same figures, it may not be necessary to take them up in detail. The next paragraph that has any change in it, as I recall it, is paragraph 20, but that is the only succeeding paragraph in which there has been a change made in the structural steel.

Mr. Loweth: I would suggest that a little more study be made of this page and the next. We have two kinds of steel reinforcement. The simpler kind consists of rods and bars, and the more complicated, of shapes and plates, riveted or otherwise fastened to gether. I think the committee could simplify the requirements for reinforced steel so as to make the structural steel conform to the specifications already approved by the association, and then make a more comprehensive and clearer specification covering just plain bars and rods.

Mr. Condron: That was discussed in the committee, and I believe it was the sense of the committeee, although there was not a full attendance, that the high carbon steel specified here should be limited by a clause saying that the specification applies to rods and bars only. It was not intended to be applied to shapes or other material that might be punched and otherwise treated before it goes into the structure. I think the committee will make that change and perhaps clear up the matter Mr. Loweth has suggested.

The secretary read paragraphs 20 to 26.

C. S. Churchill (N. & W.): No. 26 says "a density proportion based on 1:9 shall be used." Is not that too positive?

Mr. Snow: I think what Mr. Churchill says in regard to 26 will also apply to 25. I think the committee should ameliorate that condition a bit.

The secretary read paragraphs 27-29.

Mr. Chamberlain: I see in paragraph 29 that reference is made to a batch mixer. I ask the chairman of the committee whether the matter of a continuous mixer was discussed in the committee. I presume it was. There are continuous mixers on the market that do satisfactory work at the present time, and I think it will be only a question of a year or two when they will be more satisfactory. That is the logical machine if it can be built to produce a proper mixture.

Mr. Humphrey: The committee is of the opinion that one of the most important things in the mixing of the concrete is to get the greatest strength out of the material, and certainly many forms of the continuous mixers on the market do not do that. One of the main essentials is that all ingredients in the mixture shall be kept continuously together for a period of not less than one minute, and the committee, therefore, indicated what they believed to be the best practice, and the surest means of getting the best practice, and they committed themselves to the type of batch mixer. If a continuous mixer is devised that will fulfill the requirements, that term "batch" could be stricken out.

Mr. Loweth: It seems to me we are not exercising care enough when we use the terms "best practice," "good practice," and "recommended practice." Now, the proposition is that these specifications shall be put in the Manual. The Manual is not a Manual of Good Practice, nor a Manual of Permissive Practice, it is not a Manual of True Practice, but it is a Manual of Recommended Practice, and I feel that it is a fair inference from that that it is not desirable to put anything in the Manual other than recommended practice.

Now, there may be several ways of making concrete. There may be a choice in these several ways, and I do not see why we should put our seal of approval on one method and condemn other methods, which in many cases will give just as good results, or in many cases will give fairly good results.

Mr. Humphrey: At the discussion of this question with the several joint committees, that point raised by Mr. Loweth was considered, and the word "batch" was omitted by the committee. The original specification called for a mixture which would produce a homogeneous concrete, not specifying the type of mixer. The committee, however, thought it best to insert "batch." I think the committee will now be willing to accept the suggestion to leave that word out.

The secretary read paragraphs 30-35.

Mr. Osgood: In paragraph 31 it says: "The materials shall be mixed wet enough to produce a concrete of such consistency as will flow into the forms and about the metal reinforcement." Was it the intention of the committee that it should be wet enough to flow without tamping? The concrete, unless it is mere slush, will not flow around the metal spaces unless it is tamped.

Mr. Humphrey: The committee's intention was that this flow should be helped by the aid of a slicing tool.

Fred Lavis (P. T. & T.): In regard to that same paragraph, it is sometimes difficult to carry out that provision entirely. For instance, in the construction of tunnels, the mixer is on the outside and the concrete must be carried a long distance to the point where it must be deposited, and it usually does separate to a certain extent. It seems to be better to allow it to do that than to make it dry so that it will not separate. That is overcome to a certain extent by a second mixing when it gets to a point where it is to be deposited.

Mr. McDonald: In the clause about depositing concrete under water, I think it would be well for the committee to emphasize the importance of guarding against laitance, not only at the point where the concrete is under water, but where it is deposited in forms. I recall instances where laitance has appeared in the filling columns and resulted in repairs to the building after the construction of it.

Mr. Osgood: I have an instance in mind where a pier for a double arch was spoiled by too much laitance, the work having been left at a critical period for a short time, and it was necessary to take down a considerable portion of the concrete.

Mr. Condron: Both those points are provided for in paragraph 50.

The secretary read paragraphs 36-40.

Mr. Snow: I suggest to the committee that they insert something as to the minimum distance for these imbedded stones, depending on the size of the pieces of the aggregate.

The secretary read paragraphs 41-47.

S. E. Coombs (N. Y. C.): There is a good deal of similarity between 36 and 47, except for the words "freezing weather" in 47.

The secretary read paragraphs 48-51.

Mr. Osgood: In paragraph 51, 50 ft. is given as the length and I think that is about right. We have usually found that a little less than 50 ft. could be obtained, and this was preferred. It also says: "To provide against unsightly cracks due to unequal settlement, a joint shall be made at sharp angles." That is the last sentence in the paragraph. It occurs to me it might be well to make some reference to the desirability of making a joint by means of triangular chips of wood, or otherwise, on each line where the two sections come together. We found it added very much to the appearance of the work, and that such cracks as occurred were confined to well defined lines, fixed by these triangular pieces of wood inserted in the forms.

Mr. McDonald: In connection with 51, I suggest the committee consider the advisability of expansion joints in the building.

Mr. Coombs: In paragraph 50, I suggest the committee outline more thoroughly what they mean by "thoroughly cleansed." That point was up for considerable discussion in the American Society of Civil Engineers, and the word "thoroughly" was understood differently by different people.

The secretary read paragraph 52.

W. H. Courtenay (L. & N.): I would suggest that an addition be made to the specification, in reference to dropping concrete from a great height, or shooting it down a chute from a great height. That is being frequently done.

The President: The committee will give due consideration to the points brought up.

Mr. McDonald: I suggest the committee request the members present to voice their objections now to any clause in the specifications which have not already been objected to, in order that the committee may have some basis on which to work the coming year.

The President: Or send it in writing, gentlemen, if you prefer.

W. F. Steffens (C. C. & O.): Was it the sense of the gentleman in the rear of the room that the high limit in reinforced rods be eliminated or continued?

Mr. Humphrey: There were two gentlemen discussing it, one in favor of eliminating the high carbon steel and the other in favor of retaining it.

Mr. Petersen: In addition to the report which has been submitted, we should like to have incorporated in the proceedings a progress report of the Joint Committee on Concrete and Reinforced Concrete; also the report on Concrete Trestles, shown in appendix D.

Mr. Humphrey: If I may be permitted to say a few words in connection with the Joint Committee report, I will state that the committee had voted to present this report as an information report. Through a misunderstanding the secretary of the association failed to incorporate it in Bulletin 108, and the reports of the Joint Committee which were distributed here were furnished in order to supply that omission.

This Joint Committee report was prepared and asked to be presented to the several societies and received as information, with the idea that it would be of value and interest to the several societies in the absence of an ability to reach a conclusive report. Of the thirty-three men composing the committee, twenty-seven voted for the report, four against and two not voting. On the basis of voting members there were fifteen votes for it and four against it, and the committee is now desirous that this be simply printed as information.

Mr. Schneider: Mr. Chairman, I would like to call attention to the fact that I am the chairman of the Joint Committee on Reinforced Concrete, and the chairman has a minority report signed by four members. That minority report has been suppressed.

Mr. Humphrey: I can say on behalf of the committee of this society that there were 3 members and 2 alternates and they simply presented the majority report of the committee as their report. The report to which the chairman referred was a report to the American Society of Civil Engineers. There was no minority report presented to the Joint Committee. The report presented here is a majority report to the Joint Committee and presented by the committee of this society, there being no minority report by any of the members.

Mr. Schneider: It is a misnomer. This report which is circulated around here is called a report of the Joint Committee.

Mr. Humphrey: As a matter of information, I would state that this committee was not aware there was any minority report presented to the Joint Committee.

Mr. Schneider: I call attention to the fact that the chairman has taken all the responsibility for that report.

ECONOMICS OF RAILWAY LOCATION.

The committee on Economics of Railway Location submitted a progress report. W. B. Storey, Jr., (Santa Fe), chairman of the committee, said:

As I understand it, the rules of the association require a report to be printed. No report having been printed there is practically nothing to be said before the association at this meeting. There has been no meeting of the committee during the year. The membership is scattered throughout the United States and it has not been possible to get them to meet and nothing has been accomplished which can be reported to this association.

ELECTRICITY.

The committee on Electricity made a progress report. S. E. Coombs (N. Y. C.) Chairman of the committee, said:

The committee on Electricity, which, with two exceptions, is the special advisory committee appointed by the Board of Direction to report upon the propriety of establishing a standing committee, held two meetings as an advisory committee and outlined a certain portion of the work. That committee has recently been appointed a standing committee, but has done no work since its appointment. The committee is at present getting together with the idea of beginning work.

CURING SLIDES AND WASHOUTS.

In Appendix C of the report on Roadway the committee gives a digest of interesting and instructive replies to a circular of inquiry sent to members of the association, which treat of various phases of the subject of curing slides and washouts. From these the following have been taken:

Richard M. Garrett (Resident Engineer, M., K. & T.):—The revetment put in by the Missouri, Kansas & Texas along the Missouri river, for shore protection, is built similar to those along the Missouri river, which have been made by the Missouri River Commission, and averages about 60 ft. in width. The first work put in by this company was during 1897, and extends from the east city limits of St. Charles down the river for 9,000 ft. A rock dike was first built out into the river, and a boom made of heavy timbers was anchored to lower side of dike, and laid parallel with it. From this boom the mat was started, having its full width at the beginning. The mat was first woven and sunk, and then the bank was graded by hydraulics to a slope of 2 to 1, and then paved from the top down.

In 1903, work was extended 3,000 ft. down the river, and was done in the same way as the first section, with the exception that the mat was anchored at the starting point with piles instead of the boom.

In 1906, revetment was again extended 7,200 ft. On this last section the bank was graded to a slope of $2\frac{1}{2}$ to 1 in advance of weaving the mat, as considerable trouble had been experienced on former work, on account of material from the bank covering the mat, so that a connection between paving and mat could not be properly made.

Grading on this section was done with a small hoisting engine on a barge, as follows: A derrick was erected on barge, having a boom long enough to reach the top of the bank to be graded, a No. 3 wheeler scraper pan was pulled along this boom from the barge to the top of bank, by a mule on the bank, and was held in place by two men and filled, and then dragged down the bank by the hoisting engine. The beginning of mat was anchored to deadmen on top of bank about 200 ft. up stream, and weaving was begun about 100 ft. back on the old mat, so that full width of new mat was gotten where the unprotected bank commenced.

In 1908, 4,000 ft. of revetment was put in on the north side of the river just above Boonville bridge. At Kingsbury, there

is a siding on the west side of main line, and out of the south end of this track the spur was built to the river; this required a main track 6,500 ft. in length, and a spur track 900 ft. in length. Track was laid about 5 to 20 ft. from top of bank all along where revetment was to go in, so that rock could be unloaded and used with as little handling as possible. The bank was first graded to a slope of 2½ to 1 by teams; the mat was then woven and sunk, and the slope paved from bottom up. It is the description of this last section that will be given, as the only differences between this and other works are those mentioned.

The bank was about 18 ft. higher than what was taken as the average low water; the soil is mostly a very fine sand and very little gumbo; the bank was clear of timber and brush, but there were several large snags along where mat was to lay that were taken out by sawing, blowing-out and using teams and line.

Shovelers first dug along the top of the bank and shoveled down all the perpendicular and overhanging points, so as to make it safe for a mule to walk along close to the edge; then a two-mule team plowed two or three furrows as close to the edge of the bank as team could be gotten. The mules were then hitched to a "go-devil," constructed of two 2x10-in. plank 8 ft. long, fastened together at the front end and flared to about 4 ft. at the back end; it required one man to drive the mules and one man to weight the drag. This was then run along the back side of furrows, and the loose earth shoved toward the river. After the bank began to slope, two or three slips were put on, and the bank brought to the desired slope.

It will be seen that only about half of the material in slope is moved, as the excavation makes the fill and does not wash away, as it does when grading by hydraulics. It was found that with this material the filled portion was as solid as the natural surface. Grading was never carried further than 200 ft. in advance of weaving, as the barges from which the mat was being woven would protect the bank from the current for this distance. .

The mat was woven 60 ft. wide with a selvage edge on the out-stream side, and sunk parallel with the shore with the inner edge about 3 ft. above the average low water. The mat was strengthened with five double rows of ¾-in. galvanized steel cable—7 strands to No. 11 wire—laid longitudinally one above and one below, and anchored with a double row of similar cable laid transversely every 15 ft. and fastened to deadmen, buried 3 ft. deep and located 15 ft. back from the upper edge of slope. At every intersection of the longitudinal with the transverse rows, the four cables are fastened together with a ⅝-in. "U" clip. The transverse rows are fastened to deadmen by wrapping one cable around the deadman twice and then fastening it to the other cable with two ⅜-in. "U" clips. The deadmen are pile butts about 3 ft. long, and the object in fastening the cable to them, as mentioned, is to allow the cables to slip when loaded, so that the same strain will be on both the under and upper cables. The willows were cut from bank of river about one mile above mat, and were hauled by wagons, hauling about 1.6 cords to the load. The road was bad at times, and it required a snap team to pull out of the mudholes, but most of the time the road was in good shape. It required 0.6 cord of brush to 100 sq. ft. of mat; average thickness of mat, about 18 in.

Weaving was started at a point at the upper end and gradually widened out to full width, anchors being placed for longitudinal cables in the top of the bank about 100 ft. above the upper end. The mat was woven with four small bags fastened together, so as to make the desired width. Fingers of skids were built on barges out of 3x12-in. plank, 24 ft. long, and spaced 5 ft. apart, extending from the water level on upstream side to an elevation of 3 ft. above floor of barge at a point about 3 ft. back from down stream side. Spools of cable were set under the down-stream ends of the fingers at the proper position for the under longitudinal cables, so that cable would unwind as the barge was let down stream. The barge was anchored at the shore end to the track, and at the upper end to the mat that had been woven. The mat was woven on the barge as high as the fingers would permit, and cable and clip men would pull the under cables through the mat by means of an iron hook about 2 ft. long, and the top longitudinal cables were run under these, and all were fastened together with a ⅝-in. clamp. The barge was then pulled from under the mat with a team, and anchor ropes slacked just enough so that about 3 ft. of mat would be left on fingers. Top longitudinal cables were cut off of reel on shore in lengths of about 100 ft., and spliced together with a square knot on mat, as the work proceeded.

The mat was sunk and held down with stone weighing from 30 to 50 lbs. An average of 1.5 cu. yds. of stone being used to the 100 sq. ft. of mat. Rock for sinking was unloaded from cars onto shoulder of slope and wheeled in wheelbarrows out onto the barge, anchored lengthwise across the mat, and dumped along the edge of barge. The mat was sunk from the shore side out, so that it would settle away from shore and the transverse cables would tighten up. Sinking was kept at least 100 ft. back from weaving barge to prevent pulling the mat off of barge. When the water was higher than the proper elevation for the shore side of mat, it was sparred out, so that in sinking it would settle to its proper position.

The rock for paving the slope was unloaded from cars onto slope and rolled down to the bottom, where paving was begun. Paving is 10 in. thick, and was paved from the bottom up, care being taken to fill all the cracks with small stone. At the upper edge of paving, spawls were piled so as to keep the surface water from washing under the paving and starting it to roll. As long as the water was low, a good connection was gotten between paving and mat, but there were parts of this work that were paved during high water, and the rock slid in afterward, making repairs necessary. The work done on the first section in 1897 is in very good shape today. The mat has rotted where it has been exposed to the air, but the paving is in good condition.

There have been some slides on the work done in 1906. At these places it was found that the rock was settling under the edge of the mat. These were places where the bank had washed after mat had been put in, and the mat does not lie up on the bank as it should.

Considerable trouble has been experienced on account of the eddy caused by the end of revetment. At Boonville bridge, the revetment ends at an old rock dike, and no difficulty is expected at that point but at all of the other places it has given trouble. At the end of the work done in 1906 it is probably more noticeable. The revetment at this place was ended at a place where the bank extended out into the river 400 or 500 ft., and now the bank is 100 ft. further in than the revetment, and the revetment has been repaired twice on account of the river washing behind the end, and allowing the rock to fall in.

The cost of the Boonville revetment is as follows: Cost per lin. ft. for 60-ft. mat; banks 18 ft. above low water; laborers paid $1.50 per day; foremen $4.00, and teams, $3.50. This does not include interest on investment or make allowances for rainy days and moving, but is the actual cost. The contractors' profit is included in the track work only:

Grading bank, per lin. ft.			.13
Weaving mat			.410
Sinking mat			.110
Paving slope			.230
Willows, including cutting, hauling and unloading, and price paid landowner			.340
Rock, at 0.75, delivered on site (2.3 cu. yds. to the lin. ft.)			1.730
Unloading rock			.120
Spotting cars with teams			.004
Hauling deadmen and cable			.018
Taking out snags			.030
Cable and Clips:			
1260—⅝-in. clips @ .06	75.60		
746—⅜-in. clips @ .035	26.16		
107150—¾-in. cable @ 1.00	1071.50	1173.26	.300
Deadmen, 270 @ 50 = $135.00			.035
Track, 7500 lin. ft.			
Labor, grading, including contractors' profit	1581.90		
Labor, laying	1493.20		
Taking up	1000.00		
	4075.10		
Bridge across draw	460.00		
	4535.10		1.140
Grading spur to quarry, $393.50			.074
Total cost per lin. ft.			$4.67

W. S. Kinnear (Assistant General Manager, Michigan Central): The writer has had quite a little experience with embankment slides, under various conditions, and recalls a side-hill embankment which gave us endless trouble from the first heavy rainfall after its construction until slide was finally checked, which will be explained hereafter. As mentioned, the embankment was on a sidehill, and initial steps to remedy the trouble consisted in hauling material by train and filling as rapidly as bank would go out below. It was found after a short time this would be practically an endless performance,

and measures were taken to ascertain the cause of the slide. A careful examination of the slope on the upper side disclosed a sloping waterbearing stratum of clay, some 8 or 10 ft. below the actual surface of the sidehill. For a considerable time after each heavy rainfall the top of this waterbearing clay would be thoroughly saturated, and it was found, in case of any disturbance below, the weight of the embankment would produce immediate slipping or sliding on the smooth clay. It was thought best to intercept the water from above and let the surface of clay, carrying the embankment below, dry out. This was done by means of a sheet piling ditch, about 3 ft. wide, some 15 or 20 ft. above the embankment. The sheet piling was driven a sufficient distance in the clay to secure firm footing and to prevent distortion. The material overlying the clay was excavated within the limits of the sheet piling, thus forming a ditch, which was carried to a waterway through the embankment to an outlet below. No further trouble was experienced, and the embankment held. It might be mentioned in this connection that a short time prior to the construction of the sheet piling ditch on the upper side one or two rows of piles were driven near the lower slope of the embankment, hoping in this manner to form some resistance to further slipping. The piles did absolutely no good, and were carried down and out of position by the slipping bank in a very short time. The writer thinks it is of the utmost importance, in case of either embankment or excavation slides, to immediately ascertain the cause, and thus save a great many false moves, which, at best, are very expensive.

The writer has also had trouble a great many times from old embankments, and has in mind one or two cases where high banks, some 20 or 30 years old, gave considerable trouble after periods of ordinary rainfall, due to conditions which we could not discover. We found the best treatment under such circumstances was to build perpendicular blind drains down the slopes, connecting with a similar blind drain parallel to the foot of the embankment. These drains were placed from 50 to 100 ft. apart, as conditions seemed to demand, and consisted of an excavated trench some 3 or 4 ft. deep, filled with one-man stones. These were carried entirely down the slope and brought up against a similar trench filled with stone carried along the foot of the slope throughout the length of the slide. We have not found one single instance where this method was not effective in stopping trouble.

It has been the writer's experience that slides in old embankments were likely to occur after the construction of a second-track roadbed. This was undoubtedly due to an interruption of the drainage and pressure of the new bank upon the old. Our method of treatment in such cases was similar to that described immediately above.

The writer has found from experience that landslides are very difficult to contend with, and in the majority of cases about the only remedy which can be applied is to keep the track as near grade as possible and wait for a new and permanent condition of the slope to become established. A study of the possibility of diverting certain surface water is always advisable under such conditions, and, in some cases, may prove of benefit, although we have always found, where a mountain side or steep sidehill is disturbed by the construction of a line of railroad, trouble will undoubtedly be experienced, which it will take years to overcome. The writer is not a believer in driving piles either in embankments or excavation to hold sliding masses.

W. A. McGonagle, First Vice-President of the Duluth, Missabe & Northern, describes two separate cases of slides that he took care of when Assistant Chief Engineer of the Duluth & Iron Range Railroad.

(1) An excavation was made for a grade reduction in a cut where the material was red clay mixed with quicksand. The depth of the cut, when finally completed, was approximately 35 ft. Considerable difficulty was experienced with slides, particularly on the up-stream or drainage side of the cut. Large cracks appeared in the material, these cracks being almost in a vertical plane. The slides were removed by the steam shovel, but the trouble did not cease until a row of cedar piles, placed 3 ft. apart, center to center, and reinforced with wallings of old bridge timber, securely bolted to the piles, was placed in position. The loose material behind this row of piles was then properly sloped. The surface was covered with manure and seeded with clover. This construction has been giving excellent service for more than ten years and no trouble has since been experienced from further slides.

(2) The approaches to the ore docks at Two Harbors consist of timber trestles supported on piles. The material into which these piles were driven was red clay mixed with quicksand, very similar to the material indicated in the preceding paragraph. The material was sloped in an angle of 2 horizontal to 1 vertical. Slides and cracks similar to those described above were experienced and in one case serious trouble resulted in pushing the trestle out of perpendicular. All kinds of experiments with drains and cross drains and with seeding the slopes were tried, none of them being successful. The slope was then changed to an angle of 4 horizontal to 1 vertical. This work was thoroughly done. The surface was then covered with manure and seeded with clover and no further trouble has been experienced during the fifteen years since the slopes were flattened. The height of the embankment at this point was approximately 60 ft.

R. Budd (Chief Engineer, Panama Railroad): The slides which we have encountered on the Isthmus are due principally to two causes: First, the inclined surface of the underlying strata of rock, and second, the unusual amount of rainfall. While it is necessary to study the conditions at each particular slide in order to arrive at treatment which it requires, there are some general conditions which apply more or less in every case. Among these, the writer would consider the prompt and effective removal of water, in order to prevent it reaching the impervious stratum of rock and flowing along it, thereby causing the overlying material to slip. The writer believes that it is an economy to establish such drainage, even at very great cost. We have used sluice boxes around the brow of a hill far enough back of the slope to be safe, and have also used V ditches lined with concrete, and make it a practice always in finishing cuts where sliding material is indicated to hand-dress the face, leaving the surface smooth to encourage the water to run away readily without giving it opportunity to soak into the side of the cut, as would occur if it was left rough.

In making large fills against a steep hill, where the additional weight of the embankment caused sliding, we have effectually prevented slides and stopped them by making a fill at a lower elevation and at a distance at one side about equivalent to 2-to-1 or 3-to-1 slope line, so that the filling at the toe of the proposed embankment would act as a balance to hold the side hill in equilibrium. Piles or retaining walls built of concrete or masonry placed at the toe of the slope act in the same way, but for preventing slides when making embankments of over 50 ft. in height, piles have not proven effective here, either because they do not get sufficient penetration in stable material, or, if they do, the force of the slide is sufficient to break the pile.

We have done very little in the way of building retaining walls, principally because on the Isthmus there is an abundance of excellent material for filling, and it has been cheaper to weight down the toe of the slope with excavated material from the Isthmian canal, which does not represent any cost except the handling.

In swamps the writer has found sinkholes that could be held in shape for operation by placing in them nothing but very light material, such as sawdust, barrel staves, cinders, machine crates, and the like, but in such cases it has required constant filling to keep the track up to grade, and it is the writer's opinion, based on borings which we have made, that such sinkholes are caused by a very soft material extending to a great depth and extending for considerable width in each direction, so that the entire mass may be likened to a large body of jelly, which affords no resistance to pressure in any one direction. In handling such a place, the writer would recommend a thorough investigation of the sub-strata with diamond core drills, and if this non-supporting material does not extend to too great a depth, he would recommend filling with heavy material, remedying the trouble permanently, but if the depth is more than 50 ft., he would consider it a very hazardous undertaking to attempt to fill it and try to keep the road open for traffic at the same time. If practicable, the writer would build a temporary run-around track to carry traffic and use the permanent line only for dumping material.

W. C. Curd (Assistant Engineer, Missouri Pacific): The writer would call attention to a new form of riprapping which is being used in the South to some extent. This is known as anchor riprap. It consists of mats built of poles and brush wired together in the form of cells or pigeonholes. Each cell is about 8 or 10 ft. square and 6 ft. deep. The bottom is made as tight as possible with brush, but the walls and covers are loose to permit water to circulate and to deposit sediment in the cells. These mats are floated to place and are anchored at the desired point at low-water height. During flood conditions sediment is gradually deposited in these cells and the entire mattress soon sinks to a permanent rest. This method is claimed to be a splendid success.

MEETING OF THE RAILWAY SIGNAL ASSOCIATION.

The annual meeting of the Railway Signal Association was held on Monday, March 16. The principal feature of the meeting was the debate at the afternoon session on the report of Committee No. 1 on "Signaling Practice" for the purpose of coming to a better understanding of varying practice.

The following question was submitted: "Resolved that the Scheme of Railway Signaling Presented at the Washington Meeting is the Best Scheme of Signaling Devised to Date."

The speakers for the affirmative were Mr. W. H. Elliott, of the New York Central & Hudson River, and Mr. C. C. Anthony, of the Pennsylvania Railroad; for the negative, Mr. L. R. Clausen, of the Chicago, Milwaukee & St. Paul, and Mr. T. S. Stevens, of the Atchison, Topeka & Santa Fe.

A large chart was used to display the system of indications passed upon by the association last fall, called Scheme No. 1. On the same chart was also shown comparatively Scheme No. 2, which the negative side argued was an improvement. In other words the negative sides argued in favor of speed signaling as opposed to the route and speed system and of the type of home and distant automatic block signals, using a second arm to indicate the position of the next signal ahead.

Mr. Elliott, for the affirmative, contended that Scheme No. 1 calls for two very important changes from present practice; the first, that the indication of the semaphore arm shall be given in the upper quadrant, and the second, that the required indication shall be given by one arm and by one light instead of by a combination of one arm and two lights.

Mr. Elliott made the following points:

That the giving of the indication by one arm and one light is better than by two or more lights and arms in combination.

That the giving of the cautionary indication by a distinctive position of the arm is the most consistant and the safest practice.

That the change from the present to the uniform system may be made without confusion and danger.

That it will be comparatively inexpensive to change from the present to the uniform system.

Mr. Stevens, for the negative, dwelt principally on night indications and was in favor of using two signals on the pole, a top arm to inform the engineer as to what he should do immediately, and one below to indicate the position of the next signal.

Mr. Anthony, for the affirmative, said that Scheme No. 1 does not require the engineman to remember where the signal is located. The top arm, he said, is to govern high speed, main line movements, the lower arm is to indicate reduced speed movements, as where one track diverges from another. He thought that in considering a signal system of uniform use, the committee ought to consider the habits of enginemen and follow established principles as far as possible. He made several specific claims to show that Scheme No. 1 was far less radical than Scheme No. 2.

Mr. Clausen, who closed for the negative, held that Scheme No. 1 contained arbitrary indications which required study even on the part of a signal engineer, to say nothing of an engineman running at high speed. He was of the opinion that the scheme differed too much from standard code practice.

In the general debate which followed, C. E. Denny, signal engineer of the Lake Shore & Michigan Southern, said that in the near future his road proposes to change from left-hand to right-hand running. When the change is made, he said, a new system of signaling will be introduced, and it has been decided to adopt Scheme No. 1, or that recommended by the committee.

The majority of those who participated in the debate seemed to be of the opinion that Scheme No. 1 was the easier of application to present practice.

THE ROAD AND TRACK SUPPLY ASSOCIATION AT THE CONVENTION.

The exhibit of railway appliances made by members of the Road and Track Supply Association on the occasion of the annual convention of the American Railway Engineering and Maintenance of Way Association in Chicago was, in every respect, the most interesting and important exhibition ever given by this association; in fact, it was one of the largest, most varied, most interesting and most important exhibitions of appliances used in the construction, maintenance and operation of railways ever given anywhere, or at any time.

In previous years the Road and Track Supply Association used about 4,300 sq. ft. of floor space in the Auditorium Hotel for its exhibits. This year it secured the Coliseum and used all of the main floor and part of the Annex; in all, 54,897 sq. ft., of which 38,655 sq. ft. were devoted to exhibits, and 16,244 sq. ft. to aisles. There were about 140 exhibitors. The Coliseum was well decorated and presented a very attractive appearance. The crowds attending the exhibition were large.

The Road and Track Supply Association furnished automobiles for the convenience of its guests in going between the Auditorium hotel and the Coliseum. Band concerts were given at the Coliseum each afternoon and evening.

On Tuesday, March 16, the Road and Track Supply Association held its annual meeting at the Coliseum and elected the following officers for the ensuing year:

President—W. F. Schleiter, of Dilworth, Porter & Co., Ltd., Pittsburg, Pa.

Vice-President—T. W. Snow, Otto Gas Engine Works, Chicago.

Secretary and Treasurer—John N. Reynolds, Western Manager, Railroad Age Gazette, 160 Harrison street, Chicago.

Executive Committee—John McKinnon, Kalamazoo Railway Supply Co., Kalamazoo, Mich.; George Stanton, Cleveland Frog & Crossing Co., Cleveland, Ohio; Robert E. Belknap, Pennsylvania Steel Co., and Maryland Steel Co., Chicago; John W. Duntley, president Duntley Manufacturing Co., Chicago; A. P. Van Schaick, president W. K. Kenly Co., Chicago; Azel Ames, Kerite Insulated Wire & Cable Co., New York, N. Y.

The following is a list of exhibitors, together with an enumeration of the articles and devices that they have on display, and the names of their representatives:

Adams & Westlake Co., Chicago.—Signal lamps, lanterns, railway specialties. Represented by W. H. Baldwin, G. L. Walters, H. G. Turney, A. S. Anderson, C. B. Carson and and W. J. Piersen.

Alamo Manufacturing Co., Hillsdale, Mich.—Gasoline engines for railway service, pumping outfits, electric outfits and storage batteries. Represented by L. C. Thompson.

Allith Manufacturing Co., Chicago.—Allith parallel door and fire door equipment. Represented by W. D. Jameson and F. E. Sladden.

American Asphaltum & Rubber Co., Chicago.—Model tunnels, reservoirs, floors, platforms and bridges showing waterproofing process, roofings and railway paints. Represented by Harry N. Fox, advertising manager; N. S. Kidder, Harry E. Fox, W. R. Trasher and J. Y. Hill.

American Concrete Co., Chicago.—Full size section of reinforced concrete culvert pipe, model of a reinforced concrete pile trestle and photographs of reinforced concrete slabs and girders. Represented by T. E. Kelly and A. M. Anderson.

American Guard Rail Fastener Co., Philadelphia, Pa.—Anchor guard rail clamp, plate guard rail fastener, reinforced malleable iron brace, and Vaughan automatic rail anchor. Represented by D. F. Vaughan.

American Hoist & Derrick Co., St. Paul, Minn.—Moving pictures showing the American railway ditcher in operation. Represented by W. O. Washburn, F. J. Johnson and W. L. Manson.

American Locomotive Co. and Atlantic Equipment Co., New York.—Photographs and pamphlets, steam shovels and locomotives. Represented by John H. Wynne, Ottis Parsons and A. M. Sheffer.

American Rail Joint Co., Toronto, Canada.—Reinforced angle bar. Represented by T. D. Beddoe.

American Rolling Mill Co., Middletown, Ohio.—American ingot iron corrugated metal culverts and American ingot iron corrugated roofing and siding. Represented by G. H. Charls.

American Specialty Co., Chicago.—Collis flat and flat twisted high speed drills and Use-em-up drill sockets. Represented by J. L. Walker and H. L. Mills.

American Steel & Wire Co., Chicago.—Right of way fences, rail bonds, triangle mesh concrete reinforcements. Represented by R. S. Knight, C. D. Sturdevant, B. H. Ryder, R. Stanley Green and B. B. Ayres.

American Valve & Meter Co., Cincinnati, Ohio.—Water service supplies, embracing Poage automatic water column, tank fixtures, float valves, Fenner drop spout; track devices, showing Anderson's Economy switch stands for main line and yard purposes. Represented by N. Paul Fenner, Jr., J. T. McLarry, F. C. Anderson and E. P. Smith.

American Well Works, Chicago.—Pumping machinery, well

drilling machinery, steam engines, gasoline engines and air compressors. Represented by Geo. W. Igo, C. O. McLean and Harry Spiller.

Asphalt Ready Roofing Co., New York.—Arrow and Protection brands of roofing and model showing how Protection roofing can be laid on reinforced concrete. Represented by A. H. Allen, C. A. Sparrowhawk and Barney Blackwell.

Baird Railway Steel Tie Co., Topeka, Kan.—Railway steel ties, etc. Represented by Archie M. Baird, L. T. Yount, W. H. Holmes and E. D. Coon.

Barrett Manufacturing Co., New York.—Bridge waterproofing with bituminous binder protection, floor construction for use where a wooden floor is required directly on the ground without air space beneath and gravel roofing. Represented by W. S. Babcock, L. P. Sibley, H. B. Nichols and C. T. Bilyea.

Bausch & Lomb Optical Co., Rochester, N. Y.—Surveying instruments of new and improved types. Represented by H. D. Skelton.

Beaver Dam Malleable Iron Co., Beaver Dam, Wis.—Tie plates and rail braces. Represented by J. V. Cowling, James Small, E. A. Hawks, W. L. Douglass and D. P. Lamoreux.

J. A. & W. Bird & Co., Chicago.—Zolium flexible tile roofing, Paradux canvas roofing, Rex Flintkote roofing and Ripolin imported enamel paint. Represented by F. A. Moreland, F. A. Dale, Paul L. Griffiths, Howard Schofield and H. D. Johnson.

Blake Signal & Manufacturing Co., Boston, Mass.—Dispatcher's office desk for selective signalling, steam railway type semaphore signals and electric railway type semaphore signals. Represented by C. C. Blake, E. J. Burke and G. H. McFee.

Blocki Brennan Refining Co., Chicago.—Carboxide elastic metal preserver and its bi-products. Represented by W. F. Brennan, F. W. Blocki and R. P. Brennan.

Bryant Manufacturing Co., Sales Agents for the McClintock Manufacturing Co., St. Paul, Minn., also Sandwich Electric Co., Sandwich, Ill., Chicago.—Railway signals, appliances and supplies, train dispatchers' telegraph system. Represented by George Bryant, R. I. Baird, Edward McClintock, W. M. McClintock, M. A. Hovey, E. C. Hennis, E. Parsons, H. O. Rugh and C. S. Rhoades.

Bryant Zinc Co., Chicago.—Signal supplies, battery supplies, fibre conduit storage batteries, crossing bells, battery wells. Represented by E. M. Deems, M. R. Briney, R. N. Baker, H. J. Horey, S. Bryant, A. F. Klink, Rufus N. Chamberlain, R. Parmelee and F. N. Herbst.

Buda Foundry & Manufacturing Co., Chicago.—Railroad motor and velocipede cars, also parts of same; track drills, portable tool grinders, ball and cone bearing and ratchet jacks, switch stands, car replacers, adjustable switch rods and electric crossing gates. Represented by H. K. Gilbert, Wm. P. Hunt, Jr., L. M. Viles, W. S. Weston, C. H. DeLano, J. L. Artmier, A. R. Dyer, W. C. Dyer, H. S. Evans, J. J. Gard, L. Hamill, J. T. Harahan, Jr., J. M. Lovett, W. B. Paulson, G. B. Shaw and H. L. Shepard.

Buffalo Railway Wrench Co., Buffalo, N. Y.—Large ratchet wrenches for railway and bridge work. Represented by Lucian C. Jackson and George C. MacGregor.

D. J. Burlingame, First National Bank Bldg., Chicago.—Burlin vertical filing cabinet and office equipments of all kinds. Represented by D. J. Burlingame.

Call Automatic Switch Co., Chicago.—Automatic railway switch. Represented by O. C. White, I. A. Call and George W. Call.

Carnegie Steel Co., Pittsburg, Pa.—Section of standard track with Carnegie ties, insulated and non-insulated; Duquesne splice bars, rail sections, steel tie sections, portable track, steel wheels, light electric traction service wheels, Friestedt interlocking channel bar piling, U. S. steel sheet piling, freight car wheels on axle showing condition after service of 76,698 miles without turning, and slack barrel cooperage illustrating steel hoops on spike and bolt kegs. Represented by N. M. Hench, W. A. Bostwick, C. G. Bacon, W. G. Totten, C. B. Friday, P. W. O'Brien and J. B. Arnold.

Central Foundry Co., New York.—Universal cast iron pipe. Represented by Julian L. Yale & Co., Chicago, including Charles L. Sullivan, H. L. Winslow, Frank Miller and F. J. Cooledge.

Century Manufacturing Co., Columbus, Ohio.—Adjustable steel drawing tables, table covers, adjustable instrument trays and parallel rule attachments. Represented by H. J. Sharp and R. G. Thomas.

Cleveland Frog & Crossing Co., Cleveland, Ohio.—Two types of manganese crossings, manganese frogs, switches, switch stands, Lucas guard rail clamps and Prentice anti-rail creepers. Represented by G. C. Lucas and George Stanton.

J. B. Clow & Sons, Chicago.—Plumbing apparatus, steam, gas and water supplies. Represented by S. McKeeby, Y. A. Adams, W. T. Brace and T. J. Hester.

Conley Frog & Switch Co., Memphis, Tenn.—Conley patent frog. Represented by John E. Conley.

Continuous Rail & Safety Switch Co., St. Louis, Mo.—Continuous rail device eliminating present frog and guard rail. Represented by W. G. Brown and H. F. Roach.

Cook's Standard Tool Co., Kalamazoo, Mich.—Climax track drill, Magic high speed flat bits, Standard track tool grinder and Cook's combination chuck. Represented by Eugene Cook.

C. H. Cornell, Valentine, Neb.—Model of lock spike. Represented by C. H. Cornell.

Dake American Steam Turbine Co., Grand Rapids, Mich.—Locomotive headlight turbine. Represented by Charles W. Dake and R. J. Peters.

Delta Electric & Manufacturing Co., Chicago.—Represented by the Bryant Zinc Co., Chicago, and Harold N. Keifer.

Detroit Graphite Co., Detroit, Mich.—Paints for all kinds of railway stations, power houses, structural steel, water tanks, bridges, roofs, etc. Represented by B. O'F. Randolph, T. R. Wyles and L. D. Mitchell.

Paul Dickinson, Inc., Chicago.—Dickinson cast iron and fire proofed wood smoke jacks, cast iron ventilators and chimneys. Represented by J. A. Meaden, A. J. Filkins, E. W. Hodgkins and F. C. Webb.

Eugene Dietzgen Co., Chicago.—Complete line of engineering instruments. Represented by W. E. Cook, C. S. Breckenridge, W. O. Phillips and O. C. Haier.

Dilworth, Porter & Co., Ltd., Pittsburgh, Pa.—Tie plates and spikes. Represented by W. F. Schleiter and C. Stein.

Joseph Dixon Crucible Co., Jersey City, N. J.—Dixon's silica-graphite paint for railway bridges, signal pipes and steel cars; Ticonderoga graphite ore and photographs of railway bridges and other structures; crucibles, air brake and triple valve grease. Represented by DeWitt C. Smith and W. B. Worley.

Dodge Manufacturing Co., Mishawaka, Ind.—Large water softener in operation and power transmission machinery. Represented by E. Eldon.

Dressel Railway Lamp Works, New York.—Switch lamps, semaphore lamps, crossing gate and station lamps. Represented by F. W. Dressel, Edward W. Hodgkins and F. W. Edmunds.

G. Drouvé Co., Bridgeport, Conn.—Anti-Pluvius puttyless skylight and the Lovell window operator. Represented by William V. Dee, George J. Adam and R. S. Adam.

Duntley Manufacturing Co., Chicago.—Rockford motor section and inspection car. Represented by C. E. Walker.

Duplex Metal Co., Chicago.—Copper clad wire. Represented by J. F. Kimber and Frank Chambers.

Eastern Granite Roofing Co., New York.—Ready roofing, granite roofing, smooth-surfaced roofing. Represented by H. Henning, A. E. Roever and P. G. Kennett.

Economy Separable Switch Point Co., Louisville, Ky.—Mitchell and Palmer types separable switch points, Economy separable claw bars. Represented by W. M. Mitchell, W. M. Mitchell, Jr., and O. Metcalf, Jr.

Edison Manufacturing Co., Orange, N. J.—Edison and "BSCO" primary batteries for signal work. Represented by C. H. Wilson, E. E. Hudson and F. J. Lepreau.

Electric Storage Battery Co., Philadelphia, Pa.—Chloride-Tudor-Exide storage batteries for car lighting and signal service. Represented by G. H. Atkins.

Eyeless Tool Co., Newark, N. J.—Eyeless picks and railway track tools. Represented by George Ackerman.

Fairbanks, Morse & Co., Chicago.—Motor velocipedes, track tools, section motor cars, pumping engines and pumps, electric units and a model track scale. Represented by A. A. Taylor, R. E. Derby, R. A. Paterson, J. A. Steele, H. D. Smith, C. W. Kelley, R. H. Lincoln, C. T. Fugitt, C. D. Walworth, R. E. Edler and W. R. Krausch.

Frank M. Foster, 515 West First avenue, Columbus, Ohio.—Foster interlocking switch stand, modern right angle drive and photographs of the Foster sod liner and grader. Represented by Frank M. Foster and George E. Kalb.

Franklin Manufacturing Co., Franklin, Pa.—Reinforced corrugated asbestos roofing or siding, asbestos Century shingles, asbestos building lumber, a miniature asbestos lumber smoke jack and samples of all kinds of asbestos pipe covering. Represented by R. J. Evans, E. R. Rayburn, L. B. Melville and C. H. Fresher.

General Railway Signal Co., Rochester, N. Y.—Electric interlocking devices, manual interlocking devices, block signals, relays and indicators and relay boxes. Represented by W. W. Salmon, G. D. Morgan, M. Wuerpel, L. Thomas, W. G. Hovey, H. M. Sperry, M. R. Briney, W. K. Howe, F. L. Dodgson, C. O. Poor, G. H. Macdonough, J. L. Langdon, F. W. Moffett and W. R. Young.

Gifford-Wood Co., Hudson, N. Y.—Models of machinery for elevating, conveying and lowering natural and manufactured ice, ice tools. Represented by W. T. Wood, N. H. Williams and G. B. Vernier.

Goheen Manufacturing Co., Canton, Ohio.—Carbonizing coating for iron and steel. Represented by A. W. Price and J. W. Goodrich.

Henry Graff, Chicago.—Mail catcher. Represented by Henry Graff and Gus E. Nyquest.

Peter Gray & Sons, Boston, Mass.—Lamps and lanterns and Gray chimneyless burner. Represented by George M. Gray and J. M. Brown.

Grip Nut Co., Chicago.—Grip nuts. Represented by E. R. Hibbard and F. E. Miner.

Hall Signal Co., New York.—Automatic signaling devices. Represented by W. J. Gillingham, Jr.

Hart Steel Co., Elyria, Ohio.—Rolled steel, reinforced shoulder tie plates of various types. Represented by W. S. Miller, W. T. Bentz, G. S. Wood, H. W. Davis and A. W. De Rocher.

Hawley Down Draft Furnace Co., Chicago.—The Hawley (Schwartz) furnace using oil or gas and the Reyelbec coke furnace. Represented by Cliff Bleyer, Col. C. E. Bleyer and F. O. Bartlett.

Hayes Track Appliance Co., Geneva, N. Y.—Models of Hayes derails with operating and target stands. Represented by P. W. Moore, W. Harding Davis, Wellington B. Lee, Arthur Gemunder and S. W. Hayes.

Hercules Continuous Rail Devices, Chicago Heights, Ill.—Continuous rail, crossings, frogs, switch points and derails. Represented by J. W. Street and S. P. White.

James O. Heyworth, Harvester building, Chicago.—A 2½-yd. bucket used with the Heyworth-Newman excavator with photographs and literature. Represented by H. G. Halleck.

Hydrex Felt & Engineering Co., New York.—Photographs of work done throughout the United States and a model of a bridge waterproofed with the Hydrex method. Represented by E. W. DeKnight and Theodore A. Schaffer.

Interlocking Nut & Bolt Co., Pittsburg, Pa.—The Clark nut lock and bolts for railway use. Represented by R. A. Clark.

Jeffrey Manufacturing Co., Columbus, Ohio.—The Jeffrey "Lock-Jaw" track and car wrench, Jeffrey improved spike bar and other railroad specialties; also standard Jeffrey chains for elevating and conveying equipment. Represented by J. A. Werner, E. D. Clapp, G. R. Kittle and J. W. Jeffrey.

H. W. Johns-Manville Co., New York.—Asbestos and magnesia products, fuses and electrical devices, roofings, smoke jacks, packings and rubber goods of all kinds. Represented by F. W. Gilmore, P. C. Jacobs, J. E. Meek and J. C. Younglove.

O. F. Jordan Co., Chicago.—The Jordan battleship-spreader, center plow, flanger, scraper, bank builder and snow plow. Represented by O. F. Jordan and M. J. Woodhull.

Joyce-Cridland Co., Dayton, Ohio.—Hydraulic car and track jacks. Represented by F. I. Joyce, George Llewellyn and N. Kohl.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Hand and push cars, improved reinforced pressed steel wheels, velocipedes, track drilling machines, ratchet and friction track jacks, rail benders, Perfect steel surface cattle guards, track tools, track gauges, track levels, etc. Represented by John McKinnon, C. A. Wallace, W. I. Clock, C. L. Cushman and George W. Mingus.

W. K. Kenly Co., Chicago.—Latimer switch point lock, Security anchor tie plate, Universal pipe line carrier base, Pioneer rail anchor, velocipede cars, Moore track drill and Kalamazoo jacks. Represented by A. P. Van Schaick, W. J. Fauth, P. O. Wadsworth and J. T. Wells.

Kennicott Water Softener Co., Chicago Heights, Ill.—Water softener, photographs of railway installations and a machine showing enlarged lantern slide views of typical railway installations. Represented by Cass L. Kennicott, Edwin J. Flemming, Frank S. Dunham, R. S. Ellis and C. R. McKee.

Edwin R. Kent & Co., Chicago.—Rigid Stag manganese steel frog, special Stag manganese steel frog, guarded Stag manganese steel frog, Stag manganese rolled rail. Represented by Edwin R. Kent, J. H. Kent, J. T. Stafford and Geo. H. Brown.

Kerite Insulated Wire & Cable Co., New York.—Kerite insulated wires and cables. Represented by R. D. Brixey and B. L. Winchell, Jr.

Keuffel & Esser Co., New York.—Drawing materials, surveying instruments, masonry tools. Represented by Rudolf Link and O. S. Rhea.

Lackawanna Steel Co., New York.—Rails, rail joints, structural and bridge material, reinforced concrete bars, steel sheet piling and track supplies. Represented by C. R. Robinson, G. A. Hager, F. E. Abbott and D. H. Van Pelt.

Light Inspection Car Co., Hagerstown, Ind.—Light inspection cars. Represented by Will Immel.

Lufkin Rule Co., Saginaw, Mich.—Measuring tapes and rules of all kinds. Represented by Theodore Huss, S. B. McGee and Walter M. Sanford.

Manganese Steel Rail Co. and Ramapo Iron Works, Hillburn, N. Y.—Manganese steel pointed switch, switch stands, frogs, guard rail clamps, manganese steel rails, bars, springs, shovel, plate and photographs. Represented by Fred W. Snow, F. C. Stowell, Arthur Gemunder, W. C. Kidd and James B. Strong.

Maryland Railway & Electric Supply Co., Baltimore, Md.—"Spike Strut" rail fasteners, track appliances. Represented by Charles Elliott.

C. F. Massey Co., Chicago.—Massey battery wells, steel concrete composition battery chutes and pipe carrier foundation. Represened by C. F. Massey and Fred A. Lundahl.

W. N. Matthews & Brother, St. Louis, Mo.—Matthews holdfast lamp guards, guy anchors, cable clamps and the Lima jack box and plug. Represented by Claude L. Matthews, W. N. Matthews and Victor L. Crawford.

McDowell, Stocker & Co., Chicago.—Rail saws, Vixen hand milling tools, emery wheels. Represented by W. J. McDowell.

W. W. Mechling, Munhall, Pa.—M. & S. steel tie. Represented by W. W. Mechling and J. E. Smith.

Municipal Engineering & Contracting Co., Chicago.—Chicago improved cube concrete mixer. Represented by C. E. Bathrick, A. Cameron, J. B. Austin and J. Warning.

National Lock Washer Co., Newark, N. J.—Samples of nut locks in National, Harvey ribbed, tail and plain types for every size bolt and all sections of steel. Represented by F. B. Archibald, John B. Seymour and George E. Bake.

National Malleable Castings Co., Chicago.—Malleable track specialties. Represented by F. R. Angell, H. I. Hiatt, J. J. Byers and W. L. Graves.

Geo. P. Nichols & Brother, Chicago.—Electric turntable tractor, photographs of transfer tables and turntable tractors, special appliances for elecric drawbridge equipments. Represented by George P. Nichols and S. F. Nichols.

B. F. Nickerson, Chicago.—The Nickerson safe switch point lock. Represented by B. F. Nickerson.

Gus E. Nyquest, Tribune building, Chicago.—Wrecking frog and mail catcher. Represented by Gus E. Nyquest and Henry Graff.

Osgood Scale Co., Binghamton, N. Y.—Automatic freight scales for L. C. L., freight and baggage automatic scales. Represented by William E. Smith & Co., Chicago.

Otto Gas Engine Works, Chicago.—Radial overcut coal chute spouts and aprons, automatic bucket loader, guard rail clamp, photographs and literature. Represented by T. W. Snow, R. E. Gurley, R. A. Ogle, C. C. Lazenby and H. C. Harnish.

C. F. Pease Blue Print Machinery & Supply Co., Chicago.—A modern blue print plant in operation, consisting of a Pease automatic printing, washing and drying equipment with a Pease cutting and trimming table; also automatic electric blue printing machine and wall washer for separate prints. Represented by C. F. Pease, P. M. Morgan and N. L. Hayden.

Pennsylvania Steel Co., Steelton, Pa.—Solid Manard crossing, Manard anvil face frog, solid Manard frog, Manard spring rail frog, sample never turn split bolt, never slip side plate, new process switch with rolled Manard stock rail, main line safety switch stand, low New Century switch stand, low Steelton positive switch stand, intermediate pony main line switch stand, semaphore switch stand with disappearing blade, Manard pinless switch, rolled Manard rail, drop test specimens of rolled Manard rails and rail testing machine. Represented by Howard F. Martin, C. R. Reinoehl, B. L. Weaver, M. W. Long, William M. Henderson, W. H. Allen, F. A. Robins, Jr., and G. K. Reel.

Percival Wood Preserving Co., Houston, Tex.—Method of wood preservation. Represented by H. W. Graves.

Pittsburg Filter Co., Pittsburg, Pa.—Represented by F. B. Leopold and Willis C. Squire.

Pittsburg Steel Co., Pittsburg, Pa.—Electric welding fence machines manufacturing "Pittsburg Perfect" electrically welded fence for railway use. Represented by E. D. Findlay, F. A. Tower and E. Steytler.

Pocket List of Railroad Officials, New York.—Pocket lists of railway officials. Represented by J. Alexander Brown and C. L. Dinsmore.

The D. & A. Post Mold Co., Three Rivers, Mich.—Concrete post machinery and molds, reinforced cement posts and sections of same. Represented by G. H. Dougherty.

Potter Brothers, 59 Clark street, Chicago.—Reinforced concrete battery vaults, battery chutes and concrete foundation. Represented by Frank H. Potter and A. C. Heidelberg.

The Q & C Company, New York.—Q & C Bonzano joint, step or compromise joint, anti-rail creepers, guard rail clamps and guard rail braces. Represented by C. F. Quincy, E. M. Smith, G. C. Isberton, J. V. Westcott and G. L. Hall.

Rail Joint Co., New York.—Continuous, Weber and Wolhaupter types base supporting rail joints. Represented by L. F. Baine, H. C. Holloway, W. E. Clark, F. A. Poor, V. C. Armstrong, F. C. Webb, E. L. Van Dresar and J. G. Miller.

Railroad Age Gazette, New York, Chicago, Pittsburg and London.—Railroad Age Gazette. Represented by Edward A. Simmons, Ray Morris, Lucius B. Sherman, John N. Reynolds, Samuel O. Dunn, William Forsythe, Charles H. Fry, F. S. Dinsmore, C. R. Mills, Bradford Boardman and Henry Lee.

Railroad Automatic Track Inspector Co., Tacoma, Wash.—Railroad automatic track inspector for making a correct record of the gauge and level of track and location points. Automatic cattle guard, being a new type of guard to turn cattle. Represented by T. Ellis and Willis C. Squire.

Railroad Supply Co., Chicago.—Tie plates, R. R. S. derailer, highway crossing bells and relays, electric block signal relays, train annunciators and indicators, lightning arrestors, electric switch locks, circuit controllers, switch boxes, track insulations and signal maintenance materials. Represented by E. H. Bell, C. P. Cogswell, Jr., M. J. Comerford, E. W. Vogel and A. H. Smith.

Railway and Enginering Review, Chicago.—Represented by Willard A. Smith, Walter M. Camp, A. E. Hooven, P. G. Stevens, C. C. Zimmerman, Harold A. Smith and H. N. Kelley.

Railway Chemical Sprayer Co., Owensboro, Ky.—Photographs of sprayer and literature relating to work of killing vegetation on railroads. Represented by John V. Pearse.

Railway List Publishing Co., Chicago.—Copies Official Railway List. Represented by William E. Magraw.

Ritter Folding Door Co., Inc., Cincinnati, Ohio.—Horizontal folding door for round houses, machine shops, freight depots, etc. Represented by A. Ritter and J. M. Crowe.

Roberts & Schaefer Co., Chicago.—Working model of a Holman-Barrett coaling station, photographs and drawings. Represented by Edward E. Barrett, Clyde P. Ross and James Shannon.

Geo. M. Robinson, 243 Cleveland avenue, Dubuque, Iowa.—Patent metal railway tie. Represented by George M. Robinson.

Scherzer Rolling Lift Bridge Co., Chicago.—Models, photographs, designs, plans, drawings and descriptive literature on Scherzer rolling lift bridges. Represented by John T. Dickerson, H. D. Harting and R. W. Flowers.

J. M. Scott & Sons, Racine, Wis.—Hercules and Little Giant bumping posts and souvenirs of its Holdfast spike cast in aluminum. Represented by John M. Scott and Elbert E. Scott.

Scully Steel & Iron Co., Chicago.—Everlasting blow-off valve, Lucas pneumatic tube expander, Lucas roundhouse expander, Scully railway flue cutter, track and car jacks, track tools, bolts and sledges. Represented by H. C. Finlay, W. H. Dangel, F. K. Maus, F. W. Blume, W. B. Templeton, George Mason, Jr., T. T. Cavanagh and H. H. Gilbert.

Sellers Manufacturing Co., Chicago.—Sellers anchor bottom tie plate, Samson angle bar and other types of angle bars. Represented by J. M. Sellers, J. T. Markham and L. S. Gordon.

Jesse T. Shaw, 862 North Harding avenue, Chicago.—Concrete ties. Represented by Jesse T. Shaw.

Signal Engineer Co., Chicago.—The Signal Directory, The Signal Engineer, Railway Electrical Engineer. Represented by L. B. Mackenzie, A. D. Cloud, A. F. Klink and Fred W. Bender.

Simmons Hardware Co., St. Louis, Mo.—Enameled steel semaphore blades, new Groff track drills and bonding drills. Represented by J. B. Webb, G. W. Simmons and C. B. Groff.

Spencer Otis Co., Chicago.—Railway tie plates. Represented by W. L. DeRemer, H. H. Hart and Carter Blatchford.

Standard Steel Tie Co., Pittsburg, Pa.—Standard steel railway and traction ties, standard rail fasteners, fastener attachments, angle bars, wedge members and appliances. Represented by George M. Cote and J. Harvey Harrison.

Arthur L. Stanford, Railway Exchange, Chicago.—Stanford two piece and three piece rail joints and Stanford bumping post. Represented by Arthur L. Stanford.

Strauss Bascule & Concrete Bridge Co. and Strauss Self Balancing Window Co., Chicago.—Models and photographs of bascule bridges and models and photographs of self balancing windows. Represented by J. B. Strauss.

Stover Motor Car Co., Freeport, Ill.—Motor inspection cars. Represented by M. Mowbray.

Union Switch & Signal Co., Swissvale, Pa.—One arm mechanical signal, rotary circuit controller for semaphore shaft, lever dwarf machine, electrically locked circuit controller and indicator, Union electro-manual block instrument, low base R. S. A. relay, train staff instrument, combination rail clips, inside detector bar clip, Keystone insulated rail joint, Union electric crossing gate post and mechanism and literature. Represented by J. S. Hobson, W. E. Foster, T. H. Patenail and W. M. Vandersluis.

U. S. Metal & Manufacturing Co., New York.—Diamond tapered steel pole, telephone and telegraph lines and trolley poles, Columbia lock nut, structural steel Continental whistling post and the Hillman locked clevis and turnbuckle. Represented by Fred Atwater and Charles R. Day.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Model of Mansfield water column, model of hydraulic valve, model of wood tank supplying locomotive tender, U. S. ground throw switch stand, working sample of low semaphore switch stand, blue prints and literature. Represented by C. E. Ward, A. J. Anderson and L. E. Wolcott.

Variety Manufacturing Co., Chicago.—Cross horizontal folding door, Variety steel rolling shutter, Variety wood slat rolling shutter, cross-compound slide-up door. Represented by W. H. Barry, E. L. Beckerleg, W. B. Gervais and F. E. Kahl.

R. H. Vesey Manufacturing Co., Chicago.—Ideal post hole digger. Represented by F. A. Hoyt.

Vulcan Steam Shovel Co., Toledo, Ohio.—Photographs, blue prints and literature of different sizes and types of steam and electric shovels. Represented by W. S. Russell.

Weir Frog Co., Cincinnati, Ohio.—Literature on Manganese frogs, guard rail clamps and automatic switch stands. Represented by N. O. Goldsmith.

Western Valve Co., Chicago.—Fairbanks valves, Dart union couplings, Dart flange unions. Represented by H. V. Conine, G. W. Conine and B. D. Coffman.

C. H. Whall & Co., Boston, Mass.—Whall's special railroad fibre for insulating rail joints, etc., fusees for train protection. Represented by F. R. Whall.

William Wharton, Jr., & Co., Inc., Philadelphia, Pa.—Manganese steel switches, frogs and crossings, switch stands, guard rail clamps, models of derailing switches, photographs, blue prints and literature. Represented by V. Angerer, Arthington Gilpin, R. C. McCloy, W. McLain and Arthur S. Partridge.

Whiting Foundry Equipment Co., Harvey, Ill.—Photographs of cranes of all kinds, electric travelers, foundry equipment, railway turntable centers and transfer tables. Represented by C. A. Hardy and P. A. Dratz.

Williams, White & Co., Moline, Ill.—Plans and photographs of coaling stations. Represented by George W. Freeland.

Williams Boltless Rail Joint Manufacturing Co., Chicago.—Williams boltless rail joint, Twentieth Century steel tie, automatic lock nut, Smith's reinforced spike, automatic car seal. Represented by Willis D. Williams, Emil Meyer, Cortlandt F. Ames, Charles Rystrom and T. J. Dyke.

Jas. G. Wilson Manufacturing Co., New York.—Rolling steel doors for freight sheds and warehouses, rolling wood doors for engine houses and sliding swing doors designed especially for freight sheds. Represented by H. B. Dodge & Co., Western Agents, Chicago.

Winans Rail Joint Co., 509 DeKum avenue, Portland, Ore.—Rail joints. Represented by Audubon Winans.

Wright Wire Co., Worcester, Mass.—Rust proof truss and cable fence. Represented by J. J. Collins.

Robert J. Zorge, Postal Telegraph building, Chicago.—Automatic torpedo magazine. Represented by Robert J. Zorge.

A

ABBEVILLE & NORTHWESTERN.—Surveys made from Abbeville, Ga., northwest, via Pine View, Unadilla and Emerich, to Fort Valley, 58 miles. Branch from Emerich west to Montezuma, 17 miles. J. L. Bankston, President, Abbeville.

ABERDEEN & TOMBIGBEE.—Building from Okolona, Miss., southeast to Pickenville, Ala., 65 miles; surveyed. Grading finished between Okolona and Aberdeen, 17.5 miles, also Columbus to Pickensville, 11.5 miles. Contract let to S. M. Bush, Memphis, Tenn., for 14 miles from Buttshachi river south to Columbus, Miss. W. T. McKee, Chief Engineer, Aberdeen, Miss.

ABILENE & SOUTHERN.—Plans call for a line from Abilene, Tex., south to Sonora, about 160 miles, with a branch from the main line of Colorado & Southern, near Ballinger southwest to San Angelo, 40 miles. Grading completed between Abilene and Winters 38 miles, track laying under way. Morgan Jones, President of the Wichita Valley, Seymour, Tex., is at the head of the company.

ACME, RED RIVER & NORTHERN.—Projected 45-mile extension from Acme west into Cottle county.

ADIRONDACK & ST. LAWRENCE.—Line is under survey from Hermon, N. Y., to Clifton, 23 miles. H. F. Timerman, Superintendent, Hermon, N. Y.

AJO VALLEY RAILROAD.—Proposed line from Theba, Ariz., south to the Ajo mines, and thence to the Mexican border, about 125 miles. Surveys made. Expected that work will be started shortly. F. A. Bordwell, Chief Engineer, Tucson, Ariz.

AKRON, CANTON & YOUNGSTOWN.—Proposed from Akron, Ohio to Canton and Youngstown. Z. W. Davis, Cleveland, Ohio, is interested.

ALABAMA & MISSISSIPPI.—Building by the Vinegar Bend Lumber Co., Fruitdale, Ala., from a connection with the Mobile & Ohio, near Fruitdale, to timber lands, about 12 miles. N. E. Turner, Vice-President, Fruitdale.

ALABAMA RAILWAY & ELECTRIC CO.—Proposed electric line from Opelika, Ala., south to Eufaula, 60 miles, and eventually to the Gulf. Contracts let for some of the work. J. C. Chapman, Vice-President, Atlanta, Ga.

ALABAMA, TENNESSEE & NORTHERN.—Grading completed from Cochrane, Ala., south to a point in Sumter county, 10 miles.

ALASKA CENTRAL.—Building from Seward, north to Tanana river, 450 miles. Contract to Snow & Watson, for 23 miles. Surveyed to mile 183; also for branch from Knik, mile 150, east to Matanuska, 40 miles.

ALASKA PACIFIC.—Building from Martin Island, near Katalla, Alaska, to Bering river coal fields. Surveyed to Copper river valley.

ALBIA INTERURBAN.—Contract let to Patrick Fitzgerald, Atlantic, Iowa, to build extension from Albia, Iowa, northwest to Hiteman, about 6 miles.

ALBUQUERQUE & EASTERN.—Arrangements said to have been completed for building from Moriarty, N. Mex., on the Santa Fe Central, west via Frost to Albuquerque and Hagan, about 75 miles.

ALEXANDER & EASTERN.—Projected from Alexander, W. Va., northeast to Elkins, about 30 miles. J. B. Hart, Clarksburg, W. Va.

ALEXANDRIA, LEESVILLE & LUFKIN.—Proposed from Lufkin, Tex., east to Alexandria, La., about 140 miles. Preliminary surveys made. Contract for part building of the line let to J. S. Moore, of Lufkin.

ALTON, ST. LOUIS & CAIRO (Electric).—Proposed from Alton, Ill., south through Madison, St. Clair, Monroe, Randolph, Jackson and Union counties, to Cairo, in Alexander county, 130 miles. A branch is also to be built from the main line, west to Waterloo and Columbia, in Monroe county. T. N. Chase, Incorporator.

ALTOONA, HOLLIDAYSBURG & BEDFORD SPRINGS (Electric).—Organized about three years ago to build a line from Altoona, Pa., south, through Hollidaysburg, Newry, Freedom, McKees, Rooring Springs, Sharpsburg, Martinsburg, Curryville, Woodbury, Mario, Waterside, Tatesville and Everett. Rights of way have been secured. Work is to be started shortly on the line, which is intended eventually to extend south to Cumberland, Md., and east to McConnelsburg, Fulton Co., Pa. F. W. Patterson, Altoona, Chief Engineer.

ALTUS, ROSWELL & EL PASO.—Proposed to build from Altus, Okla., west via Duke and Hollis to Memphis, Tex., thence via Silverton, Plainview, Lockney, Petersburg and Lubbock to Roswell, N. M., thence to El Paso, Tex., 400 miles. Grading completed from Altus to Hollis, about 40 miles. The intention is to have this section of the line in operation by June, 1909. McCullough Construction Co., Contractors, St. Louis, Ill.

——Grading completed from Roswell, N. M., east 12 miles. Surveys made from Roswell to a point 50 miles east of Lubbock, Tex., 207 miles.

——Grading under way between Petersburg, Tex., Lockney and Cape Rock. H. H. Fielder, Chief Engineer, Altus, Okla.

ANGELINA & NECHES RIVER.—Building from Prosser, Tex., via Manning and Keltys Front, to Platt, 17 miles. J. H. Kurth, Keltys, Tex.

APPALACHIAN RAILWAY.—Projected from Foering, N. C., via Birdtown and Cherokee to Sevierville, Tenn., about 40 miles. First section from Foering to Cherokee under contract to J. C. Arbogast, contractor, Asheville, N. C. Grading completed for 6 miles and part of track laid. Work will include one 300-ft. bridge. Robert Gray, Chief Engineer, Foering.

ARIZONA & CALIFORNIA.—See Atchison, Topeka & Santa Fe.

ARIZONA ROAD.—Surveys made for proposed line from Flagstaff, Ariz., southwest to Jerome, about 55 miles. Arthur Maguire, Las Vegas, N. Mex.

ARKANSAS CENTRAL.—Building 6-mile extension from Paris, Ark.

ARKANSAS, LOUISIANA & GULF.—Building from Monroe, La., north to Pine Bluff, Ark., with a branch to Crossett, Ark., in all 143 miles. Built from Bastrop, north to Hamburg, 3.3 miles; also 5.2-mile branch to Crossett. The 80-mile further extension from Hamburg to Pine Bluff has been surveyed, and grading begun.

ARKANSAS, OKLAHOMA & WESTERN.—Surveys made for extensions from Rogers, Ark., northeast to Eureka Springs, 30 miles, and from Siloam Springs, Ark., west to Pryor Creek, Okla., 65 miles. Contract let for some of the work to the W. R. Felker Construction Co., Rogers, Ark.

ARKANSAS ROADS.—Grading contracts have been let to W. A. Dennison and to L. J. Smith for building about 7 miles of line from the mill of Moore & McFerren at Ross, Ark., which is on the Jonesboro, Lake City & Eastern, to a connection with the projected Lee Wilson Railway, which in turn is to connect with the St. Louis & San Francisco at Wilson. G. H. Pulford, of Luxora, Ark., Engineer in charge.

——Surveys made for a line from Mountain Home, Ark., south to a connection with the St. Louis, Iron Mountain & Southern, 11 miles. W. L. Marshall, Mountain Home, is interested.

ARKANSAS SOUTHEASTERN.—Proposed extension from River Junction, La., south to Farmerville, 5 miles. S. R. Neal and N. M. George, Contractors, Farmerville.

ARTESIAN BELT.—Plans call for a line from Macdona, Tex., south via Kirk, Fruitland, Poteet, Brooklyn, New Pleasanton and New Artesia to Simmons City. Contract has been given to J. F. Burns, of Divine, for the grading and track laying on the first 40 miles. Track laying begun on first section. Wm. Bradburn, Chief Engineer, 215 Alamo Plaza, San Antonio, Tex.

ASHERTON & GULF.—The Nueces Valley, Rio Grande & Mexico, now the A. & G., was organized to build from Eagle Pass, Tex., east to Aransas Pass, about 300 miles. Work now under way by the J. F. Burns Construction Co., contractor, Devine, Tex., on the 32 mile section from Artesia, Tex., west to a point on the I. & G. N. at Asherton, Dimmet county. Grading finished on 20 miles and track-laying under way. R. H. Gresham, Ch. Engr., Artesia.

ASHEVILLE & GREENVILLE (Electric).—Contracts let to Carolina Construction Co., Raleigh, N. C., to build an electric line from Asheville, N. C., south via Hendersonville to Greenville, S. C., 60 miles. J. F. Rowland, President, 301 Oatch building, Nashville, N. C.

ASHEVILLE & HENDERSONVILLE (Electric).—Surveys made from Asheville, N. C., to Hendersonville, 22 miles. C. F. White, Ashville, N. C., is interested.

ATCHISON, TOPEKA & SANTA FE.—Projected extension of the Pecos & Northern from Texico, N. Mex., the eastern end of the Belen cut-off, southeast via Plainview, Tex., Floydada, Dickens, Aspermont, Hamlin, Anson and Abilene, to Brownwood, Tex., on San Angelo branch of Gulf, Colorado & Santa Fe, about 300 miles is to be built when conditions are more satisfactory. This would give the Santa Fe a short through line from San Francisco to Galveston.

The Arizona & California projected from Wickenburg, Ariz., on Santa Fe, Prescott & Phoenix, west to Bengal, Cal., on main line, 205 miles. In operation from Wickenburg west 113 miles to the Colorado river. Bridge over Colorado river completed. No new construction work was done during 1908 on the projected extension from the Colorado river bridge west to a junction with the main line at Bengal, Cal., 92 miles, but will be carried out when conditions warrant further work.

——A reasonable amount of ballast work on the extension between Point Richmond, Cal., and Bakersfield to be done during the present year.

——See Gulf, Colorado & Santa Fe.

ATLANTA, BIRMINGHAM & ATLANTIC.—Work suspended on branch from Bessemer, Ala., to Mulga, 14.5 miles. Lane Bros. Co., Atlanta, Ga., and C. D. Smith & Co., Birmingham, Ala., contractors.

——Western extension from Talladega, Ala., is completed to Pelham and trackage rights secured over the L. & N. into Birmingham. Work on the 19 miles from Pelham to Birmingham suspended.

ATLANTA NORTHEASTERN (Electric).—Surveys made from Atlanta, Ga., through the counties of Fulton, Cobb, Milton and Forsythe, to Cumming, 42 miles. T. F. Martin, Atlanta, Ga., is interested.

ATLANTIC COAST LINE.—Contracts let to Wade & Bell, Trinity, Fla.; Wade & Morrison, Washington, N. C., and Phillips & Allport, Richmond, Va., for building extension from Wilcox, Fla., northwest to Perry, 55 miles, for a change of line at Goldsboro, N. C., 4 miles, and a change of line at St. Mary's river, Fla., 1.5 miles. Surveys made for a change of line 4 miles long at Inverness, Fla. Work of double-tracking between Folkstown and Callahan under way.

ATLANTIC, NORTHERN & SOUTHERN.—Operating 17 miles from Kimballton, Iowa, south to Atlantic. Extensions, north from Kimballton to Manning, 20 miles, and south from Atlantic to Villisca, 39 miles, under way. Ross & Judd, Atlantic, Iowa, Contractors.

AUGUSTA & EDGEFIELD (Electric).—Projected from Augusta, Ga., north, via Edgefield, S. C., to Greenwood. Surveys completed and contracts for grading and track laying let. W. P. Calhoun, Chairman, Edgefield, S. C.

AUGUSTA SOUTHERN—Revision of grades and curves under way.

B

BALLINGER & ABILENE.—Organized in 1907 to build a line from Ballinger, Tex., north to Abilene, 55 miles. Contracts let. W. J. McDaniel, Chief Engineer, Ballinger.

BALTIMORE & OHIO.—Contract let for 4 miles, single track road in Georgetown, D. C., and to boundary of the District of Columbia. The line will be part of the Washington & Western Maryland, owned by the B. & O. It is ultimately intended to operate the line in connection with the Metropolitan Southern, a branch of the Baltimore & Ohio from Linden, in Montgomery county, Md., to the Potomac river. Finished from Lindon to Chevy Chase. A link five miles long is to be built to join this with the Washington & Western Maryland at the District line. C. A. Sims & Co., Contractors, Philadelphia.

BALTIMORE & WASHINGTON (Electric).—Proposed from Washington, D. C., to Sandy

Spring, Md., 14 miles. W. A. Mellen, General Manager, Washington, D. C.

BAKERSFIELD & VENTURA.—Building from San Francisco, Cal., southeast via Santa Paula, thence southwest to Ventura, on the Pacific coast, with franchises from Sunset northeast to Bakersfield, and from Saticoy south to Hueneme, on the Pacific coast, a total of 370 miles. Branch also projected from Santa Paula southeast to Santa Monica, thence east to Los Angeles, 50 miles. 20 miles finished. T. B. Blackburn, Ch. Engr., Oxnard, Cal.

BANGOR & AROOSTOOK.—Projected north from the main line at Seboois, Me., along the east bank of the Allagash river to St. Francis, 140 miles. Surveys made over the most difficult parts.

——Contract for building line from Baton Rouge, La., east, let to John Scott & Sons, Contractors, St. Louis, Mo. Work under way between Baton Rouge and Hammond.

BAYFIELD TRANSFER.—Projected from Bayfield, Wis., west to Superior, 70 miles.

BAY POINT & CLAYTON.—Projected from Bay Point, Cal., southeast to Clayton. Finished to Cowell 10 miles. Surveyed from Cowell to Clayton, 3 miles and from Bay Point station to Bay Point landing, $1\frac{1}{2}$ miles. W. H. George, Secretary and General Manager, San Francisco.

BEAUMONT & SARATOGA TRANSPORTATION.—Extension projected from Saratoga to Batson, 15 miles.

BEAVER VALLEY & NORTHWESTERN.—Projected from Gage, Okla., thence west via Hooker to Guymon, on the Atchison, Topeka & Santa Fe, northwest to Beaver. It is intended ultimately to extend the line northwest to a connection with the Atchison, Topeka & Santa Fe in Kansas. Survey from Gage to Hooker made. Contract let to T. E. Luttgerding, Contractor, Wichita, Kans. J. W. Webb, President, Beaver.

BEAVERTON & WILLSBURG.—See Southern Pacific.

BESSEMER & LAKE ERIE.—Extending second track at several points where grading was completed in 1907, in total about three miles. H. T. Porter, Chief Engineer, Greenville, Pa.

BIENVILLE-QUITMAN.—Projected from Bienville, La., east to Quitman, 12 miles. Contracts let and work under way. Track laid on 2 miles. Richardson-Taylor Lumber Co., contractors. E. E. Scott, Chief Engineer, Bienville, La.

BIG BEND TRANSIT CO.—Projected from Spokane, Wash., west along the Little Spokane river to Metre rapids. Grading has been completed for 7 miles on the western end. Wm. A. Nichols, President, 105 Howard street, Spokane, Wash.

BIG STONY.—See Norfolk & Western.

BILLINGS & COOKE CITY ELECTRIC.—Proposed from Absarokee, Mont., northeast to Billings. Surveys made and grading will begin as soon as the right of way is secured. J. B. Clayberg, Helena, Mont.

BIRMINGHAM & GULF RAILWAY & NAVIGATION CO.—Projected from Tuscaloosa, Ala., northeast via Birmingham to Gadsden, about 120 miles. The company has bought the Tuscaloosa Belt Railway, a 12-mile belt line at Tuscaloosa, eight river steamboats and a number of barges, which are being operated on the Alabama river from Montgomery, Ala., via Selma to Mobile, and from Tuscaloosa, via Demopolis to Mobile. J. L. Pultz, Genl. Mrg., Mobile.

BIRMINGHAM, COLUMBUS & ST. ANDREWS BAY.—Contracts let to Lemuel E. Miller, Philadelphia, for building from Green Head, Fla., to St. Andrews Bay, 38 miles. Grading under way by J. M. Willis, from Sodom to Taylers, 10 miles.

——Work under way on an extension from Morrison, Fla., to Green Head, 5 miles.

BITTER ROOT.—Proposed from Lewiston, Idaho, east to Butte, Mont., about 350 miles. Surveys made from Lewiston to Clearwater river, 85 miles. G. W. Boschke, Ch. Engr.

BLOOMINGTON, PONTIAC & JOLIET. (Electric).—In operation from Dwight, Ill., southwest to Pontiac, 20 miles. Extension projected from the latter place southwest to Bloomington, 35 miles.

——See Joliet & Southern Traction.

BLUE RIDGE TRACTION.—Proposed extension to various points aggregating 16 miles. The principal extension will be through Cherryville, Pa., Weaversville and Bath. A bridge is also to be built at Alliance.

BONLEE & WESTERN.—Proposed to build 14 miles of railway in North Carolina in Chatham and Randolph counties. Work under way west from Causey, N. C. J. H. Dunlap, President, Pt. Dillon, S. C.

BOSTON ELEVATED.—Work on the Cambridge main street subway postponed, awaiting approval of plans of stations by the Railroad Commissioners.

—— Plans for the route from Sullivan Square, Charleston, to Malden, about 3 miles, are now before the Railroad Commissioners.

——Legislature authorized building of subway from the present Park street station in the Tremont street subway, west under Boston Common to south bank of Charles river, and under Charlesbank to beyond Harvard bridge. To be used by trolley cars for Newton, Brighton, Allston and other outlying points. Work not to be begun for some months yet.

——Extension from North station, Boston, to East Cambridge proposed for near future. Contracts for foundations for Charles river bridge let.

——Contracts let for station at Forrest Hills Square, George A. Kimball, Chief Engineer, Boston, Mass.

BRINSON RAILWAY.—Proposed extension Springfield, Ga., northwest to Sylvania, 32 miles.

BROOKINGS & SIOUX FALLS (Electric).—Intend to build from Brookings, S. Dak., via Flandreau to Sioux Falls, 65 miles. Grading completed from Brookings to Erico, 15 miles. Line under contract from Brookings to Flandrau, 28 miles, Western Construction Co., Brookings, S. D., Contractors. I. A. Smith, Chief Engineer. St. Louis, Mo.

BUENA VISTA & MAUK—Proposed 18 miles from Mauk, Ga., southwest to Buena Vista. E. B. Hornady, of Buena Vista, Ga.

BUFFALO, ROCHESTER & PITTSBURGH.—Main line improvements under way near Punxsutawney, Pa.

BURR'S FERRY, BROWNDEL & CHESTER.—Projected from Rockland, Tex., east via Browndel and Burkville, to Burr's Ferry, on the Sabine river, 86 miles. Grading completed from Rockland to Browndel, 28.5 miles. Track laid to Ellis Hill, 11.5 miles. Hope to complete laying steel on remaining 17 miles this summer. Work suspended. There will be a 200-ft. steel bridge over the Angelina river. P. G. Omohimdro, Ch. Engr., Beaumont.

C

CAIRO & KANAWHA.—Proposed extension from Macfarlan, W. Va., to Smithville, 8 miles.

CAIRO & THEBES.—Building from Cairo, Ill., northwest to Thebes, 25 miles. J. L. Armstrong, Ch. Engr., Cairo.

CALIFORNIA CO.—Proposed from Richardson's Bay, Cal., northeast to Sacramento, about 90 miles. Branch lines from Gallinas creek north to Petaluma, 18 miles, and from the Stanley lands north to Napa, 5 miles. Surveys made for a route from Richardson's Bay to Tiburon, San Quentin, Point Pedro, Petaluma, and thence northeast to Sacramento. Charles W. Conlisk, stockholder, San Francisco.

CALIFORNIA, NEVADA, IDAHO & NORTHERN. Work is under way on the line from Caldwell, Idaho, west to Homedale, 17 miles. Surveys made beyond Homedale south to Jordan Valley, Ore., 60 miles. Canyon Construction Co., contractors, Caldwell. F. H. Richardson, Chief Engineer, Caldwell.

CALIFORNIA NORTHEASTERN. — See Southern Pacific.

CAROLINA & TENNESSEE SOUTHERN.—See Southern.

CAROLINA, CLINCHFIELD & OHIO.—Work on the southern end of this line from Bostic, N. C., south to Spartanburg, S. C., 32 miles, is progressing rapidly. The McArthur Bros. Co., Spartanburg, S. C., has contract for this work, and have given sub-contracts for 18 miles, as follows: Bostic to Second Broad River, five miles, J. Nichols, Parkersburg, W. Va.; Second Broad River to Floyd Creek, five miles, Purcell, Allen, Shehan & Co., Washington, D. C.; Broad River to Little Buck Creek, Williams, Lewis & Spradlin, Atlanta, Ga.; Pacolet River to Peters, three miles, to Reagan & Yale. Most of the heavy masonry work has been let to J. C. Dunn, Cleveland, Ohio, and Thomas Shehan, Nashville, Tenn. The trestle work has been awarded to H. J. Collier & Co., Cleveland, Ohio. Should be completed by May 15, 1909.

CAROLINA VALLEY.—Projected extension from Thomasville, N. C., northeast, via Highpoint, to Greensboro, 22 miles; also from Highpoint northwest to Winston-Salem, 21 miles. Work under way on 12 miles.

CANADIAN RIVER RAILROAD.—See Santa Fe, Liberal & Englewood.

CAZENOVIA & SAUK CITY. — Proposed from Lavalle, Wis., south, via Ironton, Cazenovia, Lineridge and Logansville to Sauk City, about 40 miles. Right of way secured for part of line. Contracts for construction not yet let. Joseph Duren, Cazenovia, Wis.

CENTRAL ARKANSAS (Electric).—Proposed from Little Rock, Ark., southeast to Pine Bluff and southwest to Hot Springs, about 90 miles. Preliminary surveys made and some of the right of way secured.

CENTRAL CALIFORNIA.—See Southern Pacific.

CENTRAL KENTUCKY TRACTION.—Proposed from Lexington, Ky., south to Nicholasville, 12 miles. J. B. Crawford, General Manager, Lexington, Ky.

CENTRAL RAILROAD OF LOUISIANA.—Proposed from Leesville, La., to New Orleans, 242 miles. Work under way. C. L. Provost, New Iberia, Chief Engineer.

CENTRAL TEXAS TRACTION.—Proposed from Corsicana, Tex., southeast to Palestine, 60 miles. W. W. Clopton and J. V. Watkins, of Corsicana, are interested.

CHAMPLAIN & SANFORD.—Organized last year to build a line from Lake Sanford, N. Y., southeast to Schroon lake, thence along the west shore of Schroon lake, through Pottersville and Chester, to Riverside on the Adirondack division of the Delaware & Hudson. Surveys made. A. Thompson, President, Albany, N. Y.

CHARLESTON & SUMMERVILLE (Electric).—Contract let to the General Contracting & Engineering Co., New York, to build from Charleston, S. C., northwest to Summerville, 27 miles. Grading finished on 23 miles. Julius G. Hocke, President, New York; George Tupper, Secretary-Treasurer, Summerville, S. C. W. O. Sprigg, Ch. Engr., 15 Whitehall street, New York.

CHARLESTON, PARKERSBURG & WESTERN.—Track laid for 30 miles on the line building from Charleston, W. Va., north to Parkersburg, 60 miles. Engineering work under way on the rest of the line, but undecided when grading will be begun. C. P. Peyton, Ch. Engr., Charleston.

CHARLESTON & WESTERN CAROLINA.—Rebuilding yard tracks along the Savannah river at Augusta, Ga., which were carried away by high water. Improvements will include a total of 6,000 ft. of trestle work.

CHARLOTTE HARBOR & NORTHERN.—Extension from Arcadia to Plant City, 60 miles, surveyed and right of way secured.

CHATTAHOOCHEE VALLEY.—Proposed extension from West Point, Ga., north through Troup county, Ga., to Standing Rock, in Chambers county, Ala., thence to a point near Texas in Heard county, Ga.

CHESAPEAKE & OHIO.—The Raleigh & Southwestern, building from the Piney branch at Raleigh, W. Va., up the Piney river and over the divide, thence down the tributaries of the Guyandotte river in Raleigh or Wyoming counties; also extension from Raleigh up Beaver creek into the Glade creek valley. Johnson & Briggs, Richmond, Va., contractors. Work suspended July 1, 1907, and not yet resumed.

——During 1908 track was laid for about two miles on the extension of the Potts Creek branch from Jordan, Va., to Bess. No further extension intended at present.

——Double-tracking between Morrison, Va., and Lee Hall and between Lightfoot and Diascund. Grading completed, track-laying in progress.

——Double-tracking between Gauley, W. Va., and Kanawha Falls. Pitts & Calligan, Kanawaha Falls, W. Va., contractors.

——Extension of the Coal River Railway on Little Coal branch completed and track laid to mouth of Laurel Fork. Under construction from Clothier up Laurel Fork, 5 miles. G. E. McComas, Madison, W. Va., contractor.

——Grading work on the double-tracking work and change of line between St. Albans, W. Va., and Barboursville, about 30 miles, which was suspended in 1907, was resumed in June, 1908, and is still being carried on. Grading about 85 per cent. completed and tracklaying started. Rinehart & Dennis Co., Washington, D. C., Johnson & Briggs, Richmond, Va., and J. C. Carpenter & Co., Clifton Forge, Va., contractors for grading and masonry.

CHESTNUT RIDGE.—Work under way on extension from Millport, Pa., south to Palmerton, 2 miles. Extension projected from Kunkletown north to Saylorsburg 8 miles.

CHESTERFIELD & LANCASTER.—Extension projected from Croburk, S. C., north to Monroe or Charlotte, N. C., 20 to 40 miles.

CHICAGO & NORTH WESTERN.—Work under way on track elevation and a new passenger station in Chicago.

CHICAGO, INDIANAPOLIS & EVANSVILLE.—Proposed from Indiana Harbor, Ind., south through Indianapolis to Evansville, 346 miles. Contract let to Carter Construction Co., contractors. Branch from Logansport, Ind., north to South Bend, 70 miles. William Kenefick, President; J. B. Carter, Vice-President; C. A. Dunneen, Secretary, and R. Zenkere, Treasurer, Indianapolis, Ind.

CHICAGO, LAKE SHORE & SOUTH BEND (Electric).—Building from South Bend, Ind., west to Chicago, Ill., 71 miles. It is expected to have the entire line in operation by April 1. J. B. Hanna, President, South Bend.

CHICAGO, MILWAUKEE & GARY.—Projected extension from Rockford, Ill., north via Beloit, Wis., and Janesville to Milwaukee, 100 miles.

——Projected extension from Momence, Ill., north to Gary, 42 miles. Surveys made and rights of way secured.

CHICAGO, MILWAUKEE & PUGET SOUND.—From Maplevalley east there is about 18 miles of track to be laid. Johnson creek tunnel, 1,985 feet long, is about completed. Track to be laid to the Columbia river, about 24 miles, and the Columbia river bridge will be completed soon. Track laid from the Columbia river to the west end of St. Paul Pass tunnel in the Bitter Root mountains, which latter will be completed in April. Track laying between Missoula and Garrison under way.

——Grading completed on last strip within city limits of Tacoma, Wash., comprising a cut varying from 8 to 12 ft. deep, between East D street and Pacific avenue, about a block and one-half long. Track-laying under way.

CHICAGO, OTTAWA & PEORIA.—Work under way on a 16-mile branch from Streator, Ill., north to a connection with the main line at Ottawa. W. B. McKinley, President, Champaign, Ill.

——See Western Railways & Light Co.

CHICAGO, ROCK ISLAND & GULF.—Surveys made from Graham, Tex., west to Thockmorton, on the proposed extension from Graham, Tex., west to Haskell, about 75 miles. J. B. Ware Construction Co., contractors, St. Louis, Mo. Grading in progress.

——See Chicago, Rock Island & Pacific.

CHICAGO, ROCK ISLAND & PACIFIC.—Projected cut-off line from Amarillo, Tex., west to Tucumcari, N. Mex., 110 miles. Completed from Amarillo, west, to to Eldorado, 21 miles. Work to be resumed on the remaining 90 miles this Spring.

——Projected cut-off from Mangum, Okla., southeast through western Texas, across the corner of New Mexico via Carlsbad, to El Paso, Texas. J. B. Ware Construction Co., contractors, St. Louis, Mo.

CLEAR LAKE & SOUTHERN (Electric).—Proposed from San Pablo bay, Cal., north via Napa, to Lakeport, on Clear Lake, 135 miles. Surveys made. LeGrand Brown, Chief Engineer, 34 Ellis street, San Francisco, Cal.

CLEVELAND, CINCINNATI, CHICAGO & ST LOUIS.—Surveys being made under charter of the Evansville, Mt. Carmel & Northern from Mt. Carmel, Ill., south to Evansville, Ind., 43 miles.

CLEVELAND SHORT LINE.—Building an 18-mile belt line around Cleveland, Ohio. Located from West Park, 7 miles west of Cleveland southeast to near the Cleveland city limits, thence east and northeast toward Collinwood. In southeast Cleveland the line passes under the main streets; also under the tracks of the Pennsylvania Lines, the Erie and the Wheeling & Lake Erie, through double-track tunnels 40 ft. below the surface. A viaduct 1,980 ft. long will carry it over the Cuyahoga river. There are no grade crossings. The line will furnish interchange facilities between all railways entering Cleveland. Work started in May, 1906. Contracts all let to John Marsch, Cleveland, for grading and masonry, and the King Bridge Co. and the American Bridge Co. for bridges on the section from Rockport to the Cuyahoga river south of Cleveland. Grading, masonry and bridges completed. Track laid for 4 miles. S. Rockwell, Chief Engineer, Cleveland.

CLINTON, OKLAHOMA & WESTERN.—Projected from Clinton, Okla., on the St. Louis & San Francisco and the Kansas City, Mexico & Orient, northwest, via Butler, Hammon and Cheyenne to the Okla.-Texas state line on the Canadian river, 125 miles. First section of line from Clinton to Butler under contract to B. Adams, contractor, Clinton. Grading under way. C. C. Godman, President, Clinton.

COAL & COKE.—Projected extension of the Sutton branch from Gassoway, W. Va., east via Sutton, to Wolf's Creek, 8¼ miles. Contract not yet let. R. H. Pembroke, Chief Engineer, Elkins, W. Va.

COAL RIVER.—See Chesapeake & Ohio.

COLORADO, COLUMBUS & MEXICAN.—Proposed from Columbus, N. Mex., on the Mexican border, north to Golup, Colo., about 300 miles. Surveys made. A. O. Bailey, Columbus, N. Mex.

COLORADO & MEXICO.—Proposed from Douglas, Ariz., via Sulphur Springs valley to Cortland, 40 miles. Entire line is under construction. Powers & O'Connor, contractors, El Paso, Tex. J. L. Campbell, Chief Engineer, Bisbee, Ariz.

COLORADO & NORTHERN. Proposed from Hayden, Colo., to Cottonwood, 15 miles. Paul Blount, Chief Engineer, Denver, Colo.

COLORADO & SOUTHERN.—Terminals being built by the Galveston Terminal Co., at Galveston, Tex., to cost $5,000,000.

COLORADO, HEREFORD & GULF.—Construction under way from Hereford, Tex., southwest to Adrian, 36 miles. South Western Engineering & Construction Co., contractors.

——Proposed from Dalhart, Tex., southwest to San Angelo, 420 miles.

COLORADO, TEXAS & MEXICO.—Proposed from Mangum, Okla., southwest to Comfort, Tex., about 510 miles. 79 miles graded. All surveys made. The Colorado Construction Co., contractors, Mangum, Okla.

COLORADO TRANSPORTATION CO.—See Kansas-Colorado.

COLORADO & WYOMING.—Surveys made for a 6-mile extension from Tercio, Colo., northwest to Stonewall. Grading finished from Tercio to Cornell, 3 miles, but no track laid. J. Coan, contractor, Tercio. R. M. Hosea, Ch. Engr., Pueblo, Colo.

CORSICANA-PALESTINE INTERURBAN.—Surveys made and right of way secured for line from Corsicana, Tex., southeast to Palestine, about 60 miles. G. A. Duren, Chief Engineer, Corsicana.

CORVALLIS & ALSEA RIVER.—Building logging road from Corvallis, Ore., via Monroe to Alsea river 25 miles; 23 miles graded between Corvallis and Glenbrook and 17 miles of track laid, from Corvallis to Monroe. Floyd Bogue, Chief Engineer, Corvallis.

CUMBERLAND RAILROAD.—Contracts let to S. P. Condon, of Knoxville, Tenn., for extension from Artemus, Knox county, Ky., south to Jellico, Tenn., 32½ miles. Track laid from Artemus to Cumberland, 8.2 miles. B. C. Milner, Ch. Engr., Warren, Ky.

CUMBERLAND RIVER & NASHVILLE.—Contracts let to the Monticello Construction Co., of Monticello, Ky., to build from Burnside, Ky., southwest to Monticello, 20 miles; graded for 12 miles, and foundations being built for South Fork bridge. Projected from Corbin, Ky., west to Burnside, and thence southwest to the Tennessee State line, 100 miles, and from this point under the name of the Nashville & Northeastern to Clarksville, Tenn., 60 miles. S. Woodward, President, Carlisle building, Cincinnati, Ohio.

D

DAKOTA & WESTERN.—Projected from Rapid City, S. Dak., southwest to Hill City, 20 miles. Grading completed, but no track laid. A. M. Lamphere, Ch. Eng., Rapid City.

DAYTON, LEBANON & CINCINNATI.—Building from Dayton, Ohio, south to Lebanon, where connection will be made with the Cincinnati, Lebanon & Northern. Twenty-seven miles in operation. Surveyed from Lambeth, Ohio, to Dayton, 2 miles and contracts let. W. E. Johnson, Ch. Engr., Lebanon, Ohio.

DELAWARE & EASTERN.—Proposed northern extension to be built by the Schenectady & Margaretsville from Arkville, N. Y., via Holcotville and Roxbury, to Schenectady, 81 miles. Grading to be started this spring. Work includes one tunnel and two steel viaducts.

——Proposed southern extension to be built by the Hancock & East Branch from East Branch, N. Y., southwest to Wilkesbarre, Pa., 160 miles.

DELAWARE, LACKAWANNA & WESTERN. Work under way on the 28-mile cut-off from Lake Hopatcong, N. J., to Andover, through Warren county to Slateford, Pa., in seven sections as follows: Section 1, 2½ miles, to Timothy Burke, Scranton, Pa. Section 2, 2 miles, to Waltz & Reece Construction Co., Billings, Mont. Section 3, 4½ miles, to David W. Flickwir, Roanoke, Va. Section 4, 5½ miles, to W. H. Gahagan, Brooklyn, N. Y. Section 5, 5 miles, to Hyde, McFarlin Co., New York. Section 6, 5 miles, to Reiter, Curtis & Hill, Philadelphia, Pa. Section 7, 3½ miles, to Smith, McCormick Co., Easton, Pa.

DELAWARE TUNNEL RAILROAD CO.—Charter granted to this company, which proposes to build a tunnel under the Delaware river from Second and Market streets, Philadelphia, Pa., to the New Jersey line, where connection will be made with the tunnel to be built by a New Jersey corporation from the Camden, N. J., side of the river. Contracts will be let as soon as the general plans are completed. W. A. Stern, President, Philadelphia, Pa.

DENVER & RIO GRANDE.—Double-tracking from Florence, Colo., west to Canyon City, 8.3 miles.

DENVER & SOUTH PLATTE (Electric).—Projected from Denver, Colo., to Roxbury Park, 20 miles. Five miles in operation, connecting with line of the Denver City Tramway, at Englewood. No contracts yet let for remaining 15 miles.

DENVER, LARAMIE & NORTHWESTERN.—Projected from Denver, Colo., north and west, via Fort Collins, Colo., Laramie, Wyo., and Granger, to Seattle, Wash., 1,400 miles. Graded for 76 miles on the most expensive and heaviest section of the line, and the 700-ft. trestle at Sand creek (Denver) completed. Grading contract let to Frederick B. Orman & Co., contractors for first section from Denver to Fort Collins. R. H. Dwyer, General Manager, Denver.

DENVER NORTHWESTERN & PACIFIC.—Work under way on extension from Steamboat Springs toward the Colo.-Utah State line, about 145 miles. The line is being built from Denver, Colo., west to Salt Lake City, Utah, 490 miles. In operation from Denver to Steamboat Springs, 229 miles.

DES MOINES & SIOUX CITY (Electric).—Proposed from Des Moines, Ia., northwest to Sioux City, about 192 miles. Most of right of way secured. Contract for construction of line let to American Engineering Co., contractors, Indianapolis, Ind. M. H. Miller, General Manager, Des Moines, Ia.

DINWIDDIE & GARY.—Organized to extend the Chicago & Wabash Valley from Dinwiddie, Ind., via Merrillvill, Lottesville, Glen Park. Grading completed north from Dinwiddie, 4 miles and track laid on 3 miles. C. J. Hobbs, Chief Engineer, Kersey, Ind.

DULUTH & IRON RANGE.—Work under way at Two Harbors, Minn., on a new yard, to contain 6.2 miles of track. Jones Bros., contractors, Cincinnati, Ohio.

DULUTH & NORTHERN MINNESOTA.—Surveys made in Minnesota for an extension from Finland, north 120 miles.

DURHAM & CHARLOTTE.—Extension projected from Gulf, N. C., northeast to Pittsboro, 15 miles.

DYERSBURG NORTHERN.—Extension projected from Tiptonville, Tenn., to Bottom Number Nine, 9 miles.

E

ELDORADO, MARION & SOUTHWESTERN.—Under construction from Pittsburgh, Ill., to Allegheny, 6 miles. Surveyed from Allegheny to Eldorado, 20 miles.

ELKINS ELECTRIC.—Building, with its own men, an electric line from Elkins, W. Va., via Roaring Creek Junction, Harding, Junior, Belington, Clara, Meadowville, Kalamazoo, Nestorville, Danville, Claud and Knotsville to Grafton, 43 miles. The maximum grade is to be 1.5 per cent.; maximum curvature, 10 deg. Track has been laid on two miles. P. B. Bloomfield, Ch. Engr., Elkins.

EL PASO & KANSAS CITY SHORT LINE.—Projected from the southern boundary of New Mexico at the Texas state line east through the Guadalupe mountains along the Pecos valley, crossing the Pecos river at Malaga, thence northeast into the Panhandle of Texas. Surveyed in Texas through the counties of Yoakum, Gaines, Terry, Lynn Lubbock, Crosby, Floyd, Motley, Cottle and Hardeman to Quanah, where connection is to be made with the St. Louis & San Francisco. Rights of way for about 480 miles secured. Col. J. L. Bell, of El Paso, Tex.

ENID, OCHILTREE & WESTERN.—Projected from Enid, Okla., west via Ochiltree, Tex., and Hansford to Dalhart, about 265 miles. Most of surveys made and

rights of way secured. The present plans provide for building the first 100 miles from Dalhart, east to Ochiltree. On this section the grade will not exceed one-half of 1 per cent., and there will not be any bridges and only a few culverts. A. E. Wiest, Jr., Vice-President and General Manager, Dalhart, Tex.

ERIE.—Improvement work under way on Jersey City terminal. Plans provide for a 4-track open cut 70 ft. deep and 4,500 ft. long through Bergen Hill for passenger trains. The tracks will run on an elevation in the city east of the tunnel to a new station. The present tunnel will be used for freight trains. The company has bought a large tract of land at the western end of the tunnel, and the city has vacated five blocks on the meadows. Work includes excavating about 120,000 cu. yds. of earth and 480,000 cu. yds. of rock, and building 15,000 cu. yds. of concrete masonry. The Penhorn Creek Railroad incorporated to build this line, 4.74 miles. Contract let to the Millard Construction Co., Philadelphia, Pa.

——Work under way on the Genesee River Railroad from Hunts, N. Y., south to Cuba, 33 miles, as follows: Hunts to Rossburg, Millard Construction Co., Philadelphia, Pa.; Rossburg to Black Creek, W. H. Coverdale & Co., New York; Black Creek to Cuba, Bennett & Smith, Wilkinsburg, Pa.

——Double-tracking from Carrollton, N. Y., to Cuba, 25 miles. Five miles finished; work suspended.

ESTACADO & GULF.—Projected from Roby, Tex., southeast, via McCaulley, Grider and Abilene, to Coleman, 100 miles. Completed from Roby to McCaulley and grading finished to Grider.

——Branch projected from Grider to Stamford, 20 miles. Surveys made and grading will begin about April 15th.

EVANSVILLE & EASTERN RAILWAY.—Projected from Rockport, Ind., east via Grandview, Troy, Tell City and Cannelton to New Albany, and across the Ohio river to Louisville, Ky. C. H. Battin, director, Evansville, Ind.

EVANSVILLE, MT. CARMEL & NORTHERN.—See Cleveland, Cincinnati, Chicago & St. Louis.

EVANSVILLE, MT. CARAMEL & OLNEY (Electric).—Projected from Evansville, Ind., northwest to Olney, Ill., about 60 miles. Surveyed. A. Knoop, President, Olney.

EVERETT RAILWAY, LIGHT & WATER CO.—See Seattle-Everett Interurban.

F

FLORIDA EAST COAST.—Building from Knight's Key, southwest along Florida keys to Key West, about 45 miles. Work includes construction of concrete roadbed on the corral formations of the Keys. From Key West north, track is laid on part of line.

FORT WAYNE & SPRINGFIELD (Electric).—Surveys completed and grading on the remaining 11½ miles to be started as soon as weather conditions permit. Construction work will include one 49-ft. bridge.

——Extension from Decatur, Ind., south via Monroe to Berne, 12 miles.

——Surveys completed on extension from Berne to Portland. Time of beginning grading not decided.

FORT WORTH, WEATHERFORD & MINERAL WELLS INTERURBAN.—Projected from Fort Worth, Tex., west via Weatherford to Mineral Wells, 55 miles. Surveys made by Baxter Brown, St. Louis, Mo.

FRANKLIN & ABBEVILLE.—Extension projected from David Junction, La., north to Youngsville, 15 miles, and from F. & A. Junction south to Franklin, 6 miles.

FRANKLIN & CLEARFIELD.—See Lake Shore & Michigan Southern.

G

GAINESVILLE, WHITESBORO & SHERMAN (Electric).—Proposed from Gainesville, Tex., via Whitesboro to Sherman, 39 miles. Grading finished on 12 miles. Track laying has been indefinitely postponed. L. M. McArthur, Chief Engineer, Stanford, Tex.

GALATIA, HARRISBURG & SOUTHWESTERN.—The property and holdings, including the right of way of the Harrisburg & Ohio River, bought by this company. Branch now building will connect with the Illinois Central at Galatia and extend northeast to Harrisburg, 10 miles. Most of grading and bridges completed. Work to be resumed this spring.

GALESVILLE & ETRIC.—See Western Transportation Co.

GALVESTON TERMINAL.—See Colorado & Southern.

GARY, HOBART & VALPARAISO (Electric).—Proposed from Gary, Ind., via Hobert and Wheeler to Valparaiso, 20.5 miles. Grading to be started early this spring. Blake A. Mapledoram, Chief Engineer, Gary.

GENESEE RIVER.—See Erie.

GENESEE & ORLEANS (Electric).—Projected from Batavia, N. Y., north, via Albion, to the government harbor, Point Breeze, known as Oak Orchard, on Lake Ontaria, 27 miles. Grading will begin in April or May. Contracts not let. Geo. W. Mische, Rochester, N. Y., is interested.

GEORGIA & FLORIDA.—Projected connecting links aggregating 123 miles between existing lines to complete a through line from Augusta, Ga., via Keysville, Vidalia, Hazlehurst, Douglas, Nashville and Valdosta to Madison, Fla. North of Hazlehurst 8 miles is completed and the line to the Altamaha river. Contract let to M. M. Elkan, contractor, Vidalia, Ga., for entire 28.4 miles to Vidalia. About 26 miles from Keysville, Ga., to Augusta yet remain to be built.

GEORGIA ROAD (Electric).—Projected from Columbus, Ga., via Society Hill and Tuskegee to Montgomery. J. W. Mayberry, President, Society Hill.

GEORGIA, SOUTHWESTERN & GULF.—Projected from Albany, Ga., southwest via Colquitt and Donaldsonville and Marianna, Fla., to St. Andrews on the Gulf of Mexico, 160 miles. The entire line is under contract and grading will begin in the coming spring. Work includes a 500-ft. draw-span bridge over the Chattahoochie river. T. H. Hazelrigg, Chief Engineer, Indianapolis, Ind.

GILA VALLEY, GLOBE & NORTHERN.—See Southern Pacific.

GILMORE & PITTSBURGH.—Projected from Armstead, Mont., west to Salmon, Idaho. Surveys made and contracts let for grading, track laying and bridges. Work includes a 750-ft. tunnel. T. H. Bacon, Chief Engineer, Machesney building, Pittsburgh, Pa.

GLENRAY & RICHWOOD.—Projected from Alderson, in Monrie county, W. Va., north to Richwood, 40 miles, where connection is to be made with the Baltimore & Ohio. Surveys made and part of the rights of way secured. Construction work will be started early this spring. F. M. Arnold, director.

GOOSE LAKE SOUTHERN.—See Southern Pacific.

GOULD SOUTHWESTERN.—Projected from Douglas, Ark., east via Isom, Star City, Glendale, Calmer, Toledo, Rison, Croak, Bleeker and Bunn to Princeton, 104 miles. In operation from Isom to Star City, 21 miles. Rights of way for rest of line secured.

GRAND RAPIDS & NORTHWESTERN.—Projected from Grand Rapids, Mich., northwest to Ludington. Contract for first 20 miles from Ludington let to John Doyle, contractor, Grand Rapids. Eight miles completed near Wiley. Marshall F. Butters, President, Ludington.

GREAT NORTHERN.—Extension of the Vancouver, Victoria & Eastern from Keremeos, B. C., west to Princeton, 45 miles, under construction. J. H. Stewart, of Grand Forks, B. C., has grading contract for 40 miles, and F. P. Howard, of Maroon Valley, B. C., for work near Hedley. Projected from Princeton west to Abbotsford, where connection will be made with lines in operation.

——Extension under construction from Nashwauk, Minn., to Coleraine, about 16.5 miles.

—About 60 miles under construction on the Moses Coulee branch in Douglas county. Branch runs midway between the Columbia river and the Northern Pacific.

——Branch projected from Dewey Lake, Minn., north to International Falls, 78 miles of which is partially graded.

——Branch projected from Wenatchee, Wash., north to Oroville, 140 miles, which is partially graded.

—Branch projected from Wenatchee, southeast to Pasco, about 150 miles.

——See Spokane, Portland & Seattle, formerly Portland & Seattle.

GREENVILLE & KNOXVILLE.—Extension projected from Marietta northeast, via Cleveland, Riverview and River Falls to North Carolina state line, about 35 miles.

GULF & MAGNOLIA.—Projected from Hope, via Shover Springs, Bodcaw, Stockton and Waldo to Magnolia, 38 miles. Surveys made. Contracts to be let in near future. S. Q. Sevier, General Manager, Hope, Ark.

GULF, COLORADO & SANTA FE.—The Texas & Gulf is building from Center, Tex., via Tenaha to Zuber, 21.3 miles. John Scott & Sons, contractors, St. Louis, Mo., Work now in progress and will probably be completed in June, 1909.

——Work of reballasting the Beaumont division from Rayburn, Tex., east 16 miles, by the company's forces, is in progress.

GULF, TEXAS & WESTERN.—Projected from Burrs Ferry, Tex., on the Sabine river in Newton county northwest, via Henderson, Tyler, Canton, Kaufman or Terrell, Dallas, Jacksboro, Olney, Seymour and Vera, to Benjamin, on the Kansas City & Mexico, in Knox county, about 500 miles. There will also be a branch through Ft. Worth. Some 200 miles of right of way secured west of Dallas, 60 miles of which are graded. Construction work under way from Jacksboro west, about 200 miles. B. B. Cain, Vice-President, Tyler, Tex.

H

HANCOCK & EAST BRANCH.—See Delaware & Eastern.

HARRISVILLE & CORNWALLIS.—Projected from Harrisville, W. Va., to Cornwallis, 6½ miles. Four and one-half miles graded. The work includes two steel bridges. A. Wolverton, Chief Engineer, Philippi, W. Va.

HILLSBORO & NORTHEASTERN.—Extension projected from Hillsboro, Wis., south to Richland Center, 28 miles.

HOLSTON RIVER RAILWAY.—See Virginia & Southwestern.

HOUSTON & BRAZOS VALLEY.—Contract given to I. T. Austin, of Velasco, Tex., for extension from Velasco to Quitman, 3 miles.

HUDSON & MANHATTAN.—Line under Sixth avenue, New York, being extended from Twenty-third to Thirty-third street.

——Branch to be built from Sixth avenue, New York, under Ninth street, to connect with the subway at Fourth avenue.

——Double-tube tunnel being built from Hoboken, N. J., in a southerly direction through the Erie and Pennsylvania stations in Jersey City, N. J.

——Extensions to be built from the Pennsylvania station in Jersey City to a connection with the present Pennsylvania main line.

HUNTINGTON RAILROAD (Electric).—See Long Island.

I

IDAHO RAILWAY & NAVIGATION.—Projected from Lewiston, Idaho, to the upper Snake river country. The company will also operate a line of small steamers on the upper Snake river to handle freight and passenger business, pending the completion of the road and to serve the construction camps. Grading under way. L. S. McDonald, Chief Engineer, Spokane, Wash.

IDAHO & WASHINGTON NORTHERN.—Work under way on the extension of this road from Newport, Wash., north along the west bank of the Pend O'Reille river to Ione, 52 miles. Grant, Smith & Co., contractors, Spokane. Surveys made from Ione north to Metaline, 8 miles.

ILLINOIS TRACTION.—Work under way on extension into St. Louis, Mo., which includes a bridge over the Mississippi river from the foot of Salisbury street, St. Louis to Venice, Ill. Company expects to be using its own bridge and terminals in St. Louis before the end of 1909; the improvements, including a passenger station, freight house and the bridge, to cost about $5,000,000. Plans are complete for extensions on the north, one of 47 miles and the other 30 miles, to complete a continuous interurban line from St. Louis north-east to Chicago.

INDIANAPOLIS, CLOVERDALE & TERRE HAUTE TRACTION.—Projected from Indianapolis, Ind., southwest via West Newton, Mooresville, Gasburg, Monrovia, Cloverdale and Brazil to Terre Haute.

—Bids asked for building branch from Mooresville, Ind., northwest to Roachdale, about 26 miles. E. M. Bowman, Director, Indianapolis, Ind.

INDIANAPOLIS, LOGANSPORT & CHICAGO.—Projected from Logansport, Ind., south to Indianapolis, 66 miles. Surveys made and rights of way secured. Graded for 2.5 miles at Indianapolis. W. A. Osmer, Ch. Engr., Logansport, Ind.

INDIAN CREEK VALLEY.—Construction work on 10-mile extension from Roger Mills, Pa., north to Jones Mills to be started at an early date. Location surveys from Jones Mills to Ligonier, 16 miles, completed. S. M. Faust, Ch. Engr., Connellsville, Pa.

INTERBOROUGH RAPID TRANSIT.—Projected extension from Flatbush avenue and Fulton street, Brooklyn, N. Y., along Flatbush avenue extension to the Manhattan bridge now under way. The Interborough offers to do the necessary construction for $1,200,000 and to operate the line under lease. The route of the proposed subway in Brooklyn is identical with a part of the Fourth avenue subway, for the construction of which the Public Service Commission has just let contracts; and the proposition of the Interborough seems to have been made on the assumption that these contracts will not be carried out for the reason that the city is not at present in a position to provide the necessary money.

——Work under way on additional subway tracks north from 96th street and Broadway to 102d street.

INTER-CALIFORNIA.—See Southern Pacific.

IOWA & OMAHA SHORT LINE.—Proposed from Omaha, Neb., via Oakland, Air Line, Guthrie Center to Des Moines, Iowa, 130 miles. Preliminary surveys made. Grading to begin at an early date. Contract let to G. W. Adams & Co., Walnut, Iowa, for 15-mile section between Council Bluffs, Iowa and Treynor. J. H. Mayne, Ch. Engr., Walnut.

J

JOLIET & SOUTHERN TRACTION.—Projected from Joliet, Ill., east, via New Lenox, Frankfort and Mattison to Chicago Heights, 26 miles. Grading completed and track laid from Joliet to Frankfort, 14 miles, and from Mattison to Chicago Heights, 4 miles. Fisher Construction Co., contractors.

——Extension projected from Chicago Heights to Hammond, Ind., 14 miles. No work done.

——Expect to build Bloomington, Pontiac & Joliet (electric) from Joliet south, via Wilmington, to Dwight during present year.

——Expect to build line from Pontiac to Chenoa this year.

JOPLIN & PITTSBURG (Electric).—General contract let to A. L. Register & Co., of Philadelphia, Pa., for extension from Pittsburg, Kan., southeast to Joplin, Mo., 25 miles. H. F. Coleman, Ch. Engr., Joplin.

K

KANSAS CITY, MEXICO & ORIENT.—Building from Kansas City, Mo., southeast via Wichita, Kans.; Fairview, Okla.; Chillicothe, Tex., Sweetwater and Presidio; Chihuahua, Mex., Minaca and El Fuerte to Topolobampo, on the Pacific coast in the state of Sinaola, 1,659 miles. In operation for 795 miles. Track laid in Kansas, 74 miles; Oklahoma, 199 miles; Texas, 172 miles; Mexico, 442 miles, a total of 887 miles, leaving 772 still to be built. Work is under way in the United States between Emporia, Kans., and Eldorado; between Sweetwater, Tex., and San Angelo. In Mexico, on the Chihuahua division, between the Rio Grande river and Folanier; on the western slope of the Sierra Madre mountains west of Sanchez and east of Hornillos on the Pacific coast division.

——The Kansas City Outer Belt & Electric, which will furnish the entrance into and terminal facilities at Kansas, Mo., the K. C. M. & O. building double-track line. Bridge over Missouri river not yet built.

—Branch projected from San Angelo, Tex., south to Del Rio, 180 miles.

KANSAS CITY, MEXICO & ORIENT.—See this company under United States.

KANSAS CITY, OZARKS & SOUTHERN (Electric).—Projected from Mansfield, Mo., southeast to Ada, 14 miles. Grading completed and part of track laid. Ozark Construction Co., contractors, Mansfield. Electricity is to be generated by water power on the Bryant river. J. B. Quigley, Ch. Engr., Mansfield.

KANSAS CITY OUTER BELT & ELECTRIC.—See Kansas City, Mexico & Orient.

KANSAS CITY, PARIS & GULF.—See Quitman & Great Northern.

KANSAS CITY SOUTHERN.—Grading on cut-off south of Howe, Okla., completed to Heoner. Bridging and track laying postponed.

KANSAS CITY TERMINAL CO.—Company incorporated to build new passenger station for railways entering Kansas City, Mo. Work will include a number of yards and retaining walls, highway and railway viaducts. John V. Hanna, Ch. Engr., Kansas City, Mo.

KANSAS COLORADO (Electric).—Projected, in conjunction with the Colorado Transportation Co., from Garden City, Kans., via La Junto, Colo., Rocky Ford, Pueblo, Canon City and Colorado Springs to Denver. Surveys made from Garden City to Canon City. Contracts for grading and bridging for this section given to Northern Electric Co. A. H. Atwater, Director, Canon City. The Colorado Transportation Co. is also capitalized at $5,000,000, and has the same directors as has the K.-C.

KANSAS SOUTHERN & GULF.—Projected extension from Westmoreland, Kan., to Manhattan, 22 miles, including a 300-ft. bridge over the Blue river. Surveys made.

——Projected extension from Blaine, Kans., to Falls City, Neb., 65 miles. Surveys made.

KENTUCKY & OHIO RIVER (Electric).—Contracts for building part of the line from East Cairo, Ill., east to Paducah, Ky., 38 miles, let to Simms Bros., contractors, Thebes, Ill., for $70,113. Contracts let to Forbush & Stotlar, contractors, Benton, Ill., for building the 18 bridges on the line.

KENTUCKY MIDLAND.—Surveys made for extension from Midland to Madisonville, 13 miles.

KEWEENAW CENTRAL.—Surveys made for branch from Mandan, Mich., to Fish Cove, 12 miles.

KNOXVILLE, SEVIERVILLE & EASTERN.—Projected from Knoxville, Tenn., southeast to Sevierville, 26 miles. W. J. Oliver & Co., contractors. W. A. Seymour, Ch. Engr.

KOKOMO WESTERN TRACTION.—Projected line to be operated by gasolene motor cars, from Kokomo, Ind., west to Young America, 17 miles. Surveys completed and contracts for construction to be let soon. C. C. McFann, President and General Manager, Kokomo.

L

LAKE CHARLES RAILWAY & NAVIGATION.—Projected extension from Edna, La., to Kinder, 5 miles. Work under way. Where connection will be made with the Colorado Southern, New Orleans & Pacific.

LAKE ERIE & PITTSBURG.—See Lake Shore & Michigan Southern.

LAKE ERIE & YOUNGSTOWN (Electric).—Projected from Conneaut, Ohio, south to Youngstown, about 60 miles. Right of way partly secured. J. H. Ruhman, of Youngstown is interested.

LAKE SHORE & MICHIGAN SOUTHERN.—The Franklin & Clearfield has been building through Pennsylvania during the past two years. As projected the line is to run from Franklin, Penn., southeast to Brookville, 62 miles, thence east to Clearfield, a total of 110 miles. The eastern end of the line, from two miles west of Brookville to Clearfield, has not been finally located. The western end is finished from Franklin to Welch Run, 53 miles, and work is well advanced on the 7 miles from the river to two miles west of Brookville. The line is being built to secure a low grade route through the mountainous country bordering the Allegheny river, thence to the summit of the Alleghenies. There is to be one tunnel of 2,100 ft. and another of 1,700 ft. The extension to Clearfield will necessitate piercing a tunnel 2,500 ft. long. It is thought that the line will be in operation within a year. This will be made possible by traffic arrangements between Brookville and Clearfield. It is understood that such negotiations are under way with the Pennsylvania and the Buffalo, Rochester & Pittsburgh. In the event of such agreements it would only be necessary to build from Dubois to Clearfield.

——Contract let in 1907 by the Lake Erie & Pittsburgh to the Carter Construction Co., Indianapolis, Ind., to build from Mill Creek Junction, near Cleveland, southeast to Ravenna, 32 miles. Grading and bridge construction finished this year. Track laying under way and completed to Tinkers Creek, 7 miles. The line from Mill Creek Junction, which will connect with the Pennsylvania west of Ravenna, will probably be ready for operation this fall.

LAKE SUPERIOR & ISHPEMING. Work on change of main line through Negaunee, Mich., about 3 miles; also for reducing the grade on a 5-mile branch and to extend this branch 3 miles completed and will probably be opened for traffic this summer.

LARAMIE, HAHN'S PEAK & PACIFIC.—Work under way on extension from the present end of track at Albany, Wyo., south to Summit, Colo., 15 miles. Bradbury & Dittmer, contractors. Extension is projected south from Summit to Coal Bank, Colo., an additional 55 miles.

LAWTON, WICHITA FALLS & NORTHWESTERN.—Projected from Red River junction, where connection will be made with the Wichita Falls & Northwestern, north via Randlett and Emerson, to Lawton, 40 miles. Intention is to have section from Randlett to Lawton, 34 miles, in operation by November, 1909. J. E. Kirk Cons. Co., contractor, Oklahoma City, Oklahoma. J. M. Bellamy, President, Lawton. A. J. Robinson, Ch. Engr., Frederick, Oklahoma.

LIVE OAK, PERRY & GULF.—Work under way on extension from Hampton Springs west to St. Marks, 30 miles. H. E. Warwick, contractor, Hampton Springs, Fla.

LONG ISLAND. Work started in 1907 on Huntington Railroad (electric) from Huntington, N. Y., south to Amityville, 15.75 miles. Includes three bridges. Track laid on 7 miles. Surveys on the Babylon extension (electric) from Babylon west to Amityville, 5.82 miles. Jamaica & South Shore branch from Springfield Junction south to Cedarhurst, 3½ miles. All of this work suspended.

——Work under way to eliminate grade crossings at Old West road, Westbury, and New York avenue, Huntington.

——See Pennsylvania.

LOOP & LOOKOUT.—See Sewall Valley.

LOUISIANA & PINE BLUFF.—Contracts let to S. R. Neel, of Huttig, Ark., for extension from Dollar Junction, Ark., to New London, 15 miles. Further extension projected from New London to Wilmington, 15 miles. Work on these extensions postponed.

LOUISVILLE & NASHVILLE.—The Madisonville, Hartford & Eastern, projected from Madisonville, Ky., via Anton, Millport, Sacramento, Moorman, Centertown, Hartford and Dundee, to Mitchell, 55.6 miles, is about four-fifths completed. Contract let to C. G. Kershaw, contractor, Talladega, Ala., for 5 miles from Madisonville to Anton; to W. B. Sproule & Co., contractors, Dundee, for 8 miles from Pond river to Black lake, and to Edington; Griffitts Construction Co., contractors, Knoxville, Tenn., for 5 miles from Black lake to Green river. Track laid for 2 miles west of Madisonville. The masonry work of all the important bridges is completed and the steel work on hand. G. W. Feagin, Ch. Engr., Hartford, Ky.

——See Atlanta, Birmingham & Atlantic.

M

MADISONVILLE, HARTFORD & EASTERN.—See Louisville & Nashville.

MANISTEE & NORTH-EASTERN.—Projected extension of eastern branch from Wexford, Mich., northeast toward Alpena, 18

MARSHALL & EAST TEXAS.—Formerly the Texas Southern, operating from Winnsboro, Tex., on the M. K. & T., southeast to Marshall, on the T. & P., 74 miles. Projected extension from Marshall, south to Walker, 20 miles. Contract for first 12 miles of grading let to John Scott & Sons, contractors. Surveys being made for the second section.

MEMPHIS, PARIS & GULF.—Projected from Memphis, Tenn., via Little Rock, Ark., to Paris, Tex., 400 miles. In operation from Nalumco, Ark., southwest to Ashdower, 26.90 miles. Surveys made from Nalumco, northeast to Murfreesboro, about 15 miles.

METO VALLEY RAILROAD.—Projected from McCreanor, Ark., on the C. R. I. & P. south, through Lonoke county, about 16 miles. Work will include one bridge. S. M. Savage, President, Lonoke, Ark.

METROPOLITAN SOUTHERN.—See Baltimore & Ohio.

MILWAUKEE WESTERN ELECTRIC.—Projected from Milwaukee, Wis., northeast via Pewaukee, Oconomowoc, Neosho, Hutisford and Juneau to Beaver Dam. Contracts for bridging, track-laying, bridges, etc., will be let this spring. C. A. Chapman, Chief Engineer, Marquett building, Chicago.

MINIDOKA & SOUTHWESTERN.—See Oregon Short Line.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—Work under way by Foley, Welch & Stewart, St. Paul, on extension from Brooten, Minn., northeast to Duluth, 189 miles. In operation to Onamia, 86.5 miles.

MISSOURI, ARKANSAS & SOUTHWESTERN.—Projected from Batesville, Ark., northeast to Black Rock, 40 miles. R. W. Earnhart, President, Batesville.

MISSOURI, OKLAHOMA & GULF.—Building extension from Wagoner, Okla., north to Joplin, Mo., 120 miles, and another from Lamar, Okla., south to Denison, Tex., 114 miles.

MISSOURI SOUTHERN.—Extension projected from Bunker, Mo., northwest to Salem, 28 miles.

MONROE, FARMERSVILLE & HOPE.—Projected from Monroe, La., to Hope, Ark. Surveys made. D. H. Nichols, P. O. Box 509, Monroe, La.

MONTANA ROAD (Electric).—Projected line from Conrad, where connection is to be made with the Great Northern to Valier, 27 miles. Grading to be started this spring or summer. M. S. Darling, Conrad.

MORGAN'S LOUISIANA & TEXAS.—See Southern Pacific.

N

NASHVILLE & HUNTSVILLE (Electric).—Projected from Nashville, Tenn., south to Huntsville, Ala., 105 miles. T. W. Pratt, V.-Pres., Huntsville, Ala. I. L. McCord, contractor, Huntsville.

NASHVILLE & NORTHEASTERN.—See Cumberland River & Nashville.

NATCHEZ, COLUMBIA & MOBILE.—Projected extension from near Loweton, Miss., east to Pearl river, 3.5 miles. Surveys made.

NEBRASKA, KANSAS & SOUTHERN.—Projected from Stockton, Kans., via Ransom and Ness City to Garden City, 162 miles. Contract let to Kansas Railway Construction Co., Kansas City, Mo. Grading completed from section 5 to section 12, 7 miles. B. L. Brown, Ch. Engr., St. Louis, Mo.

NEBRASKA TRACTION & POWER CO.—Projected from Omaha, Neb., via South Omaha and Ralston to Papillion, 12 miles. About 75 per cent. of grading completed. General Construction Co., contractors, Omaha, Neb. W. D. Crist, Gen. Mgr., Omaha.

NEVADA & CALIFORNIA.—See Southern Pacific.

NEVADA-CALIFORNIA-OREGON.—Projected extension from Alturos north to Lakeview, Ore., 60 miles.

NEW ORLEANS GREAT NORTHERN.—Projected extension from Monticello, Miss., north to Jackson.

NEW YORK CENTRAL & HUDSON RIVER.—Work under way by company's men on Grand Central terminal in New York. Steel work being erected by Terry & Tench.

——Buffalo grade crossing elimination work in progress. Contract let to the Eyre-Shoemaker Co., Inc., contractors, Philadelphia, Pa.

——Work on large yard at Gardenville, near Buffalo, N. Y., temporarily suspended; 27 miles of track laid.

——Tracks in Tenth and Eleventh avenues, New York, to be removed from the surface. Not yet determined whether they will be elevated or depressed in a subway.

——Elimination of grade crossings on Harlem division in Mount Vernon, N. Y., in progress.

——Proposed elimination of grade crossings on Hudson division through Yonkers, Tarrytown and Ossining, N. Y. Necessary before electrification can be extended to South Croton. Some work done, but now suspended, awaiting action of New York Public Service Commission.

——Proposed elimination of grade crossings on Harlem division at Tuckahoe, N. Y. Plans being considered by village authorities.

——Proposed improvements at Oswego, N. Y., to cost $150,000.

NEW YORK CONNECTING.—See Pennsylvania.

NEW YORK, PHILADELPHIA & NORFOLK.—See Pennsylvania.

NEW YORK, PITTSBURG & CHICAGO AIR LINE.—Projected from Pittsburg, Pa., east via Indiana, Cherry Tree, Irvona, Sandy Ridge, Loveville, Tusseyville, New Berlin, Sunbury, Mahanoy City and Tamaqua to Allentown, 298 miles. Surveys made. Expected that construction work will begin this year. Joseph Ramsey, Jr., Orange, N. J., is interested. No connection with electric line projected under similar name.

NEW YORK SUBWAYS.—Work under way on a 4-track subway loop to connect the Brooklyn and Williamsburg bridges in the Borough of Manhattan. Contracts let on 5 sections, aggregating $9,094,606, as follows: Bradley Contracting Co., in Centre street between Pearl street and Park Row; Degnon Contracting Co., in Centre street between Pearl and Canal streets, including a spur from Centre street to the Manhattan bridge approach; Cranford Co., in Centre street between Canal and Broome streets; Bradley Contracting Co., in the new extension of Delancey street between Centre street and the Bowery; same company in Delancey street between Bowery and Norfolk street.

——The Public Service Commission, First district, has approved plans for the Broadway-Lexington avenue subway from the Battery at the south end of Manhattan Island, north under Church and Vesey streets to Broadway, thence under Broadway and Lexington avenue to the Bronx side of the Harlem river, where it will branch into two spurs, one to Woodlawn Cemetery and the other to Pelham Bay Park. The estimated cost of the work with a line across the island at Canal street, is $67,000,000.

——Contracts let for 6 sections of the Fourth avenue (Brooklyn) subway as follows: Nassau to Willoughby streets, Jas. P. Graham, $1,121,850; Willoughby street to Ashland place, William Bradley, $3,494,714; Ashland place to Sackett street, William Bradley, $3,600,227; Sackett street to 10th street, E. E. Smith Contracting Co., $2,490,205; 10th to 27th streets, Tidewater Building Co. and T. B. Bryson, $2,196,716; 27th to 43d streets, E. E. Smith Contracting Co., $2,982,648. Total, $15,886,360. Work on these contracts not yet authorized by the Board of Estimate and Apportionment.

NORFOLK & WESTERN.—Work in progress double-tracking line between Huger, W. Va., and Welch. Improvement includes a double-track tunnel at Welch. It is expected to have this work finished about July 1.

——The Interior & West Virginia, building from the terminus of the Big Stony Railway at the Virginia state line to connection with the Virginia & Potts Creek Railroad, 17.55 miles. Expected to have the line in operation by July.

——The Virginia & Potts Creek under construction from the end of the Interior & West Virginia Railroad to Paint Creek, Va. Grading finished on the 4.2 miles.

NORTHERN OF MAINE.—Projected from Van Buren, Me., west along the northern boundary of the state, via Grand Isle, Madawaska, Frenchville, Fort Kent and St. John to St. Francis, 62 miles. Edson E. Goodrich, Pres., and Henry F. Hill, Ch. Engr., Waterville, Me.

NORTHERN PACIFIC.—Projected extension from Mandon, N. Dak., northwest, along the Missouri river to Mondak, Mont., connecting with the Great Northern.

NORTH JERSEY RAPID TRANSIT.—Projected from Suffern, N. Y., south to Paterson, N. J., about 16 miles. W. A. Barbour, Pres.

NORTHWESTERN PACIFIC.—Surveys made for extension of main line from Willits, Cal., north to Shively, 108 miles; also for branch from the main line at Healdsburg northwest to Floodgate, 63 miles, where connection is to be made with branch from Albion, on the Pacific coast.

NORTHWESTERN RAILROAD.—See Oregon Short Line.

NORWOOD & ST. LAWRENCE.—Surveys made to build, under name of Raymondville & Waddington, an extension from the present northern terminus at Raymondville, N. Y., west to Waddington, 13 miles.

NUECES VALLEY, RIO GRANDE & MEXICO.—See Asherton & Gulf.

O

OCEAN SHORE (Electric).—Building double-track line from San Francisco, Cal., south to Santa Cruz, 78 miles. On main line grading 26 miles, in operation on 52 miles, also operating 2½ miles of branch line. The contractors are Lilly & Heins and Humboldt Contracting Co., of Santa Cruz; Graham-Nicholson Contracting & Engineering Co., of San Francisco, and Ransome-Crummey Co., of Oakland.

——The Ocean Shore & Eastern to build a branch from Santa Cruz, Cal., southeast to Watsonville, 19 miles. Surveyed. Nothing done in 1908.

——The San Juan Pacific to build from Watsonville, Cal., to Hollister, 25 miles. Surveyed. In operation for one-third of the distance. Nothing done in 1908.

——The San Joaquin Valley Western to build from Hollister, Cal., to Coalings, 200 miles. Surveyed. Nothing done in 1908.

OCEAN SHORE & EASTERN.—See Ocean Shore.

OCILLA SOUTHERN.—Contract given to R. S. Talmage, of Ocilla, Ga., to build from Ocilla south to Allapaha, 17 miles, thence to Nashville, 13 miles. J. A. J. Henderson, Ocilla, Ch. Engr.

OHIO NORTHERN & MICHIGAN (Electric).—Proposed lines to be built as follows: Toledo and Ann Arbor branch, to run north connecting Lambertville, Mich., Petersburg, Dundee, Milan and Ann Arbor; extension from Petersburg northwest to Jackson via Britton, Ridgeway, Tecumseh, Brooklyn and the chain of lakes south of Jackson. Graded from Petersburg to Ann Arbor, and track laid from Toledo, Ohio, north to Petersburg. The section from Petersburg to Jackson to be built at once. A. E. Lee, Pres., Vermillion, S. Dak. C. W. Steudell, Ch. Engr., 122 Monroe street, Chicago, Ill.

OKANOGAN ELECTRIC.—Proposed line from Nighthawk, Okanogan county, Wash., to the head of navigation on the Columbia river at the southern end of Okanogan county via Loomis, Okanogan, Ophir, Malott and Brewster, 80 miles; also branches to Coconully, Omak and Riverside. A. M. Dewey, Pres., and G. D. Needy, Sec., box 1864, Spokane, Wash.

OKLAHOMA & GOLDEN CITY.—Incorporated in Oklahoma, capital $12,000,000, to build from Pawhuska, Okla., northeast via Climax Springs, Mo., to Jefferson City; also branch from Climax Springs south to Springfield. Contracts for grading, track laying, etc., to be let in April. There will be five large bridges and some smaller ones, also some trestle work. W. S. Pope, Pres., Jefferson City; J. A. Griesel, Gen. Mgr., Golden City; E. M. Dempsey, V.-Pres., and W. S. Hawkins, Ch. Engr., Pawhuska, Okla.

OKLAHOMA ROADS.—The Miller Lumber Co., Millerton, Okla., is building a logging road from Millerton north, about 15 miles.

OREGON & WASHINGTON.—See Oregon Railroad & Navigation.

OREGON WESTERN.—See Southern Pacific.

OREGON EASTERN.—See Southern Pacific.

OREGON ELECTRIC.—Projected branches and laterals, aggregating 283 miles, as follows: Portland, Ore., to Tillamook; Portland to Eugene; Salem to Mill City; Salem to Dallas; Salem to Albany; and Albany to Cascadia. G. B. Moffat, Pres., New York, and G. W. Talbot, V.-P. and G. M., Portland.

OREGON RAILROAD & NAVIGATION.—The Oregon & Washington, projected from Portland, Ore., north to Tacoma and Seattle, Wash., 230 miles. At Tacoma there is to be a 8,700-ft. tunnel. Surveyed to Tacoma. Contract let to Twohy Bros., Spokane, Wash., for the first section. J. D. Farrell, V.-P. and G. M., Central building, Seattle.

OREGON SHORT LINE.—The Northwestern Railroad projected from Huntington, Ore., north along the Oregon-Idaho state line following the Snake river to Lewiston, Idaho. Grading and track laying under way by the Utah Construction Co., Ogden, Utah, from Blakes Spur north to Homestead, 58 miles; includes 2,200-ft. tunnel east of Huntington.

——Surveys under way for a line of about 120 miles from Twin Falls, Idaho, south to a connection with the Southern Pacific, about 20 miles east of Wells, Nev. The Minidoka & Southwestern has amended its charter to cover this survey. Construction not yet authorized.

——Surveys made for a line from Rupert, Idaho, northwest to Fuller. Construction not yet authorized.

——Grading work for double-track from Salt Lake City, Utah, north about 12 miles under way.

P

PALESTINE & DALLAS INTERURBAN.—Contracts to be let in May to build from Palestine, Tex., northwest to Dallas, 110 miles, with a branch from Waxahachie east to Ennis, 10 miles. J. V. Watkins, Pres. G. A. Duren, Ch. Engr., Corsicana, Tex.

PECOS & NORTHERN.—See Atchison, Topeka & Santa Fe.

PENHORN CREEK.—See Erie.

PENINSULAR RAILWAY (Electric).—Built from Bartow, Fla., west to Mulberry, 8 miles. Expects to begin work soon on remaining 37 miles to Tampa. Right of way secured. The Wm. H. Evers Engineer ing Co., in charge. W. H. Evers, Ch. Engr., Cleveland, Ohio.

PENNSYLVANIA & NEWARK.—See Pennsylvania.

PENNSYLVANIA.—Terminal improvements at New York being carried out by the Pennsylvania Tunnel & Terminal Railroad as follows:

——New line from Harrison, N. J., at a point east of Newark, where the tunnel line leaves the present main line, to the Weehawken shaft of the Hudson river tunnel. All of the masonry, outside of Bergen Hill tunnel and superstructure completed except the Hackensack river drawbridge superstructure, now under contract to the Pennsylvania Steel Co., of Steelton, Pa. Double track embankment nearly finished.

——Work on two single-track tunnels from Bergen Hill being carried on from both ends and from a shaft in the center. William Bradley & Sons, contractors. Excavation and concrete lining finished.

——Two single-track tube tunnels from Weehawken under Hudson river to 11th avenue shafts; tubes completed and concrete lining being put in. O'Rourke Engineering Construction Co., contractors.

——Western approach to passenger station between Ninth and Eleventh avenues. New York Contracting Co., contractors. All excavated and work from Ninth and Tenth avenues two-thirds finished.

——Contract for construction of the station building and all electrical equipment for the entire terminal and approaches let to Westinghouse, Church, Kerr & Co. Steel work under way on station building.

——Tunnels under 32d and 33d streets, Manhattan, from terminal station at Seventh avenue to East river. About one-half finished. United Engineering & Contracting Co., contractors.

——Four single-track tubes under the East river, from Manhattan shaft to Long Island completed except small amount of concrete. S. Pearson & Son, Ltd., contractors.

——Tube tunnels from river shaft east under Long Island city to East avenue shaft. Excavated, iron lined and concrete finished. S. Pearson & Son, Ltd., contractors.

——Tunneling under streets in Long Island City from East avenue shaft to western end of Sunnyside yard, near Thompson avenue; about two-thirds finished.

——Large terminal to be known as the Sunnyside yard, between Jackson and Thompson avenues, Long Island City. To be 5,500 ft. long, 1,550 ft. wide at widest point and include about 400 acres. Work on viaducts, embankments, and bridge masonry under way. Yard about 75 per cent. finished.

——Franchise granted to the Long Island Railroad for Glendale cut-off between Glendale Junction and Woodside, at the entrance to Sunnyside yard. The cut-off is to be a four-track line. All grade crossings between Jamaica and Woodside will be eliminated.

——Franchise granted the New York Connecting Railroad for line through Brooklyn and Queens boroughs, New York City, and over the East river on a bridge to connection with the New York, New Haven & Hartford at Port Morris on the Harlem river. New line to be built from Manhattan Junction, on Long Island Railroad, to the East river and bridge over the East river and Ward's and Randall's islands, with a connection at Long Island City to the Sunnyside yard. The line is to include on its south end through Brooklyn the Bay Ridge line of the Long Island Railroad from East New York to Bay Ridge, on which improvements are under way to eliminate 115 grade crossings, at a cost of about $7,000,000.

——Work to be started soon on large freight terminal at the Bay Ridge waterfront, Brooklyn. This is to be the western terminus of the New York Connecting Railroad, where cars will be put on boats to be sent to the Pennsylvania yard at Greenville, N. J. Contracts for piers and float bridges let. There is to be a pier 600 ft. long with four tracks. The yard will have a frontage on the upper bay of 565 ft., extending to Fifth avenue between 64th and 65th streets. About 40 tracks, with a capacity of 1,800 cars, are to be laid west of First avenue.

——Terminal yard at Pacific street, Brooklyn, N. Y. Work nearing completion.

——Track elevation begun on the Kensington branch in the northeastern part of Philadelphia. Contract let to the James McGraw Co.

——On the Monongahela division the Ten-Mile Run branch, from Ellsworth, Pa., to Millsboro, 15.5 miles, has been finished from Ellsworth south 8 miles, and from Millsboro north 1.6 miles.

——Improvement of grades and curvature between Jersey Shore, Pa., and McElhattan. Under way.

——Proposed relief freight line, to be built under the name of the Pennsylvania & Newark, from West Morrisville, Pa., to Newark, N. J., 50 miles. With its completion, the 6-track system will extend from Trenton to Jersey City. Includes new bridge across the Delaware river from Trenton, N. J., to Morrisville; nothing done in 1908.

——Plans to complete the 4-track system between New York and Pittsburgh, Pa., are now under consideration. It is proposed to make a cut in place of the present two-track main line tunnel near Greensburg, Pa. It will cost about $650,000 to cut out the tunnel, and widen for four tracks, put up a new passenger station, and underground and overhead crossings.

——Bids asked for widening the stone arch bridge over the Conemaugh river, just west of South Fork, on the Pittsburgh division, to hold four tracks instead of three as at present.

——The New York, Philadelphia & Norfolk is building 3 miles of second track between Keller, Va., and Olney. Arrangements being made to lay second track between Salisbury, Md., and Fruitland, about 4 miles.

PENNNSYLVANIA TUNNEL & TERMINAL RAILROAD.—See Pennsylvania.

PHILADELPHIA & READING.—Agreement made with the city of Philadelphia to elevate tracks. Much of the grade elimination work on the Philadelphia, Germantown & Norristown was let last year.

PHILIPPINE RAILWAY.—Work under way by the Philippine Railway Construction Co., which has let contract to J. G. White & Co., New York, to build 300 miles of road on the islands of Negros, Panay and Cebu, P. I. Grading under way on 33 miles in island of Panay, track laid on 40 miles in Panay, and 60 miles in Cebu. William Salomon, Chairman, and Charles M. Swift, Pres., New York.

PHILADELPHIA TERMINAL TRANSFER.—Projected from the Schuylkill river, between Manayunk and Norristown south, to Delaware river, adjacent to Philadelphia, Pa., at Fort Mifflin, 14.5 miles. E. B. Colket, President. H. A. Farrand, Ch. Engr., Philadelphia, Pa.

PITTSBURGH, BINGHAMTON & EASTERN.—Organized to build from Binghamton, N. Y., southwest to Clearfield, Pa., 232.5 miles. About 6 miles of track laid between Powell, Pa., and Canton, 20 miles graded, and some four bridges have been put up. Contract let to Wm. J. Oliver & Co., of Knoxville, Tenn., and sub-contract to Rivenac & Co. Louis T. McFadden, John P. Reynold, Jr., and Fred C. Leonard, Canton, Pa., Receivers, appointed in latter part of 1908.

PORTLAND & SEATTLE.—See Spokane, Portland & Seattle.

PORT O'CONNOR, RIO GRANDE & NORTHERN.—Projected from Port O'Connor, Tex., on the Gulf of Mexico, north to San Antonio, 190 miles, with a number of branch lines, including one to Gonzales, in all 234 miles. About 100 miles graded, but no track laid. Contract reported let to J. H. Collins, of Chicago. L. A. Gueringer, Ch. Engr., Victoria, Tex.

PRESCOTT, READER & FORDYCE.—Surveys being made from Lyda, Ark., west, to Prescott, 18 miles. One mile built last year.

Q

QUITMAN & GREAT NORTHERN.—Surveys being made from Paris, Tex., south to Minneola, 85 miles, thence under the name of Kansas City, Paris & Gulf, to Sabine Pass, 225 miles additional. Located from Quitman to Mineola. M. J. Healy, General Manager, Quitman, Tex.

R

RALEIGH & SOUTHPORT.—Projected extension from Fayetteville, N. C., southwest to Hope Mills, 5 miles.

RALEIGH & SOUTHWESTERN.—See Chesapeake & Ohio.

ROARING FORK.—Surveys for an extension from Roaring Fork, Va., to Big Black Mountain, 4.5 miles. E. L. Gobble, Chief Engineer, Blackwood, Va.

ROCHESTER, SYRACUSE & EASTERN.—See Syracuse, Lake Shore & Northern.

ROGUE RIVER & OREGON SOUTHERN (Electric).—Organized to build from Grant's Pass, Ore., southwest through the Rogue river valley to Waldo about 50 miles. Work to be begun this spring. O. S. Blanchard, of Grant's Pass, is interested.

ROME & OSCEOLA.—Organized to build from Rome, N. Y., north to Osceola, 25 miles. W. P. White, President, Utica, N. Y.

ROSCOE, SNYDER & PACIFIC.—Work is under way by Smith & Harrington, of Snyder, Tex., on 9 miles, J. W. Sammons on 3 miles and L. M. Kirkes 6 miles, on an extension from Snyder, Tex., northwest to Fluvanna, 20 miles. Grading on this extension to be finished March 20, and track laying to be begun this summer. Chartered to build from Roscoe, Tex., north to Portales, N. Mex., 230 miles. Now in operation from Roscoe to Snyder, 30.4 miles.

ROYALTON & ELIZABETHTOWN STREET RAILWAY.—Grading to be begun April 1, from Middletown, Pa., southeast to Mount Joy, 15 miles, with a branch from Conewago northeast to Lebanon, 22 miles surveyed. Shops are to be put up at Elizabethtown. Office 1324 Real Estate Trust bldg., Philadelphia, Pa.

RUSTON, NATCHITOCHES & NORTHEASTERN.—Surveys have been made for a line from Ruston, La., north to Farmerville, 26 miles. J. H. Nolan, President, Ruston.

S

ST. LOUIS & ILLINOIS BELT.—Contract let last year to the J. A. Ware Construction Co., 308 Houser building, St. Louis, Mo., for an extension from the present end of track to Edwardsville, Ill., 4 miles.

ST. LOUIS, BARTLESVILLE & PACIFIC.—Contract let last year for the construction work between Joplin, Mo., and Bartlesville, Okla. The entire survey covers about 300 miles. D. H. Rhodes, Ch. Engr., 213 Fourth street, Joplin, Mo.

ST. LOUIS, BROWNSVILLE & MEXICO.—Building a spur line from Buckeye, Tex., via the plant of the Tres Palacios Rice & Irrigation Co., finished for 9 miles. This spur may be developed and extended to form a 20 mile branch.

——Surveys made for an extension from Donna, Tex., to Sugar Mill, 2 miles.

ST. LOUIS, WEBSTER & VALLEY PARK (Electric).—Building from West End Heights, Mo., southwest to Valley Park, 15 miles. Chas. Schueler has contract for grading. Paul D. Cable, President and General Manager, 223 Wainwright building, St. Louis, Mo.

ST. MARY'S & KINGSLAND.—Work to be started soon by the company's men, on an extension from Kingsland, Ga., northwest to Waycross, 48 miles. A further extension west is projected from Waycross to Nashville, 50 miles.

ST. PAUL BRIDGE & TERMINAL RAILWAY.—Contract let to Wm. J. Hoy, of St. Paul, for substructure work, consisting of four concrete piers on pile foundation for steel bridge over the Mississippi river. The line is under construction from South St. Paul, Minn., to St. Paul yards at Dayton's Bluff, 2¾ miles. Pile and trestle approaches up to west bank of river finished and track laid to the river. Alfred Jackson, St. Paul, is Engineer in charge.

SACRAMENTO SOUTHERN.—See Southern Pacific.

SALEM, FALLS CITY & WESTERN.—Building from Dallas, Ore., to Salem, 14 miles. Work suspended during winter to be resumed April 1. It is expected that the extension will be finished by October. L. Gerlinger, President, Portland, Ore.

SALT LAKE & OGDEN.—Contracts let last year for an extension. It is expected that the road will have a total length of 100 miles by the end of 1909; also that the electrification of the line between Salt Lake City, Utah, and Ogden will be finished.

SAN ANTONIO & RIO GRANDE.—Contract let last year to the Hidalgo Construction Co. for building 25 miles of this line. The proposed route is from Brownsville, Tex., north to San Antonio, 300 miles. S. A. Robertson, Ch. Engr., San Benito, Tex.

SAN DIEGO, EL PASO & ST. LOUIS.—Incorporated in Texas to build the first section of 100 miles from El Paso, Tex., northeast to the New Mexico state line. Charter ready to file in New Mexico for next section about 200 miles to be built across southeastern New Mexico. Surveys now being made for the section in New Mexico. Rights of way and sites for terminals secured along almost the entire line. To be built to the Red river at the Texas-Oklahoma state line, a total of 500 miles. Three bridges. W. H. Winter, Secretary. P. A. McCarthy, Ch. Engr., El Paso.

SAN JOAQUIN VALLEY WESTERN.—See Ocean Shore.

SAN JUAN PACIFIC.—See Ocean Shore.

SANOODY VALLEY.—Contract let last December to J. B. Taylor & Co., Hudson Terminal building, New York, to build this line from DeKalb, Miss., to a connection with the Mobile & Ohio at Sucar-

nochee, Miss., 12 miles. J. P. Hornaday & Co., 30 Church street, New York are interested.

SANTA FE, LIBERAL & ENGLEWOOD.—Work under way at various points from Des Moines, N. Mex., east via Hooker to Woodward, Okla., a total of 321 miles. The Canadian River Railroad, building from Woodward, southeast to Watonga with a branch east to Guthrie and another branch southeast to Oklahoma City 220 miles, is to form part of this line. H. B. Peebles and A. H. Applegate, of Woodward; C. A. Barden, of Boston, Mass.; H. C. Morand, of New York, and F. L. Hamilton, incorporators.

——The Santa Fe, Raton & Des Moines has given a contract to the Nevada Construction Co., of Raton, N. Mex., for an extension from Capulen, N. Mex., southwest to Cunningham, 13 miles.

SANTA FE, RATON & DES MOINES.—See Santa Fe, Liberal & Englewood.

SAVANNAH, AUGUSTA & NORTHERN.—Organized to build from Savannah, Ga., northwest to Chattanooga, Tenn., with an easterly line to Augusta, in all about 425 miles. Surveys made from Statesboro to Chattanooga. Track laid on first 25 miles from Statesboro to Garfield. Graded from Garfield to Louisville, about 20 miles. Rights of way secured from Louisville to Commerce, about 100 miles. Wm. H. Lynn, Pres., New York; Hinton Booth, Secretary, Statesboro, Ga.

SAVANNAH VALLEY.—Contract reported let last year to J. W. Wright, Jr., to build this projected line from Garnett, Ga., south to Sylvania, 15 miles. E. T. Comer and L. J. Kilpatrick, both of Mill Haven, are directors.

SCHENECTADY & MARGARETSVILLE.—See Delaware & Eastern.

SEATTLE-EVERETT INTERURBAN.—Contract given by this company and the Everett Railway, Light & Water Co. to the Stone & Webster Engineering Corp., Boston, Mass., for a line from Halls Lake, Wash., to Everett, 13 miles.

SEWALL VALLEY.—Building from Meadow creek, W. Va., to the mouth of Sewell creek, 21 miles, about two-fifths graded. Work being done by the Morasco & Pasqualichis Co., on 2 miles, and company's men on 19 miles, to be finished in 1909. At the mouth of Sewell creek connection to be made with the Loop & Lookout Railroad, to be built along Meadow river, 25 miles, partly graded. J. M. Raine, Ch. Engr., Meadow Creek.

SHREVEPORT NORTHEASTERN.—Projected from Shreveport, La., northeast via Minden and Homer, La., and Eldorado Ark., to Memphis, Tenn., 285 miles. Rights of way secured; also land for stations and terminal sites. Under construction from Shreveport to Homer, 50 miles; to be extended to Eldorado, 35 miles. Graded for 28 miles, and track laid for 8 miles. A. K. Clingman, Shreveport, La., President and General Manager.

SIOUX CITY & SPIRIT LAKE (Electric).—Contract let to Westinghouse, Church, Kerr & Co., to build from Sioux City, Ia., northeast to Spirit Lake, 108 miles. Work to be begun this spring. Frank Patch, Pres., and L. F. Wakefield, Ch. Engr. American Block, Sioux City.

SOUTHERN.—Second-track work under way on 3 miles between Motley, Va., and Galveston, expected to be finished by April.

——Similar work between Winesap, Va., and Durmid, including a line through the city of Lynchburg, 6.9 miles, is heavy and includes a 1,300-ft. tunnel. Work suspended, except on tunnel, to be finished in May.

The Carolina & Tennessee Southern, projected from Bushnell, N. C., west along the northern bank of the Little Tennessee river to the North Carolina-Tennessee state line, 26 miles, is finished from Bushnell for 14.5 miles; and in operation on 13.9 miles; work suspended. From the state line further extension under the name of the Tennessee & Carolina Southern to Maryville, Tenn., 38.8 miles; on the latter grading has been finished for 37.4 miles. In operation on 25.3 miles; work suspended.

——About 132 miles of second track is now in operation between Washington and Atlanta, 650 miles; 32 miles more will be put in operation about May 1.

——The Memphis & Chattanooga projected from Chattanooga, Tenn., to Stevenson, Ala., 42 miles, grading and masonry from point near Chattanooga to east portal of Lookout mountain tunnel, about 90 per cent. finished. Work suspended. Work on the double-track tunnel through Lookout mountain, 3,500 ft. long, finished.

SOUTHERN PACIFIC.—Morgan's Louisiana & Texas is building an extension from Lafayette, La., northeast to Port Allen (opposite New Orleans), 53 miles, graded for 41 miles and track laid on 29 miles. Piers for the large bridge over the Atchafalaya swamp have been sunk and material for the superstructure is on the ground. Work under way east of the Atchafalaya river. Extension graded from Bayou Sale to South Bend and track laid on 7 miles.

——The Central California, building from Niles, Cal., to Redwood City, 16 miles. Graded for 14 miles and track laid on 12 miles.

——The Inter-California building an extension east from Calexico, Cal., through the northern part of Mexico to Hanlon Junction, Ariz., 54 miles. In operation to Tecolote, Mex., 33 miles.

——The Oregon Eastern has finished surveys from Natron, Ore., south to Klamath Falls, 152 miles; also for a line from the Cascade mountains east to the eastern boundary of the State at Ontario. Charter amended to build a branch from Lakeview, Ore., south to the California state line, about 15 miles, an extension of this branch is projected south through California.

——Oregon Western projected 82 miles. Surveys made from Drain, Ore., via Marshfield to Ward and considerable right of way secured. Grading and tunneling under way and a large part of steel bridges, rails, ties and other track material bought; about 20 miles finished.

——The Nevada & California extension from Keeler, Cal., south to Mojave, 140 miles, track laid from Mojave on 52.80 miles, in operation on 48.3 miles. Work on the remaining 93 miles in progress.

——The Sacramento Southern, building from Sacramento Cal., south to Antioch, 54 miles, is graded for 10 miles and has track laid on 4.45 miles. Work is now in progress on the remainder of the line.

——The California Northeastern, building from Weed, Cal., north to Klamath Falls, Ore., 89 miles, is in operation from Weed to Holland, 74 miles. Work under way on remaining 15 miles to Klamath Falls.

— The Sunset Western, building from Pentland, Cal., northerly 14.86 miles; during 1908 laid track from Pentland, north, on 12.73 miles.

——Surveys made for extension of the Gila Valley, Globe & Northern, through Globe, Ariz., to Miami. No definite conclusion has been reached to build.

——Work under way on the remaining 10.17 miles of the Beaverton & Willsburg, a cut-off projected from Beaverton, Ore., east to Willsburg (Portland), 13.5 miles. Pacific Coast Construction Co., contractors, Portland, Ore.

——The Goose Lake & Southern, incorporated to build 406 miles of railway from Goose Lake, Cal., south to Alturas, from which point there are to be two branches, both continuing in a southwesterly direction to connections with the Southern Pacific at Vina and at Cottonwood.

——For Southern Pacific Railroad of Mexico and Cananea, Yaqui River & Pacific, see Southern Pacific under Mexico.

SOUTHERN UTAH.—Contract let to the Ely Construction Co., of Springville, from Mill creek coal mine, Utah, east to Price, 20 miles. Finished for 6 miles. J. F. Williamson, Price, Utah, Ch. Engr.

SPARTA RAILWAY & POWER CO.—See Western Transportation Co.

SPOKANE & INLAND EMPIRE (Electric).—The Spokane, Columbia & Western to build from Spokane, Wash., west to Davenport, thence northwest to Miles City, 73 miles. Surveys being made, and work under way on tunnel in Spokane.

SPOKANE, COLUMBIA & WESTERN (Electric).—See Spokane & Inland Empire.

SPOKANE, PORTLAND & SEATTLE.—This road, formerly the Portland & Seattle, is a joint project of the Northern Pacific and Great Northern, to give them a direct low-grade line to Portland, Ore. Building from Portland up the north bank of Columbia river and to Spokane, Wash., with branch east along the Snake river to Texas Ferry, Wash., a total of 415 miles. In operation from Vancouver, Wash., to Kennerwick, opposite Pasco, 221 miles; also from Vancouver, south, to Portland, 10 miles. The line between Pasco and Spokane, 145 miles, is to be put in operation in April, and the branch to Texas Ferry, 41 miles, is to be finished in 1909.

STAMFORD & NORTHWESTERN.—A general contract has been given to P. M. Johnston, Son & Allhands, of St. Elmo, Ill., for grading, buildings, bridges, etc., and sub-contract let to J. L. McSpadden for the first five miles out of Stamford. The company plans to build from Stamford westerly to Dickens, 75 miles. All grading to be finished and several miles of track laid by July. L. M. Buie, President, and P. G. Burns, Ch. Engr., Stamford.

SUGAR CREEK & NORTHERN.—See Wheeling & Lake Erie.

SUNSET WESTERN.—See Southern Pacific.

SYRACUSE, LAKE SHORE & NORTHERN (Electric).—Extension from Fulton, N. Y., northwest to Oswego, about 20 miles, will probably be built in 1909.

——Extension of the Rochester, Syracuse & Eastern from Port Byron, N. Y., east to Syracuse, about 35 miles is to be built in 1909. Surveys made, franchises and rights of way secured. Contracts to be let in March.

T

TAMPA NORTHERN.—Projected extension from Brooksville, Fla., north to Dunnellon, 35 miles.

TENNESSEE & CAROLINA SOUTHERN.—See Southern.

TENNESSEE NORTHEASTERN.—Projected from Winfield, Tenn., southwest through Scott, Fentress, Cumberland and White counties, to the N. C. & St. L., near Ravenscroft, about 90 miles. D. L. Fickes, President, and P. C. Chesbrough, Treasurer, both of Scranton, Pa.

TENNESSEE RAILWAY.—Building from a point 2 miles below Smokey creek, Tenn., to Beech fork, on New river, 8½ miles; also spur along Smokey creek to Asher fork, 8½ miles. Track laid for 10 miles and in progress on remaining 7 miles.

TEXAS & GULF.—See Gulf, Colorado & Santa Fe.

TEXAS & NEW ORLEANS.—Grading about finished on Rusk branch, from Gallatin, Tex., to Rusk, 9 miles. Track laid from Gallatin on 2 miles. The Suderman-Dolson Co., Galveston, Tex., contractors.

TEXAS SOUTHEASTERN.—Projected extension to Crockett, and eventually to Waco. Surveyed.

TEXAS STATE.—Building from Rusk, Tex., west to Palestine, 30 miles. Nearing completion.

——Projected extension from Rusk, Tex., south 100 miles towards Houston.

THOMPSON RUN COAL & RAILROAD.—Projected extension of 6 miles; now in operation from Thompson Run Mines, Pa., to Ellwood Junction, 4 miles.

TOLEDO & MICHIGAN.—Considerable work is being done from Adrian, Mich., through Clayton, Hudson, Pittsford, Osseo, Hillsdale, Janesville, Quincy and Coldwater, about 60 miles. The roadbed is graded for 32 miles and a number of concrete culverts and bridges are built. P. T. Duket, President, Ohio building, Toledo, Ohio.

TOPEKA & NORTHWESTERN.—See Union Pacific.

TOPEKA-SOUTHWESTERN.—The Topeka Southwestern Construction Co., Topeka, Kan., building from Topeka, Kan., southwest to Council Grove, about 60 miles. V. R. Parkhurst, of Topeka, is Chief Engineer of the railway company.

TUSCARORA VALLEY.—Projected extension from the present southern terminus at Blair's Mills, Pa., southwest to McConnellsburg, 27 Miles surveyed.

TWIN CITY & LAKE SUPERIOR (Electric).—Building double-track third rail line from Minneapolis, Minn., via St. Paul and Superior, Wis., to Duluth, Minn., 130 miles. Contracts let to Westerdahl & Carlson to build from Lower St. Croix river to Upper St. Croix, 33 miles, and to Smith & James from Upper St. Croix to Superior, Wis., 60 miles. Track laid from Minneapolis to Coon lake, 25 miles. Contracts for 2 large bridges to be let about April 1. J. H. Thomas, Ch. Engr., 440 Railway building, Minneapolis, Minn.

U

UNION PACIFIC.—On the remaining 52.63 miles of the projected line from Hershey, Neb., to Northport, 51.17 miles are graded and ready for track laying. Work suspended.

——Contract let to the Kilpatrick Bros. & Collins Co., of Beatrice, Neb., for extension of Topeka & Northwestern from Onaga, Kans., northwest to Marysville, 32.44 miles, graded for 13.13 miles.

——Building two small branch lines east of Greeley, Colo., about 25 or 30 miles; also branch from Denver to a connection with the Boulder branch near Erie, about 18 miles.

UNION TERMINAL RAILWAY.—(St. Joseph, Mo.).—This company connecting all lines entering St. Joseph, proposes to lay two miles of additional tracks in St. Joseph.

UNITAH RAILROAD.—Surveys for an extension from Dragon, Utah, northwest to Randlett, 65 miles. E. A. Grove, Superintendent, Mack, Colo.

V

VALLEY RIVER.—Building from Mill Creek, W. Va., south to Clover Lick, 44 miles; graded from Mill Creek south to Elkwater, 7 miles. John M. Alden, Ch. Engr., Elkins, W. Va.

VANDALIA.—Second-track work in Indiana between the Wabash river bridge, Terre Haute and Macksville will probably be finished this summer.

VINEGAR BEND LUMBER CO.—See Alabama & Mississippi.

VIRGINIA & CAROLINA SOUTHERN.—Building extension from St. Pauls, N. C., north to Hope Mills, 12 miles.

VIRGINIA & SOUTHWESTERN.—Contract let to Callahan Construction Co., of Knoxville, Tenn., for extension from Moccasin Gap, Va., south to the Tennessee state line, 6 miles, thence under the name of the Holston River Railway, southwest to Persia, Tenn., 38 miles. All grading and structures 80 per cent. finished. Additional contracts to be let soon. It is expected that the line will be ready for operation by October, 1909.

VIRGINIAN RAILWAY.—Contracts let to T. Towles & Co., Mullens, W. Va.; W. O. Lipscomb, Roanoke, Va.; J. C. Carpenter & Co., Clifton Forge, Va.; Mason & Hanger Co., Richmond, Ky., for the Winding Gulf branch, between Mullens, W. Va., and Pemberton, about 25 miles. Expected that track-laying will begin in April and the branch to Pemberton completed by November.

W

WABASH-PITTSBURGH TERMINAL.—Work under way replacing old timber trestles with steel bridges and viaducts, on concrete masonry, and with concrete arches and embankments. About 75 steel bridges are to be repainted. The lining of two tunnels with concrete is being done by the company's forces and 5 more will be finished in 1909. Contracts for lining 7 additional tunnels have been let.

WASHINGTON & WESTERN MARYLAND.—See Baltimore & Ohio.

WASIOTA & BLACK MOUNTAIN.—Contract let to T. J. Asher & Sons, of Wasiota, Ky., to build from Mill Rice, Ky., north to Toms creek coal fields. Track laid on 3½ miles. T. J. Asher, President; A. B. Gloster, Ch. Engr., Middesboro, Ky.

WEAVERVILLE ELECTRIC CO.—Contract let to the Asheville Dray, Fuel & Con. Co. to build from Asheville, N. C., northwest to Weaverville, 8 miles. Track laid for 1 mile.

WESTERN & ATLANTIC.—A commission has been appointed by the State of Georgia to investigate the practicability of extending this road from Atlanta to the Atlantic seacoast.

WESTERN PACIFIC.—Building from Salt Lake City, Utah, west to Oakland, Cal., 923.7 miles, from which point a ferry service will be used to San Francisco, 3.5 miles. Of this, 121.5 miles will be in Utah, 427.3 miles in Nevada and 378.4 miles in California. Contracts let to the Utah Construction Co., Ogden; E. B. & A. L. Stone, Oakland, Cal., and Maney Bros. & Co., Winnemucca, Nev., for building the line. Up to January 1, 1909, grading on the main line was finished on 745 miles, and track laid on 489 miles. There will be a total of 43 tunnels, aggregating 45,527 ft., which are about 89 per cent. finished, and there are to be 40 steel bridges aggregating 9,261 ft., of which 22 are finished, aggregating 4,985 ft. The company has also completed a telegraph line for 356 miles. The terminal ferry slip improvements at Oakland Mole are finished except the house. Stations have been finished from Salt Lake City, Utah, to Shafter, Nev., and eleven are under construction in California. Division terminals are in process of construction at Wendover, Utah; Elko, Nev., and Stockton, Cal. Regular trains are now in operation from Salt Lake City, west to Shafter, Nev., 161 miles, which will probably be extended to Elko, Nev., 261 miles early in March. It is expected to have the entire main line, which will have a maximum grade of one per cent., finished by September, 1909.

WESTERN RAILWAYS & LIGHT CO.—The Chicago, Ottawa & Peoria, organized to build an electric line from Peoria, Ill., north, and thence east to Chicago, about 175 miles, is in operation from Princeton, Ill., east to Seneca, 58 miles. Work started on a branch from Ottawa south to Streator, 16 miles.

WESTERN TRANSPORTATION CO.—Surveys made and rights of way secured on 30 miles from Portage, Wis., north via Briggsville, Oxford, Friendship and Arkdale to Grand Rapids, about 70 miles.

——Negotiations finished to take over the Sparta Ry. & Power Co., organized to build from Sparta, Wis., northwest via Angelo, Trout Falls and Cataract to Melrose, 28 miles. Contracts let to local parties to build the entire line. Contracts to be let soon for bridges, including one 800 ft. long, with approaches. Shops and car barns are to be built at Sparta.

—— The Galesville & Etric, which had projected a line in Wisconsin, will be built in 1909 by the W. T. Co., as well as a 60-mile interurban electric line in Montana. C. Oehler, Ch. Engr., St. Paul, Minn.

WHEELING & LAKE ERIE.—Work on the Sugar Creek & Northern.

——Building a low grade cut off line from Bolivar, Ohio northwest to Orrville, 22 miles under way, and is expected to be ready for operation about May 1. The 1,800-car yard, roundhouse, coaling tipple and shop buildings at Brewster, Ohio, will be completed later.

——Extending 90-lb. rails from Middle Branch, Ohio, on the Cleveland division to a connection with the Sugar Creek & Northern, 21 miles.

WICHITA FALLS ROUTE.—Preliminary surveys being made by the Wichita Falls & Northwestern, from Frederick, Okla., northwest. Route not yet decided. Surveys made for extensions from Frederick, west, via Olustee and Duke, to crossing of fork of Red river north of Duke.

——Projected extension of the Wichita Falls & Southern, from New Castle, Tex., south to Llano, about 200 miles. Nothing done. Track laid last year on 12½ miles to New Castle. Plans are under consideration to continue the extension south 50 miles to the Texas & Pacific at Cisco, Tex.

WILLIAMSPORT & NORTH BRANCH.—Surveys made for an extension from Bernice, Pa., to coal mines in the Bernice district, about four miles.

CANADA.

ALBERTA CENTRAL.—Subsidy granted to build from Red Deer, Alb., west to the Rocky mountains, 70 miles. Further extension projected from near Rocky Mountain House, Alb., to the Grand Trunk Pacific near Yellow head Pass, and from Battle river to Saskatoon, Sask., or Warman; also from east of Red Deer, Alb., southeasterly to Moose Jaw. Smith & Johnston, solicitors, Ottawa, Ont.

ALGOMA CENTRAL & HUDSON BAY.—Building extension from present end of track mile 69.35, at the Chippewa river, Ont., north to mile 170; mile 173 to mile 233, with branch from mile 163 to Missanabie on the Canadian Pacific, in all 190 miles.

——Projected extension of branch from Missanabie to James Bay, 314 miles.

——The Manitoulin & North Shore building extension from mile 13 to mile 25.5; also from Little Current to Stanley on the Canadian Pacific and from mile 29.35 to mile 35, in all 51.65 miles.

——Projected branch of the Manitoulin & North Shore from Gertrude to Searchmont on the A. C. & H. B., 160 miles.

ATLANTIC, QUEBEC & WESTERN.—Work under way on 62 miles in Quebec between Pabos and Gaspe by the New Canadian Co., Ltd., New Carlisle, Que., Canada.

CALGARY & KNEEHILL.—Extension of time asked until March 15, to build first 30 miles of line from Calgary, Alb., northerly to Kneehill creek, and a further extension of two years from that date for the completion of the rest of the line. The directors include F. Aylwin, Ottawa, Ont.; P. Roy and J. E. Laurencelle, both of Edmonton.

CANADIAN, LIVERPOOL & WESTERN.—Incorporation to be asked soon to build from the Grand Trunk Pacific, near the St. Maurice river, Que., northeasterly to the south shore of Lake St. John, thence east along the Saguenay river, with a branch from the mouth of that river southwesterly along the St. Lawrence to Quebec and Montreal. Smith & Johnston, solicitors, Ottawa, Ont.

CANADIAN NORTHERN.—The Rossburn branch extension, previously referred to as the Brandon-Regina line, recently put in operation from Rossburn, Man., west to Regina, Sask, 220.8 miles, is eventually to be extended west to a point near the western boundary of Saskatchewan.

——Building branch from Dalmeny, Sask., north about 45 miles. Track laid last year from Dalmeny to Laird, 28 miles.

——Building from Etoimami, Sask., northeast via Pas Mission, Keewatin, to Fort Churchill, on Hudson bay, 588 miles. Track laid on 120 miles from Etoimami northeast. The Dominion government has agreed to subsidize and guarantee bonds for the 488 miles from Pas Mission to Hudson bay.

The Goose Lake branch, building from Saskatoon, Sask., southwest, has track laid to Zealandia, Sask., 75 miles from Saskatoon. Graded for 20 miles further.

——Extension of the Edmonton & Slave Lake in operation from Edmondton, Alb., north to Morinville, 23 miles, projected north via Athabasca Landing and the Lesser Slave lake to Peace river, about 400 miles.

——Extension of the line built from Strathcona, Alb., into Edmonton, 4½ miles, and 21 miles from Edmonton west to Stony Plain. Projected west to the boundary of British Columbia, passing south to Jasper House, about 200 miles west of Edmonton. Extension also projected north of this line from Edmonton northwest to the British Columbia boundary, 300 miles.

CANADIAN NORTHERN ONTARIO.—Work under way from Ottawa, Ont., east to junction with Canadian Northern Quebec at Hawkesbury, 55 miles. It is expected that the line will be ready for traffic in March.

——Subsidy granted for a line from Sutton Junction, Ont., to Hatton Mines, not to exceed 30 miles.

——The main line between Toronto, Ont., and Sudbury, 268 miles, is now completed, as are the branches to the Moose mountain mines at Sellwood and to Key Harbor the company's Georgian bay port. Surveys being made west for 550 miles, to be built from Moose mountain mines to a connection with the Canadian Northern lines at Port Arthur.

——Application is to be made for authority to build lines as follows: From Nepigon bay, Ont., to the National Transcontinental Railway, with branch lines to the northern and southern ends of Lake Nepigon; from Vermillion bay to the National Transcontinental crossing of the Abitibi river, thence to the south end of Lake Temiskaming.

——Application to be made for an extension of time to build authorized lines in Ontario as follows: from Washago to Kincardine; Arnprior to Gananoque; Pembroke to Cobourg; Pickering to Owen Sound; Niagara to Goderich; Port Dover to Owen Sound; Hawkesbury to Toronto; Parry Sound to North Bay; French River to Batchewana, and Toronto to Ottawa.

CANADIAN NORTHERN QUEBEC.—Contract let to J. P. Mullarkey, of Montreal, for extension from St. Jacques, Que., to Rawdon, 11 miles. Grading under way.

——Subsidy contracts, at $3,200 a mile, made with the Canadian government for a line from near Arundel, Que., to a point near the united townships of Preston, Que., and Hartwell, about 30 miles.

CANADIAN PACIFIC.—Building extension of the Northern Colonization Railway from Nominingue, Que., west to Rapide de L'Original, in Wright district, 35 miles. Track laid to mile 32.7.

——The Georgian Bay & Seaboard building from Victoria Harbour, Ont., to Cold Water, 13.3 miles. Track laid on 10 miles.

——Building extension of the Winnipeg Beach line, from Komarno, Man., north to Icelandic river, 30 miles.

——Work under way on 18 miles to complete the double-tracking from Winnipeg, Man., east to Fort William, 427 miles. Foley, Welch & Stewart, contractors, Winnipeg.

——Building branch from Regina, Sask., north to Bulyea, 43 miles.

——Building extension of the Yorkton branch from Sheho, Sask., northwest to Lanigan, 82 miles. Track laid from Sheho to Wynward, 46.10 miles, in operation to Leslie, 24 miles.

——Extension of Stoughton-Weyburn line projected from Weyburn, Sask., west 100 miles to Range, 30, west of the second meridian.

——Projected branch from Moose Jaw, Sask., northwest to Lacombe, Alb., 375 miles. Grading from mile 50 to mile 123. Contract let to J. D. MacArthur, Winnipeg, for work from Moose Jaw north via Tuxford to point 30 miles beyond Rutland, 50 miles. Finished for 119.1 miles. Work also under way from Lacombe, east on 100 miles towards Moose Jaw. Surveyed and 51 miles in operation east to Stettler, Alb. Foley, Welch & Stewart, contractors.

——Line from Saskatoon, Sask., west to Wetaskiwin, Alb., 325 miles. Contract let to Foley, Welch & Stewart, from Wetaskiwin, east to Battleford, 250 miles. Built from Wetaskiwin east to Hardisty, 95 miles and from Saskatoon west to Wilkie, 99.6 miles.

——Reconnoissance for proposed line from Killam, Alb., northwest to Strathcona, 80 miles.

McLeod, for new line from Lethbridge, Alb.,
——Contract let to Janse & McDonald, of west to McCloud, 36 miles. Grading finished. Belly river bridge, 5,327 ft. long, 60 per cent finished. Work just started on Old Man river bridge, 1,890 ft.
——Contract reported let to McDonnell & Gzowski, of Vancouver, B. C., and work under way improving the main line grades near Field, B. C. The improvements include two new tunnels aggregating about a mile and a half, one on each side of the Kicking Horse river, and two bridges. To cost about $1,500,000. Work 85 per cent. finished.
——Proposed route inspected for branch line from Penticton, B. C., to Coutlee. Work is to be started at once.
——Contracts let to John Bright, of Vancouver, and Dixon & Moore, of Parkesville, B. C., to extend the Esquimalt & Nanaimo from Wellington, B. C., to French Creek, 23 miles. Surveys made for further extension of 35 miles from French Creek to Alberni, at the east end of the Alberni canal, island of Vancouver.

CANADA WEST COAL COMPANIES RAILROAD.—Work to be begun early this year on a line from Calgary, Alb., south to the smelters at Butte, Mont. Address O. A. Robertson, St. Paul, Minn.

CENTRAL ONTARIO.—Grading finished on an extension north of Maynooth, Ont., for 11½ miles, and track laid on 10½ miles. Work on the rest of the 27½ miles to Whitney, suspended for the present.

CROWS NEST & NORTHERN.—Surveys filed for a line from Crows Nest, B. C., to Crown, over 12 miles. J. A. Williams, Pres., and C. O. Diffenderfer, Ch. Eng., Spokane, Wash.

EASTERN BRITISH COLUMBIA.—Building from the south fork of Michel creek, B. C., on the Crows Nest branch of the Canadian Pacific, south 14 miles. D. Corbin, Pres.; E. G. Taber, Ch. Engr., Fernie, B. C.

EDMONDTON & SLAVE LAKE.—See Canadian Northern.

ESQUIMALT & NANAIMO.—See Canadian Pacific.

GEORGIAN BAY & SEABOARD.—See Canadian Pacific.

GRAND TRUNK PACIFIC.—To extend from Moncton, N. B., west 3,550 miles across Canada to Prince Rupert, B. C., a new port on Kai En Island, about 25 miles south of Port Simpson. The total length of all the projected lines is 7,900 miles.
——Moncton to Winnipeg, Man., 1,804 miles, called the National Transcontinental, to be built by the Canadian government. Contracts let for all this eastern section except 1.11 miles covered by the Quebec bridge and approaches. Track laid at end of 1908 was 309.15 miles, of which 39.71 are in New Brunswick, 120.99 in Quebec, and 148.45 in Ontario and Manitoba. Contracts let as follows:
——To Grand Trunk Pacific Railway Co., of Montreal, Que., in District A from near Moncton, N. B., west 50 miles.
——To John W. McManus Co., Ltd., of Memramcook, N. B., in District A, from near Chipman, N. B., easterly 8 miles.
——To Grand Trunk Pacific Railway Co., in District A, from 58 miles west of Moncton to about mile 97.7 at the Intercolonial Railway, 39.7 miles.
——To Grand Trunk Pacific Railway Co., in District A, from mile 97.7 west to Tobique river at about mile 165.7 less one mile, about 67 miles.
——To Willard Kitchen Co., Ltd., of Grand Falls, N. B., in District A, from near Tobique river west to 2.5 miles west of Grand Falls, N. B., about 31.5 miles.
—To Lyrons & White, of Edmundston, N. B. in District A, from near Grand Falls, westerly to the Quebec-New Brunswick boundary, about 62 miles.
——To M. P. & J. T. Davis, of Quebec, in District B, from the Quebec-New Brunswick boundary westerly about 52.4 miles.
——To M. P. & J. T. Davis, in District B, from near the Quebec bridge easterly about 150 miles.
——To Macdonell & O'Brien, of Montreal, in District B, from the north end of the Quebec Bridge & Railway Co.'s bridge to near La Tuque, Que., about 150 miles.
——To Grand Trunk Pacific Railway Co., in District B, from 150 miles west of the Quebec bridge, westerly to Weymontachene, about 45 miles.
——To Macdonell & O'Brien, in District C, from near Weymontachene, Que., westerly about 107 miles.
——To Macdonell & O'Brien, in District C, from 107 miles west of Weymontachene, westerly to the end of the G. T. P. Railway Co.'s contract, about 114.97 miles.
——To Grand Trunk Pacific Railway Co., in Districts C and D, from 8 miles west of the Abitibi river crossing Ontario, easterly about 150 miles.
——To E. F. & G. E. Fauquier, of Ottawa, Ont., in District D, from 8 miles west of Abitibi river crossing, westerly about 100 miles.
——To M. P. & J. T. Davis, in Districts D and E, from the westerly end of Fauquier Bros' Abitibi contract westerly about 104.24 miles.
——To M. P. & J. T. Davis, in District E, from 60 miles west of the eastern boundary of District E in Ontario, westerly to end of Fauquier Bros' contract north of Lake Nepigon, about 100 miles.
——To E. F. & G. E. Fauquier, in District E, from about 19.5 miles west of the Mud river crossing near Lake Nepigon, Ont., easterly about 75 miles.
——To O'Brien & McDougall, of Ottawa, Ont., in Districts E and F, from the western end of Fauquier Bros' contract, north of Lake Nepigon, westerly to near Dog lake, about 126 miles.
——To O'Brien & McDougall in District F, from near Dog Lake, Ont., to 2.6 miles west of Peninsula Crossing, about 24.13 miles.
——To J. D. McArthur, of Winnipeg, Man., in District F, from near Winnipeg east to Peninsula Crossing, near the junction point of the Fort William branch of the G. T. P. Ry., about 245 miles.
——The western line, Winnipeg, Man., via Saskatoon, Sask., Edmonton, Alb., and Yellow Head pass to Prince Rupert, 1,750 miles, and the Lake Superior branch east of Winnipeg to Fort William, to be built by Grand Trunk Pacific.
——The main line is under construction from Winnipeg, Man., west to mile 916, at the eastern foot of the Rocky mountains; also on the western end from mile 1655, west to mile 1755, 100 miles. Track laid at various points up to end of 1908 as follows: Province of Manitoba, Winnipeg, west 212.32 miles, Saskatchewan, mile 212.32, to mile 627.10—414.78 miles; Alberta, mile 627.1, to mile 685—57.9 miles, and from mile 786.6 to mile 791.6, five miles, a total of 690 miles. Surveys under way from mile 1045, west to mile 1655. The line is not under construction from mile 916 to mile 1655—739 miles.
——Work under way on a branch from the main line at Kitimat, B. C. (Pacific Northern & Omineca), to mile 53.7. Foley, Welch & Stewart of Stony Plains, Alb., and Prince Rupert, B. C., are the contractors. Contracts for about 300 miles are to be let soon.
——Extension of time of two years has been granted to the Grand Trunk, Pacific Branch Lines Co. for the following branches from the main line of the Grand Trunk Pacific: Belt line around the city of Winnipeg, Man., and through the outlying portions of that city. Winnipeg, Man., to a point on the international boundary within 25 miles east or west of the Red river.
——Neepawa, Man., to a junction with the Grand Trunk Pacific to Brandon and from thence to Regina, Sask.
——Line from Brandon to a point on the southern boundary of the province near Turtle mountains.
——From a point on the western division near township 22, range 6, west of the second meridian, to Yorkton, Sask., thence to a port on Hudson's bay.
——From the same point as the above branch southward to Regina, Sask., and thence to the international boundary near North Portal.
——From a point on the western division between 105th and 107th degrees of longitude to Prince Albert, Sask.
——From a point on the western division between 108th and 109th degrees of longitude to Prince Albert, Sask.
——From a point on the western division between 111th and 113th degrees of longitude to Calgary, Alb., and from thence to the international boundary near Coutts, Alb.
——From Vancouver, B. C., to a junction with the Grand Trunk Pacific or to a junction with the Pacific Northern & Omineca, or both between the 122d and 124th degrees of longitude.
——From a point on the north shore of the island of Vancouver southerly to Victoria, B. C.
——From a point on the western division between 127th and 129th degrees of longitude to Dawson City, Y. T.

GREAT NORTHERN.—See Great Northern under United States.

HALIFAX & GUYSBOROUGH.—Location surveys made by the Canadian government for a line from Halifax, N. S., northeast to Guysborough via Lawrencetown, Musquodoboit Harbor, Little River. Upper Musquodoboit and Cole Harbor, 165 miles, also for a number of branch lines. G. E. Boak, of Halifax, is interested.

INTERCOLONIAL.—Double-tracking between Moncton, N. B., and Painsec Junction, 7 miles Three-quarters finished. Surveys made.
——Surveys made for relocation of line from Georges river, Nova Scotia, to Sydney mines for double track from Painsec Junction to Sackville, 30.75 miles, and from Amherst via Parrsboro to Truro, 90 miles. Work not yet decided upon.

INTERNATIONAL LUMBER CO.'S ROAD.—This 5-mile logging road now in operation from Campbell River, B. C., is to be extended 25 or 30 miles into the island of Vancouver. C. H. Cobb, Pres.; F. H. Parks, Mgr., Campbell River, B. C.

INTERNATIONAL RAILWAY OF NEW BRUNSWICK.—A new subsidy contract has been made with the Canadian government for building an extension from the western end of the 20 miles already built from Campbellton, N. B., to a point on the St. John river, between Grand Falls and Edmundston.

MANITOULIN LINE & NORTH SHORE.—See Algoma Central & Hudson Bay.

MATANE & GASPE.—Building from Metis, Que., from a junction with the Intercolonial near St. Octave de Metis via Matane to Gaspe; also westward from the junction with the Intercolonial to Rimouski; and on the eastern end from Gaspe to Griffin cove, a total of 286½ miles. A branch is projected from near Metis southwest to the Grand Trunk Pacific near Glazier lake. Right of way is nearly all secured. Contract let to the H. J. Beemer Co., Quebec, for building from point near St. Octave de Metis east to Matane, 31 miles. The second section to be built will be from Matane east to Ste. Anne des Monts, 60 miles. Contract is to be let shortly for the remaining section from Ste. Anne des Monts east to Gaspe, 127 miles. Senator P. A. Choquette, President, Quebec, and P. E. Hunter, Ch. Engr., Ste. Flavie, Quebec.

NORTHERN COLONIZATION.—See Canadian Pacific.

PRINCE ALBERT & HUDSON BAY.—Organized to build from Prince Albert, Sask., northeasterly to the mouth of Nelson river or York Factory, on Hudson bay. F. W. Halliday, solicitor, Prince Albert, Sask.

PRINCE EDWARD ISLAND RAILWAY.—Bids in for the construction of a branch line from Harmony, P. E. I., to Elmira Kings county, 10 miles, by D. Pottinger, General Manager, Moncton, N. B.

QUEBEC CENTRAL.—Surveys being made for an extension from St. George, Que., to St. Justine, 30 miles, to be built this year.

QUEBEC & LAKE ST. JOHN.—Surveys made for an extension to be built this year from Roberval, Que., northwest to St. Felicien, 20 miles.

ST. MARY'S & WESTERN ONTARIO.—Organized to build from Woodstock, Ont., northwest to St. Mary's, thence to Exeter and then south and west to Sarnia, 125 miles. Surveys made. Built from Embro to St. Mary's, 18 miles, and is operated under lease by the Canadian Pacific. Subsidy granted for the entire line.

TEMISKAMING & NORTHERN ONTARIO.—Extension of Englehart-Charlton branch located from Charlton, Ont., to Elk lake, 19 miles.

VANCOUVER, VICTORIA & EASTERN.—See Great Northern, under United States.

MEXICO.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

INTEROCEANIC OF MEXICO.—Heavy grades and sharp curves to be removed gradually, and new stretches of road so built that a change from narrow to standard gage may be made later.

LA DICHA & PACIFIC.—Concession granted by the federal government to this company amended to provide that 12½ miles were to be finished by February 25, 1909, and an additional 12½ miles finished every year thereafter up to 1914. The general offices are at La Dicha, Guerrero.

MEXICAN CENTRAL.—Surveys reported made for rebuilding division between Irapuato, Guanajuato and Guadalajara, 161 miles. The estimated cost is $2,000,000.
——Work reported suspended on the Tampico cut-off, building from Mexico City

east to Tampico, 304 miles. About 191 miles remains to be built.

—Large terminal to be built at Manzanillo. About 1,000 acres of land bought.

MEXICAN ROADS.—Surveys being made for a 200 mile line from the San Carlos mines via Sierra Rica to a point on the Kansas City, Mexico & Orient, or to the Southern Pacific in Texas, about 200 miles. Estimated cost $21,000 a mile. The promoters are: Albert Terrazas, Governor Creel, Manuel Gameros and Dr. C. F. Z. Caracristi, San Carlos de Ojinaga, Chihuahua, Mex.

——Gustavo A. Madero, of Zacetecas, has a concession to build from Comacho, Zac., east to Mazapil, 60 miles.

——The Mexican Milling & Transportation Co. has a concession to build lines in Guanajuato, La Pas and Santa Rosa, with branches, in all 50 miles. G. W. Bryant is interested.

MEXICAN SOUTHERN.—Building an extension from Oaxaca, Mex., in the state of Oaxaca, south via Zimatlan and San Pablo Huixtepec to Taviche, 34 miles. Built from Oaxaca to San Pablo, and grading contract let for the remaining 16 miles to Taviche.

PACIFIC, GULF & YUCATAN.—See Pan-American.

PAN-AMERICAN.—This company has concessions for a line to Panama through San Salvador and Nicaragua.

——The Pacific, Gulf & Yucatan is a projected branch from Jalisco, Chiapas, to point in State of Yucatan, 660 miles.

RIO GRANDE, SIERRA MADRE & PACIFIC.—Work on the extension west from Terrazos toward the Pacific coast is to be resumed when financial conditions improve. The first section to be built will be about 175 or 200 miles. Graded for about 30 miles. The projected route is from Nueva Casas Grandes, Chihuahua, southwest, via Santa Elena and Ocampo, to a point on the Pacific coast, either at Guaymas or at Topolobampo, 300 miles.

SAN JUAN, TAVICHE & OAXACA.—An extension of two years from May 9, 1908, granted to C. A. Hamilton, of Oaxaca, to build from San Pablo Zimatlin, Oaxaca, to the Taviche mining camp, about 17 miles.

SONORA RAILWAY.—See Southern Pacific.

SOUTHERN PACIFIC (Mexico). The Southern Pacific Railroad of Mexico, formerly referred to as the Mexican Pacific Coast, building from Navajoa, Sonora, south of Corral on the Cananea, Yaqui River & Pacific, southeast to Guadalajara, Jalisco, 730 miles. From Navojoa south the line is in operation to Culiacan, 218 miles. Graded south of Culiacan to Quila, and track laid on 6½ miles. The roadbed north of Mazatlan is finished on 32 miles and track laid on 25 miles south of Mazatlan graded for 12½ miles and track laid on 9½ miles. It is expected that the line will be in operation in 3 years. Work progressing. The Grant Bros. Construction Co., contractors, Los Angeles, Cal.

— Concession granted authorizing the construction of as many branches on either side of the trunk line from Navojoa to Guadalajara (each branch not to exceed 93.15 miles long) as may be desired to be designated prior to November, 1915. No concession for the construction of parallel lines within a zone of 20 miles on each side of the line can be granted to any other company prior to November, 1920.

The Cananea, Yaqui River & Pacific is building a branch from Corral, Sonora, north along the Yaqui river. Projected to international boundary, near Douglas, Ariz., 388 miles. The concession calls for the completion of the line by May, 1914. Built to Aguas Calientes, 60 miles. Grant Bros. Construction Co., Los Angeles, Cal., has contract to Tonichi.

——The Cananea, Yaqui River & Pacific has a concession from the Mexican government for a branch from Naco, east to Juarez, Sonora, 150 miles.

Branch to be built from Tonichi to coal fields of Barranca, 4½ miles.

Work under way by the Grant Bros. Construction Co., of Los Angeles, Cal., on branch from the Yaqui river line Sonora, at the junction of the Yaqui and Moctezuma rivers, north to Nacozari, 111 miles. The concession calls for the completion of the line by May, 1914.

The Sonora Railway is to be rebuilt from Nogales, Ariz., to Guaymas, Mex., 265 miles. Concession for this improvement work granted.

SOUTHERN PACIFIC RAILROAD OF MEXICO.—See Southern Pacific, under Mexico.

TORRES, PRIETAS & REPRESO.—Operating 19 miles of railway from Torres, Sonora, on the Sonora Railway east to Prietas. Projected 80-mile extension east to the Yaqui river.

TUXPAN-FURBERO.—Percy M. Furber, of the Oil Field Co., of Mexico City, is building a line from Furbero, Vera Cruz, to the port of Tuxpan, 50 miles. Track laid from Tuxpan to Cazones, 20 miles. A. C. Payne, Gen. Mgr., Mexico City.

VERA CRUZ TERMINAL.—Contracts let to S. Pearson & Sons, Sucs., London, and the Campania Bancaria de Obrasy Bienes Raices of Mexico City for new terminal buildings and improvements at the Port of Vera Cruz, Mex., to cost about $8,000,000. J. W. Richardson, Ch. Engr., City of Mexico.

PENNSYLVANIA STATION AT NEW YORK.

The plans for the Pennsylvania's New York passenger station were shown in the *Railroad Gazette* of February 9, 1906, and May 25, 1906. The station building and yards cover the six blocks bounded by Ninth avenue, Thirty-third street, Seventh avenue and Thirty-first street. Within the 25 acres of ground area are 16 miles of tracks. The two single-track tubes under the Hudson river run east as far as Tenth avenue. Here the tracks will spread out and be multiplied so that at Ninth avenue there will be 21. This number continues to a point under the eastern part of the station building, which covers all the space from Eighth avenue to Seventh avenue, when the tracks begin to converge and finally pass into two double-track tunnels running eastward across to the East river.

The accompanying photograph of the front of the station on Seventh avenue (Fig. 1) was taken from the corner of Thirty-first street and Seventh avenue, looking northwest. The stone work of this facade is completed, and most of this work is finished on the Thirty-first street side, at the left in the photograph. Fig. 2 shows the progress of the work on the Eighth avenue face of the building. The highest steel work is over the main waiting room, while the low steel arches are over the concourse. Fig. 3 is a nearer view of the Eighth avenue face, taken from the Thirty-third street, or north, side of the excavation. Fig. 4, looking north, shows the eastern side of the Ninth avenue work. The street is supported on girders and concrete work; forms for the latter are in the foreground at the left. The temporary timber supports for the Ninth avenue elevated railway are visible in Fig. 5, which shows the west side of Ninth avenue. Fig. 6 is a near view of the same side, but near Thirty-first street. Grading is all finished east of Ninth avenue, but west of and under Ninth avenue there is still some rock excavation to be done, as shown

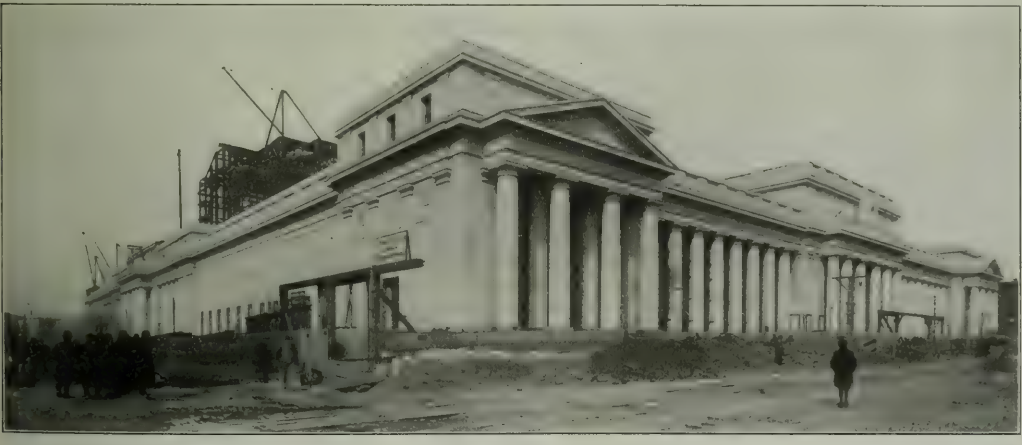


Fig. 1—Main Facade; Pennsylvania Station.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

in Figs. 5 and 6. The last view, Fig. 7, was taken from Ninth avenue, looking west toward the tube portals. The upper halves of these portals, which are timbered, may be made out at the left of the foot of the trestle in the distance, behind the derrick in the middle of the excavation.

RAIL JOINTS.

Many joints have been designed which theoretically seemed to satisfy every requirement, but have failed in actual service, because the treatment which a joint under traffic has to stand cannot be figured out in the foot-pounds. It may give excellent service at first on new rail in well ballasted and well surfaced track; on poorer track, or as soon as the joint becomes slightly worn, it fails.

To get some definite information as to the efficiency of different kinds of joints, we invited engineering officers of some important roads in the country to send blueprints of the joints they had in approved use, their experience with them, and their opinions of the value of them and of other joints they have tried. No attempt was made to gather complete statistics, and therefore any percentages as to the comparative number of each kind of joint in use, worked out from the answers received, are only indicative and not conclusive. It must be remembered also that since the roads concerned are large ones, with many miles of track laid with plain angle bars, changes of standards mean great expense. This is not so true of smaller roads. The proportion of patented joints in approved use, figured from our returns, is therefore lower than the proportion now being bought if every road in the country were considered.

Fifty-six answers were received. Taking up first those roads which had in approved use plain angle bars rather than patented joints, Fig. 1 shows the section of angle bar to which the practice of the majority of roads conform. The variations from this section, as applied to 80 and 85-lb. rail, are in many directions. A comparatively frequent one is the thickening of the vertical web to ⅞ in. Another tendency is to put more metal into the upper part of the web near the underside of the rail head. An extreme development of this latter practice is shown in the Pennsylvania's angle bar for use with its new section of rail. Fig. 2 shows this section as applied to 100-lb. rail; the one for 85-lb. rail shows the same tendency, though not so marked. The horizontal extension of the lower flange of the bar is another direction in which the angle bar section is frequently modified. Fig. 3 shows an extreme design. The greatest variations occur in rails lighter than 80 lbs. A pronounced characteristic is the simplification of the general lines, making the rolling simpler. In these lighter joints this is natural, because the amount of metal used being comparatively small, it is not found to be economical to carry far the refinements resulting in a more advantageous disposition of metal. On 70-lb. rail the widely extending lower flange occurs frequently.

The four-hole 24 to 26-in. joint is at present the most common length. For six-hole joints, 30 in. is the most popular. In both cases the joints are suspended. Both joints are applied to rails from 80 to 100 lbs. Extreme lengths are in a few cases still in approved use. In four cases, six-hole joints 40 in., and more, long are used. One road using a 40-in. bar with 90-lb. rail under heavy freight traffic finds it makes a very satisfactory joint, and no trouble with battered rails developed, The same road uses a four-hole 24-in. joint on side tracks. A second road uses a 44-in. joint with a wide flange on 72-lb. rail. It considers it a good joint, especially with rail of good quality, but it is quite likely to bend, particularly if the head of the rail becomes battered. The other two use 40 and 42-in. joints with 75-lb. rail. One considers it the best joint on the market, but the other intends to use hereafter a thicker four-hole 24-in. bar instead. One of the largest roads uses a six-hole 38-in. bar with 100-lb. rail. They have been breaking lately, and the engineer believed that they do not give better service in proportion to their additional cost and the extra amount of material in them as compared with a 25-in. bar. In a three-tie supported joint he found that unless the middle tie is constantly tamped up, the joint becomes a long suspended joint. Eleven roads report six-hole joints from 28 to 37 in. long. These are all large roads, with fast heavy freight service. They are used on rails 80 to 100 lbs. These are nearly all suspended joints, and several engineers call attention to the need of careful tamping. One road, which is changing to one of the patented joints for its 1909 requirement on double track, is, however, still using a 36-in. supported joint on single track, considering it much better than a two-tie joint for traffic in both directions. With this joint, 95-lb. rail is used, and the bars have wide flanges, giving a broad bearing on the tie at each side of the rail base similar to the one shown in Fig. 3. The other roads using angle bars as standards use four-hole bars from 22 to 26 in. long. They are nearly all suspended joints.

Nut locks, or lock nuts, are used on about two-thirds of the six-hole joints reported. The proportion is still greater on four-hole joints. The bolts are placed alternately on the outside and inside of the rail. This makes the joint symmetrical and may perhaps balance strains. The main reason for this, however, is that in case of derailment the wheels will cut off nuts on one side of the rail only, leaving enough fastening to hold the joint together temporarily. There are records of cases where wheels have been off the track, shearing bolts, for miles before discovery. There are a number of different arrangements, both bolts at the ends of the rails sometimes having the nuts on the same side, while the next two have the nuts on the other side. There are several cases, however, where all the bolts have the nuts on the same side. The advantage of this is that a man can see all the nuts more easily in inspecting.

Among the unusual angle bar joints is the design used by the Atlanta, Birmingham & Atlantic, shown in Fig. 4. This, as shown, has the vertical web reinforced somewhat like the Sampson joint and is used with 80-lb. A.S.C.E. section rail. The Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha use a base plate ⅜ in. thick under the rail running the length of the angle bar. The plate extends out $1^{5}/_{16}$ in. on each side of the rail base, being thickened in this portion to ⅝ in. The spikes connect it with the angle bar above. The Central of Georgia uses a joint plate in connection with its standard four-hole 26-in. angle bar joint, with 80-lb. A.S.C.E. rail. The officers of the above consider these joints the equal of base-supported joints. They may be criticized in that they cannot act as a unit, their only connection between the angle bar portion and the base plate being due to pressure of the spikes, which for this purpose is negligible.

Two roads report the use of fish plates. On the first, they are in use on old, very light rails only. The other, the Mexican Railway, uses them not because it likes them, but because it is the only thing that can be used on the greater part of its lines, due to the design of steel tie in service.

The Norfolk & Western in 1892, and for two or three years after that, bought a good many rails of 60 ft. lengths with mitered joints. Some of this rail is still in track on the Shenandoah division, where traffic is somewhat light. On other divisions where traffic is heavy, this rail has been worn out and removed from main track, the best of it being relaid on some side lines. The company stopped buying 60-ft. rails solely because of the premium asked by the mills because of the difficulty in strengthening it. This premium amounted to more than the saving resulting from fewer joints. The extra width of opening necessary to allow for expansion is also undesirable and the mitered joint has not been successful, the acute angle being subject to wear and having

other disadvantages similar to the troubles developing with switch points.

Nearly all the roads report the use, to a greater or less extent, of one or more forms of patented joints. The majority of them favor patented joints and were either planning to come to their use ultimately for main line traffic, at least when they decided just what design they preferred, or else said that the increased first cost and difficulty of applying were the only objections. In one instance the ordinary angle bar joint was considered little, if any, inferior to any patented joint now on the market, taking into consideration the additional cost of applying them. This criticism cannot be fairly made against patented joints in general. This officer called attention to the fact that no joint will keep the rail up without work under the ties supporting the joint, and he had not found that the need for this was reduced to any great extent by any patented joint. Other roads, while feeling that certain patented forms are far preferable to the ordinary angle bars, have not yet worked up enough figures as to the saving in maintenance to be able to decide what they can afford to pay for improved joints. Improvements are being made steadily and a better joint than any in service is to be hoped for.

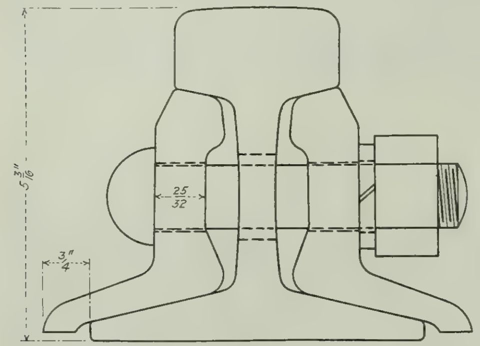


Fig. 1.

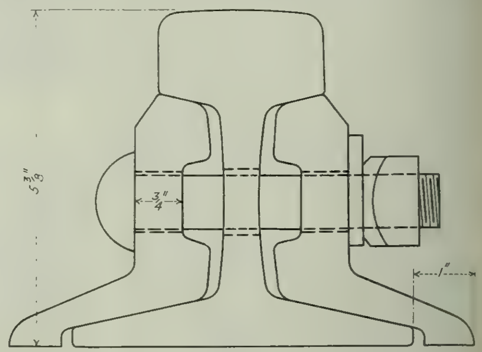


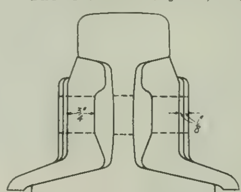
Fig. 3.

In considering the different kinds of patented joints it must be remembered that the figures here given are by no means complete. As mentioned at the beginning of this article, reports from only a comparatively small list of roads were received, and the proportions of these roads which favor certain kinds of joints only suggest comparative value. There are six patented joints which are now in service in sufficient numbers to merit consideration. They may be divided into two classes: those with deep girder flanges, namely the Hundred per cent., the Duquesne and the Bonzano; the base-supported type, consisting of the Continuous, the Weber and the Wolhaupter.

A recent form of the Hundred per cent. joint is shown in Fig. 5. Of the 56 roads reporting, 11 spoke of trials of the Hundred per cent. joint and four had it in approved use either as a standard or buying it in large quantities. One road which uses these joints and the Duquesne, Fig. 6, under heavy traffic and angle bars under light traffic found that the angle bar cost from two-and-a-half to three times as much per mile of track per month to maintain as the two kinds of patented joints. Another road has had 80 miles of Hundred per cent. joint under 100-lb. rail in service for five years and reports them in excellent condition. It also has had about 30 miles of these joints on 80-lb. rail for over six years and they are giving as good service. Four roads report trials of Duquesne joints, and it is being bought for 1909 requirements by two roads which are also buying Hundred per cent. joints.

Fig. 7 shows a recent type of the Bonzano joint. In other forms of this joint the depending flange is deeper and correspondingly thinner. Eleven roads reported trials of the Bonzano joint and five of them have quantities in approved service.

The Continuous joint, Fig. 8, is reported as having been tried by 23 of 56 roads in question and 16 roads have it in approved use. One road, which is perhaps the largest user of Continuous joints, says that the improved alinement and service of this joint is so great that in running from the old angle bar track laid with Continuous joints, one's



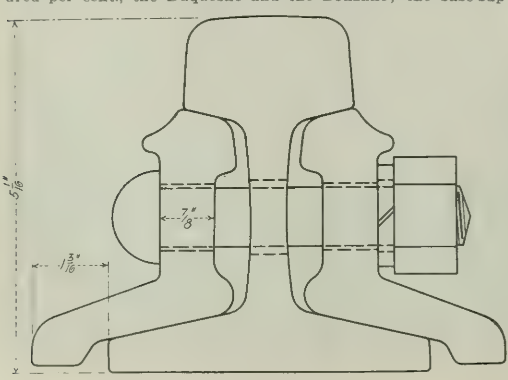


Fig. 2.

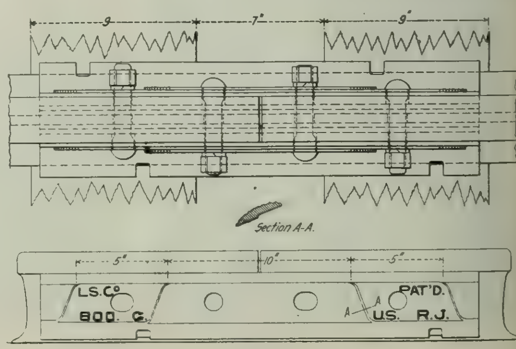


Fig. 4.

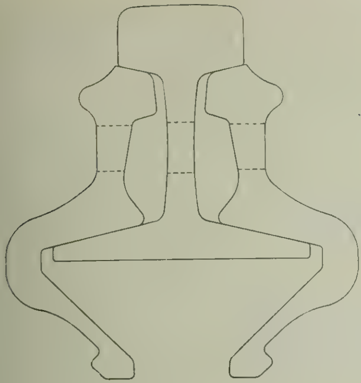


Fig. 5—Hundred Per Cent.

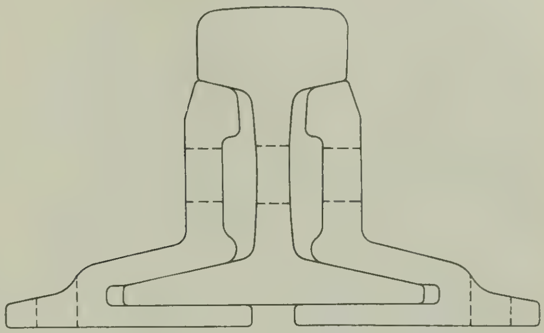


Fig. 8—Continuous.

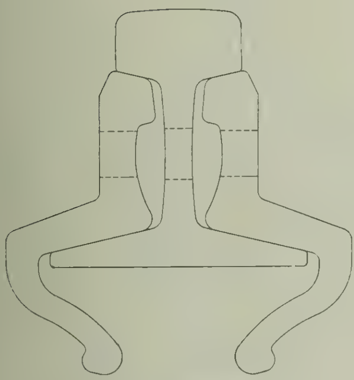


Fig. 6—Duquesne.

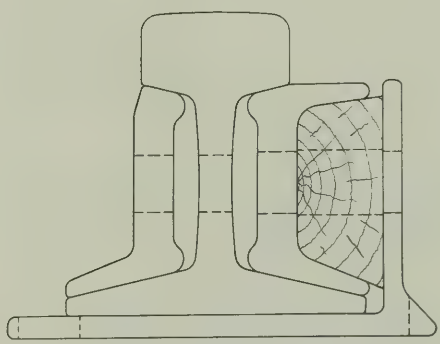


Fig. 9—Weber.

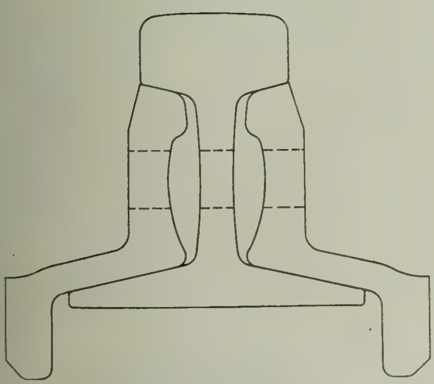


Fig. 7—Bonzano.

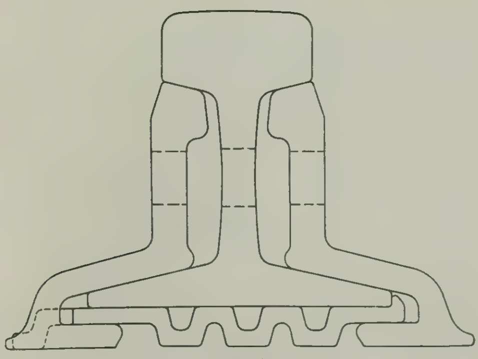


Fig. 10—Wolhaupter.

attention is at once attracted by the smoother riding. An officer of an electric road which has been replacing angle bars with Continuous joints considers it the best adapted to elevated track, because of its being a two-piece joint. There is less noise and he believes that it supports the rail better than any other type. In applying the joints his people are as careful as possible to see that the ends of the rail are well cleaned off and free from scale, and the base of the rail was usually daubed with oil or grease so that the joint would fit up snug and get a uniform bearing. Nut locks were used, and two or three days after the nuts had been set they were again tightened up and the nut lock then turned down into position. In many cases he found that where the ends of the rails were uneven, the joints were causing them to wear smooth. Another road reports that its trackmen say they need to pay very little more attention to the joints than to the rest of the track, except for tightening up the bolts occasionally. An officer of another road believes that on dirt and thinly ballasted track these joints can be kept tighter at less cost than the ordinary angle bars.

The Weber joint, Fig. 9, has been tried by 17 of the roads, and it is reported in approved use by three. One road has used it entirely for many years in connection with renewing 75 and 85-lb. rail. This road gives as the particular advantages of this joint the fact that, when first assembled, it adapts itself well to irregularities in the rail, and that the slight give of the side plate and wood filler block makes an effective nut lock. As a defect, a tendency to kick slightly after bolts had been secured is mentioned. An officer of another road which has been using Weber joints as standard for the last 10 years says that the wood filler made previous to five years ago were not quite thick enough, and he has been therefore replacing some of those used nine or ten years ago. He says that if he were ordering new rails for branch lines where traffic was light, he would order common angle bars, but that such branches are now being relaid with rails taken from the main lines, and Weber joints are being transferred with the rails. He says the cost of maintenance of these joints has been very small. Another road which has been using only about 20 miles of Weber joints on 60-lb. rail, being the only patented joint in use on that line, reports they have not been used long enough to say exactly what the cost of maintenance is as compared with ordinary angle bars, after allowing for the increased cost of the Weber joints. Probably, however, the cost of maintaining ordinary joints is a fourth or more greater. An officer of the road which spoke of the use of Continuous joints on dirt and thinly ballasted track considers that the decreased cost of keeping joints tight was still more noticeable with the Weber joint, The Wolhaupter joint, Fig. 10, has been tried by five roads. Its advantages seem to be possessed to a full extent by the Continuous and other Weber joints.

FOREIGN RAILWAY NOTES.

The shares of the Western Railway of France, which was acquired by the state during 1908, sold for 829 francs at the beginning of the year, and at 944 at the end of it, so that the purchase was profitable to the shareholders at least.

The German Dining-Car Co., during its fiscal year ending with September, 1908, extended its service over three additional routes, added 12 to the number of its cars, bringing it up to 75, of which 25 are 12-wheeled cars. Its net earnings during the year were sufficient for a 10 per cent. dividend.

Even German newspapers sometimes exaggerate. One of them recently told a story of a pocketbook containing 17,000 marks ($4,060) found in the cushion of a car sent to the shop for repairs, and regarded it as probable that it was stolen money which the thief hid in the cushion and did not dare to claim. Further investigation shows that in fact a pocketbook was found in the cushion of a car when repaired in the shop, and that this pocketbook did contain money; not 17,000 marks, however, but 2 pfennige (less than half a cent) and a pawn ticket for 6 marks.

The Swiss state railways earned 1 per cent. less in 1908 than in 1907, and their working expenses were nearly 4 per cent. greater—largely due to higher wages. This results in a decrease of 10 per cent. in net earnings. To economize, the number of passenger trains will be reduced next summer.

COLOR BLINDNESS.

"The Imaginary Dangers of Color Blindness" was the title of a brief note quoted from Prof. J. W. Baird, published in the *Railroad Age Gazette* of January 8, page 81, and the title at once caught the sharp eye of Dr. Charles H. Williams, of Boston, the inventor of the Williams lantern for testing railway men's eyes; and he wants to know why we use such a title. The dangers of color blindness are not imaginary, of course; and they have often been pointed out in these columns; and Dr. Williams's point is well taken. What we had in mind in writing that title was the fact that theorists continue to indulge excessively in wordy refinements of this subject long after all practical questions relating to it have been settled. The theorists seem to imagine that dire disaster is going to result if they do not prove to the whole world the soundness of their theories to the last detail; whereas the actual dangers of color blindness have been practically done away with. The railways all know enough now to exclude color blind persons. These dangers were almost neutralized before Professor Holmgren and the other pioneers pointed out the facts and the remedy, for color-blinds had a remarkable facility in distinguishing the right light from the wrong one, by various comparisons, in spite of their infirmity. But, whatever the gravity of the danger, the remedy is so simple that the railway or steamship company which does not exclude color blinds from its engines and pilot houses would now be hard to find. Dr. Williams cites a case of a pilot who mistook a red light for a green one near Norfolk, Va., in 1875, and caused a collision resulting in the loss of ten lives; and another (no date given) of a color blind engineman who was himself killed in a collision caused by his running past a red signal. The proof in these cases would be challenged, no doubt, in a lawsuit, and not without influence on a jury; but this is not an important point, from the railway manager's standpoint, for, the safeguard being so easily provided, it is to his interest to apply it, even if the dangers be very remote.

Dr. Williams advises that his lantern, to use in connection with colored worsteds, for testing eyes, is now standard on ten prominent railways. The list of these roads, with the years in which they adopted the combined system, is as follows:

New York, New Haven & Hartford	1899
Great Northern	1901
Boston & Maine	1902
Northern Pacific	1903
Australian lines	1904
Erie	1905
Canadian Pacific	1906
New York Central & Hudson River	1906
Chicago, St. Paul, Minneapolis & Omaha	1907
Southern Railway	1908

As our readers well know, the Williams lantern, which has been heretofore described and which is shown on another page of this issue, is a valuable supplement to the worsted test, in that it is so arranged as to make an image minute enough to detect color blindness in the small central area of the retina, which sometimes occurs, from the use of tobacco, in men not congenitally color blind. This defect is not detected by testing with yarns at short range, because the image is so large as to extend beyond the affected area.

General News Section.

Beginning January 1, 1909, the Interstate Commerce Commission will require monthly reports of earnings from the express companies.

It is reported in Canada that the Canadian Pacific will, this summer, run a train through between Montreal and Vancouver, 2,896 miles, in 72 hours. This is 24 hours quicker than the best time ever made in the past, and averages about 40 miles an hour, including stops.

At Washington last week Messrs. Knapp and Neill, who constitute the government mediation board, listened to statements from the two general managers of the Pennsylvania and the leader of the firemen's brotherhood concerning differences between those roads and their firemen. The firemen presented to the commissioners a long list of grievances, nearly all of which the managers had refused to adjust.

The Brooklyn Rapid Transit Company, operating the street railways of Brooklyn, has been called upon to comply with the federal hours-of-labor law, interstate freight traffic being conducted over one of the company's minor lines. It appears that some of the telegraph or telephone operators employed by the company have tried to invoke the law for the purpose of reducing their hours. The officers of the company say that none of the operators is engaged in any work which affects the safety of trains.

The Interstate Commerce Commission has ordered the railways to report by May 1 the number of freight cars owned, number equipped with air-brakes and average percentage of air-braked cars used in trains during the six months ending Feb. 28, 1909, together with a statement of the instructions issued by the carrier respecting the use of air on its line; and on May 5 the commission will give a hearing on the question of increasing the present minimum percentage of power-braked cars which shall be operated in each train.

The Railroad Commission of Texas has given out a statement that the freight earnings of Texas lines increased $2,361,459, or 7.44 per cent., during the six months ended December 31, 1908, as compared with the same months in 1907; that passenger-train earnings decreased during the same period $286,151, or 2 per cent.; that other earnings increased $22,447, or 15 per cent.; that gross earnings increased $2,097,756, or 4 per cent.; that operating expenses decreased 7.9 per cent., and that income from operation increased 51 per cent.

Steps are being taken toward the organization in Chicago of a club to be called the Chicago Railway Club. It is believed that the Rock Island Railway Club can be made the nucleus for a larger organization. This club has been in existence for two years and is composed mainly of the chief clerks in the various departments of the Rock Island in Chicago and of men holding positions substantially similar in rank. C. Nyquist, Chief Clerk of the Secretary and Treasurer of the Rock Island, is Chairman of the committee that is seeking to bring about the organization of the larger club. Railway men from vice-presidents down to assistant chief clerks would be eligible to membership in the proposed club.

Personal damage suits against the railways in Texas rose from $223,749 in 1891 to $1,018,636 in 1900. The Southern Pacific lines in Texas in the past nine years have settled 8,776 claims for personal injuries, of which 90 per cent. were settled without suit. Other roads settled from 75 to 95 per cent. of such claims without suits. These are among the figures that were recently submitted to the legislature in opposition to a bill to render invalid contracts of settlement for personal injuries made by railways within 90 days after the date of the injury. It was shown that out of all the settlements of suits made out of court only 23 were subsequently attacked; and of these 14 were set aside.

Railway Supplies, Imports and Exports.

The monthly summary of commerce and finance of the United States for December, 1908, gives the figures for that month and for the complete year 1908, comparing them with the figures for December, 1907, and the years 1906 and 1907. The figures for December, 1908, and the totals for 1908 are subject to revision.

The imports of machinery into the United States in December, 1908, were valued at $260,392 as compared with $328,998 in 1907, and the value of machinery imported in the year 1908 was $3,242,765 as compared with $4,566,897 in 1907.

The following table gives the value of exports of freight and passenger cars and parts:

	For steam railways.	For other railways.
December, 1908	$527,066	$165,375
December, 1907	581,486	467,941
Year 1908	5,727,330	1,677,143
Year 1907	9,191,023	2,141,346

One of the most noticeable decreases in the export of cars is the decrease in value of cars exported to British North America. In 1908 this value was $487,135, and in 1907 it was $1,493,175. The loss for the month of December is even greater proportionately. In December 1908, the value was $14,678, and in December, 1907, the value was $43,922.

In 1908, 196,510 tons of rails were exported, valued at $6,021,549, while in 1907, 338,906 tons were exported, valued at $10,411,072, and in this case also, the falling off in the month of December was more than proportional to the falling off in the whole year. There were exported 10,243 tons of rails, valued at $305,143, in December of last year as compared with 20,763 tons, valued at $640,682, in December of 1907.

The following table shows the countries to which rails were exported and the respective amounts and values in 1907 and 1908:

Exported to—	1908. Tons.	1908. Value.	1907. Tons.	1907. Value.
Europe	2,246	$66,452	496	$17,108
British North America	14,807	421,883	37,216	1,110,758
Cent. America and Br. Honduras	8,172	234,892	28,715	860,313
Mexico	61,687	1,965,435	32,930	1,052,189
West Indies and Bermuda	19,702	560,913	28,165	863,598
South America	28,510	817,212	85,919	2,437,100
Japan	22,070	679,874	34,922	1,102,931
Other Asia and Oceania	38,437	1,249,984	88,470	2,936,330
British Africa	365	11,040	277	7,741
All other Africa	514	13,864	796	23,004

There were 116,878 tons of structural steel, valued at $6,289,610, exported in the year 1908 as compared with 138,442 tons, valued at $7,784,618, in 1907. In the month of December, 1908, 9,935 tons, valued at $508,832, were exported as compared with 9,401 tons, valued at $495,557, in 1907. It will be seen that the December figures show a gain, while the figures for the year show a loss.

In 1908 there were 48,380 car wheels, valued at $387,662, exported. In 1907 there were 43,082 car wheels, valued at $348,142, exported. In December, 1908, 3,358 car wheels, valued at $28,128, were exported, as against 5,885 car wheels, valued at $49,755, in 1907.

The value of electrical machinery exported during the 1908 year was $6,956,722 as against $9,735,230 in the previous year, and the value of electrical machinery exported in December, 1908, was $587,559 as compared with $837,811 in December of the previous year. The exports to the United Kingdom, to British North America and to Mexico show the most noticeable decreases, British North America especially, the value of exports of electrical machinery to that country being $579,409 in the year 1908 as compared with $1,543,450 in 1907. The exports to Japan of this machinery, on the other hand, fell off only slightly. They were valued at $1,232,958 as compared with $1,411,229 in 1907.

The value of metal working machinery exported showed even a greater proportion of shrinkage, the figures for 1908 being $5,205,606 and for 1907, $10,142,835. The figures for the month of December show relatively about the same shrinkage. The value exported in December, 1908, was $363,140 and in 1907, $741,835. Here again the exports to the United Kingdom and to Germany as well show a large shrinkage in value, but the exports to British North America only show a comparatively small shrinkage in value.

There were exported in the year 1908, 566 locomotives, val-

ued at $6,319,309, and in 1907, 885 locomotives, valued at $9,080,337. In the month of December, 1908, there were 29 locomotives, valued at $294,981, exported as compared with 58 locomotives, valued at $619,355. The following table shows the number and value of locomotives exported to different countries for 1907 and 1908:

	1908.		1907.	
Exported to:	No. of locos.	Value.	No. of locos.	Value.
Europe	33	$685,986	27	$602,657
British North America	99	542,406	216	1,516,034
Central America and Br. Honduras	13	74,850	79	846,062
Mexico	79	978,672	50	467,705
Cuba	26	198,916	76	710,666
Other West Indies and Bermuda	8	56,365	2	12,688
Argentina	54	843,385	16	206,491
Brazil	46	519,949	47	745,776
Other South America	51	492,587	78	1,125,850
Chinese Empire	10	119,300	2	12,235
Japan	39	354,025	71	588,318
British Australia	2	13,000	78	109,603
Philippine Islands	5	27,285	10	60,148
Other Asia and Oceania	100	1,402,408	132	2,072,979
Africa	1	10,175	1	3,125

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers to be held on Wednesday, March 17, 1909, at 8.30 p.m., a paper entitled "Steel Sheeting and Sheet-Piling" will be presented by L. R. Gifford, Assoc. M. Am. Soc. C. E. This paper was printed in the February proceedings.

Illinois Fuel Conference.

The United States Geological Survey, acting in co-operation with the Illinois State Geological Survey and the University of Illinois, has established a mine explosion and mine rescue station at Urbana, Ill. The purpose of the station is to interest mine operators and inspectors in the economic value of such modern appliances as oxygen helmets and resuscitation apparatus as adjuncts to the normal equipment of mines. The station also will concern itself with the training of mine bosses and others in the use of such apparatus. Its service is to be rendered gratuitously so far as possible to all in Illinois, Indiana, Michigan, western Kentucky, Iowa and Missouri who may desire the benefits thereof.

The formal opening on March 11 of the laboratory at Urbana was attended by a conference extending over three days. At the first session, addresses were made by President Edmund J. James of the University of Illinois, J. A. Holmes, representing the United States Geological Survey, A. J. Moorsehead, representing the Illinois Coal Operators, and T. L. Lewis, representing the United Mine Workers. At the afternoon session of that day demonstrations were made in the use of the helmets and in resuscitation work by R. Y. Williams, Mining Engineer, United States Geological Survey. In the evening there was an address on "Mine Explosions: What the United States Geological Survey is Doing to Prevent Them," by J. A. Holmes, Chief of the Technical Branch of that department, and one on "The Work of Foreign Mine Explosion Stations," by G. S. Rice, Mining Engineer, of the same department.

Friday morning the meeting was addressed by C. W. Balke, Associate Professor in Chemistry, University of Illinois, on "The Chemistry of Explosives," and the conference discussed "Mine Explosions and Their Causes," the principal speakers being David Ross, James Epperson and Joseph Taylor. The afternoon conference was devoted to the subject of "Smoke Suppression," and the discussion was participated in by Paul P. Bird, W. A. Evans, A. Bement and L. P. Breckenridge. At the evening session addresses were made on "First Aid Work in the Anthracite Mines," by H. H. Stoek; "The College of Engineering and the Mining Interests of Illinois," by W. F. M. Goss, and "Work of the University of Illinois Engineering Experiment Station," by L. P. Breckenridge. The conference dealt with "Economy in the Use of Fuel for Industrial and Domestic Use," the speakers being A. Bement, D. T. Randall, R. H. Kuss, Edward H. Taylor and J. M. Snodgrass.

At the closing session on Saturday an address was given on The Fuel Resources of the Country, by George Otis Smith, Director, United States Geological Survey; one on The Fuel Interests of the State, by H. S. Bain, Director State Geological Survey; and one on Coal Analysis, by N. W. Lord.

It is expected that these addresses and the principal parts of the discussion will be published in a bulletin issued by the Engineering Experiment Station of the University.

Resolutions were adopted looking to another annual conference, and asking the legislature of Illinois for an appropriation for the establishment of a School of Mining Engineering in connection with the University of Illinois.

The Pullman Company.

The total revenue of the Pullman Co. for the fiscal year ended June 31, 1908, amounted to $31,620,241 as compared with $32,186,013 in 1907. The total expenses of operation were $18,001,759 in 1908, and $17,388,741 in 1907. There was $3,362,238 charged for depreciation of cars and other property of the company in 1908 as against $2,421,597 in 1907. Dividends of $7,998,356 were declared last year, and $7,476,878 in the previous year. There was a net surplus of $1,790,568 for 1908, and $4,149,455 in 1907.

No balance sheet is given as of July 31, 1907, but the balance sheet as of July 31, 1908, shows cash on hand of $9,054,320, and sundry accounts receivable of $3,074,343. There is carried as a liability reserve for depreciation and adjustment accounts $5,509,025, and there are sundry accounts payable of $1,617,875.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C. Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Altanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held on Friday evening, March 19. No special technical paper will be presented and discussed, but a number of experts of recognized authority in the electrical and railway world have been invited to address the club on whatever question relating to electrification of railways appeals to them as being at this time of vital interest and importance. Several have elected to speak on "The Approaching Transfer of the Electrification Problem," "How Much Standardization is Desired from Present Knowledge of Electrification," and "How Much or How Little Can Be Done as Small Portions of Lines Are Electrified to Approach a Final Standardization?". Definite acceptances to speak have been received from L. B. Stillwell, W. S. Murray, Electrical Engineer of the N. Y., N. H. & H. R. R.; N. W. Storer, of the Westinghouse Electric & Manufacturing Co.; Henry G. Stott, C. L. de Muralt, William McClellan and Frank J. Sprague, all of New York.

Tentative affirmative responses have been received from Bion J. Arnold, of Chicago; J. E. Muhlfeld, of Baltimore; L. C. Fritch, Consulting Engineer of the Illinois Central, Chicago; George Gibbs, of New York. An opportunity will be afforded for such as desire to speak on the question and give their views on the "Abuse of the M. C. B. Repair Card." Members having changes to recommend in the Interchange Rules are requested to send them to the secretary, who will forward them to the secretary of the M. C. B. Association for the Arbitration Committee's consideration.

Traffic News.

The Central New York Car Demurrage Bureau had a total number of cars reported for February of 57,312, with an average detention by the railways of 0.33 days, and by the consignees of 1.34 days.

The Lake Superior Demurrage Bureau reports that in February, 1909, 22,848 cars were reported and an average detention of 1.18 days as compared with 21,479 cars reported in February, 1908, and an average detention of 1.18 days.

The Nashville, Chattanooga & St. Louis has given notice that the uniform bill of lading will be put into effect on its lines April 1, 1909. Shippers will be permitted to use up forms, which they now have on hand under the usual regulation.

The monthly report of the Pacific Car Service Bureau for January, 1909, shows that 86,380 cars were reported, of which 75,250 were commercial and 11,130 company cars. The commercial cars held overtime totalled 6,410, as compared with 6,285 in January, 1908, and the company cars 1,706, as compared with 2,390 in January, 1908.

The Pennsylvania Railroad has arranged with the Pennsylvania State College of Agriculture to run an educational train on March 23, 24 and 25. In furtherance of its plans, the railway lately took its agents between Harrisburg and Williamsport and between Lemont and Montandon to State College that they might become informed as to the crops that can be raised with profit on the farms in their individual neighborhoods. This next instruction train will cover the territory tributary to the Northern Central between New Freedom and Sunbury. Special efforts will be directed towards interesting the farmers in alfalfa, corn improvement, forestry, soil tillage and fertility, and dairy husbandry.

A meeting of the traffic executives of the railways in Missouri was held in St. Louis on March 11 to consider what action should be taken in regard to passenger fares in that state, in view of the decision of the Federal court holding the state 2-cent fare law unconstitutional. Ne decision was reached and the matter will be considered again at a later conference. It is well known that some of the roads wish to restore the 3-cent fare while others favor adopting on the main lines, at least, a 2½-cent fare as suggested by Judge McPherson. It is not improbable that Governor Hadley and Attorney-General Major will be conferred with to see if a compromise cannot be made under which the roads will put in a 2½-cent fare and the state will not appeal the case to the Supreme Court. However, Attorney-General Major has definitely announced that he will appeal.

N. A. Stedman, attorney for the principal railways in Texas, has given out a statement analyzing the Texas Railroad Commission's report of the earnings of the railways in that state during the six months ended June 30, 1908. The commission's figures showed that there had been substantial increases in both gross and net earnings. Mr. Stedman says that the earnings of the roads for the last six months of 1908 were better than for the last six months of the previous year, not because business was what it ought to have been in the later period, but because it was exceedingly unsatisfactory in the earlier period. While the income from operation was greater in the last six months of 1908 than in the same months of 1907, it was less than in the same months of 1906. On 14 lines doing nine-tenths of the business in the state, earnings during the last half of 1908 were $2,600,000 less than in the same months of 1906. Based on the value placed on the roads by Mr. Thompson, former Engineer of the Texas Commission, in recent testimony before the Interstate Commerce Commission, Mr. Stedman estimated that the roads, after paying operating expenses and taxes, earned 4.7 per cent. in the year ended June 30, 1906; 6 per cent. in the year ended June 30, 1907, the best year in their history, and only 2.85 per cent. in the year ended June 30, 1908.

INTERSTATE COMMERCE COMMISSION.

Unlawful Combination.

Mayor and Aldermen of the City of Bristol, Tenn., v. Virginia & Southwestern et al. Opinion (831) by Commissioner Harlan. Case 1297.

While evidence of unlawful combinations are always admissible as part of the history of the rate of which complaint is made, and may often throw light on the question of its reasonableness, the unlawful combination, standing by itself, without proof also of the unreasonableness of the rate, is not a sufficient ground for an order reducing the rate.

Complainant's contention that the rate here involved is discriminatory as compared with the rates of one of the defendants from Middlesboro to Knoxville is not sustained, as the circumstances surrounding the shipments from Middlesboro are dissimilar.

Under all the circumstances shown of record the flat rate of 85 cents per ton for the transportation of both steam and domestic coal from the Appalachia coal field in Virginia to Bristol, Tenn., is unreasonable. The rate of 75 cents per ton will yield a fair and reasonable compensation.

Adjusting Rates to Get Long Haul.

Chamber of Commerce of Milwaukee v. Chicago, Rock Island & Pacific et al.—Opinion (832) by Commissioner Harlan. Case 1615.

The complainant, and those on whose behalf the petition herein was filed, are entitled to through routes to Milwaukee from the points in question on the lines of that part of the system of the Chicago, Rock Island & Pacific that was formerly the Burlington, Cedar Rapids & Northern, and to reasonable joint through rates for the movement over those routes of corn, rye and oats to the Milwaukee market. The joint through rates on those grains from such points ought not for the future to exceed the through rates on those grains to Chicago.

In claiming that as Chicago affords as good a market for grain as does Milwaukee, the principal defendant may therefore lawfully so adjust its rate schedules as to force the grain to Chicago, the defendant overlooks the right of the shipper to choose his own market and to do business where he prefers or finds it more advantageous to carry it on. It also overlooks the chief function of a common carrier, which is to carry at reasonable rates the traffic that is tendered to it.

A carrier has no right to insist that a shipment shall go to the end of its rails if the shipper desires it to be diverted

at an intermediate point to another market off its rails. Nor may a carrier accomplish these results indirectly by any unreasonable adjustment of its rate schedules with that end in view. It cannot lawfully compel the shipping public to contribute to its revenues on any such grounds.

L. C. L. Shipments of Inflammable Products.

National Petroleum Association and National Refining Co. v. Louisville & Nashville.—Opinion (835) by Chairman Knapp.

Under the circumstances of the case, the rule enforced by defendant, restricting the receipt and shipment of L.C.L. lots of coal oil and products of petroleum to one day in each week, found to subject complainants and other like dealers to undue and unreasonable prejudice. Any rule which restricts shipments of the oils in question to less than two days in any week is unreasonable, and the days selected for the receipt of these commodities should be separated by at least two intervening days.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has canceled its order of March 10, 1904, adopting a uniform bill of lading for use in Louisiana, and has ordered that the standard forms of "straight" and "order" bills of lading approved by the Interstate Commerce Commission on June 27, 1908, be used for shipments between points in Louisiana. The order is effective March 15.

The Railroad Commission of Louisiana has authorized the application of Southern Classification No. 36 on intrastate shipments. The commission found that there had been both reductions and advances in rates by changes in the classification, but that the necessities of shipping demand changes from time to time and the remedy of any shipper who considers any of the rates excessive or unreasonable is to complain to the commission.

COURT NEWS.

In the Supreme Court at White Plains, N. Y., March 11, a suit brought by the New York Central against John Smith, a milk dealer, for reparation in a case where milk had been carried for Smith at less than the published rates, the decision was in favor of the road. In his decision Judge Tompkins says: "The contract between the plaintiff and defendant for a freight rate less than the tariff rate fixed by the schedule, filed and posted under the Public Service act, was and is illegal, and does not protect the defendant, or bind the plaintiff, and the plaintiff is entitled to recover the difference between the rate fixed by the filed and posted schedule and the amount paid under the said illegal agreement."

In the United States Circuit Court of Appeals, at Baltimore, March 13, Judges Goff, Pritchard and Morris, the petition of the Baltimore & Ohio for an injunction against the Interstate Commerce Commission in the matter of reporting excessive hours worked by employees was denied, and the road ordered to pay the costs of the proceedings. The Interstate Commerce Commission, as a part of its regulations for enforcing the laws limiting the working hours of trainmen and telegraphers, called upon all the railways to report regularly all cases in which men had worked longer periods of time than those specified in the law; and the Baltimore & Ohio and other roads refused to make such reports, claiming that the information given would tend to incriminate the company, and that therefore, under the constitutional provision, the information need not be given. It is said that suits brought by various other railways for injunctions will be held in abeyance until the B. & O. case is decided.

Judge Farrington, of the United States Circuit Court at Carson City, Nev., has rendered a decision sustaining the constitutionality of the law of that state creating a state railroad commission. On the subject of maximum rates established by the commission, the court holds that in the case of the Central Pacific the rates are not confiscatory. The Nevada & California rates are held insufficient, but the company was denied an injunction because the commission had taken no action to enforce the maximum rate. In the case of the San Pedro, Los Angeles & Salt Lake the evidence does not show the rate to be confiscatory. The court holds that the Eureka & Palisade, the Tonopah & Goldfield and the Virginia & Truckee failed to substantiate their cases against the state. The bills are all dismissed and the restraining orders vacated, but the dismissal of the bill of the Nevada & California is without prejudice.

The Nevada legislature last week passed a new railway commission bill. It gives the commission power to regulate fares and freights "reasonably" and does away with the maximum rate law.

The constitutionality of the New York State Public Service Commissions law was upheld by a unanimous decision last week by the Appellate Division of the Supreme Court. Justice Clarke wrote the decision. The court says: "The act is a valid exercise of legislative power. It is the latest expression of the public policy of the state in reference to public service corporations. The right of the state to regulate and control corporations has always been asserted and recognized. The subject matter is clearly indicated in the title. There is no constitutional objection to embracing several separate matters in a general as distinguished from a private or local bill. * * * The fact that a part of the moneys necessary to meet expenditures is raised, in the wisdom of the legislature, by taxation upon a portion of the state makes those officers none the less state or general officers, and does not bring the expenditure within the prohibition of the constitution. The act is general, not private or local; it contains no matter not germane to the title thereof; the provision for payment of the expenses of the commissions created is properly included in the act creating them; the provision requiring payment of a portion thereof by taxation on a specified district is but a matter of apportionment, well within the taxing power of the legislature, and no indebtedness within the meaning of Section 10, Article 8, of the constitution is to be incurred. The act is a valid exercise of legislative power."

The Steinway tunnel—the tunnel under the East river, New York, from Forty-second street, Manhattan, to Queens, cannot be seized by the city as a penalty for non-compliance by the company with the provisions of the charter. This is the substance of a decision of the Appellate division of the Supreme Court, which holds that although the original company—the New York & Long Island Railroad—has ceased to exist, its property is now rightfully held by the trustees for the benefit of the stockholders, and the court holds that the franchises and rights granted by the aldermen are property, and do not lapse with the forfeiture of the charter. It is expected that the trustees, who were the directors of the company, will now procure the organization of a new company.

The decision, written by Justice Clarke, says: "The corporation has ceased to exist, and its powers incidental to corporate existence, derived from the state, have been forfeited to the state. These powers it can no longer exercise. But as the state has said its powers shall cease, so it has said also that its property shall be preserved and vested in its directors as trustees for the benefit of its creditors and members. This corporation has nearly completed its road; it is physically in the streets as to which it had a consent. It has expended large sums of money which it was only enabled to get by virtue of the consent of the local authorities, which consent had become attached to the tangible property put into construction and by the purchase of private property through a portion of which the road runs. Under these circumstances it seems to me that these consents, which were not limited in time or dependent upon expenditure, were as much the property of the corporation before its dissolution as its physical property; that the franchises, rights, and privileges granted by the several Boards of Aldermen did not cease and determine on Jan. 1, 1907."

Standard Oil Case Thrown Out of Court.

Judge Anderson in the Federal court at Chicago on March 10 instructed the jury in the famous rebating case against the Standard Oil Company of Indiana to bring in a verdict

of "not guilty," and the verdict was returned in accordance with this instruction.

The famous case, in which at the first trial Judge Landis fixed a fine of $29,240,000, was practically thrown out of court because Judge Anderson held that counsel for the government had failed to prove that the rates of 18 cents and 19½ cents, which the government claimed were the legal rates, were ever legally fixed by the Chicago & Alton, and that therefore no illegal concession had been made to the Standard Oil Company in giving it rates of 6 and 7½ cents. In giving his instructions to the jury Judge Anderson said that he was governed entirely by the decision rendered by the United States Circuit Court of Appeals in reversing the decision of Judge Landis. He added in part:

"The government charges that the carrier had in all respects complied with the statute with regard to establishing, filing and publishing its rates, and that by that compliance with the statute it established as the rate, for illustration, between Chicago and common points and East St. Louis 18 cents per 100 lbs. It then charges that the Standard Oil Company received the concession in that it shipped at 6 cents. But the evidence does not prove the charge. The government now, as in the former trial, relied upon as establishing this 18-cent rate this tariff No. 24, and this Illinois classification. The higher court clearly states that on the tariff sheet itself no 18-cent rate for petroleum appears and that the 18-cent rate was arrived at by a process of circumlocution, or, in other words, with the aid of, and by recourse to the Illinois classification.

"It was found," the court continued, "that petroleum and its products were set down in the 'fifth' class; and then by turning back to tariff sheet No. 24 it was found that the rate set down for the 'fifth' class was 18 cents.

"And, so out of this process of reference and cross-reference, the lawful published rate was evolved by the trial court to be 18 cents; not because it so appeared on the face of the tariff sheets, but because, by reference to other sheets—sheets fixing, not rates, but classification, and that not by the Interstate Commerce Commission or the carrier, but by the Illinois Railway Commission—it could be so figured out.

"How many nice judicial questions are raised in this case upon the accuracy and validity of the result thus arrived at. Tariff schedule No. 24, for instance, with the words thereon printed, 'Governed by Illinois classification,' took effect May 15, 1899.

"The Illinois classification that the government relies upon as adopted by reference was not adopted until nearly four months afterward, to wit, Sept. 7, 1899. No proof is in the record of the existence of any Illinois classification as of May 15, 1899, the time the tariff sheet was filed. Do the words 'governed by Illinois classification' refer to a classification in existence when the tariff was filed? If so, the proof fails, for no such classification is shown.

"Are the words to be interpreted as if they read 'governed by Illinois classification' as from time to time that classification may be changed? If so, it is only because words not expressed are to be judicially imported into the face of this tariff sheet—the clause to be so enlarged by judicial interpretation that it would be thereafter within the power of state commissions, at any time, through changes of state classifications, to alter from time to time and without consent of the interstate carriers, interstate rates for interstate commerce, unless such interstate carrier instantly reconformed its tariff sheets to the changed classification of the several state commissions.

"Indeed, taking this along with some of the other questions that have been brought to our attention in connection with these schedules, we are not prepared to say that tariff sheet No. 24 really fixes the rate on petroleum and its products at 18 cents. The most we can say is that judges after full discussion might reasonably disagree.

"The Court of Appeals have said, upon this same evidence, after having considered it in all its relations, that they cannot say that these two papers really fix any 18-cent rate.

"Therefore, gentlemen of the jury, if the Court of Appeals have so ruled, and if it is a question on which trained judges may differ, then, of course, the evidence is not sufficient to warrant you in finding that these papers establish that rate beyond a reasonable doubt."

Car Service Operations.

The monthly summary of commerce and finance of the United States for December, 1908, in making comparisons of car service operations, says:

"The figures for 1908 and for December, 1908, are subject to revision.

"Thirty-five different associations and demurrage bureaus report monthly the number of cars handled in their respective territories. Only in a very rough way, however, do these figures indicate the changes in volume of traffic, inasmuch as they do not, in some cases, include more than one-third of the cars actually handled at a given traffic center, and the territory under control of an association may be extended or contracted from time to time. The figures are given, nevertheless, as a convenient general gage of increase or decrease of traffic by rail, assuming that they are made up on substantially the same basis from year to year.

"The number of cars handled during December by 35 car-service associations and demurrage bureaus in various parts of the country, while over 16 per cent. in excess of the like number for December, 1907, shows, however, a decrease since the previous month. The total for the year, 28,278,414 cars, was 13 per cent. below the number handled during the preceding year, and even below the totals for the years 1905 and 1906.

"The latest report of the American Car-Service Association indicates a large increase in the number of idle cars of all classes and in all sections of the country, the unfavorable turn of the traffic situation appearing more clearly in the eastern industrial states. While part of this increase was to be expected after the months of the heaviest crop movement and with the passing of the holiday trade, the large increase in the number of coal, gondola and hopper cars indicates a slackening demand for coal, ore and building material.

NUMBER OF CARS HANDLED BY 35 CAR-SERVICE ASSOCIATIONS AND DEMURRAGE BUREAUS DURING DECEMBER AND TWELVE MONTHS ENDING DECEMBER, 1907-1908.

Names of Associations and Bureaus.	Month of December. 1907 Cars.	1908 Cars.	Twelve Months Ending December. 1907 Cars.	1908 Cars.
Alabama Demurrage and Storage Bureau	44,715	60,014	779,402	631,487
Baltimore and Washington Demurrage Bureau	49,278	55,100	735,103	640,074
Central New York Car Demurrage Bureau	57,377	63,045	753,269	738,054
Central (St. Louis) Demurrage and Storage Bureau	63,107	78,769	919,130	838,017
Chicago Demurrage Bureau	159,789	214,278	2,282,191	2,161,767
Cincinnati Car Service Assn.	52,625	55,696	771,990	635,365
Cleveland Car Demurrage Bur.	69,538	63,244	1,016,003	715,764
Colorado Car Service Assn.	38,910	39,490	445,900	385,260
Columbus Car Service Assn.	28,300	30,771	469,773	363,130
East Tennessee Demurrage and Storage Bureau	24,717	26,803	388,066	293,597
Indiana Car Service Assn.	79,053	94,532	1,104,855	1,077,786
Intermountain Demurrage Bur.	12,776	17,426	184,577	153,885
Lake Superior Car Serv. Assn.	29,470	28,460	415,642	338,109
Louisville Car Service Assn.	32,761	46,596	506,528	518,955
Memphis Demurrage and Storage Bureau	22,068	27,778	255,169	239,156
Michigan Car Service Assn.	58,414	66,275	838,928	696,926
Missabe Range Car Serv. Assn.	2,243	3,107	42,786	42,930
Missouri Valley Demurrage and Storage Bureau	139,451	142,912	1,910,139	1,606,758
Nashville Demurrage Bureau.	23,774	26,046	351,572	326,385
New York and New Jersey Car Demurrage Bureau	102,788	108,024	1,409,161	1,248,609
North Carolina Car Serv. Assn.	29,037	35,437	407,257	404,334
Northeastern Pennsylvania Car Demurrage Association	62,477	43,028	917,936	633,655
Northern Demurrage Bureau	130,470	121,684	1,736,981	1,515,706
Pacific Car Bureau	86,854	98,382	1,166,886	1,147,345
Pacific Northwest Car S. Assn.	63,104	73,815	888,093	845,405
Phila. Car Demurrage Bur.	147,197	190,939	2,326,723	1,921,142
Pittsburg Car Demurrage Bur.	140,359	185,477	2,935,299	1,977,891
Southeastern Car Serv. Assn.	61,763	78,811	853,720	823,948
Southern Car Serv. Assn.	44,224	50,777	492,914	513,438
Texas Car Demurrage and Storage Bureau	78,571	143,908	986,475	1,118,622
Toledo Car Serv. Assn.	34,055	30,839	530,617	383,870
Virginia and West Virginia Demurrage Bureau	60,129	63,644	893,905	778,940
Western and New York Car Demurrage Association	65,828	73,625	986,962	806,488
Western (Omaha) Demurrage Bureau	57,771	67,971	770,470	733,346
Wisconsin Demurrage Bureau.	73,549	86,225	1,118,720	1,022,270
Total reported by 35 associations and bureaus.*	2,226,542	2,592,928	32,593,142	28,278,414

*The Butte Terminal Association was superseded by the Montana Demurrage Bureau in May, 1908. The returns of the new bureau for December were 44,740 cars and for the seven months beginning with June, 237,825 cars.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Edmund Pennington, General Manager of the Minneapolis, St. Paul & Sault Ste. Marie, has been elected also President, succeeding Thomas Lowry, deceased.

Harry Cotter, Assistant Claim Agent of the Toledo, St. Louis & Western, has been appointed a Claim Agent, with office at Frankfort, Ind., succeeding John Bedford, resigned.

Edward T. Nichols, the Third Vice-President, Secretary and Assistant Treasurer of the Great Northern, has been elected also the Secretary and Treasurer of the Colorado & Southern, succeeding James S. Mackie, resigned.

William McNab, President of the American Railway Engineering and Maintenance of Way Association, was born in Scotland in 1855. He is a son of the late Thomas McNab and grandson on his father's side of the late William McNab, Curator and General Superintendent of the Royal Botanic Gardens, Edinburgh, Scotland, and on his mother's side of the late James Haig Cobban, Collector of Her Majesty's Customs, Alloa, Scotland. He came to Montreal with his parents at an early age and received his education at the McGill Model School and at the Montreal Collegiate School. On graduating from the latter in 1870 he began railway work on the Grand Trunk as an indentured pupil in the Engineering department, and has since been continuously connected with that road. From 1870 to 1875 he was engaged with the Chief Engineer upon detail matters connected with the works of the International bridge, then in course of construction across the Niagara river between Buffalo, N. Y., and Ft. Erie, Ont.; on the location and construction of the Lewiston & Auburn Railroad in Maine, including its bridgework; the construction of the union station buildings and general terminal facilities at Toronto, and the erecting and machine shops at Stratford, Ont. He also tended the various works connected with the renewal in iron of all the large Howe truss bridges on the road; the construction of the new train ferry docks at Point Edward, Ont., and Ft. Gratiot, Mich., and the methods adopted for and practical work in narrowing the old broad gage roadbed to the present standard gage. From 1875 to 1885, after having passed an examination before the Province of Quebec Board of Examiners for the study of land surveying, he was engaged for several years almost exclusively upon Grand Trunk surveys, acting as Engineer of Surveys and Levels on upwards of 400 miles of Grand Trunk lines for projected recision work; as Engineer of Construction of double-tracking between Scarborough, Ont., and Toronto, and of the York Yard terminals and engine houses and Engineer of Location and Construction of portions of lines in Michigan and Provinces of Ontario and Quebec, now merged into the Grand Trunk System. Between 1886 and 1896 he had charge of general engineering work and maintenance of way, including control of construction of the terminal station at Montreal, the subway under the freight and terminal yards, Wellington street, Montreal; Back Cove drawbridge and approaches, Portland, Me., and the design and construction of masonry and other general structures. From 1896 to 1907 he superintended the drafting room and assisted the Chief Engineer in various new works, including the replacing of the single-track Victoria iron tubular bridge across the St. Lawrence river at Montreal by the present double-track steel trusses. In 1907 he was appointed Principal Assistant Engineer of the entire system. He is a member of the American Society of Civil Engineers as well as of the Canadian Railway Club and the Canadian Society of Civil Engineers. He was a member of the Council of the latter body in 1903 and in 1907, and is at present chairman of its committee on transportation routes. He is a charter member of the American Railway Engineering and Maintenance of Way Association, and in this connection was the first Vice-Chairman of the committee on graduation (afterwards roadway), becoming Chairman in 1902. In 1904 he was appointed Chairman of a new committee, that on economics of railway location, and in 1905 was elected a Director of the association. In 1907 he was elected Second Vice-President of the association, and in the same year succeeded to the office of President made vacant by the death of the late Walter G. Berg.

Operating Officers.

James H. Burke has been appointed the Superintendent of the Northern Railway of Costa Rica, with office at San Jose, Costa Rica, succeeding W. D. Danley, resigned.

H. J. Roth has been appointed the Assistant Superintendent of the Wyoming division of the Union Pacific, with office at Cheyenne, Wyo., succeeding W. C. McKeown, promoted.

C. W. Martyn has been appointed the Assistant Superintendent of the Southern Pacific Lines in Oregon, with office at Portland, Ore., succeeding G. C. Morris, resigned to engage in other business.

Guy Adams, the Supervisor of Mails of the Chicago, Rock Island & Pacific, the Chicago & Eastern Illinois and the Evansville & Terre Haute, has been appointed also the Supervisor of Mails of the St. Louis & San Francisco, with office at St. Louis, Mo., succeeding T. J. Franks, General Agent, resigned.

George Geiger, the Superintendent of the Red River division of the St. Louis & San Francisco, has resigned. M. A. Gossette, the Assistant Superintendent, has been made Chief Despatcher, with office at Francis, Okla., succeeding J. P. Lathrop, appointed a Despatcher. J. F. Hickey, Assistant Superintendent at Hugo, Okla., has been transferred to Francis, Okla., succeeding Mr. Gossette, and H. E. Gabriel, the Assistant Superintendent at Ft. Smith, Ark., succeeds Mr. Hickey. These changes were made necessary on account of the abolition of the Red River division, as announced in the *Railroad Age Gazette* of March 12.

Charles W. Kouns, as previously announced in these columns, has been appointed the General Manager of the Western Lines of the Atchison, Topeka & Santa Fe, with office at Amarillo, Tex. He will have charge of the Western, Arkansas, River, Colorado, New Mexico, Rio Grande and Panhandle divisions, including about 3,200 miles of track. He was born October 22, 1854, at New Holland, Ohio. He began railway work in 1871 as a telegraph operator on the Kansas Pacific, now a part of the Union Pacific. In 1873 he was made a Train Despatcher on the same road, and in 1876 was appointed Train Despatcher of the International & Great Northern. In 1877 he was made chief clerk to the Master of Transportation of the Galveston, Harrisburg & San Antonio. From 1877 to 1880, he was a freight conductor, Chief Train Despatcher and Trainmaster of the International & Great Northern. In 1880 he was appointed Train Despatcher of the Eastern division of the Missouri Pacific and in 1881 he returned to the International & Great Northern as Trainmaster. In 1883 he was appointed Master of Transportation of the Galveston, Harrisburg & San Antonio, and in 1885 was made Division Superintendent of the Union Pacific. In 1888 he was appointed Superintendent of Transportation of the Atchison, Topeka & Santa Fe, and in 1907 was made Assistant to the Second Vice-President, which position he held until his recent promotion.

C. W. Kouns

Carl Henry Stengel, whose appointment as the Superintendent of Coal Terminals of the Virginian Railway has been previously announced in these columns, was born September 13, 1879, at Yonkers, N. Y. Attending Cooper Institute in the evenings, he took a five-year course from 1897 to 1902, and received the degrees of Bachelor of Science and C. E.

When he was 15 he worked as axman for the city surveyor of Yonkers, and in 1896 became instrument man on public works in Yonkers. Two years later he became draftsman for a paper mill works, and later was promoted to General Designing Engineer, doing all the designing of steel and machine work. In 1901 he was appointed Assistant Engineer in the Structural Engineering department of the Cambria Steel Works. He began railway work in 1902 as draftsman on the New York Central & Hudson River, later being promoted to Assistant Designing Engineer, having charge of the design for the foundation work of the Yonkers power station. In 1905 he was made Designing Engineer on the Virginian Railway, where beside his other work he designed plans for the Sewells Point terminals. He held this position until his present appointment.

Traffic Officers.

A. C. Braun has been appointed a Traveling Freight Agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Dayton, Ohio.

W. J. Dibble has been appointed a Traveling Freight Agent of the Elgin, Joliet & Eastern, succeeding Charles D. Dibble, resigned to go into other business.

W. R. Johnston has been appointed a Commercial Agent of the Gulf Line Railway, with office at Sylvester, Ga., reporting to the Vice-President and Traffic Manager.

G. S. Pentecost has been appointed a Division Passenger Agent of the Chicago, Rock Island & Pacific, with office at Omaha, Neb., succeeding F. P. Rutherford, assigned to other duties.

C. D. Wayne, Assistant General Passenger Agent of the Seaboard Air Line, with office at Portsmouth, Ga., has been transferred as Assistant General Passenger Agent to Atlanta, Ga., succeeding J. J. Puller, resigned.

C. W. Colby has been appointed the General Pacific Coast Agent of the Erie, with office at 36 Ellis street, San Francisco, Cal. He will be in charge of freight and passenger traffic of the states of California, Oregon, Washington, of the territory of Arizona, of British Columbia, Alaska, and of that portion of the state of Nevada east of Battle Mountain and Las Vegas.

D. M. Denison, Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, has been appointed an Assistant General Freight Agent, with offices at Minneapolis, Minn., succeeding H. F. Marsh, resigned to engage in other business. E. O. Eckhart, Commercial Agent, succeeds Mr. Denison, with office at Minneapolis. M. J. Hannam, Commercial Agent, succeeds Mr. Eckhart, with office at St. Paul, Minn. H. T. Boyd succeeds Mr. Hannam, with office at Des Moines, Iowa.

Engineering and Rolling Stock Officers.

G. W. Robb has been appointed an Assistant Master Mechanic of the Grand Trunk Pacific, with office at Rivers, Man.

W. C. Weigel has been appointed the General Time and Work Inspector of the Motive Power Department of the Union Pacific, with office at Omaha, Neb.

W. H. Wells, Engineer of Construction of the Southern Railway, has been appointed the Chief Engineer of Construction, with office at Washington, D. C., and his former office has been abolished.

Euclid E. Grist, Assistant General Foreman of the Ft. Wayne, Ind., shops of the Pennsylvania Lines West, has been appointed an Assistant Master Mechanic, with office at Ft. Wayne. Allen S. Courtney succeeds Mr. Grist.

Purchasing Officers.

E. V. Dexter, Purchasing Agent of the Mexican Central, has resigned, and all purchasing and sales for account of the National Railways of Mexico will in future be done by J. H. Guess, Purchasing and Fuel Agent, with office at Mexico City. Carl Holt Smith has been appointed the Assistant Purchasing Agent of the National Railways of Mexico and of the Mexican International and the Interoceanic of Mexico, with office at Mexico City, and will report to the Purchasing and Fuel Agent.

OBITUARY.

John W. Sharp, Superintendent of the Rochester division of the Erie, died the early part of last week from injuries resulting from being struck by a trolley car.

John Butterfield died at his home in Utica, N. Y., on March 9. He was 82 years old and was one of the party of seven who established the first overland mail route to the Pacific coast in 1858.

General William J. Palmer, formerly President of the Denver & Rio Grande and of the Mexican National, a hero of the civil war, a pioneer of Colorado and a prince of philanthropy, died at his home in Colorado Springs March 13, at the age of 72.

Alfred B. Farnsworth, formerly General Eastern Passenger Agent of the Chicago, Rock Island & Pacific, with office in New York, died in Grand Rapids, Mich., March 7. A few years ago Mr. Farnsworth retired from active business because of failing health, and at the time of his death was living in Grand Rapids, Mich. He leaves a wife and one daughter, Mrs. H. H. Atkinson.

Railroad Financial News.

Maine Central.—Bond & Goodwin have bought from the company $2,000,000 4 per cent. debenture notes of March 1, 1914. The proceeds of the sale are to be used by the Maine Central to refund about $1,000,000 notes maturing this year and for other purposes.

Minneapolis, St. Paul & Sault Ste. Marie.—The stockholders are to vote on April 10 on the lease of the Wisconsin Central under terms already approved by the directors.

The directors have authorized $6,148,000 new stock, one-third to be preferred and two-thirds common. The stock is to be offered at par to stockholders. There is now $16,800,000 common stock outstanding and $8,400,000 preferred stock. The common stock was selling at about 144 on the New York Stock Exchange last week and the preferred stock at 154 to 157.

Horace Lowry has been elected a director, succeeding Thomas Lowry, deceased. (See Wisconsin Central.)

Mobile, Jackson & Kansas City.—See New Orleans, Mobile & Chicago.

New Orleans, Mobile & Chicago.—The plan for the reorganization of the Mobile, Jackson & Kansas City and the Gulf & Chicago formulated in 1907 and modified in October, 1908, has become operative. The new company, the New Orleans, Mobile & Chicago, is to issue the following: Fifty-year 5 per cent. bonds secured by mortgage on the property and limited to $30,000 per mile of completed road; $5,000,000 6 per cent. non-cumulative preferred stock and $11,500,000 common stock.

New York State Railways.—The consolidation of the Rochester Railway, the Rochester & Eastern Rapid Transit and the Sodus Bay Railway under the name of the New York State Railways has been approved by the New York Public Service Commission, Second district. (Jan. 8, page 90.)

Northwestern Elevated (Chicago).—The committee of three in charge of negotiations for the consolidation of the elevated roads in Chicago, and the committee of five representing the Metropolitan West Side Elevated, say that all the roads have given tentative approval to the plan which provides for the formation of a central company, which is to purchase the Union loop, now owned by the Northwestern Elevated and said to be worth about $8,000,000. The central company is then to lease the other lines, agreeing to pay the stockholders of the latter fixed dividends, possibly on a sliding scale, based on the earnings of the respective roads. Expert accountants have been set to work on the books of most of the roads to secure the figures on which the arrangement may be worked out by the promoting committee.

Rochester & Eastern Rapid Transit.—See New York State Railways.

Rochester Railway.—See New York State Railways.

Sodus Bay Railway.—See New York State Railways.

Union Pacific.—The company has reconveyed to the United States, it is reported, about 4,560 acres of coal lands in Wyoming valued at about $10,000,000, thus settling out of court the suit brought by the government involving ownership of these lands.

Washington, Baltimore & Annapolis.—The interest due March 1 on the first mortgage bonds of the Baltimore Terminal Co., which are guaranteed principal and interest by the Washington, Baltimore & Annapolis, was not paid. There are outstanding $1,992,000 first mortgage Baltimore Terminal bonds, of which about $[illegible] are used for collateral purposes, and the interest on the bonds used for collateral purposes, it is said, does not have to be paid.

Wisconsin Central.—The directors on March 11 authorized a refunding first mortgage securing bonds not to exceed $60,000,000, of which $36,000,000 is to be reserved for refunding and the remainder to be issued during the next 50 years.

The stockholders on April 13 are to vote on the proposition to lease the property to the Minneapolis, St. Paul & Sault Ste. Marie for 99 years. (See Minneapolis, St. Paul & Sault Ste. Marie.)

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Duluth & Northern Minnesota has ordered one locomotive from the Baldwin Locomotive Works.

The Acme, Red River & Northern has ordered one locomotive from the Baldwin Locomotive Works.

CAR BUILDING.

The Chicago, Burlington & Quincy is in the market for 10 tank cars.

The Southern is asking prices on 114 passenger cars of different types.

The American Smelters Security Co., Ely, Nev., has ordered 100 sixty-ton steel ore cars from the Ingoldsby Automatic Car Co. They will be 27 ft. 6 in. long over end sills and weigh about 38,000 lbs.

The Cleveland Furnace Co., Cleveland, Ohio, has ordered 4 sixty-ton steel ore cars from the Ingoldsby Automatic Car Co. They will be 27 ft. 6 in. long over end sills and will weigh about 38,000 lbs.

The Delaware, Lackawanna & Western, reported in the *Railroad Age Gazette* of February 12 as having ordered 40 locomotives from the American Locomotive Co., has divided this order as follows: One eight-wheel switch, nine Mogul for fast freight service, 18 consolidation, 10 six-wheel switch, and two Mogul for pusher service.

General Dimensions.

	8-wheel switch.	Mogul freight.	Consolidation.
Number	1	9	18
Weight on drivers	201,000 lbs.	150,000 lbs.	167,500 lbs.
Total weight	201,000 "	171,000 "	188,000 "
Cylinders	22 in. x 28 in.	22½ x 26 in.	21 in. x 26 in.
Diameter of drivers	57 in	63 in.	57 in.
Boiler, type	Wagon top.	Straight top.	Straight top.
" wkg. steam pressure	200 lbs.	200 lbs.	200 lbs.
Heating surface, tubes	2,836 sq. ft.	2,191 sq. ft.	2,589 sq. ft.
" " firebox	190 "	167 "	174 "
" " total	3,026 "	2,358 "	2,763 "
Tubes, number	379	310	341
" outside diameter	2 in.	2 in.	2 in.
" length	14 ft. 3½ in.	13 ft. 6 in.	14 ft. 6 in.
" material	Steel.	Steel.	Steel.
Firebox, type	Semi-wide.	Semi-wide.	Semi-wide.
" length	9 ft. 3⅜ in.	8 ft. 6 in.	8 ft. 6 in.
" width	6 ft. 3 in.	6 ft. 3 in.	6 ft. 3 in.
" material	Steel.	Steel.	Steel.
" maker	Carbon steel Co.	Carbon Steel Co.	Carbon Steel Co.
Grate area	58 sq. ft.	53.4 sq. ft.	53.4 sq. ft.
Tank capacity	60,000 gals.	7,000 gals.	7,000 gals.
Coal capacity	10,000 tons.	10,000 tons.	10,000 tons.
Tractive effort	40,400 lbs.	29,484 lbs.	34,200 lbs.

	Six-wheel switch.	Mogul, pusher service.
Number	10	2
Weight on drivers	132,000 lbs.	150,000 lbs.
Total weight	132,000 "	171,000 "
Cylinders	19 in. x 24 in.	21 in. x 26 in.
Diameter of drivers	15 in.	57 in.
Boiler, type	Straight top.	Straight top.
Boiler, wkg. steam press.	180 lbs.	200 lbs.
Heating surface, tubes	1,690 sq. ft.	2,410 sq. ft.
" " firebox	164 "	168 "
" " total	1,854 "	2,578 "
Tubes, number	269	341
" outside diameter	2 in.	2 in.
" length	12 ft.	13 ft. 6 in.
" material	Steel.	Steel.
Firebox, type	Semi-wide.	Semi-wide.
" length	7 ft. 6 in.	8 ft. 6 in.
" wide	6 ft. 3 in.	6 ft. 3 in.
" material	Steel.	Steel.
" maker	Carbon Steel Co.	Carbon Steel Co.
Grate area	46.3 sq. ft.	53.4 sq. ft.
Tank capacity	3,300 gals.	6,000 gals.
Coal capacity	6 tons.	10 tons.
Tractive effort	25,992 lbs.	34,200 lbs.

Special Equipment.

Axles	Midvale
Bell ringer	Snow
Boiler lagging	Sectional magnesia; Johns-Manville or Franklin
Brakes	Westinghouse-American E. T. No. 6
Brake shoes	Perfecto
Couplers	Gould cast steel. 5 x 7 in. shank
Driving boxes	Cast steel
Grease cellars on driving box	(2) 16-in. Dressel
Inspirator	No. 11 Hancock composite
Journal bearings	Magnus
Piston and valve rod packings	United States
Safety valve	(2) 3-in. Consolidated
Sanding devices	Leech Air and Hand
Lubricators	Nathan B. E. No. 9
Springs	Cast steel, D., L. & W. specifications
Steam gages	Ashcroft
Staying	Tate flexible in breaking zone
Tires	Midvale
Tender journal boxes	Symington
Tender draft gear	Session friction Acme coupling device

IRON AND STEEL.

The Great Northern is in the market for 2,000 tons of structural steel.

The Atchison, Topeka & Santa Fe has ordered 5,000 tons of tie plates from the Illinois Steel Co.

The Chicago Railways Co. is in the market for about 500 tons of structural steel for building new car barns.

The Northern Pacific is in the market for from 3,000 to 5,000 tons of structural steel for bridge construction.

The Chicago & North Western is in the market for 11,000 tons of structural steel for track elevation work.

The Chicago, Milwaukee & St. Paul has ordered 300 tons of plate girder construction from the Wisconsin Bridge & Iron Co. and will place an order soon for an additional 600 tons.

General Conditions in Steel.—Recent reports indicate that a continuation of the present price war and underbidding by the United States Steel Corporation will work a hardship on some of the independent companies, and it is even intimated that shutdowns may result. An officer of one of these independent companies is quoted as having said that the corporation has gotten practically all of the large orders for structural steel recently placed. The independents are said to be bidding as low as possible without operating at a loss, and that unless there is some improvement in the near future, material changes in wage scales will result. The price of rails is yet maintained, and although there is some slight feeling of a reduction, nothing definite has yet resulted.

RAILROAD STRUCTURES.

Garrett, Ind.—Local reports are that the Baltimore & Ohio is preparing to build a new roundhouse during the coming spring.

New Orleans, La.—The St. Louis & San Francisco and the Southern have petitioned the City Council for a franchise for a new passenger station to replace their present structure. It is proposed to erect a structure extending from the lake side of Basin street to North Rampart street and either 10 or 12 stories high.

SEATTLE, WASH.—The Hurley-Mason Co., of Tacoma, Wash., has been given the contract for the concrete piling and foundation for the new passenger station of the Union Pacific to be located between Jackson and King streets and Fourth and Fifth avenues south. The foundation work will cost about $40,000 and will involve driving concrete piling to a depth of 38 ft.

TACOMA, WASH.—The Chicago, Milwaukee & Puget Sound, according to press reports from Tacoma, has announced that car building and car repairing shops will be erected on the tide flats near its terminal holdings. It is stated that the shops will be almost as large as those at Milwaukee and will be equipped to provide facilities for the western lines.

VICTORIA HARBOR, ONT.—The Canadian Pacific has given the contract for a grain elevator to John S. Metcalf, 184 La Salle street, Chicago. It is estimated it will cost $750,000.

WICHITA, KAN.—The Atchison, Topeka & Santa Fe has completed plans for the new passenger station which is to replace the present structure. It will be of terra cotta construction, one-story high and will have dimensions of 222 ft. x 60 ft. The interior will be finished in tiling with cement floors. The general waiting room will have a floor space of 4,000 sq. ft.; two waiting rooms each 23 ft. x 36 ft. and baggage room 46 ft. x 59 ft. Work upon this structure will begin in a few days.

SIGNALING.

In the Union Switch & Signal Company's Long Island order, referred to in our issue of March 12, inductive bonds will be used, the system being essentially the same as that installed by the Union on the New York, New Haven & Hartford from Vernon to East Hartford, and described in the *Railroad Gazette* January 17, 1908; that is, not only will the track circuits be alternating current, but the operation of the motors and the slot magnets and the lighting of the signals will be alternating current also. This system has worked with practically perfect success on the line from Vernon to East Hartford, and with small power consumption. The Long Island contract was awarded the afternoon of Saturday, March 6, with the stipulation that the signals shall be installed, tested and ready for regular operation May 15. There will be 31 block sections.

Supply Trade News.

F. W. Boldrick, Representative of the Hofius Steel & Equipment Co., at Spokane, Wash., has been appointed Representative of E. P. Jamison & Co., of Seattle, Wash., with office in the Fernwell building, Spokane.

Henry M. Steele, for the past few years Chief Civil Engineer for J. G. White & Co., Engineers and Constructors, New York, has resigned on account of ill health and has moved with his family from New York to Asheville, N. C.

The Grant Locomotive & Car Works, Inc., Houston, Tex., is the new name of the company formerly known as the Grant Iron Works. The business of the company is repairing and rebuilding locomotives and cars. A department has been added recently for manufacturing steam and electric railway frogs, crossings and switches. It is the intention of the company to eventually add facilities for the building of new cars.

A third and final decision after a four years' contest has just been rendered in the patent office by the Commissioner of Patents on appeal in favor of Edward E. Gold, President of the Gold Car Heating & Lighting Co., New York. The patent relates to the "impositive lock" which forms part of the Gold hose coupler. This lock is an automatic device which prevents uncoupling but yields when the cars pull apart, permitting the couplers to uncouple automatically.

The Pitts Foundry & Contracting Co., South Houston, Tex., has recently been organized to manufacture railway and machine castings. A new foundry is being erected, consisting of a main building 80 ft. x 125 ft., with cupola house, core house, core ovens, pattern shops and a building for tumbling and cleaning castings. The foundry will be equipped with a 15-ton traveling crane and five 2-ton trolleys. It is expected that the plant will be in operation about April 1. L. A. Pitts is President.

The Barrett Manufacturing Co., New York, is exhibiting at the Coliseum this week something new in waterproofing, it being the use of a bituminous binder protection over the waterproofing course in overhead bridges. A new system of floor construction is also a feature of the exhibit. It is for use where a wooden floor is required directly on the ground without air space beneath. This construction protects the floor against the ground dampness and results in a wooden lower floor lasting as long as any other part of the building.

The annual meeting of the stockholders of the Union Switch & Signal Co., Swissvale, Pa., was held on March 9. Owing to the absence in Europe of George Westinghouse, President, H. G. Prout, Vice-President of the company, acted as chairman. The following were elected as directors: George Westinghouse, Robert Pitcairn, William McConway, George C. Smith, Thomas Rodd, H. G. Prout and James J. Donnell. At the close of the meeting the representative of the company said that there is at the present time orders on hand at Swissvale amounting to $1,357,000.

The American Concrete Co., Chicago, is exhibiting at the Road & Track Supply Association, held at the Coliseum this week, a full size section of a reinforced concrete culvert pipe which is 8 ft. long and 48 in. in diameter. This pipe is being made in smaller sizes also and has been adopted by the Chicago, Burlington & Quincy as standard. A reinforced concrete pile trestle, shown by a model, is new insofar as the concrete piles are concerned. The pile used is patented by A. C. Chenoweth, Brooklyn, N. Y. It is fabricated instead of being moulded, thereby giving it a mesh reinforcement practically on the outside of the pile, which adds to its strength as a column.

Burton W. Mudge & Brother, Chicago, have been appointed Western Representatives of the McInnes Steel Co., Corry, Pa. This company manufactures a complete line of tool steels, including steels in all tempers for chisels, drills and cold sets; "Cello" oil hardened steel for dies, taps, reamers and special tools; "Extra" high-speed steel for locomotive tire lathes; annealed steel for dies, taps and reamers and special lathe tool steels. The Western Machinists' Supply Co., Minneapolis, Minn., of which L. R. Roy is President, will represent the McInnes company in the Northwest, and the National Steel Co., Pittsburgh, will attend to that district. The Eastern representatives are Schrock & Squires, New York.

The National Lock Washer Co., Newark, N. J., report among recent orders: Curtain fixtures for the eight passenger coaches recently ordered by the Virginian Railway; sash balance and curtain fixture specified for use on the four cafe and club cars to be built for this road; sash lock, sash balance and curtain fixture specified for the five passenger coaches and two passenger and baggage combination cars recently ordered by the Seaboard Air Line; curtain fixture for the 12 coaches building for the Carolina, Clinchfield & Ohio Railway; curtain fixture specified for the 15 new coaches building for the Central Railroad of New Jersey; curtain fixture and sash lock for over 300 cars rebuilding for the Philadelphia Rapid Transit Co., and curtain fixture for the 200 odd cars building for the Third Avenue Railway, New York.

The gross sales of the Pressed Steel Car Co., Pittsburgh, Pa., for the year ended December 31, 1908, were $8,589,422 as compared with gross sales of $36,443,304 in 1907. Of the sales in 1908, over 70 per cent. of the amount was sold during the first three months. The falling off in gross sales was caused by a great reduction in the purchasing power of the railways resulting from the general business depression and from adverse legislation which forced the most rigid economy. The net profits for the 1908 year amounted to $265,478 and in 1907 the net profits were $2,907,920. There was very little change in the assets and liabilities of the company as represented by the value of property and franchises and securities outstanding or in the securities owned. In current assets, however, accounts receivable were reduced from $4,172,653 in 1907 to $668,105 in 1908, and stock of materials on hand from $3,500,154 to $246,510. The supply of cash in banks

was increased from $1,733,487 to $2,837,990; thus current assets decreased from $9,406,293 in 1907 to $3,752,604. At the same time current liabilities decreased from $5,012,488 to $446,301. For instance, accounts payable in 1907 amounted to $3,770,611 and in 1908 to but $169,532. The company anticipating that there would be large cash balances which would not be required in the business, paid in August, 1908, the eighth annual installment of $500,000 on the notes secured by mortgage. This leaves but $1,000,000 unpaid on these notes, due $500,000 February 1, 1910, and $500,000 February 1, 1911. For the first time the steel passenger car department contributed to earnings, and business booked for next year indicates a continuance of revenue from this source. There was spent for improvements and betterments $283,516, and charged to properties and franchises.

TRADE PUBLICATIONS.

High-Tension Magnetoes.—The Hess-Bright Manufacturing Co., Philadelphia, Pa., are mailing an article on high-tension magnetoes, which is a reprint from one which appeared in the *Cycle and Automobile Trade Journal.*

Telephones.—The Western Electric Co., New York, are mailing a small pamphlet containing six half-tone reproductions of photographs of President Taft using a Western electric telephone in receiving the news of his election.

Locomotive and Car Shops.—The Arnold Company, Chicago, are mailing a postal card showing a general view of the locomotive and car repair shops of the Frisco Car & Engine Co., at Springfield, Mo., construction of which was recently resumed.

Compressors.—The Ingersoll-Rand Co., New York, in Form No. 3011, illustrate and describe Imperial, Type X, duplex steam-driven compressors. This is a standard loose-leaf pamphlet, 6 in. x 9 in., suitable for binding and loose-leaf cover.

Excavator.—The Heyworth-Newman excavator is described in a pamphlet recently issued by James O. Heyworth, Harvester building, Chicago. This is a drag-line bucket excavator capable of handling various materials and has a large digging radius.

Grand Trunk Pacific.—A booklet giving information regarding the western terminus of the Grand Trunk Pacific at Prince Rupert, B. C., has recently been issued. The railway has acquired 24,000 acres of land at Prince Rupert and vicinity for the purpose of a townsite and the development of the port and the first subdivision of this, including about 2,000 acres, will be sold about May 1. Full particulars and a copy of the booklet may be obtained from the Secretary of the road at Montreal, Que.

Strauss Bascule Bridges Completed During the Past Year.

During the past year there have been completed and put in service seven Strauss bascule bridges. The most notable of these is the Kinzie street bridge for the Chicago & North Western, Chicago,—the largest and heaviest double track, single leaf bascule in the world, with an average of 1,000 bridge movements a month and 300 train movements a day. This bridge was described in the *Railroad Age Gazette*, December 18, 1908.

Another notable structure is the Knippels bridge at Copenhagen, Denmark, the design for which was selected in international competition and which was dedicated with elaborate ceremonies on the first of the year. A similar bridge to the one at Copenhagen is the Federal street bridge, at Camden, N. J.

A unique design has just been completed for the Ohio Electric Railway, over Swan creek at Toledo, Ohio. It comprises a series of three plate girder spans. The bascule portion is nothing more than an independent lifting truss attached to a pair of plate girders.

The Benson street bridge of the Miami & Erie canal at Lockland, Ohio, is as broad as it is long, being 60 ft. each way. There is no operator's house for this structure, the movement of the bridge being directed from a motorman's box fixed to one of the end posts.

The Lazaretto road bridge over Darby creek, in Delaware county, Pa., is a small double leaf bridge of the underneath-counterweight type. This bridge comprises four deck plate girder spans, paved with brick, and is of unusually substantial construction.

The South First street bridge, Elizabeth, N. J., is a semi-through span with overhead counterweight, similar to the bridge for the New Jersey Shore Line Railway at Rahway, N. J., not far distant.

There are a number of additional Strauss bridges under construction, the most important being the Polk street bridge for the city of Chicago and the Walnut street bridge for the city of Green Bay, Wis.

The performance of all these bridges is reported to be most satisfactory. The Wheeling & Lake Erie bridge, at Cleveland, Ohio, after 3½ years of service, is working most smoothly. A comparison of this bridge with the Kinzie street structure brings out the marked advance made in simplifying and concentrating the Strauss design. The bridges are designed and built by the Strauss Bascule & Concrete Bridge Co., Chicago.

Eureka Continuous Crossing.

One of the chief features of the Eureka continuous crossing, illustrations of which are given herewith, is the solid cast steel bed plate with the anti-skid devices which hold every part of the crossing rigid and prevent displacement through creeping of the rails. The illustrations show clearly the method of maintaining a continuous rail in either direction. The operating mechanism, consisting of num-

Fig. 1—Eureka Continuous Crossing Set for North and South Line.

Fig. 2—Eureka Crossing Set for East and West Line.

ber of levers, is also shown in Fig. 2, and Fig. 1 shows the method of protecting mechanism from injury. The rails are moved through these levers and locked in position, being moved from the tower only. The manufacturers claim that this continuous rail, which does away with the severe hammer blow to locomotives and cars when passing over the flange openings of a solid crossing, affords a saving in spring hangers on locomotives and arch bars on cars sufficient to cover cost of the crossing. In the case of one of these installations which has

been in track for over a year and exposed to snow, rain and sleet, it is said that it has never ceased working, nor has it been necessary to make any adjustment or to tighten or loosen any of the nuts. This crossing is thrown with less effort than that necessary for an ordinary switchstand. The following are particular features of this continuous rail crossing: Suitable for high speed usage; a life equal to that of any of the other rails in the track; maintaining its position, and eliminating the hammer blows of engines and cars.

A track foreman of an eastern road, on which one of these crossings is now in service, is quoted as having said that the slip rail is as great an improvement over the solid crossing as the point switch is over the old time stub switch, and that as the crossing is simple it will be easily maintained, since it is required to withstand no hammer blows from passing locomotives and cars.

Q. & C. Anti-Rail Creepers.

In the accompanying cuts are shown six different designs of anti-rail creepers. Fig. 1 shows the Racine No. 1, which is made with two malleable iron castings in the form of jaws which engage the lower flange of the rail. These jaws are drawn tight against the rail with one bolt, fastened with a nut lock. The creepers extend below the rail and brace against the tie. Corrugated pieces of metal in the jaws bite the rail when the bolt is tightened. This design is made to fit any size of rail by using different lengths of

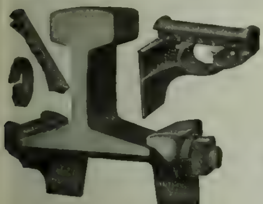


Fig. 1.

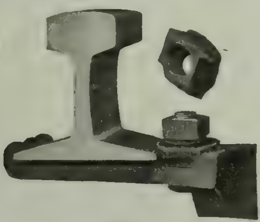


Fig. 2.

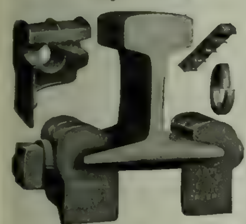


Fig. 3.

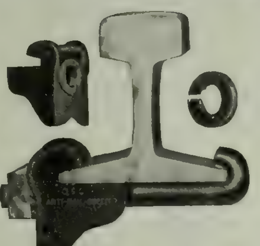


Fig. 4.

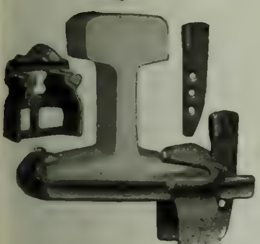


Fig. 5.

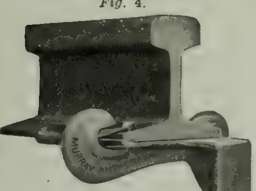


Fig. 6.

Q. & C. Anti-Rail Creepers.

the bolt. It will fit either right or left hand rail. Fig. 2, the L. & S., No. 4, is a design which is especially recommended for use with new rails. It is heavy and very strong. Fig. 3, the L. & S., No. 9, shows a design which has hard iron or steel wedges inserted in the upper jaw of the two depending lugs. These wedges engage the top of the base plate of the rail, and prevent the device from slipping. The wedges are of harder metal than the rail and will therefore bite into it. Fig. 4 shows an adjustable creeper which is made in one malleable casting either right or left. Fig. 5 shows the "Bull Dog Grip," which has knife shaped edges which grip the rail. It is made in three pieces with no bolts, securely fastened to the rail by use of the wedge which supports the upper jaw. Fig. 6 show the Murray anti-rail creeper which is said to be a very strong device, using no bolts or nuts. These anti-rail creepers are being put on the market by the Q. & C. Co., New York.

Buffalo Railway Ratchet Wrench.

The railway ratchet wrench shown in the accompanying illustration is designed for track work on steam and electric railways and made to withstand rough usage. The wearing parts and ratchet mechanism are heavy and hardened to insure long life and minimum wear. This tool is simple in construction, of few parts, and with the ratchet mechanism enclosed so that it will not become clogged with dirt, snow or ice. The socket projects on either side of the head, and for reversing it is only necessary to turn the wrench over, as one side is used for tightening and the other side for loosening a nut. This wrench

Buffalo Railway Ratchet Wrench.

is designed to enable the workmen to accomplish a large amount of work in a short time. The wrench is made in sizes to fit standard square or hexagon nuts, including ¾-in., ⅞-in., 1-in. and 1⅛-in. This track wrench is made with a handle 30 in. long. Small ratchet wrenches, designed to fit standard square or hexagon nuts from ¼-in. to 1-in., and adapted for automobile, pulley and general use, are from 6 in. to 15 in. long. These wrenches are made by the Buffalo Railway Wrench Co., Buffalo, N. Y.

Interstate Railway Pile Drivers.

The illustrations reproduced herewith show types of railway pile drivers designed for strength, stability and simplicity. Provision has also been made for making rapid and economical repairs, every part of the machine being easily accessible. The entire machine is made of steel with the exception of the wood used in th operator's cab.

As seen in Fig. 1, the driver is mounted on a steel car. The superstructure, which rests upon the turntable, can be revolved through the entire circle. This permits driving the pile at a distance of 30 ft. 2½ in. from the center of the truck as shown in Fig. 2. The greater number of piles are driven from that end of the car farthest from the turntable, and the maximum distance available in this direction is 8 ft. 2½ in. from the center of the truck to the center of the pile. By rotating the turntable and bringing the plie driver leads to a position at the other end of the car, it is possible to drive piles at a distance of 19 ft. 2½ in. from the center of the nearest truck. This is at a greater distance than is necessary for one standard bent.

All operations, such as propelling the machine, rotating the superstructure, raising and lowering the leads and driving the piles are power controlled. This machine is said to exert a high tractive effort, and in reality to be a work-train locomotive as well as a pile driver. The steel leads are 40 ft. long, built of steel channels and plates rigidly fastened together. The back braces are angle struts strongly made, and a ladder is provided for convenient access to the top of the leaders. When lowered no part of the leaders project beyond the main body of the car, and although long and very heavy they are raised and lowered with safety by power under control of the operator. About two minutes time is said to be required for bringing the machine to position for driving.

The circular rack upon which the superstructure rotates is a massive steel casting securely fastened to the car, and it forms a circular track for the rotating pinion. This rack is mounted upon a vertical shaft connecting with the mechanism on the turntable. The rack is of large diameter to give stability when rotating and the turntable is mounted upon eight rollers. These rollers are of a self-oiling type, bronze bushed, and backed by bronze washers. The turntable supporting the superstructure is of heavy steel construction, thoroughly stiffened by cross members, and has 15-in.-channel side sills. The propelling power is supplied to the rear radial trucks. This point in design is said to be unique on account of the difficulty which has obtained in applying a simple and positive drive on radial trucks. In this machine the power is carried from the propelling mechanism down through a vertical shaft, which transmits the power through beveled gears to a horizontal shaft on the rear truck and under the car body. A spur gear, mounted on the horizontal shaft, meshes with the slightly curved face spur gear on the nearest truck axle, and the truck and gear are made extra heavy to provide for excessive bending. The curved face gear is cast in halves for ready mounting upon the track axle, and this relieves any binding tendency when rounding curves upon the truck axle. This design does away with the necessity of having a system of universal joints. The propelling mechanism under the car body can be thrown out of mesh when the car is being drawn over the road. Friction clutches control all opera-

tions, with the exception of applying the propelling power to the truck, which is controlled by a jaw clutch.

A 40-h. p. Scotch horizontal boiler, designed for 150 lbs. pressure, is furnished. This provides ample steam for pile driving or propelling the machine on a level track at a speed of from seven to eight miles per hour. This machine is said to have made a record run as high as 15 miles per hour, but this was under very favorable conditions. All exhaust steam is led into the stack to create forced draft, although a live steam jet is also provided. A three-way throttle valve is placed in the exhaust valve.

The operating mechanism is mounted between massive cast-iron side frames, which are securely anchored to the turntable. The mechanism

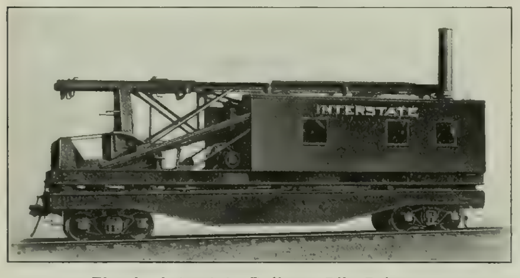


Fig. 1—Interstate Railway Pile Driver.

consists of two drums, one for operating the hammer line and the other for the pile line, and drums for raising and lowering the leads, all of which are controlled by friction clutches. The hammer and pile line drums are mounted on the same shaft, but are independent of each other. Each drum is equipped with a differential band brake operated by a foot lever and the drums for handling the pile and hammer lines are equipped with toothed segments for stopping the drum. The operating levers are mounted in quadrants on a platform located at one side and in front of the machine, affording the operator the best possible view of the work. A hand lever controls the hammer and pile lines, the sluing, propelling, and the raising and lowering of the leads. One lever controls, through a right and left-hand friction clutch, the raising

Fig. 3—Driving Pile at Angle With Track.

Fig. 2—Driving at Extreme Side Position.

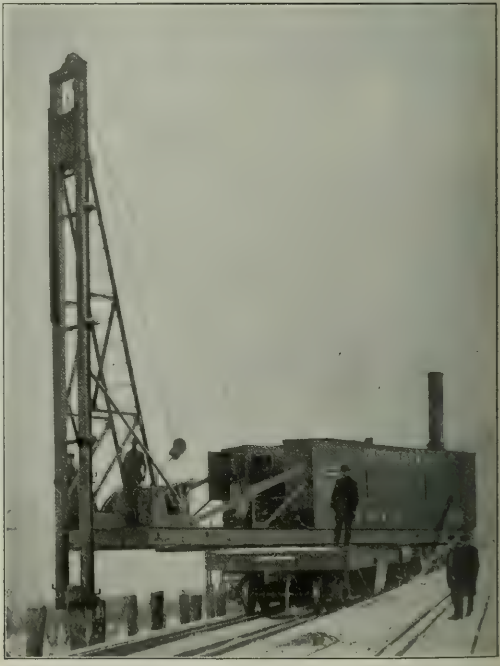


Fig. 4—Interstate Pile Driver on the P. & L. E.

and lowering of the leads. A band brake with a hand lever is provided for the hammer and pile line drums, and the sluing mechanism.

Double horizontal engines, mounted in the operator's cab with the cylinder end toward the rear, are used. This brings the vibration due to reciprocating motion close to the support, which arrangement permits a longer connecting rod than is commonly used and is said to increase the efficiency and reduce vibration of the mechanism.

The car body is provided with Graham-Mitchell draft rigging with either Climax or Tower couplers. The trucks are of the standard pattern with extra heavy arch and inverted bars, designed according to M. C. B. requirements for a 50-ton car. The wheels are chilled cast iron, 33-in. in diameter. Jacks are provided in the bolsters for relieving the truck springs when the driver is in operation. Westinghouse air-brake equipment, including an 8-in. x 7½-in. x 9-in. air pump, is provided, which permits the machine to operate as one car in a train or independently as a locomotive.

These machines are made in two types, Nos. 6 and 7. No. 6 is intended for driving straight piles with a 3,000-lb. hammer, and No. 7 for driving batter piles. The leaders on the No. 7 type are intended to swing to either side, it being possible to place them at any desired angle up to 3 ft. horizontal swing and 1 ft. vertical. In this case the leaders are pivoted at the middle point to a rigid frame mounted on the front end of the turntable, a turned steel pin passing through the upper end of this frame and the steel casting which is attached to the leaders.

For light pile driving work locomotive cranes are also fitted with pile driver attachments as shown in Figs. 2 and 3. The design permits the leaders being taken down and the crane used for hoisting, handling a bucket, etc. These pile drivers are made by the Interstate Engineering Co., Bedford, Ohio, builders of railway locomotive cranes, wrecking trains and steel locomotive pile drivers.

Continuous Rail Device.

The present rigid frog is much the same as a broken rail; a guard rail is necessary to keep the train on the track as it passes the frog point. In addition to causing derailments, the frogs and guard rails also have a tendency to break the wheel flanges.

The continuous rail device is exhibited at the exhibition of the Road and Track Supply Association at the Coliseum. It needs no guard rail, makes a continuous rail and smooth track both for the main line and turn-out, eliminating pounding and danger of derailment. In these ways, it is claimed, it lessens wear and tear on rolling stock and reduces operating expenses.

Fig. 1—Continuous Rail in Line for Main Track.

There is a large base plate of cast steel, about 9 ft. long, to which is attached at each end to lugs, which are part of the base plate, the four connecting rails. The movable rail is of cast steel, hardened. The limit stops are protected by the base of the movable rail, so as to prevent any foreign matter from interfering with operation. These three limit stops, one at each end and one in the center of the movable rail, are cast integrally with the base plate and fit in corresponding sockets in the movable rail. When the device is set for the main line, the movable rail is bearing against these limit stops on one side, and when set for turn-out it bears against the opposite sides of the limit stops.

The device as shown in Figs. 1 and 2 is for main line use, being connected with the switch point by connecting rods as shown. The accompanying will provide, however, for situations in yards where speeds are low, a connection by which an engine or car coming out of the side track with the device in the position shown in Fig. 1 will, before reaching the device, set it for the side track.

Fig. 2—Continuous Rail in Line for Turn-out.

One of these devices was placed at a point on the Mobile & Ohio Railway, where it had been necessary to replace the frog and guard rail on an average of every three months. This continuous rail device has now been at this same point for over seven months without showing wear at any point. The device, it is claimed, will last the life of the abutting rails. The devices are now being used by the Mobile & Ohio at East St. Louis, Ill.; the Southern Railway (St. Louis-Louisville Division) at East St. Louis, Ill.; the St. Louis & San Francisco at St. Louis, Mo.; the Chicago, Rock Island & Pacific at Chicago; the Southern Pacific (Morgan's Louisiana & Texas) at New Orleans, La.; the Missouri, Kansas & Texas at Parsons, Kan.; the Litchfield & Madison at Edwardsville, Ill.; and the St. Louis-Southwestern at Pine Bluff, Ark. They can be seen in actual operation at all these points. The device is made and sold by the Continuous Rail & Safety Switch Co., whose sales office is in the Syndicate Trust Building, St. Louis, Mo.

Cincinnati High Power Milling Machines.

The development of an all gear spindle drive milling machine by the Cincinnati Milling Machine Company, Cincinnati, Ohio, has resulted in a new line of high power machines, and some of the more notable of them are here described and illustrated. These machines were designed for taking heavy cuts on work where fast feeds are permissible and especial attention has been given to those details which provide for the convenience of the operator.

The starting point in the design is the amount of metal removed, as the modern basis for selling such machines should be the quantity and quality of work produced and not the weight of the machine and the size of the driving pulley. The standard cut has a rate of feed sufficient to remove 8 cu. in. of machinery steel, 55,000 lbs. tensile strength, per minute in continuous service and the maximum cut is much larger.

Each machine consists of a system of units composed of the several groups of mechanisms, such as, the drive box, the feed box and the reverse box. Each of these units is made interchangeable on all machines, horizontal and vertical, of each size. This permits of changing a machine to a right angle drive or motor drive at any time by substituting the desired drive box for the one in use. The general appearance of the exterior of these drive and feed boxes is well illustrated in Fig. 5. The drive is through a constant speed belt and no counter-shaft is required. The main driving pulley is of large diameter, wide face, and running at a high speed delivers more than twice as much power to the spindle as is possible on the cone driven machine of former design. This pulley is not fastened directly to the driving shaft, but is journalized on a bracket bolted to the column of the machine and the entire pull of the belt is taken by this bracket. A disk friction clutch of large proportions connects the pulley to the driving shaft and the machine is started and stopped by operating this clutch by the lever located at the front of the machine. When the clutch is out, every part of the machine stops except the main driving pulley, and when the clutch is thrown in, the power is transmitted to the main driving shaft and the driving gears shown in the details of the driving gear boxes. All changes of speed are made through the pilot wheel and the two handles shown next to it, and the index plate, seen in Fig. 5, shows the lever combinations for any desired speed.

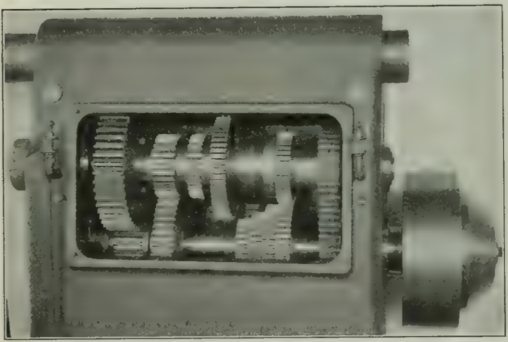


Fig. 1—View Showing Driving Gears; Cincinnati Milling Machine.

Fig. 1 is a detail of the upper part of the column with the cover plate removed, showing the driving gear train.

Fig. 2 is an interior view showing the driving gear box cover and the connections for the handles outside. The machine having been stopped to change the speed, the gears may interfere with the shifting levers and it is therefore necessary to revolve them slightly. This is accomplished by the treadle shown in Fig. 3. It is connected to the main clutch lever and operates on an auxiliary disk clutch. The operation of speed changing, therefore, consists in selecting the lever position for the desired speed, setting the pulley wheel to its position, moving the change lever as far as it will go and then if the gears interfere exerting a light pressure on the treadle. This does not require the operator to turn the gears over by pulling on the belt or on a hand wheel or other device with one hand, while attempting to shift the levers with the other hand as he operates the treadle with his foot.

Fig. 4 shows the motor drive arrangement. The motor is mounted on an extension of the base at the rear of the machine where it is entirely out of the way and does not increase the floor space, since the space it occupies is not available for other purposes, as it must be kept open to accommodate the table travel. The drive is through

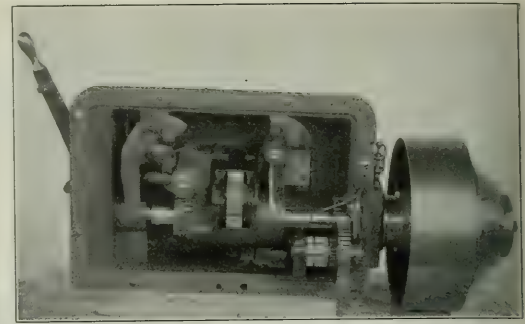


Fig. 2—Interior of Gear Box.

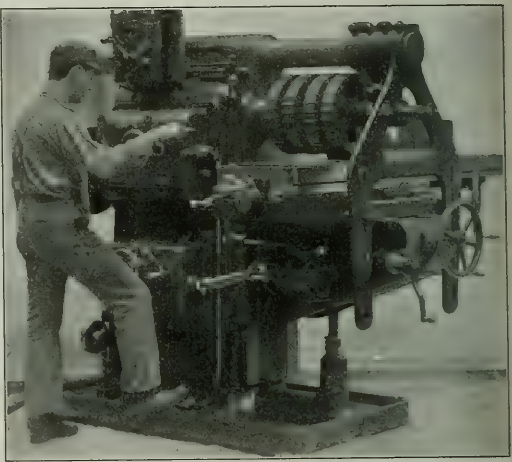


Fig. 3—View Showing Position of Operator and Convenience of Adjustments.

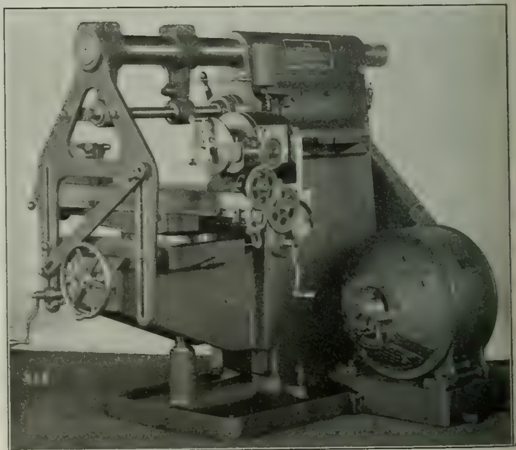


Fig. 4—View Showing Motor Attachment and Outer Arbor Bearing Support.

reducing gears direct to the driving shaft by means of a silent chain. Either constant speed or variable speed motors can be used, but for variable speed standard motors are used with two to one speed variation.

The column of these milling machines is a box section of liberal dimensions, provided with stout walls for supporting the knee and

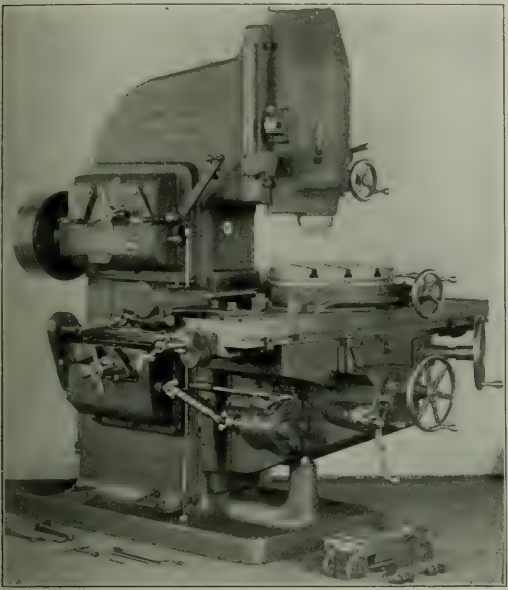


Fig. 5—Cincinnati Vertical Spindle Milling Machine Showing Location of Gear Boxes.

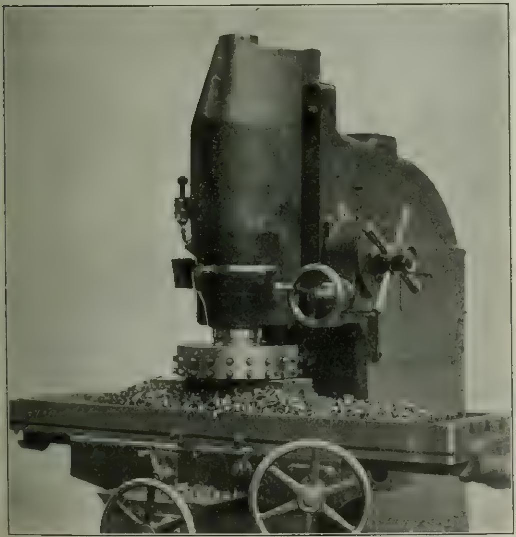


Fig. 6—Vertical Milling Machine Removing 10 cu. in. of Steel Per Minute.

both the front and rear spindle bearing. The knee is of box section exceedingly heavy and rigid for each size of machine. The table has unusually great vertical depth giving it stiffness as a beam to resist springing when work is clamped to it. Fig. 4 shows the outer arbor bearing support. When doing heavy milling it is important that the outer arbor bearing be rigidly supported and to accomplish this the machines are fitted with a solid overhanging arm of large diameter and massive braces of truss form made in one piece. To further increase its stiffness when milling is done with the knee in its lowest position an additional diagonal brace is provided.

Fig. 5 shows the circular milling attachment which is entirely of new design. It is made to fit interchangeably any of the standard high power vertical and horizontal millers made by this company and it of ample proportion to do milling up to the full capacity of the machine. This is geared direct to feed mechanism and has 16 changes in the feed. Its drive is by a shaft independent of the regular feed shaft, and therefore the power feed of the machine can be used while the circular milling attachment is in place. It is adapted for either internal or external milling. This attachment is made in sizes 16, 20, and 24 in. in diameter.

Fig. 6 shows a portion of the high power vertical miller at work milling forged steel bars having 55,000 lbs. tensile strength. The bars are 5 in. wide and the machine takes a cut ⅛-in. deep feeding 16 in. per minute. This amounts to 10 cu. in. of steel removed per minute, the motor using 12 h.p. This machine was on exhibition at Atlantic City last June, but at that time it was taking a cut ¼-in. deep with a feed of 8 in. per minute on the same quality of steel. This also was equivalent to the removal of 10 cu. in. of metal per minute.

Fig. 7 illustrates a portion of the No. 4 plain horizontal milling machine which was also exhibited at Atlantic City last year, although

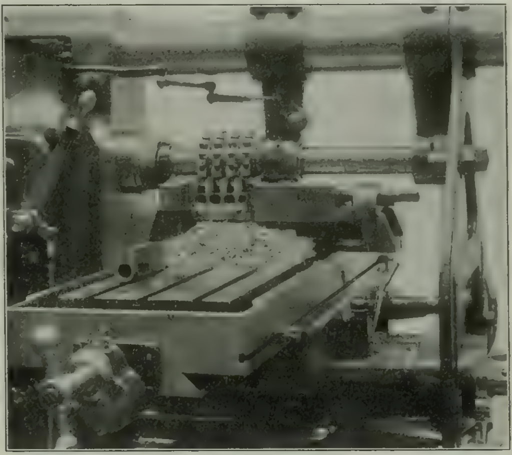


Fig. 7—No. 4 Horizontal Cincinnati Milling Machine.

it was not then doing heavy milling. The cut shows it milling four drop forged steel pieces at one time, taking a cut in each piece $\frac{13}{16}$ in. wide and 1¼ in. deep with a table travel of 2 in. per minute. This amounts to 8⅛ cu. in of steel removed per minute with a consumption of 10 h.p. This is remarkably heavy cutting when using cutters on a horizontal arbor, and it is evidence of the very high efficiency of the machine.

Roll Bascule Bridges at Indiana Harbor.

To provide a water outlet for the industries at Indiana Harbor, Ind., the Indiana Harbor Land Co. decided, early in 1907, to build a ship canal connecting Lake Michigan with various manufacturing plants already located at that point, and for new industries that might be attracted there by its favorable situation as a manufacturing center. As a preliminary to the building of the canal, the land company induced the various railways that would cross it to build movable bridges, so that when the canal should be opened, navigation and railway traffic would not be hampered by interference from construction work. The three roads concerned, the Pennsylvania Lines, the Lake Shore & Michigan Southern and the Baltimore & Ohio decided to invite tenders jointly, after adopting the bascule bridge as the type that would meet all the requirements, and especially the requirement that additional tracks and the bridges to carry them might be installed without changing the existing tracks and bridges.

The Rall bascule bridge was chosen by the three roads and a contract given to the builders for four double-track bridges, duplicates of each other, two of which were for the Lake Shore and one each for the other roads.

The substructures were designed by the railway companies, being

concrete piers on wooden piles. As there was no navigation, each railway built a pile and timber runaround, so that traffic would not interfere with the work. Coffer-dams were built and pumped out to the elevation of the bottoms of the piers. The piles were driven with a water jet. As the material to be penetrated was water-bearing sand, some difficulty was experienced on account of the washing away and undercutting of the sand.

Each bridge consists of a double-track, through riveted single-arm span of the Ball type, the river arm being 86 ft. long, center to center bearings. The principle of the design is shown by the accompanying drawing. The bridge does not require a pit for receiving the tail arm in the opened position. In the closed position the bridge rests directly on the forward pin bearings at the counterweight end of the river arm and on cast steel shoes at the other end. These bearings take the entire live load and part of the dead load in the closed position. The proportioning of the parts was in strict accordance with the requirements of the specifications of the Pennsylvania Lines West of Pittsburgh.

The tail, or that part of the bridge from which the counterweight is suspended, is 28 ft. long and consists of an irregular polygon, the forward portion of which is a triangular girder in which the trunnion or turning pivot of the truss is mounted, the center of this pivot being

Open Position; Roll Bridges on Lake Shore.

the center of gravity and the center of rotation of the movable part of the bridge. The motion is controlled by the swing strut, which is connected with the forward fixed pin support and free to move around it, and pin-connected with the triangular girder part of the truss at a point somewhat back of and below the trunnion.

The bridge is operated by means of a pinion mounted on the bridge and meshing into a straight rack in the operating strut. The latter is located at the extreme end of the bridge, back of the counterweight. This operating strut is hinged at the bottom to the foundation and is free to accommodate itself automatically to the irregular curve described by he pinion in the tail of the bridge while in motion. This method of applying the power is one of the special features of this design. There are no racks or tracks for the bridge operation, greatly simplifying the work in the office, shop and field. The operating gear is held in mesh by means of a steel carriage which travels along a track at the rear of the operating strut and is connected with the axle of the main pinion and moves with it.

The trunnion about which the bridge rotates is carried by a roller or wheel which turns around the trunnion. This roller has a cast iron center on which are shrunk steel tires 1½ in. thick.

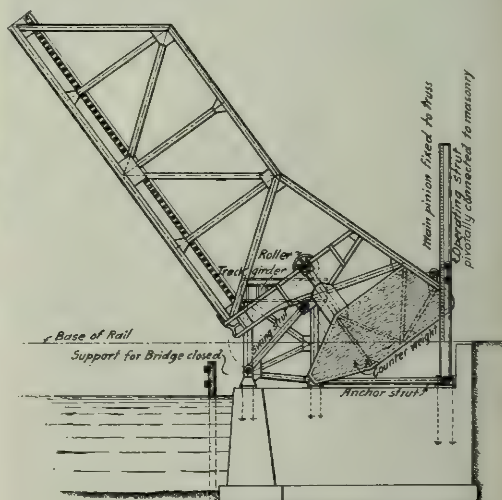
The journal bearings between trunnions and rollers are bronze bushed, the maximum pressure being 1,600 lbs. per square in. The trunnions are 14 in. in diameter and 4 ft. long. The rollers are 55 in. in diameter and have a smooth face of 25 in. with a flange at the outer edge for alinement of the bridge. The pressure is 22,000 lbs. per lineal inch.

The track on which the roller travels is straight and short, the travel opening the bridge being made just long enough to enable the tail to clear the masonry when the bridge is open. The retractile motion of the bridge permits of the use of a minimum length of span, which reduces the cost.

Closed Position; Roll Bridge on Baltimore & Ohio.

The track girder carrying the bridge while in motion has three webs with side plates and deep channels in the top chords in order to provide proper rivet areas for the large concentrated loads. When the bridge is closed the roller bears but lightly on the track and consequently the live and dead loads are not carried by the trunnion and track girders, but by the forward pin supports and the bearings at the extreme end of the bridge.

The counterweight consists of cast iron blocks for its lower third,



Design of Roll Bridge.

carried by and bolted to a steel framework, continuous with and an integral part of the main trusses. The upper part of the counterweight consists of stone concrete in which pig iron is embdedded. The concrete is also reinforced with heavy wire meshing and tied transversely by iron rods. The concentration of load possible with cast iron blocks for a part of the counterweight made their use more

economical than to have the entire counterweight of concrete. Provision is made for attaching additional cast iron counterweight blocks if necessary.

Each bridge is equipped with the necessary bridge and rail locks and river signals. The operating machinery consists of three sets of cast steel gear wheels connecting with each motor and meshing into the straight rack of the operating strut. A reinforced concrete platform connects one truss with the other at the op of the bridge for convenience of the bridge tender in oiling and caring for the machinery. The main trunnions are lubricated from this platform through gaspipe conduits and pressure grease cups.

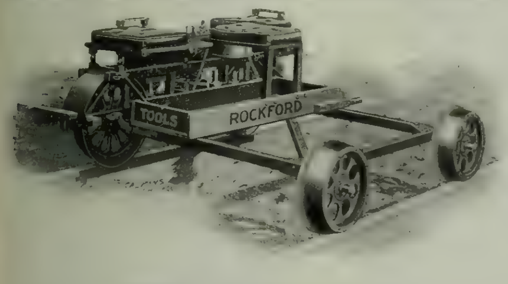
Each bridge is moved by two 35 h.p., 220-volt, d. c. motors, geared to the main cross-shaft. The actual power required to open or close the bridge in one minute under ordinary wind conditions is 25 h.p. Therefore one motor is sufficient to operate the bridge safely, the second being for emergency purposes. Each motor is equipped with an electric solenoid brake, normally set by means of a spring and released by the controller. A hydraulic emergency brake on the driving shaft is operated by a hand-pump in the operator's house. The rail locks are operated at 2½ h.p. d. c. motor, and the end lock by a similar motor.

The Pennsylvania's bridge, being remote from the others, is operated from the signal tower adjacent to the bridge. The other three bridges are operated from the signal tower controlling the tracks of the roads using the bridges, the power plant being in the same building. This installation is of interest because of the number of drawbridges operated from one point. Three-phase alternating current, at 440 volts, from a power company, is transformed to direct current by two 40-amp. mercury-arc rectifiers. It charges a storage battery of 128 "Chloride Accumulator" cells, used for operating the several bridges, and for the electric interlocking and signal system governing the tracks crossing the bridges. In addition there is a direct-connected 35 k.w. motor-generator set, for emergency or joint use with the battery. The several motors on each bridge are electrically interlocked with each other and with the signals governing the approaching tracks. Nothing can be done toward opening any bridge until all signals governing the approaching tracks are set at "danger," and in closing, the signals cannot be set for a clear track until the bridge is closed and locked and the rail locks set for the passage of trains. Each bridge has its own switchboard and controllers, and each board has electric indicators showing the operator the position of all devices on the corresponding bridge.

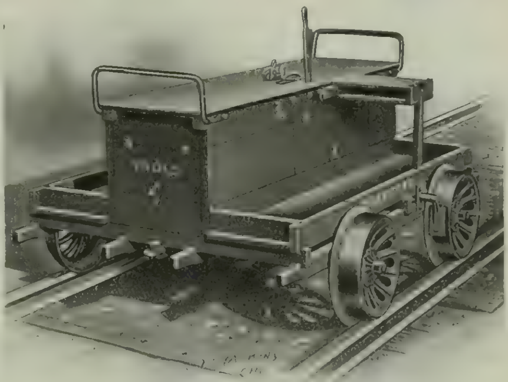
The weight of structural steel for each bridge is 626,000 lbs. and of the entire operating machinery 27,000 lbs. The Strobel Steel Construction Co., Chicago, who designed the bridges, prepared all plans, erected the superstructure and installed the machinery. The structural steel was fabricated by the Pennsylvania Steel Co., Steelton, Pa., and the machinery was furnished by George P. Nichols & Bro., Chicago, who also furnished and installed the electric equipment. The railway companies were represented by Albert Lucius, Consulting Engineer, and by their respective bridge engineers.

Rockford Motor Cars.

The Rockford gasolene motor cars for section men and signal, telegraph and bridge inspectors, manufactured by the Duntley Manufacturing Company, 1913 Fisher building, Chicago, have been in successful use about three years, and are now being ordered in large numbers. Fifty-four of the No. 4 motor cars have been delivered to the Chicago, Milwaukee & St. Paul. The simplicity of the cars is readily seen in the illustrations. They have no gears, no friction clutch, no chains and no water cooling apparatus to freeze up in winter. Some doubts have been expressed as to whether this gasolene engine would run successfully without some sort of a cooling device, and tests have been made to determine its running conditions. The engine was operated at a speed of 360 revolutions per minute at a temperature of 115 deg. for one hour continuously. This corresponds to a speed of 26 miles per hour. In the test, the engine was enclosed so that it did not have the benefit of the cooling effect of the air rushing past at 26 miles per hour. This proved conclusively that the engine could be operated in hot weather without a water cooler. The advantage of the high speed car is in getting men to and from their work, resulting in a saving of one to two hours per day for each man. The car is also useful in making a quick delivery of material in urgent cases, and the section foreman can get over his section more frequently and detect track defects. The saving of time of extra and section gangs and of labor in operating ordinary hand cars has been estimated as equal to $50 per mile per year. The engine can easily be applied to any standard hand car if desired.



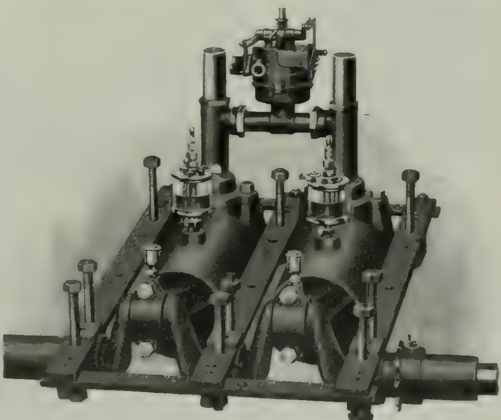
Rockford Inspection Car No. 2.



Rockford Section Car No. 4.

The No. 4 Rockford section car is intended to take the place of the hand-driven cars in common use. The axles are steel, 1⅝ in. in diameter; wheels 16 in., platform 6 ft. x 52 in. The car can be worked up to a speed of 30 miles per hour. It will carry 10 men, including the operator, and has sufficient power to carry as many men and tools as can be crowded on the platform. The car has been tested under a load of 5,100 lbs. at a speed of 6 miles per hour on a 1½ per cent. grade. Its weight is 650 lbs.

The inspection car, No. 2, which is also shown herewith, is specially adapted to signal telegraph and bridge inspection; it accommodates two passengers in addition to the operator and has a tray for carrying tools. The engine is capable of operating 90 miles on one gallon of gasolene when the speed does not exceed 20 miles per hour. The weight of the car complete is 350 lbs. and it can be easily removed from the track by one man in 3 seconds.



Engine for Rockford Car No. 4.

For extra heavy service the No. 5 car is recommended. This has four cylinders directly connected to the axles and when maximum power is not required either pair of cylinders can be cut out or in at any speed. In transferring material two loaded hand cars can be handled by the No. 5 car, and it is fitted with a drawbar for this purpose.

Foster Interlocking Switch Stand.

The Foster interlocking switch stand is designed for main line facing point switches not connected with an interlocking plant. It is arranged to operate a distant signal suitably connected so that the signal can

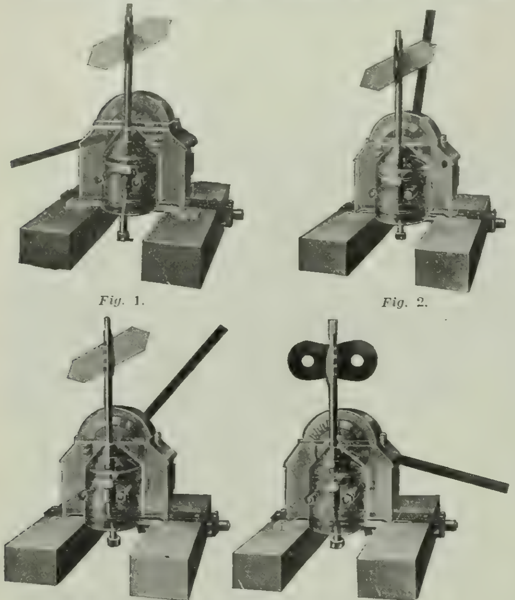


Fig. 1. *Fig.* 2.

Fig. 3. *Fig.* 4.

Foster Interlocking Switch Stand.

be pulled clear only when the points are set for the main line. All the operations are made by one lever.

The lever, in one motion parallel to the track, performs successively three operations; throwing the switching points, locking them in position and clearing both the target and the distant signal. Revere motion of the lever throws both signals to danger, unlocks the points, then opens the switch. When it is desirable to do switching and have the protection of the distant signal, the switch points can be thrown by moving the lever back and forth between the position shown in Figs. 1 and 2, and the signals be allowed to remain at "stop."

The switch stand and the locking parts are spiked to the ties independently and when the points are set for the main line, the switch stand could be removed or destroyed without imperilling the safety of the switch. The interlocking connection may be placed below the top of the tie if desired so that in case anything drops from a car it will be protected.

Fig. 1 shows the lever in the position it takes when the switch is opened. The first operation is accomplished by moving the lever to the position shown in Fig. 2, when the switch points are set for the main line. At this point the gear operating the switch point locks and remains locked until the throw of the lever is completed. When the lever is in the position shown in Fig. 3, the switch points are locked in place by a plunger which passes through the locked bar. When the lever moves to the position shown in Fig. 4, the target is in the clear position. Moving the lever from the third to the fourth position, operates two gears simultaneously, one gear turning the target 90 deg., and the other turning the sheave 160 deg. This sheave is grooved for a chain which works the distant signal.

If the point should not come up close to the stock rail in closing the switch, the plunger will not enter the hole in the lock bar, and the lever will not take the position shown in Fig. 2 and as the gears operating the signal do not engage until the lever reaches the third position, the signals cannot be cleared unless the points are interlocked. Each of the intermittent gears is locked when not in motion, and can only be operated by moving the lever through the portion of its travel for that particular gear. As the gear turns 180 degs., the crank is on the dead center when the points are set for either track. The lever can be locked only when it is in one of the extreme positions. This switch stand is patented by Frank M. Foster, Columbus, Ohio, and is now in service on the Toledo & Ohio Central, at Columbus, Ohio.

Duff-Bethlehem Forced Steel Hydraulic Jacks.

The Duff Manufacturing Co., Pittsburgh, Pa., exclusive manufacturer of the Barrett jacks and the Duff ball-bearing screw jacks, has put on the market the Duff-Bethlehem forged steel hydraulic jack. This jack is forged entirely out of steel and patents covering its special features and construction have been allowed the Bethlehem Steel Co., South Bethlehem, Pa., which has designed and perfected this jack and which does the special forgings necessary. The Duff Manufacturing Co. has the entire and exclusive handling of this Duff-Bethlehem jack.

The new jack has special features whereby all imperfections and troublesome conditions in a hydraulic jack are avoided. It weighs from 30 per cent. to 60 per cent less than a hydraulic jack of any other make of equal lifting capacity and stroke. This is made possible by its forged steel construction. It further provides greater strength, capacity and durability.

Both the cylinder and ram have a solid bottom, thus requiring no packing and dispensing with joints at those points. The most troublesome packing in a hydraulic jack is at the bottom of the cylinder. As the cylinder of the Duff-Bethlehem jack has its base, or bottom, forged integrally therewith, it obviates entirely this trouble. Another packing that frequently causes trouble and expense is the one insuring closure of the ram piston from the pump socket. The new jack has a solid ram bottom forged integrally with the pump socket, thus dispensing with this packing. There are only two packings proper in the jack, and these are small. As joints are also eliminated, there is no chance for leakage and no expense watever for renewal of packings.

By the improved construction and location of valves, the jack can be extended its full length in a vertical, horizontal or inclined position, without an adjustment whatever, and all sizes will separate at any angle. In the operating mechanism, a minimum number of parts of simple and strong construction are employed and any parts may be easily replaced if necessary, without special tools. Also, the valves may be attended to without removing the packing, and the packing without removing the valves. The valves are positive and require no special adjustment or parts to insure their operating under all conditions. The load may be tripped or may be lowered as slowly as desired, or stopped at any point when lowering.

These jacks are constructed of open-hearth fluid compressed forged steel and bronze, and their inside working parts are drop forgings. They are made in all types and capacities adapted to railway and general lifting purposes. The low or telescopic type, representing the highest development, is fitted with an improved duplex pump, automatically regulating the change of speed proportional to the load being lifted.

Duff-Bethlehem Hydraulic Jacks.

It is made regularly with capacities ranging from 30 tons to 300 tons, and higher capacities if required.

This line of hydraulic jacks is complete, and together with the Barret jacks, Duff ball-bearing screw jacks, etc., covers needs for lifting jacks for all purposes from jacks lifting 500 lbs. up to those capable of lifting 1,000 tons.

Scherzer Rolling Lift Bridge in Burma.

In August, 1904, the Burma Railways Company began work on an extension from Henzada to Kyangin. This work necessitated the construction of a bridge to cross the Ngawun river, about 16 miles from Henzada. It was originally intended to build this bridge of fixed spans, grading up the approaches so as to provide a clearance of 40 ft. underneath the bridge for the passage of vessels, but as this construction would require a grade of ½ of 1 per cent., it was decided to reduce the grade to ⅙ of 1 per cent., and include a movable bridge for the channel span.

Scherzer Rolling Lift Bridge Across Ngawun River, Burma.

Extensive navigation is carried on along the Ngawun river by the Irrawaddy Flotilla Company, which operates a line of steamers for both freight and passenger traffic. The Government required a clear channel of 200 ft., for navigation, which, with the local conditions, caused careful consideration of the most suitable type of movable bridge. A double-leaf, through Scherzer rolling lift bridge was selected.

The bridge was fabricated at the works of Spencer & Company, Melksham, Wiltshire, England, and was shipped to Burma after having first been erected temporarily at the works.

The superstructure consists of a double-leaf, through single-track rolling lift bridge having a span of 220 ft. center to center of bearings, flanked on one side by three 160-ft. through truss spans, and on the other by two spans of this same length. The substructure consist of brick masonry piers founded on wells, the type of construction generally used in India and Burma. The design of the bridge was based on the specifications of the Government of India for railway bridges.

The superstructure of the fixed spans was erected on falsework com-

Erection of North and South Leaves.

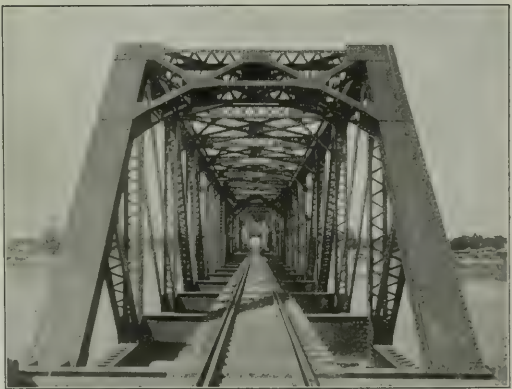
posed of frame bents resting on piles, there being four towers of two bents each for each approach span. The leaves of the bascule span were erected in the open position by means of a sliding derrick which was raised on the open leaf as each panel was added. In this way the channel was not obstructed during erection. As shown in one of the photographs, work was carried on on both leaves at once. Another photograph shows the method of placing the end floor beam after the leaf has been operated to closed position.

The track girders on which the moving leaves roll in opening and closing, are carried by the adjacent fixed spans, eliminating the piers usually provided to support the rear ends of the track girders. One of the distinguishing characteristics of the design of this bridge is the economical arrangement and the small size of the piers, providing ample support to the superstructure with the least possible obstruction to the flow of water. The rivers in India and Burma during the rainy season are subjected to heavy floods and obstructions to the flow of water result in deep holes being scoured in the rived bed, necessitating great care in foundation design. The great advantage of the bascule bridge over the swing bridge in this respect is apparent from a study of the general view of this bridge. In this photograph, showing the movable span closed, the water of the river is at a low stage.

The bridge is operated by hand power from winches on the deck of the approaches, transmitted by a system of gearing to the main operating struts, of which there are two on each leaf outside of the trusses, the center line of the struts coinciding with the center line of the approach trusses. The two winches for operating each leaf are located on platforms on the outside of the approach spans.

The substructure was completed and erection started in the spring of

South Leaf Operated to Closed Position.



End View from South Abutment.

1908, the bridge being completed and opened early in December, 1908.

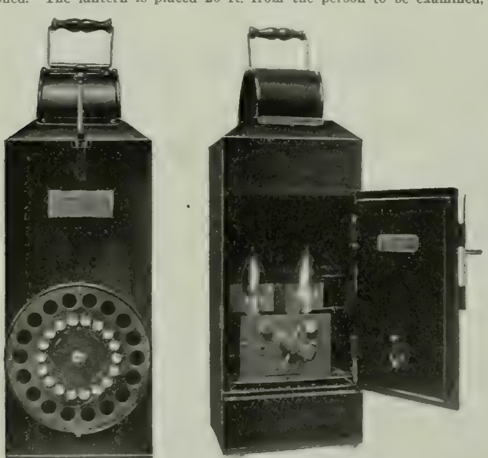
This is the largest movable bridge yet built in Asia, and its successful and satisfactory completion will undoubtedly lead to the construction of other bridges of this type where similar problems are to be solved. By the use of the rolling lift bridge the base of rail can be placed at a minimum distance above water, effecting a large saving as compared with the cost of a fixed bridge high enough above the water to allow vessels to pass underneath, necessitating the construction of long and high embankments to reach the bridge level. The grades would be a perpetual tax on all traffic crossing the bridge.

The work was executed under the supervision of Rendel & Robertson, Consulting Engineers, 8 Great George street, Westminster, S.W. The Scherzer Rolling Lift Bridge Co., Chicago, designed the superstructure of the bascule span and the two adjacent approach spans in co-operation with the engineers of the railway company. The substructure was designed by the railway company. G. Mills was in direct charge of the work as Chief Engineer of Construction for the railway until the completion of the substructure, being succeeded by J. A. Despeisis, Superintendent of Ways and Works. A. E. Kindersley was Executive Engineer. C. B. Bell was Assistant Engineer in charge during the construction of the substructure, and J. Rowland was Assistant Engineer in charge of the erection of the superstructure. James I. Vincent was Resident Engineer for the Scherzer company during the erection of the superstructure.

Color Perception Testing Lantern.

The accompanying photographs show the latest model of Dr. C. H. Williams' lantern for testing color perception. There are eighteen different glasses in the revolving disc, and they can be shown, either singly, or in pairs for comparison of colors, for instance, two reds of different shades, two greens, a red and a green, etc., in eighteen different combinations, and with a large, medium or small illuminated area, regulated by the sliding shutter inside the lantern. Under each color is a number which is lighted when that color is shown, the number being screened from the person examined, but visible to the examiner. This is done by a circular steel plate which is in front of the numbers, but allows them to be seen from the side. It was removed when the accompanying photograph was taken. These numbers allow a record to be made of the examination, each number with the name of the color given to it, being noted as the examination proceeds. Every glass in each of these lanterns is personally tested by Dr. Williams before the lantern is sent out.

The rear view shows electric lights in use. Oil lamps are also furnished. The lantern is placed 20 ft. from the person to be examined,



Front and Back Views of Williams Lantern.

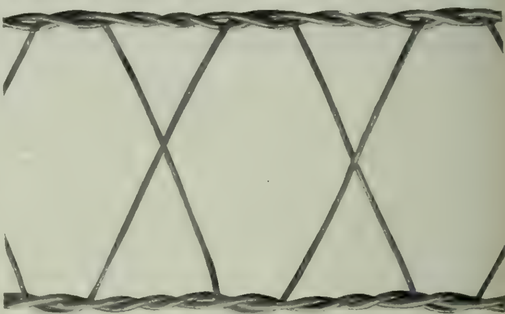
and on a level with his head, the side of the lantern carrying the disk with the colored glasses facing directly toward him. The disk is revolved, showing different pairs of lights and also single lights by manipulating the shutter.

The names given to the colors by the person examined are recorded and checked by reference to the corresponding figures on the small dials. With the smallest opening in the shutter, the apparent size of the colored light at a distance of 20 ft. is the same as the apparent size of a switch light five inches in diameter seen at a distance of 1250 ft.; and with the largest opening in the shutter, as the apparent size of such a switch light at a distance of 160 ft., but it must be remembered that with colored lights the color can be distinguished, at night, at a much greater distance than objects of similar size could be seen by day, and the size of the colored area of a signal light at night does not bear the same relation to the ability to see it that the size of a semaphore, or position signal, would by day.

This lamp is made by Peter Gray & Sons, Boston, Mass.

Wright Rust Proof Wire Fencing.

The accompanying illustration shows a section of rust proof wire fencing which is woven from plain hard drawn steel wire of high tensile strength, after which it is galvanized by being passed through a bath of molten pure zinc, which process is said to result in a heavy protective coat equal to about 20 per cent. of the weight of the fence. The manufacturers claim that the important feature of his fencing lies in the method of its manufacture, in that the coating of pure zinc, equal to about 20 per cent. of its weight, put on after the fencing is woven, is superior to other makes of fencing made of wire which is galvanized to about $3\frac{1}{2}$ per cent., of its weight before being woven



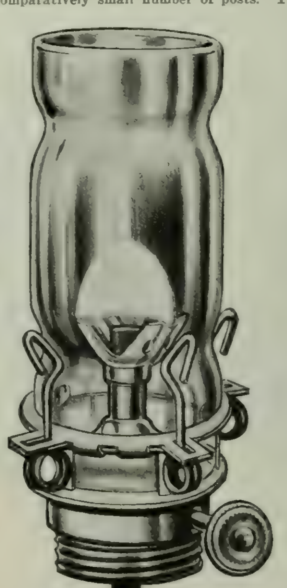
Wright Rust Proof Wire Fencing.

into fencing. It is also claimed that the fencing which is made by the latter process will last from three to four years, and that the rust proof fencing, which has a coating much heavier, will last from six to eight times as long.

It is said that poultry netting, made from No. 20 wire, which is galvanized after weaving, and has a coating equal to about 16 per cent. of its weight, has lasted as long as 24 years. Rust proof fencing is said to be very strong and long lived on account of the heavy coat of zinc, adaptable for many purposes, easy of erection and requiring a comparatively small number of posts. This fencing, manufactured by the Wright Wire Co., Worcester, Mass., is shipped in compact rolls of from 75 to 100-lbs. each, in 2-ft. and 4-ft. widths.

Adlake Flat Flame Long-Time Burner.

The Adams & Westlake Co., Chicago, makers of a non-sweating balanced draft type of signal lamps and long time burners for switch and semaphore signal lamps, have recently placed on the market an improved long-time burner, No. 51, which is shown in the accompanying cut. This burner, which has a flat flame, was designed to meet a demand for a lamp, the flame of which would give a greater diffusion to the rays than the round flame burner, which has been in general use. The spread of the flame is approximately $\frac{5}{8}$-in. and is said to be of an intense whiteness. Very satisfactory results are obtained, and the increased oil consumption due to the larger flame is not sufficient to cause any trouble in handling the lamps under established practices.



Adlake Flat Flame Long-Time Burner.

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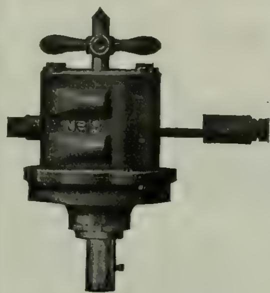

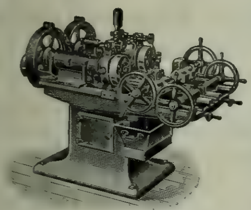

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CONTENTS

The New York State Public Service Commission, in refusing to grant a "certificate of public convenience" to promoters of the Buffalo, Rochester & Eastern Railway, to parallel the New York Central from Lake Erie to the Hudson river, has done a notable public service. The commission justifies its existence. The opinion, said to be a long one, is not yet made public, but the commission has issued a summary of its 19 findings or reasons for refusal. The first six of these findings pertain strictly to that function of the commission which is intended to conserve the interests of the investors in railway bonds and stocks. The commission thinks the road would not pay. The findings numbered seven to ten are that the eastern connections, supposedly the Boston & Maine, have insufficient facilities for taking care of additional traffic. Findings 11 and 12 indicate that the western lake and rail connections do not have a capacity for supplying more traffic than the existing New York lines are capable of handling. Findings 13 to 15 are that the new proposition does not offer cheaper transportation, offers only slight additional facilities for local business and is not so located as to appreciably increase traffic. Findings 16 to 18 consist of a rather emphatic endorsement of the New York Central's representation as to the quality and quantity of its existing facilities, tracks and terminals and their present and prospective increases. Finding No. 19, to the effect that the financial ability of the applicant, the Buffalo, Rochester & Eastern, is inadequate, is final and suggestive: "There are more than a dozen reasons why I don't want that horse of yours; in the first place, I haven't any money." "You needn't bother about giving the other dozen reasons; they don't interest me," said the seller.

"Resolved, That this Association appreciates the educational value of the exhibition of railway appliances at the Coliseum, and the high standard upon which the exhibition was organized and conducted."

This formal expression, made in the closing session of the tenth annual convention of the American Railway Engineering and Maintenance of Way Association, was deserved and sums up the value to railway officers, especially those in the engineering departments, of the splendid exhibition made by the Road and Track Supply Association in the Coliseum, Chicago, last week. From a few small tables of models crowded into a compact mass in the Auditorium Hotel, this annual display of railway appliances suddenly blossomed into a world's fair of track and signal appliances, covering more than 35,000 square feet, excluding the aisles. The doubt about the probable attendance of members of the American Railway Engineering and Maintenance of Way Association was dispelled on the opening day. And the visitors were not confined to the members and guests of that association. Presidents and railway officers from every department, and from nearby and distant points, took advantage of the invitations sent them to visit the Coliseum. The exhibition was successful from every standpoint and is destined to be a permanent feature and an addition to the splendid work of this important association. We again express the hope that a way may be found to hold the meetings and the exhibition under one roof.

A STUDY OF RAILWAY "MONOPOLY."

The annual report for 1908 of the Railway Commission of Massachusetts just come to hand contains two groups of figures which happen this year to be of exceptional interest though unlikely to attract instant attention. They are the two tables which show the average rate per ton-mile for freight and the average passenger fare per mile on the three prominent railway systems of New England—the Boston & Albany, the Boston & Maine, and the New York, New Haven & Hartford. The special significance this year rests on the fact that ere long the last two systems will probably be united in form as they are already, in many respects, united in fact. Opposition to the control of the Boston & Maine by the New Haven's large purchase of shares undoubtedly continues in Massachusetts. But it is evidently waning, if for no other reason because of that "tired feeling" which affects both parties to a contest long drawn out. The event of merging the two systems will come very likely within a few months, and when it comes there will be an end of any comparison in the state railway commission reports of figures for freights and fares on the two roads. An interesting railway situation in New England will end, albeit a still more interesting one will be ushered in.

During the last few years we have referred a number of times to a territorial status of the railways of New England which make that region of six small but highly populated states unique. But the situation may be briefly restated. In the south is well nigh complete railway monopoly represented by the New Haven system intensified and conserved by boat line and trolley ownership. In northern New England is the Boston & Maine without boat line ownership, holding but a single trolley line and its territorial occupancy somewhat less than that of the New Haven. It stands for qualified monopoly. Between lies the Boston & Albany, which is no monopoly at all. We have thus in New England, in an intensive railway traffic region, monopoly, qualified monopoly and non-monopoly so closely related that

they may be studied on the same screen; and the best test of their threefold outworking in the direction of public necessity and convenience is, undoubtedly, the variation *downward* of freight rates and passenger fares through a considerable period of time. In a campaign of the kind there are, undoubtedly, some elements that cannot be computed. There have been readjustments of rates as new lines have been absorbed, new freight classifications and—in the case of passengers—uncertain coefficients represented, for example, by commutation and excursion business. But some of these elements are constants or nearly so, others tend to offset each other and they leave a residuum for comparison at once suggestive and fair after one or two of the more important variables have been pointed out and allowed for. The tables for three decades and the year 1908 follow:

Railways.	Average freight rate per ton-mile. 1880.	1890.	1900.	1908.	Average passenger fare per mile. 1880.	1890.	1900.	1908.
	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.
Boston & Albany	1.21	1.11	0.82	0.87	2.09	1.86	1.75	1.77
Boston & Maine	2.56	1.76	1.44	1.04	2.14	1.83	1.73	1.71
N. Y., N. H. & Hart.	2.41	2.07	1.45	1.42	1.92	1.73	1.78	1.59

In the Boston & Albany return for freight rate the absolutely low rate due to its large volume of low class through freight from the west must be noticed as well as the drop in the last entry of the Boston & Maine rate due to absorption several years ago (1901) of the Fitchburg line, a "through" line toward the west which before its absorption was carrying freight at the low rate of eight-tenths of a cent per ton-mile. Its merger in 1901 dropped the general freight rate of the Boston & Maine from 1.44 cents to 1.13 cents, a difference of 0.31 cents, which would imply say 1.35 cents in 1908 instead of 1.04 cents, the actual return. It seems fair to let such a change stand. Reduced to percentages the variation downward for 28 years becomes then for the Boston & Albany 28.1 per cent.; for the Boston & Maine 47.3 per cent. and for the New Haven 41.1 per cent. For passengers the corresponding figures are: Boston & Albany, 15.3 per cent.; Boston & Maine, 20.1 per cent., and New Haven, 17.2 per cent. The New Haven "monopoly" thus stands midway in passenger fares between qualified monopoly and non-monopoly, and far ahead of the latter in reduction of freight rates; and would, very likely, be ahead of the Boston & Maine in passenger fares reduced if the recent reduction to two cents a mile on its whole system were fully in the computation. Its absolute low passenger rate far below both monopoly and qualified monopoly will also be noticed.

But a fairer test is a comparison of the year 1908 with 1896, when, by its control of the New York & New England lines, the New Haven all but rounded out its railway monopoly of the southern New England region. For average freight rate per ton-mile the figures are:

	1896.	1908.
Boston & Albany	0.94 cts.	0.87 cts.
Boston & Maine	1.53 "	1.04 "
N. Y., N. H. & Hartford	1.57 "	1.42 "

While in average passenger fare per mile the following is the comparison:

	1896.	1908.
Boston & Albany	1.75 cts.	1.77 cts.
Boston & Maine	1.79 "	1.71 "
N. Y., N. H. & Hartford	1.76 "	1.59 "

Stated in percentages the freight rate variation downwards is for the Boston & Albany 7.4 per cent.; Boston & Maine 11.8 per cent., allowing for the Fitchburg merger; and for the New Haven 9.6 per cent. Corresponding figures for the passenger fares are Boston & Albany 1.1 per cent. *increase;* Boston & Maine 4.5 per cent. decrease, and New Haven 9.7 per cent. decrease, which would probably be considerably more with just allowance for the New Haven's two cents a mile reduction, while the much lower New Haven absolute rate is still conspicuous.

It is to be noted also that in New England we have the spectacle of a monopoly which has reduced rates voluntarily, both freight and passenger; and the passenger reductions were made against the filed protests of both qualified monopoly and non-monopoly; and we may add in passing that both were later compelled to lower rates themselves.

In a broad generality based upon the foregoing returns, perhaps the last of the kind that will be available in New England we see that railway monopoly, measured by the test of public service as expressed in reduction of rates, comes out somewhat ahead of qualified monopoly and a good deal ahead of non-monopoly. Were quality of public service and maintenance of plant considered, "monopoly" represented by the New Haven would undoubtedly be still further in advance. It is the more striking as the New Haven has had all but dominant influence over legislation in Connecticut and Rhode Island, and has developed along the lines of its elastic Connecticut charter. Consolidation followed by more efficient operation together with the potency of "monopoly" as a form of popular outcry are probably the prime factors in official returns which can hardly be reckoned harbingers of woe—in a local New England sense—when the New Haven, in full control of the Boston & Maine, acquires the railway overlordship of six states. What that domination may mean for railway systems outside of New England is another matter.

ELECTRIFICATION OF RAILWAY SYSTEMS.

The meeting of the New York Railroad Club for March was the annual electrical meeting and was marked by the increased moderation in the claims of the representatives of the new form of power. This tendency has been noted before, and it is a curious coincidence that as the electrical engineer's seat in the saddle becomes more secure he becomes less insistently dominant in his claims for the all pervading reliability of the electric locomotive and motor. We do not hear nearly as much of the rapid disappearance and relegation to the scrap heap of the steam locomotive, as we did ten years ago, and, while there is no apparent diminution in the dream of complete electrification, it seems now to have been set back into the dim and indefinite future.

As usual on these evenings the speaking was done exclusively by the electrical engineers, and it appears, from a general resumé of what was said, that there is a pretty thorough disagreement among the doctors themselves as to the exact remedy to be given to the railway in order that its operation should be put upon the most economical basis of operation. There are strong advocates of each of the five systems that are in use: The low-tension direct-current; the high-tension direct-current; the single-phase; the three-phase, and the independent electro-gasolene or other motor. It is probable that each has its own peculiar field in which it can outclass any of its competitors, but with this reservation it seems to be pretty generally agreed that for long distance, heavy transmission railway work there must be a high voltage on the line; and, as one speaker put it, high voltage means 10,000 or more. Beyond this we are still in a state of uncertainty. With a fairly definite agreement as to what might be best for any specific case, we are far from being able to render a decision as to what course is best to pursue for a general scheme of electrification involving a wide extension. Probably it might almost be said at once that this would involve the use of the alternating-current in some form. In fact, the discussion referred to was marked by an absolute lack of any advocacy whatever for the low-tension direct-current system that is in use on the New York Central. It was absolutely ignored as far as trunk line or long distance work was concerned and the fight was waged between the advocates of the single-phase and three-phase systems; a conflict that involved some pretty flat contradictions and the development of some heat in the argument, with the direct-current men simply as on-lookers. The only speaker on this system contented himself with a brief resumé of the train delays that had been caused by the various elements of the system on the New York Central. These showed a high de-

gree of efficiency and were evidences of a satisfactory performance. Beyond this there were occasional references to the greater hauling power of the direct-current locomotives, weight for weight, as compared with the single-phase. Some vague attempts were made to explain this away on the ground that these direct-current locomotives were used only on very short runs, while the single-phase locomotives, running into the same terminal, were intended for a long haul. This, however, was an explanation that did not satisfactorily explain.

If it be conceded, as it seemed to be, that the alternating-current, in some form must be used for long distance work, then the dispute is narrowed to that between the advocates of the single-phase and the three-phase systems.

In the review of the struggle with the difficulties on the New Haven, that was published in the *Railroad Age Gazette* on January 1, it appears that the serious obstacles to regular operation have been pretty well cleared away, and the single-phase system may be regarded as having been proved efficient for the work. But, there still remains the light tractive power of the locomotives as compared with the three-phase which gives the latter an advantage, whereas a handicap is, at the same time, imposed by the necessity of limiting speed by the use of a constant speed motor.

Each side points to its own achievements as indicative of its future triumph. In this country the three-phase is about to receive its first application for heavy work in the electrification of the grades on the Great Northern. Abroad it has been used somewhat extensively though not exclusively. The two most notable instances are those of the Valtellina line in Italy and that of the Simplon tunnel. It will be recalled that the Simplon tunnel line was undertaken some time ago under a guarantee by the builders and has only recently been turned over to the Swiss government. In this the three-phase locomotives are worked with a voltage of 3,000 and develop, when running at the standard speed of 45 miles an hour, about 650 horse-power. This voltage (about 3,000) appears to be the maximum under which the three-phase locomotive can be worked and is a consequent disadvantage because of the necessity of using a step down transformer.

Over against the Simplon installation comes the recent decision of the Midi of France to use the single-phase for all of its developments, and this after a careful inspection of all of the installations of Europe. So, while confessedly there is a wide and even bitter difference of opinion among electrical engineers on the subject, and the final outcome is still uncertain, it looks as though the consensus of opinion was moving towards the single-phase as the final solution of the problem of long distance or trunk line electrification.

The matter of the cost of operating heavy traffic electric lines was not touched upon at all, in the meeting in question; probably because cost everywhere continues high. But, in a communication addressed to the Massachusetts Railroad Commission last October, Mr. Mellen, of the New Haven, stated that "we are not prepared to state there is any economy in the substitution of electrical traction for steam, but on the contrary we believe the expense to be very much greater." Still, this increase of expense was justified by a previous statement that "our electrical installation is a success from the standpoint of handling the business in question efficiently, and with reasonable satisfaction, and we believe we have arrived at a point where we can truthfully say that the interruptions to our service are no greater, nor more frequent at the present time than it was when steam was in use." This is merely a public utterance of what everybody suspects, but which no one, not even the operating officials, is, as yet, in a position to finally prove or disprove.

Among the details brought out at the New York discussion, not the least important was that of the greater efficiency of the electric locomotive as compared with the steam because of the necessity of losing so much time with the latter for cleaning and roundhouse work. It was estimated that the work could be done with 64 per cent. of the number of steam locomotives required, if electricity were to be used; and, in corroboration of this the mileage of the New Haven locomotives was cited. This was put at 210 miles a day. The use of the steel auxiliary running wire was given as an instance of a great improvement in construction, that had made all the difference between success and a partial failure on the New Haven.

Again, while high voltage transmission was granted as a necessity to economical operation, it was suggested that it would be best to use low voltage generators and then step up for transmission over the line.

Standards were touched upon by nearly every speaker, and were urged as of value to a limited extent. That is to say, it was thought that it would be well to standardize the location of the third rail, the height of the over-head wire, the number of cycles to be used with the alternating-current, and a few other matters that have really already worked themselves out into what is essentially standard practice. But, for the great mass of electrical and mechanical details, it is better to keep hands off for a time as the final outcome is still too indefinite as to details, and there is too much uncertainty as to what constitutes and will hereafter constitute the best practice.

It appears, therefore, that the electrical engineer feels quite sure that he is capable of solving any problem that may be presented, but does not yet feel sure that he has the best solution that can be obtained. He is no longer predicting the speedy demise of the steam locomotive, but feels sure that the end will come eventually. He looks upon the alternating high-tension current as the solution of long-distance traffic; thinks that the single-phase offers the greatest prospects of success, but recognizes that great improvements must be made in the motors so that weight can be reduced and hauling efficiency thereby increased so as to reduce what is now the excessive first cost of the locomotives required for the work.

THE DECISION IN THE MISSOURI RATE CASE.

The Missouri rate case tells simply the old, old story. An epidemic of anti-railway agitation swept over the country. It became the fashion to reduce freight and passenger rates. The members of the Missouri legislature hadn't the slightest idea of what profit, if any, the railways in that state were making. But most of them felt sure that, whatever the roads were making, it was too much. The rest reflected that rate laws were being passed in other states, and probably it would cost them votes for re-election to oppose such legislation in their state. So, without any inquiry into the conditions and properties to which they were to be applied, a maximum freight rate bill and a 2-cent fare bill, to make big slashes in railway earnings, were passed with a "whoop." Few thought, and few cared, either in the legislature or in the constituencies, whether this was fair to the owners of the railways. They said that Mr. Hill, Mr. Gould, the Messrs. Moore, and the handful of other gentlemen who are reputed to own the roads were rich and "could stand it"—which is what a footpad might reflect after relieving Mr. Hill or Mr. Gould of his watch. The railways, strangely enough, did not relish being thus hazed and robbed. They appealed to the federal court. The court made the investigation of the value, the expenses and the earnings of the roads that ought to have been made by experts before the legislature ever seriously considered the passage of the rate laws. The investigation showed that the rates fixed were entirely unremunerative; and there was nothing for the court to do but nullify them.

The result shows—similar results in similar cases had shown a score of times and will show again—that a policy of railway regulation that is shaped entirely by the prejudice and quackery of those who regard with suspicion all corporations; by the

malice of those who have been injured, or think they have been injured, by railways; by the demagoguery of office-seekers; by the covetousness of travelers and shippers; and by the combined ignorance of the public about railway matters, will, in the long run, be ineffectual except to burden the calendars and the time of the courts, to increase the difficulty of bringing about proper relations between the carriers and the public, to hinder the development of transportation facilities, and to increase the probability of government ownership of railways, with its attendant incurable evils. The decision may, of course, be reversed by the Supreme Court of the United States. But that seems improbable. Repeatedly the Supreme Court has nullified state rate laws, because, having been passed without investigation or regard to fairness, they were found to be confiscatory. Every such decision is a warning to Congress, state legislatures, railway commissions and the public, that the regulattion of railways, in order to be constitutional and effective, must be intelligent and fair; and fair and intelligent regulating can be done only by unprejudiced bodies of experts, such as are to be found in not over a half-dozen states in the Union. It takes a long time to teach and learn a lesson so plain, and simple, and just.

Judge McPherson's decision probably means that practically all the freight and passenger rate legislation passed in the West in the past two and a half years will be set aside. But it does not establish any new principles. Counsel for the railways argued very persuasively that the Missouri laws were unconstitutional, not only because they were confiscatory, but also because they interfered with interstate commerce. The case was a good one in which to urge this point. Owing to the presence of such basing points as St. Louis and Hannibal on the Mississippi river, the state's eastern boundary, and Kansas City and St. Joseph on the Missouri river, its western boundary, and the competitive relations between the lines serving these cities, and also between these lines and the lines serving the cities on the eastern and western boundaries of Iowa, the state rates in Missouri, whether fixed by the railways, the legislature or the state commission, absolutely determine the interstate rates on commodities moving in, out of and through Missouri and the states north and south of it. But Judge McPherson refused to hold that rates fixed by state authority which would pull down interstate rates interfered unconstitutionally with interstate commerce. "The sole theory," he said, "on which rates are adjudged void can only be that the rates are not compensatory." There are many good lawyers who think that the Supreme Court of the United States will hold differently if a case is ever presented to it attacking rates made by state authority solely on the ground that they interfere with interstate commerce. It said in its decision in the Minnesota rate case last year that "the question, at any rate, is not frivolous."

One of the most interesting and important parts of Judge McPherson's opinion is that in which he discusses and specifies the percentage of return on its value which he thinks a railway is constitutionally entitled to earn. He holds that a "railway property, properly built and properly managed, should, over and above expenses, make a return of 6 per cent. per annum," basing his ruling chiefly on the recent decision of the Supreme Court of the United States in the Consolidated Gas Company case. Is it a logical inference, from the ruling that the Consolidated Gas Company is entitled to 6 per cent., that this is all to which a railway in Missouri is entitled? Capital is scarcer, the demand for it stronger and the rate of interest higher in Missouri than in New York. The difference in conditions is recognized by the interest laws of the two states. The maximum rate of interest for which anyone may legally contract in New York is 6 per cent.; in Missouri, 8 per cent. If a public service corporation is entitled to a minimum of 6 per cent. in New York it would seem that a public service corporation in less developed parts of the country, where business conditions are less stable, should be entitled to the opportunity to earn more than that amount.

The court evidently meant that 6 per cent. is the minimum *average* annual return to which a railway may constitutionally be restricted by public authority. It may be allowed, from motives of public policy, to earn more; but it cannot constitutionally be limited to less. A railway is quite a different kind of concern from a gas company. A railway's earnings fluctuate much more violently in transitions from good to bad, and from bad to good times, than a gas company's; and if a railway is entitled to an *average* of 6 or 8 per cent. per annum, it is obvious that it must be allowed to earn more than that much in the fat years in order to average that much in both the fat and the lean years—unless, indeed, the states and nation are prepared to make good its deficits in bad times from the public purse.

There is another important difference between steam railways and municipal public service corporations such as the Consolidated Gas Company. A water, or gas, or light, or telephone, or traction company in a city usually has a partial or complete monopoly of its business. But every steam railway meets competition at many points; and the lowest rate on any line between any points, whether made by its own management or by public authority, is the highest rate than any other road can get between those points. Now, if it be judicially established that *every* railway is entitled to earn at least 6 per cent. per annum on its value; and any one or more of a number of competing roads cannot earn that much on the basis of existing rates; does it not follow that all the competing roads are legally entitled to raise their rates until the weakest can make 6 per cent. even though the stronger lines be thereby enabled to earn more—perhaps much more—than 6 per cent.?

While Judge McPherson held the laws in question unconstitutional, he also, on the same evidence, expressed the view that a 3-cent passenger rate on the weak lines and a 2½-cent rate on the strong lines would be reasonable and fair. The very data that Judge McPherson cites in his opinion shows that on all of the weak lines and on many of the strong ones a 2½-cent fare would be insufficient to yield the 6 per cent. return to which he held that a railway is entitled. Nevertheless, there was at first a strong sentiment among the officers of the Missouri lines in favor of readjustment of passenger fares on the basis that the court suggested. When, however, Governor Hadley and Attorney-General Major, instead of indicating a willingness to negotiate with a view to reaching some basis of compromise, issued statements that they would carry the case to the highest court, the railway men who had favored a 2½-cent rate decided that the position of the roads in the ensuing fight would be strengthened by the restoration of the 3-cent rate everywhere. This outcome will be mainly due to the uncompromising attitude of the state, and we have no doubt that if the roads were officially assured that the establishment by them of a 2½-cent rate on the main lines of travel would end the litigation and create a more favorable public sentiment toward them, the lower rate would promptly be adopted.

Letters to the Editor.

BUSINESS-LIKE CO-OPERATION BY EMPLOYEES.

Owosso, Mich., March 15, 1909.

To the Editor of the Railroad Age Gazette:

I have read in the *Railroad Age Gazette* of February 26 the very interesting article on the matter of Railroad Brotherhood and Discipline, of which Mr. Cairncross, a conductor of the Gulf, Colorado & Santa Fe, is author. The subject is one of great importance in the operation of trains, and one which should receive broad consideration from both brotherhood and railway officers.

Mr. Cairncross says that in his long experience with brother-

hoods he has never heard discussed in the lodge room the matter of remedies for accidents and protection to company property. It will interest your readers to know that union meetings are being held by employees of the Ann Arbor Railroad, once each month, for the purpose of discussing accidents, rules and other matters pertaining to the best interests of the company. I attach a copy of a circular letter issued to all employees, for the meeting held February 14, which will show the subjects discussed and give an idea of the feeling of interest and loyalty of the men.

At these meetings there are members of all departments: enginemen, trainmen, yardmen, section-men, despatchers, agents and operators. The meetings are conducted according to parliamentary usages. Each employee is given an opportunity to bring up any matter of interest for discussion, and proposals are placed in the hands of a committee for recommendations to the head of the department.

At the meeting February 14 the general superintendent, superintendent, superintendent of motive power, chief despatcher, traveling engineer and general shop foremen were also in attendance, and a letter from the vice-president and general manager to the general superintendent was read. I take the liberty of enclosing a copy of it. The kind expressions and encouragement in this letter made the meeting one of unusual interest, and the men manifested renewed enthusiasm. They were made to feel that their loyalty in this direction was appreciated. Only when loyalty is thus recognized can the best results be accomplished.

The interest manifested in these meetings is such that they are of material benefit to the service. Unquestionably the men are brought closer together; they reach a better understanding of the rules and discipline. They come closer to the officers and thus open up the secrets of minor irregularities, the correction of which prevents larger ones.

When employees thus show their loyalty they command the highest respect, and no officer should hesitate in extending his hand and making them feel that they are welcome. He should interest himself to make their positions as pleasant as conditions will permit. When the men realize that he does that, the best results must follow.

Transportation officers and subordinates should also bear in mind that we are virtually in a mercantile business and must not lose sight of our obligations to the public. We manufacture transportation; our traffic departments are our salesmen; if we do not place a good quality of transportation on the market our salesmen cannot dispose of it. Under these conditions we should strive to make our goods the highest standard; be courteous to our patrons; make our deliveries promptly and in good order, and above all exercise eternal vigilance in delivering our cargoes of humanity to their destination in safety.

K. A. GOHRING,
Superintendent Ann Arbor Railroad Co.

[*Extract from Circular.*]

A union meeting of employees, representing the several departments of the service, will be held in Owosso on Sunday, February 14th, at 2 p. m., in the Engineers' Hall. One of the topics for discussion at this meeting will be: "In the interests of the company and the employees, how can we raise the standard of efficiency?" Employees unable to attend may send suggestions to H. O. Smith, Yard Master, Owosso. We request the co-operation of train despatchers, agents, operators and track foremen. . . . We ask the hearty co-operation of each department, one with the other. Each is a spoke in the wheel of progress, moving to a higher and better plane. This is a duty we owe to the company, the public, ourselves and our families.

(Signed) Geo. Pulcipher, B. of L. E.; A. T. Stotenbur, O. R. C.; Roy Bates, O. R. T.; L. Hayden, B. of R. T.; V. Almendinger, B. of L. F.

[*Extracts from Vice-President's Letter to General Superintendent.*]

. . . When you realize the antagonistic feeling that has existed, and does exist, between employers and employees on some roads, you can well feel proud of the invitation from the employees. It has the ring of loyalty. Loyalty covers a great number of short-comings. This letter shows that the employees are anxious and even hungry for a better feeling between the employer and the employee.

I have always been a believer in labor organizations, from the time I was a member myself, provided they are conservatively handled, and the railway labor organizations of to-day are handled by conservative and brainy men. There is no reason why the representatives of the railways should not extend their hands to the members of these organizations who are in their service, and work in unison with them, doing all they can for their comfort. We all know that railway life is hard at its best, and I know from experience that if these men that are laboring day and night for the success of the company, have the feeling that their work is appreciated by the officials over them, you can rest assured that they will respond and show their appreciation of it by good and efficient work.

Encourage meetings of this kind, and try to bring about closer relations. We are all employees, whatever may be the position we occupy, and we are all working for one common cause. The employer has no reason to feel himself above the men in the ranks. To make a perfect piece of machinery, there are a great many parts required; each part no matter how small has its own function to perform, and should receive due consideration.

GEO. K. LOWELL.

Contributed Papers.

RECIPROCAL DEMURRAGE.*

BY F. O. MELCHER,
General Manager, Chicago, Rock Island & Pacific.

The main objections to the bill itself, as such, may be outlined as follows:

1. We find in several different places, without systematic arrangement, instructions governing the placing, loading and forwarding of cars; being the initial steps in transportation process. Such an arrangement is confusing, incomplete and difficult of comprehension to the men who will be obliged to be instructed in this matter, in case this bill should become a law.

2. Section 3 requires the railway to deliver empty cars of the kind, size and capacity ordered, without the necessity of specifying the commodity to be forwarded. The bill should not contain this provision, but should simply require the railway to furnish cars for the commodities offered, and the railway should be advised of the nature and amount of the commodity, as well as be given full shipping instructions. The railway must not be restricted to the class of equipment which the shipper may desire for the movement of commodities; otherwise there will be an extravagant and uneconomical handling of equipment, and we cannot conserve the car supply, which is so necessary.

3. There should be some evidence of good faith in the ordering of cars for commodities to be forwarded. According to the terms of this bill, the railway could be required to furnish any number of cars, without any obligation on the part of the shipper to load the same. If such a bill is passed, it should contain a provision requiring a deposit of a portion or all of the freight charges by the person ordering the equipment, in order to prevent shippers from ordering cars, which they do not intend to load, for the purpose of securing to themselves the available equipment, to the detriment of some other person or interest.

4. There should be a provision which would make it clear that the railway will have a lien on the contents of the car in case the consignor or the consignee refuses to pay the demurrage charges accruing under the provisions of the bill.

5. If any restrictions are to be placed upon the time the railways will have to furnish cars, they should be reasonable restrictions that we can reasonably expect to observe. As an example: A greater time should be allowed to supply five cars than to supply one car, and the railways must, at all times, have sufficient time to supply special equipment that is not ordinarily available.

6. If restrictions governing the rate per day at which cars shall move after being loaded are incorporated they should relieve the roads from penalties in the event of emer-

*A memorandum submitted to the Railroad Committee of the Iowa Senate opposing the adoption of a reciprocal demurrage bill now pending before the Iowa Legislature.

gencies over which they have no control. There should be, in addition to the time permitted at junction and division points, further additional time allowed where carload or less-than-carload freight has ordinarily to be transferred.

7. Section 2 specifying the notice to be given to consignees, should provide additional time, or some arrangement to govern reconsigned freight, and should stipulate definitely when such notice may be considered as having been delivered.

8. Section 3 requires the railway to place loaded cars at accessible places for unloading, as directed by the consignee. This is objectionable, inasmuch as it may be impossible for the procedure indicated to be carried out. The opinions of the road's agent and the consignee may differ as to whether or not the place specified is accessible. The bill should not restrict the railway in the placing of its cars for unloading.

9. Section 3 provides additional free time, which is objectionable because it still further restricts the flexibility of the car supply as indicated before.

10. Section 4 allows additional free time for releasing cars of more than 60,000 lbs. capacity. This is extremely objectionable, inasmuch as it results in the same restriction of the car supply as indicated before.

The foregoing indicates, in some detail, the principal objections to the bill. The following *fundamental objections* to the passage of such bill should be considered, rather than any question of the efficiency of the various sections forming such bill:

The act under consideration purports to "prevent delays in the transportation and delivery by railways of freight." This object cannot be accomplished by legislation, and if the value of the bill is dependent upon accomplishing this purpose, then it is useless and a failure, and a burden on the commercial and transportation interests.

If the various bills passed by the states, individually, had any merit, the Rock Island Railroad would have discovered it before this. The Rock Island operates in fourteen states, and of these fourteen states nine have enacted so-called reciprocal demurrage laws. In these nine states you will not find any testimony by an intelligent person to show that laws of this character have prevented delays, or accelerated the movement of freight. You can readily imagine a road operating under fourteen sets of laws; what would be legal in one state would be illegal in another, although the conditions might be the same. A car moving from Chicago to Kansas City might find itself violating one law in Illinois, and suddenly find itself restored to a legal status in Iowa, and again discover that it is costing the railway company money, in the shape of fines and penalties, in Missouri.

The provisions of these bills cannot apply to interstate commerce, and therefore must constitute a discrimination against interstate commerce, in that no penalty exists for failure to furnish cars for interstate business or to forward them at a certain rate per day when employed in such traffic. Railways that sought to avoid the penalties of such enactments could reasonably supply cars for local or state traffic, at a greater expense, making a lesser number of miles per day, and permit interstate shipments to remain at shipping and receiving points, awaiting disposition, in order to care for state traffic. This discrimination would be detrimental to transportation interests.

If the railways sought to avoid penalties, they would send their cars to states where the penalties are greatest, in order to be relieved of the burdens of those states, and thus discriminate in favor of one state, as against another, and disturb the equity of car distribution, which is so essential to transportation success.

Therefore, the principal trouble in bills of this character is that they are not uniform. Demurrage bills, if they are necessary, must be uniform for all states, and apply alike to all traffic. If there is no uniform system governing all states and all railways, there must be discrimination in favor of certain individuals or states, and thus the way is easily opened for a legalized system of rebating.

Such enactments must be flexible enough to accommodate the great pressure of unusual transportation demand, which at times occurs.

The so-called "car shortage" started the agitation that led up to the introduction of these bills, coupled, in some cases, with the selfish interests of some communities which sought to enforce advantages.

The passing of a law cannot stop a car shortage any more than it can stop an epidemic. Car shortages occur in times of extreme pressure on transportation facilities, caused by an abnormal and rapidly changing commercial condition. The remedy is in improved facilities. Terminal facilities are required of sufficient capacity to assemble the freight that can be transported over a line of railway. The merchant must improve his facilities and be able to release the cars promptly. If the railway is furnishing cars of 80,000 lbs. capacity, the merchant must be prepared to take care of these cars in the same time as he formerly took care of a car of but 40,000 lbs. capacity. Railways seek to increase the efficiency of their equipment by purchasing equipment of improved design. Take the case of drop bottom or hopper bottom coal cars, which are designed to discharge their loads by gravity. Instead of spending a day and $4 in unloading 40 tons of coal, it should be unloaded in five minutes at scarcely appreciable cost, if the merchant handling the coal provides the proper facilities for so doing. When the railways are furnishing the cars the merchants must furnish the facilities.

By restricting the use of cars as warehouses and places of storage is the only way we can get the benefit of our increased transportation equipment. The railway company needs no greater incentive to furnish cars, and to move them promptly, than that of enjoying the increased earnings resulting from such efficient operation.

To penalize a railway for failing *to do something does not remove the disability* that makes it *impossible* for the railway *to do that for which it has been penalized.*

Take into consideration, please, that the railways, in order to meet the demands in flush times, have spent millions of dollars, and now have on hand 300,000 idle cars. Can your bill make these cars produce earnings? Why in times of car plenty is it necessary to apply penalties and still further burden the railways, when such penalties cannot be effective or of assistance in times of car shortage?

The bill under consideration contemplates that the originating road can be called upon to furnish any number of cars for any place, regardless of destination, within a short day of twenty-four hours, or pay a dollar a day for each car for failure so to do. Is it fair that the originating road be penalized for failure to furnish cars to load off its own rails? Will this action increase our car supply? Will this relieve congestion? Will this tend to conserve the car supply of the country? If the railways stand the penalty the people will have to carry the burden in the shape of increased freight charges, because the losses of an unprofitable transportation business must be finally assumed by the community.

This bill, in the opinion of experts, opens the door for the greatest legalized system of rebating that ever existed. You can appreciate that very little collusion between large shippers and officers of railways would permit, for example, the large elevators to get an unfair advantage over the smaller ones, and would result in defeating the purpose of the laws of the national government that place the shippers on an equal basis with regard to rates and facilities. Do not pass a bill that will bring back the rebates.

The necessity for uniformity in these matters appears to be recognized by the appointment of a sub-committee of the Committee on Car Service and Demurrage of the National Association of Railroad Commissioners, to formulate a uniform code of demurrage rules. This committee consists of five men,

with Franklin K. Lane, of the Interstate Commerce Commission as chairman, and will be aided by the expert advice of some of the more prominent car service managers. This committee, I understand, is to meet at Washington on April 2, and we are advised that it desires co-operation on the part of practical railway men. In its preliminary report it very wisely states that the rules must be framed "with a view not to securing free storage time for shippers, but to securing the largest possible use of railway equipment as a means of transportation" (in the United States). I hope your committee will consider this report very carefully.

The report I speak of further states that "public interest requires . . . that freight carriers should serve all shippers alike, no matter in what state such shippers may be located, and no matter whether such shippers are engaged in state commerce or interstate commerce. There is no dividend interest, and any rule or arrangement which makes a conflict in interest will be compelled to yield."

In these closing sentences are contained the strongest arguments against the passage of this bill.

THE APPROACHING TRANSFER OF THE ELECTRIFICATION PROBLEM.*

BY WM. M'CLELLAN, PH.D.

It has been very interesting to watch the assaults of the electrical engineer on the transportation problem, and his gradual approach to the final task—the supplanting of the steam locomotive. The street railway problem was solved years ago; then came the heavier elevated and subway applications; finally a certain amount of steam road electrification became necessary. Perhaps the opportunity would not have presented itself yet, had it not been for legislation in response to public clamor for relief from smoke and accidents in tunnels.

The electrical man approached this last important undertaking with supreme confidence, based on his past successes, so that under the stress of enthusiasm there was considerable prophecy of quick and extraordinary results. All difficulties were not foreseen, however, and in the working out temporary setbacks were recorded. Nevertheless, enthusiasm supported by patience and energy prevailed to bring success. This success is not final—will not be for years—but the thing is done. Train service can be handled reliably and economically by electric power. Proof of this is close at hand in the magnificent successes of the New York Central and the New Haven installations, both of which are now operating with most satisfactory reliability, and so far as we can learn, with pleasing economy.

As a result, the electrification problem is practically ready to be transferred to the field of the railway engineer. Hereafter the question will never be "Can I?" but must be "Shall I?"

Of course, it is not to be understood that the electrical engineer may drop all conection with the work. He will be just as necessary as a mechanical engineer is at present. But if he is an electrical engineer and nothing more, his sole function will be the perfection of details and methods. The real problem will be solved by the men who have both a thorough knowledge of railroading and of the possibilities of electric traction. Such men can be derived from the two heretofore distinct electric and railway fields, and the process is started. For some time numerous electrical engineers have been acquiring an accurate and profound knowledge of railroading and vice versa.

One can conceive of conditions, which, if they had prevailed, would have called for nothing more than an extension of modern subway and elevated practice. But these conditions did not obtain in the work to be done. Through trains, and other traffic, requiring interchange of motive power demanded the development of large electric locomotives. This feature marked the departure from all previous experience and was looked upon as the only uncertain element. As a consequence much attention and study was put on the locomotive with most satisfactory results. In one great terminal electrification it was the only part of the work which was not an enlargement or further development in details of what had been more or less standard for some time in subway and elevated work.

The system used for heavy transportation work up to the beginning of steam railway electrification had been the 600-volt, direct-current third-rail system. This system has been used so extensively that it has become standard in many of its details and could be made wholly so in all essential purposes, if proper means were used. But study of the electrification problem showed that there were some disadvantages in this system which would prevent it answering all requirements. Men began to look to other systems which perhaps would be more advantageous. As a result of this study and development, the railway engineer in taking up this problem is confronted with no less than five different systems, any one of which would probably do the work reliably, and with more or less economy and would be financially practicable. These systems are:

(1) The 600-volt direct-current third-rail system.

(2) The 1,200-volt (or higher) direct-current third-rail, or trolley system.

(3) The high voltage alternating current single phase system.

(4) The high voltage alternating current three-phase system.

(5) Various gasoline electric cars, and gasoline car systems.

A careful study of all these systems from both the technical and the financial standpoints will show that each has its own advantages under certain particular conditions. Congestion of traffic, limitations of space, number and kinds of grade, physical characteristic of the country, danger to public, etc., all bring about this singularity of advantage. For this reason, it may be stated very positively that no electrical engineer who comes to the matter with an unbiased mind is willing to advocate any one system as the only system to be used. Even those men who have greatest faith in one system find themselves compelled to counsel the use of other systems when warranted by circumstances of a problem at hand. This difficulty of selection has been in evidence in every important decision that has been made. The last important decision of this sort was made after the elaborate installations of the New York Central and the New Haven roads were available for study in a practical way, but in addition a large number of special experiments were thought necessary, all of which proved that the decision was far from easy.

There are a number of engineers who suggest disposing of all difficulties by simply deciding each specific case, whether large or small, according to its own conditions. If it be a terminal, a tunnel, a heavy grade, or what not—simply put in the system which is best adapted at the time. This would seem to be a short-sighted policy, and only justified if other action is found impracticable. Electrification does start in spots, but it will not end with these, and the question of extension is likely to arise very quickly. We know now that electrification is not a luxury which will be used under favorable circumstances, but is a system of transportation which is gradually bound to do a large amount of work now done by steam.

The fact is, we are not electrifying terminals, tunnels, grades, etc., but must electrify whole systems, and this point should be kept in the mind in all decisions. Electrification means investment of millions, partly in direct outlay, partly by losses due to interruption during installation, and partly

*A paper read at the New York Railroad Club March 19.

due to amortization of apparatus. It is of the utmost importance therefore to get started right, even if the work is only for a very small portion of the whole road. There is no problem before engineers in the railway world to-day which requires more broad-minded attention and consideration than steam railway electrification.

It is natural that the point of getting started right should appeal most strongly to the directors and other officials of railways who must finally accept the responsibility for spending the large amount of money necessary. These men think of whole roads and even systems. They see clearly not only the disadvantages of getting started wrong, but also the great advantage of starting right. For example, the present standard gage in use to-day has as its chief advantage the fact that it is standard. All engineers wish that a view far enough into the future had been possible in the early days so as to show the great advantages of a wider gage. It is not sufficient therefore to show that various systems can be installed more or less satisfactorily. The whole matter will be counted as experimental by broad-minded men, and will not command real backing on its merits until there is a practical unanimity among technical men as to what simple or composite system is generally applicable to all work.

A composite system would be undesirable, but it may be necessary. At one time the combination of apparatus for both direct and alternating current on one locomotive seemed formidable, but only a few days ago the speaker made several trips on a New Haven locomotive where this is done, and the change from one power to the other was simplicity itself—a push of a button or two on the controller. Nevertheless, it is probable that it is a case of simplicity being a result of careful design and eternal vigilance in operation.

Assuming, therefore, that it is desirable to settle at the earliest possible date just what electrical system will be most suitable for steam railway electrification in general, it becomes necessary to determine what conditions such a system must satisfy in order to be acceptable, and then to attempt to find means by which the adoption of this system may be secured.

It is evident, first of all, that if trunk line electrification is ever to be accomplished *it will be done by means of a high voltage system. By this we mean a voltage of ten thousand or more.* Arguments on this point have been presented, so that it is useless to introduce them here. It may be stated, however, that this conclusion is based chiefly on cost. We are considering, of course, freight and passenger traffic, local and through service, branch and main lines; in other words, a whole system. It does not take a great deal of consideration to show how difficult it would be to handle the whole traffic of the Pennsylvania Railroad between New York and Pittsburgh with anything but a high voltage system.

The necessity for high voltage will be all the more obvious when it is recognized that a fundamental requirement for complete electrification will be the ability to transmit enormous amounts of power to shifting locations, dependent upon accidental congestions of traffic. There may be times when a large part of the total generating capacity may be required at a place for a short time only. It is idle to lay out the transmission or contact system for any predetermined train service. The railway engineer can now mass his motive power to suit his convenience, and he will not be satisfied with less under electrification. It should be a fundamental maxim that no feature of electrification design should hamper or restrict railway operation proper.

Secondly, the system must be adaptable to all sorts of conditions. High voltage requires a certain amount of space, and perhaps would not be available in places where the space was insufficient, such as tunnels, subways, etc. Moreover, as years go on railway trains, particularly local ones, will undoubtedly run more into the streets of cities, above or below them, instead of stopping at terminal stations. It will probably be a long time before permission could be obtained or 11,000 volts could be used safely in the streets of a city. Therefore, if the same equipment is to be used, it will be necessary to have a lower voltage. This, of course, can be most easily and effectively done by means of alternating current, though the present working of the New Haven system in the Grand Central terminal shows that it is possible with direct current. The simplicity of the control apparatus, however, with the alternating system would make it more attractive than the use of both kinds of current. Moreover, in a long system there might be various tunnels, bridges and towns where the voltage would have to be lowered for a short distance and where the installation of direct current for that particular small portion of the road might be very expensive.

The simplicity of the alternating current system under these circumstances is obvious, when it is remembered how easily high tension taps could be placed on the auto transformer for varying trolley voltages. No changes would be necessary in low tension taps and group switches. The various sections of the line would be separated by section breaks of necessity. An automatic device could easily be arranged by which the transformer would always be set for the highest line voltage whenever a section break was struck, after which the motorman could throw in the proper tap which also could be easily protected from a mistake on his part.

An overhead trolley necessarily follows if a high voltage system is used, and, as noted above, a third rail or overhead trolley with direct or alternating current for low voltage where necessary.

We shall say nothing about cost here, because it is assumed that any system otherwise available will stand the financial test both in first cost and in operation.

The early standardization of details of electrification is almost equally important with the adoption of a general system. It must be acknowledged, however, that great care must be exercised in attempting anything along this line. If we standardize too soon we run the serious risk of adopting inferior methods and faulty design. We also may commit the greater error of stifling progress for a time and restricting the normal development of the art. On the other hand, we have too many examples of methods and arrangements adapted carelessly at the beginning of an art through inattention allowed to grow into standards. We suddenly find a much-to-be-desired change practically impossible.

To avoid this the whole matter should be placed in the hands of committees of the great national societies, just as all other matters requiring standardization. We have too many fine examples of proper action by these committees to need any discussion as to how conservative they should be. No one need fear that a committee from the American Institute of Electrical Engineers acting jointly with committees from the Master Mechanics' and Maintenance of Way associations would give hasty or insufficiently considered decisions.

It will now be well to note those parts of electrification which are most fundamental and therefore most in need of standardization. By fundamental we mean those features which would involve great interruption of service and enormous expense if they had to be changed later, and also all features which are involved in the interchange of equipment by different divisions or roads. Some of the features mentioned have become almost standard by usage.

(1) Location and type of third rail and shoe.

(2) Location of overhead contact conductor.

(3) Side and top clearances.

(4) Location of end couplings.

This includes sockets for lighting and heating bus, power bus and train line. Hose couplings have standard location now.

(5) Low voltage for direct and alternating current on third rail and overhead contact line.

(6) High voltage for overhead contact line.

(7) Frequency of alternating current.

EXPERIMENTAL VERIFICATION OF ARCH FORMULAS.

BY MALVERD A. HOWE.

Formulas based upon the elastic theory have been universally accepted as applicable to solid arch ribs composed of iron or steel, and, by those familiar with the theory and the behavior of materials under stress, the formulas have been accepted as applicable to stone and concrete arches.

The only attempt to verify by experiment, on a large scale, the accuracy of the formulas, was made some fifteen years ago by the Austrian Society of Engineers and Architects. The results were published in 1895, in 131 folio pages and 27 plates. The verification consisted in the comparison of the computed and measured movements of various points upon the arches under various loadings and then in loading the arches until failure took place. The results were quite satisfactory in all cases.

The object of the experiments described below was to verify the results obtained from using the writer's summation formulas for the fixed arch as applied to ribs of reinforced concrete. These formulas are for the determination of H the horizontal thrust, M the bending moment at the support, and V the vertical reaction at the support. (In the experiments only vertical loads were considered. The formulas can be used for any loading.)

Fig. 2—Plumb Line and Microscope Used in Adjustment of Arch.

As a direct verification of the formulas was desired, it was decided to actually weigh the values of H, M and V at one end of a fixed arch.

The problem to be solved, then, consisted of building an arch with one end absolutely fixed and the other so arranged that at all times three conditions should be satisfied under all loadings. The three conditions being: (a) the span to remain unchanged in length, (b) the elevation of the support to remain constant, and (c) the tangent to the arch axis at the support to have a constant direction.

In order to actually weigh H, M and V, one end of the arch, evidently, had to be supported free of the usual abutment. To do this and satisfy the three conditions stated above seemed almost impossible, in fact the writer was told that it could not be done, yet it was done and the results obtained are *very satisfactory* when the difficulties encountered are considered.

The arch rib constructed for these experiments was of reinforced concrete. The axis was segmental with a span of 20 ft. and a rise of 2 ft. The depth at the crown was 8 in. and at the abutments 16 in. The reinforcement consisted of eight ¼-in. old style Johnson bars, four being 1¼ in. from the introdos and four 1¼ in. from the extrodos. The rib was 12 in. wide throughout.

The concrete was composed of one part of Alpha Portland cement and four parts of bank gravel. About 10 per cent. of the gravel remained on a No. 1 sieve and about 50 per cent. passed a No. 8 sieve (eight meshes to the inch).

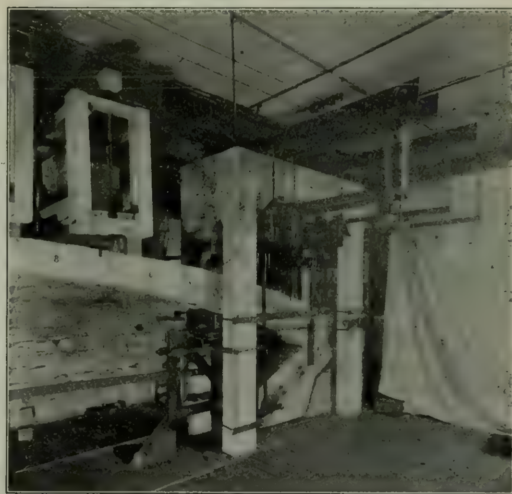

Fig. 3—Weighing Apparatus South End of Arch.

The weighing levers are seen at the right, suspended from beams. The first is No. 4, the next No. 3, and so on.

The concrete was mixed to the consistency of thick cream and the entire rib cast in a continuous operation.

The arch, its abutments and all weighing apparatus were supported on a concrete T beam composed of one part of Wabash Portland cement and six parts of bank gravel.

The arch was located in a transept, in the civil engineering laboratory of the Rose Polytechnic Institute, between two heavy stone walls running north and south. The north end of the arch was fixed by heavily reinforcing the concrete abutment and by eight ⅞-in. rods securely anchored in the masonry walls mentioned above. A steel pin $1\frac{7}{8}$ in. in diameter marks the end of the span. In order to check the immovability of this abutment one end of this pin was provided with "cross wires" on an enameled surface and by means of a powerful microscope, supported from the T-beam foundation, the end of this pin was found to be fixed under all conditions of loading.

At the south end (see Figure 3) a $1\frac{7}{16}$-in. steel pin was placed in a similar position between the arch and the mass

of concrete used for attaching the weighing apparatus. This mass was called the "head," for lack of a better name. The "head" was heavily reinforced with steel and so shaped that the center of gravity was directly below the center of the steel pin.

The weighing apparatus was supported from a reinforced framework carried by the T-beam foundation. Four distinct weighing systems were constructed, three weighing vertical loads and one the horizontal thrust. The vertical systems were attached to the steel pins by loop eyes extending to equalizing bars. The horizontal weighing device contained a bell crank so counterweighed that it floated when there was no horizontal stress. All systems contained turnbuckles for adjustment.

The arch span was divided into 20 equal parts and the loads applied on platforms resting upon two adjacent points of division.

Suppose no external load on the arch, and let levers 1 and 3 be brought into action by the turnbuckles and also lever 4. The turnbuckles being turned enough to insure that the "head" hangs perfectly free of the abutment. The weighing levers may now be balanced and the weights recorded. Let any external load be placed upon the arch, then in order that the difference between the weights recorded and the new weights shall represent the true values for a the added load. For example: For the empty arch, suppose lever 1 shows 1,025 lbs. and lever 3 shows 1,569 lbs. Let some load be applied and suppose lever 1 now shows 1,481 lbs. and lever 3, 2,046 lbs. 1,481 — 1,025 = 456 lbs. and 2,046 — 1,569 = 477. Then 456 + 477 = 933 lbs. = V, or the vertical reaction produced by the added load.

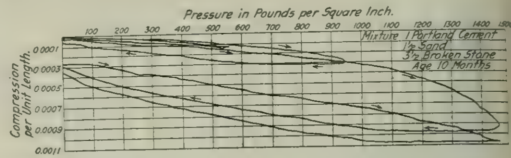

Fig. 4—Autographic Stress Strain Diagram Showing "Lag" —Concrete Block 6 in. x 6 in. x 9 in.

Since weighing systems 1 and 3 are each 2 ft. from the axis pin and 4 ft. apart,

(477 — 456) 2 = (21) 2 = 42 = M for the added load.

In other words, it requires a moment of 42 lbs. ft. to bring the "head" back to its first position.

That this moment produces tension in the upper fibers is evident since lever 3 has the greater weight. This corresponds to a negative moment. These results can be correct

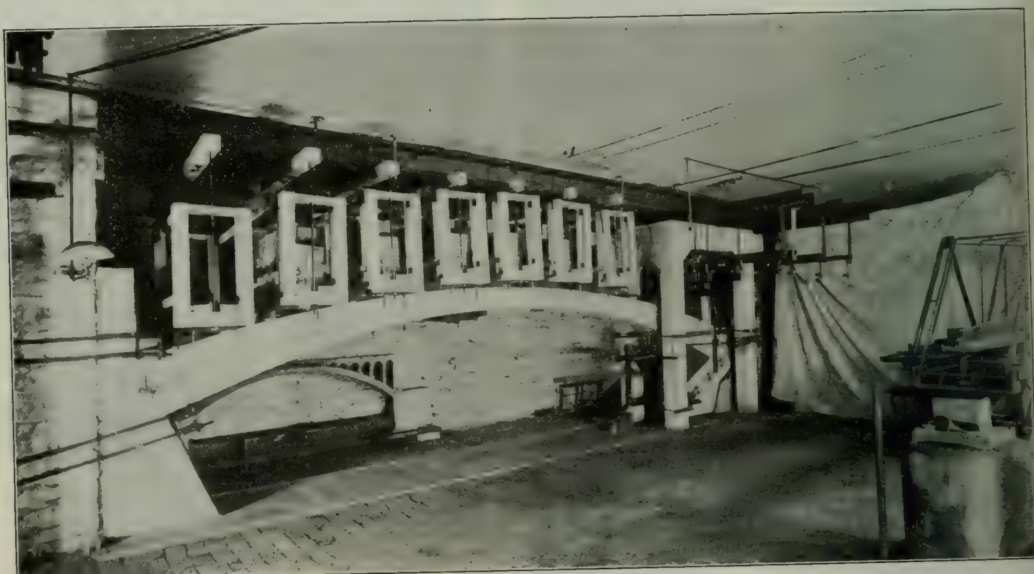

Fig. 5—Experimental Arch.

fixed arch, it is necessary to bring the "head" back to its first position and also be sure that the span and elevation of the arch axis at this support are the same as before.

The angular position of the "head" was fixed by means of a plumb line suspended from an upright attached rigidly to the "head" (Fig. 2). The weight at the lower end of the line was about two-thirds submerged in oil. As low down as possible, and attached to the "head," was a microscope opposite the plumb line. By means of turnbuckles in systems 1 and 3, this line and the cross wires in the microscope were kept in the same relative positions and consequently the tangent to the axis at this end was also in a constant position. Manipulating the turnbuckles in systems 1 and 3 to keep the plumb line in its proper place, changes the relative weights of 1 and 3, and hence we can determine the moment produced by only when the span and the "elevation of the support" remain unchanged.

The elevation of the support and length of span was fixed by a microscope reading to $^1/_{10000}$ in., placed about opposite the south axis pin and carried by a steel bar clamped to the upright posts of the frame supporting the weighing devices (Figure 3). From the upper surface of the "head" an arm was brought, holding a glass with cross lines about opposite the center of the axis pin (Fig. 3). When the arch was empty the cross lines on the glass and the wires in the microscope were brought into some position readily recognized. When the additional load was added this position was maintained by manipulating the turnbuckles.

This adjustment and the plumb line adjustment were necessarily performed in conjunction, for both adjustments were

required in order to fulfill the requirements for a fixed arch.

As a very slight twist of the "head" would throw the microscopes out of focus, this was prevented by four roller bearings upon the two sides of the "head," the bearing against the head being that of a steel sphere, 1 in. in diameter (Figs. 2 and 3).

Two series of experiments were made, one in which the values of H, M and V were weighed for isolated loads on points 3 and 4, 5 and 6, 7 and 8, 9 and 10, 9' and 10' and 8' and 7'

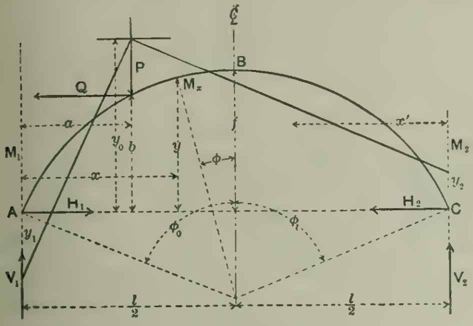

Fig. 6—Experimental Arch.

respectively, and the other for loads on points 3 to 4, 3—6, 3—8, etc.

In both cases the method of procedure was as follows: Arbitrary values of H, M and V were set on the weighing levers with the arch empty and the two microscopes adjusted to fix

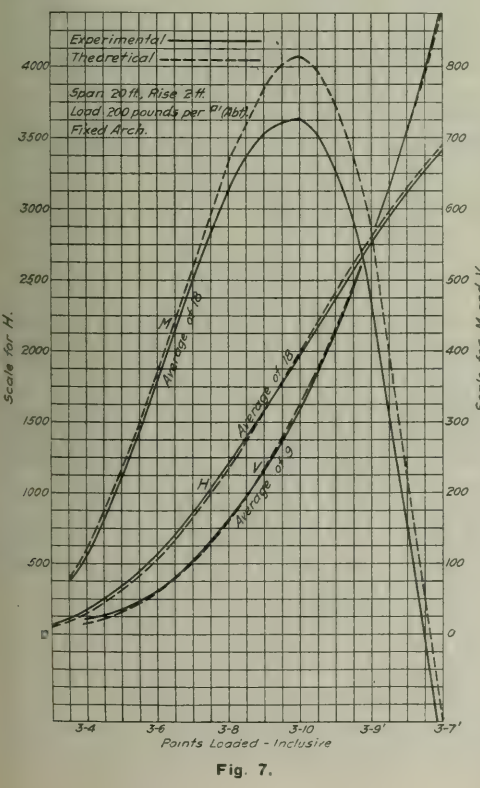

Fig. 7.

the span, elevation and tangent, also at the north end the microscope was set to detect any movement of the north pin. (This was used only occasionally, as no movement could be detected.) Then the loads were applied, and by means of the turnbuckles in weighing system 4, the span was brought to its original position. Next, by means of the turnbuckles in systems 1 and 3, the plumb line was brought back to its first position. Then the elevation was corrected. The last adjustments would usually change the span slightly and the same routine was followed again and again until all three adjustments were as nearly perfect as possible. It was found that *about right* would not answer, but that each adjustment had to be as nearly correct as it was possible to make it. Even after long practice the men assigned to the microscopes could not make two consecutive settings so nearly the same that a difference would not show upon the weighing levers. The weighing levers were sensitive to less than 5 lbs. under any loading used, which was more sensitive than the method employed for fixing the span, elevation and tangent. This was clearly shown by attempting to use a very sensitive level in

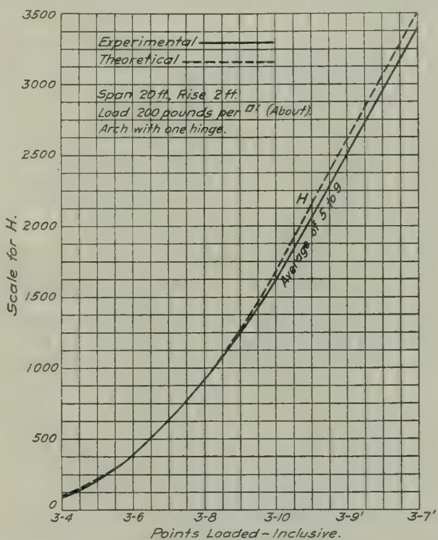

Fig. 8.

place of the plumb line. The bubble would "stick" enough under the slight change required to seriously affect the results.

Another explanation of the inability of getting two consecutive results, for the same loading, to agree was the lag in the adjustment of the arch material itself—or hysteresis.

If a block of concrete be tested in compression and an autographic stress strain curve drawn it will be made up of a series of loops if the load is alternately applied and released, the size of each loop depending to some extent upon the time element (Fig. 4). The time required for the loop curve under a decreasing load to return to zero under no load is quite long and apparently in some cases the zero is never reached —that is, the molecules have a new arrangement and the specimen has what appears to be a permanent set.

This effect appeared in all the arch experiments and was complicated by the fact that different portions of the arch were under stresses of different intensities.

It was impossible to wait long enough between weighings to permit the lag to catch up, so to speak, on account of the non-feasibility of keeping the temperature of the room constant for long intervals. The time element was ignored and the result showed that no harmful effects followed.

To illustrate this lag, the following log of one run of weighings is given:

Log of One Run.

Points loaded.	Lever 1, lbs.	Lever 3, lbs.	Lever 4, lbs.	Remarks.
Empty.	1.180	1.380	2.263	Temp. 69¾ deg. F.
3-4	1.195	1.390	2.389	
3-6	1,304	1.323	2.835	
3-8	1.423	1.308	3.471	
3-10	1,515	1,385	4.225	
3-9 ft.	1,501	1.550	5.070	
3-7 "	1.607	1,855	5,740	
3-9 "	1,610	1,537	5.104	
3-10	1.560	1.338	4.320	
3-8	1,464	1,265	3,596	
3-6	1.313	1,321	2.889	
3-4	1.242	1,341	2,519	
Empty.	1,194	1,367	2,309	Temp. 69½ deg. F.

It is noticed that, for the arch empty, at the end of the run the weight on lever 1 is 14 lbs. larger than at the beginning, and that on lever 3 the weight is 13 lbs. smaller, making the total vertical reactions agree within one pound. This readjustment of the weights is more or less true for all observations. In the case of lever 4, which weighs the horizontal pull, the first and last reading differ by 36 lbs., a discrepancy slightly greater than 1 per cent.

*The formulas used in computing the values of H. M and V are as follows:

$$H_1 = \frac{\Sigma\, m_x \Delta \left(y - \frac{\Sigma\, y \Delta}{\Sigma\, \Delta}\right)}{\Sigma\, y \Delta \left(y - \frac{\Sigma\, y \Delta}{\Sigma\, \Delta}\right)}$$

$$H_a = H_1 \left\{ 1 - \frac{\Sigma\, y \Delta \left(y - \frac{\Sigma\, y \Delta}{\Sigma\, \Delta}\right)}{\Sigma\, y \Delta \left(y - \frac{\Sigma\, y \Delta}{\Sigma\, \Delta}\right) + \Sigma \frac{(\delta x)^2}{F_x \delta s}} \right\}$$

True:

$$H = H_1 - H_a$$

Where

$H_1 =$ the horizontal thrust neglecting the effect of the axial thrust.

$H_a =$ the horizontal thrust due to the axial thrust.

$H =$ the true horizontal thrust.

$m_x =$ the common moment for the given loading on a simple beam supported at the ends, or

$m_x = R - \Sigma P (x - a)\ x > a.$

$\Delta = \frac{\delta s}{I}$ where $I =$ moment of inertia of cross section.

$\delta s = \delta x \div \cos \varphi$ and $\delta x = \frac{1}{20}$ span.

$F_x =$ area of cross section.

$\Sigma =$ summation between A and C.

Other nomenclature is evident from Fig. 6.

The value of H_1 was first computed for each load, and then the value of H_a, which is simply a constant percentage of H_1 regardless of the loading and its position. Of course, this last statement is not absolutely true, but very nearly so. The true value of H can now be found by percentage. In this particular case the true H is only about 76 per cent. the common H which is used by a great many in every day practice. As pointed out by the writer in his Treatise on Arches, the effect of the axial thrust should not be neglected when flat arches are used. The comparison of the results obtained from the above formulas and by experiment, show in Fig. 7, is a very conclusive verification of this statement.

For the bending moment at the south end:

$$M = H \frac{\Sigma\, y \Delta}{\Sigma\, \Delta} - \frac{\Sigma\, m_x \Delta \left(x - \frac{\Sigma\, x^2 \Delta}{\Sigma\, x \Delta}\right)}{\Sigma\, \Delta \left(\frac{l}{2} - \frac{\Sigma\, x^2 \Delta}{\Sigma\, x \Delta}\right)}$$

and for the vertical reaction at the south end:

$$V = \frac{M_1 - M}{l} + (R = \text{common reaction}).$$

$M_1 =$ moment at north end of arch.

Symmetrical Masonry Arches, by Malverd A. Howe. John Wiley & Sons New York.

The comparative values of M are shown in Fig. 7.

The agreement between the theoretical and experimental values is not as close as for the values of H. The maximum discrepancy amounts to an "error" in the weights on beams 1 and 3 of +25 and —25 lbs., respectively, which corresponds to an exceedingly small movement of the "head."

The values of V, shown in Fig. 7, are in close agreement as might be expected.

These experiments show that the summation formulas can be depended upon to give the correct values of H, M and V for reinforced concrete arches, provided, however, that the conditions upon which the formulas are based are fulfilled by the structure as built. A very slight change at the support does seriously affect the values of H and M. This is according to theory and experiment and probably partially explains why so many concrete and stone bridges show cracks, especially where abutments are founded on piles.

As a matter of curiosity a set of readings was made, considering the arch as fixed at the north end and *hinged* at the south end. The results are shown in Fig. 8. The maximum discrepancy is small, but not as small as found for the fixed arch. This is undoubtedly due to the slight rotation of the point selected as limiting the length of the span. The only point which could be correctly employed would be one opposite the center of the south axis pin. A mark on the end of this pin could not be used, as it deflected different amounts according to the pulls of levers 2 and 4. The glass plate used for the fixed arch was set approximately opposite the center of the pin, with the arch empty, and used in all experiments. If this was not exactly right it would change its position slightly as the "head" changed its position by rotating around the pin.

The arch and all weighing apparatus was constructed by Messrs. W. W. Kelley, E. J. Miner, W. R. Plew and R. A. Strecker, members of the class of 1907. These gentlemen also made a series of experiments, which were not considered satisfactory and owing to lack of time, they were unable to locate the errors. The work was continued by Messrs. C. B. Andrews and P. G. Lindeman, members of the class of 1908. They were able to eliminate a number of errors and, finally, when their time was about up, they were able to obtain satisfactory results.

The writer is greatly indebted to all of these gentlemen for their hard and conscientious work throughout the time at their disposal.

UNIT COST OF CONCRETE BUILDINGS.

It has been a common method to estimate the approximate cost of a building by either the square foot of floor or the cubic foot of space enclosed. In a recent paper, Leonard C. Wason, President of the Aberthaw Construction Company, Boston, Mass., presents numerous comparative costs obtained through his own experience and states as his conclusion that "after making this comparison he is convinced that neither method is accurate enough to put much reliance on, but that the square foot method is a little safer than the other." Four of the tables from his paper are presented herewith. In each case the total cost includes masonry and carpentry work without interior finish or decorating, plumbing and heating. The effort has been made to put the buildings upon a comparative basis as regards the amount of work done on each.

The first table consists of the total cost of actual contracts executed. The second table consists of bona fide bids on complete buildings on which Mr. Wason's company were not the lowest bidders, but where the difference was not as a rule very great. The third and fourth tables are bona fide bids on work by another contractor whose experience was similar to that of Mr. Wason's. As a rule, cubic foot measurements are given in cents only, seldom being carried to any closer subdivision. In reference to Table 4 on second class buildings, it

will be noted that for the largest building a variation of one cent per cu. ft. amounts to over twenty-eight thousand dollars, while the smallest one in the list amounts to only a little over fifty-four hundred dollars. Again, on the last three items, the cu. ft. price is practically identical, while the corresponding square foot measurements vary by more than 100 per cent. with no easily apparent reason in the design.

In Table 3 another discrepancy is noticed. In the first and the last items, the highest and lowest per cu. ft. as well as per sq. ft. are on office buildings of similar types which were within one mile of each other where there is no apparent reason for such discrepancy in the design or difficulty of access in the erection of the building. It is recommended by Mr. Wason that very little reliance be placed upon this class of estimates.

TABLE No. 1.—*Cost of Fireproof Completed Contracts.*

Kind of building.	Job cost.	Volume, cu. ft.	Floor area, sq. ft.	Unit cost— Cu. ft.	Sq. ft.
Offices and stores...	$181,194	1,365,830	90,474	$0.133	$2.00
Offices and stores...	61,646	496,780	39,840	.124	1.545
Factory	12,774	112,440	7,519	.114	1.70
"	44,652	746.674	49,543	.060	.902
"	39,830	312,000	24,960	.127	1.60
Garage	10,436	156,198	10,806	.085	1.23
Filter	19,993	149,250	19,208	.134	1.04
Fire station	6,757	44,265	2,982	.153	2.26
Observatory	3,625	9,734	657	.373	5.45
Filter	20.076	59.991	5,243	.333	3.82
Highest				.333	3.82
Lowest				.060	.90
Average				.138	1.72

TABLE No. 2.—*Cost of Fireproof Complete Buildings.*

Kind of building.	Job cost.	Volume, cu. ft.	Floor area, sq. ft.	Unit cost— Cu. ft.	Sq. ft.
Storehouse	$141,755	1,714,448	168,696	$0.0827	$0.84
Hospital	60,800	703,692	57,654	.0865	1.05
Office building	61,646	496,780	39,840	.124	1.545
Cold storage	200,051	1,535,000	154,000	.13	1.30
Factory	19,292	212,400	15,000	.091	1.28
Factory	141,529	1,327,868	106,022	.107	1.335
Storehouse	76,796	1,140,000	146,000	.0685	.575
Manufacturing bldg..	91,377	1,380,500	90,240	.067	1.01
Office	136,880	693,840	56.552	.197	2.42
Factory	13.064	105,600	8,800	.124	1.485
"	75.604	1,211,364	74,604	.0625	1.01
"	23.332	180,000	16,394	.129	1.42
Highest				.197	2.42
Lowest				.0625	.575
Average				.1088	1 27

TABLE No. 3.—*Cost of Fireproof Buildings.*

Kind of building.	Job cost.	Volume, cu. ft.	Floor area, sq. ft.	Unit cost— Cu. ft.	Sq. ft.
Office building	$70,690	441,000	35,854	$0.159	$1.97
Cold storage	132,365	1,016,400	101,640	.13	1.30
Hospital	44,451	348,320	34,832	.127	1.27
Hospital	51,574	414,732	29,838	.124	1,73
Bank	65,580	533,750	....	.123	....
Masonic	180,197	1,479,456	....	.122	....
Warehouse	31,280	259,700	24,500	.120	1.28
Garage	59,105	497,420	....	.118	....
Warehouse	275,723	2,597,000	212,000	.106	1.30
Hotel	220,646	2,116,106	....	.104	....
Hospital	49,724	485,789	38,247	.100	1.30
Office	25,151	264,687	....	.095	....
Cold storage	82,711	909,240	66,745	.091	1.24
Club	43,586	513.808	....	.085	....
Office	60,003	501,575	67,400	.084	1.12
Highest				.159	1.97
Lowest				.084	1.12
Average				.113	1.39
5 variation high and low, per cent........				53.8	57.0

TABLE No. 4.—*Cost of Mill Construction or Second Class Building.*

Kind of building.	Job cost.	Volume, cu. ft.	Floor area, sq. ft.	Unit cost— Cu. ft.	Sq. ft.
Mill	$66,516	544,788	44,172	$0.122	$1.51
Warehouse	337,000	2,808,850	....	.12	....
Mill	113,288	1,271,300	129,920	.0891	.875
Storehouse	101,098	1,714,448	168,696	.059	.60
Mill	90,703	1,622,128	152,200	.056	.60
"	72,048	1,331,200	83,200	.054	.865
"	85,754	1,752,609	81,500	.048	1.05
"	122,128	2,641,000	98,059	.046	1.25
"	94,341	2,036,731	174,000	.046	.542
"	129,405	2,867,535	157,730	.045	.82
Highest				.122	1.51
Lowest				.045	.542
Average				.069	.90

FOREIGN RAILWAY NOTES.

The railway from Singapore, India, to Penang, opening up a valuable rubber district, has been finished.

The French have completed their railway from the east coast of Madagascar inland to Tananarivo, the seat of government, a distance of 181 miles. It is of metre gage and has cost $19,500,000.

The Universal Supply Co. and the Siemens-Schuckert Co. are urging the building of an electric railway between Cologne, Germany, and Dusseldorf, about 25 miles. These equipment companies offer to finance and build the road if the cities will not furnish the money.

There is talk of advancing the passenger fares on the Swiss railways during the three summer months, when the country is full of travelers from other countries. It is argued that most of the visitors who would be kept away by the higher fares then would still visit the country earlier or later, when the hotel charges are reduced as well as, by this scheme, the fares. But Switzerland is a small country, and the cost of travel in it, even at high rates, is not great. The cost of getting to it is a much more serious matter.

COMPARATIVE COST OF FUEL OIL MOTOR CAR AND STEAM LOCOMOTIVE SERVICE ON ROCK ISLAND.

During the months of November and December, 1908, and January, 1909, the Chicago, Rock Island & Pacific used, on its Salina branch, a motor car which was built by the American Locomotive Company. The run from Herington, Kan., to Salina is 49 miles. The motor car was operated 47 days during these three months, making a total mileage of 4,975 miles. The average cost of operation per mile in November was 15 cents; in December 18.5 cents and in January 20.4 cents.

In January the motor car was in service five days and the service for the balance of the month, 26 days, was performed by a steam locomotive and train, making a total mileage of 2,548 miles, and the average cost per mile was 17.31 cents. The train was made up of one combination car and one coach, the two having a total weight of 60 tons. The locomotive was an 8-wheel engine with cylinders 18 in. x 24 in. and drivers 64 in., weight on drivers 54,400 lbs., weight of engine 89,000 lbs., weight of engine and tender, 80 tons, and the weight of engine and train, 140 tons.

The motor car was illustrated in the *Railroad Age Gazette* September 18, 1908, page 961. The total weight of the car is 100,000 lbs.; weight on drivers, 32,400 lbs., the cylinders are compound, 9¼ in. and 14½ in. x 12 in. stroke. The boiler is of the return tubular type with working pressure 250 lbs. Its total heating surface is 624 sq. ft. and it is furnished with a superheater. The maximum power of the engine is 250 h.p. The car is 55 ft. 9 in. long. It has engine and baggage compartments and a seating capacity for 40 passengers. Much of the time the motor hauled the coach as a trailer and the total weight was then 130 tons, but the oil consumption was not materially increased over that of the motor car alone.

The table below gives in detail the items making up the cost per mile of the motor car performing 20 days' service in November, 1908, when it made a total mileage of 2,325 miles, compared with the locomotive and train which performed 26 days' service in January, 1909, and made a mileage of 2,548 miles.

	Average cost per mile.— Motor car. 20 days. Nov., 1908.	Loco. and train. 26 days. January, 1909.
Fuel oil	3.35 cts.	5.64 cts.*
Wages, enginemen	3.15 "	6.80 " †
Wages, conductor	2.15 "	2.48 "
Running repairs	4.13 "	0.51 "
Cleaning	0.96 "	0.57 "
Roundhouse service	0.62 "	0.57 "
Miscellaneous supplies......	0.56 "	0.56 "
Oil and waste	0.21 "	0.18 "
Total	15.13 cts.	17.31 cts.

*Coal.
†Fireman included.

It is now intended to further experiment with the motor car on a short stub run of 5 miles with frequent service between Atchison and Rushville.

INDIANAPOLIS-TERRE HAUTE DOUBLE TRACK OF THE BIG FOUR.

During the past three years the Cleveland, Cincinnati, Chicago & St. Louis has been rebuilding its St. Louis division between Indianapolis, Ind., and Terre Haute. The work involved the conversion of a single track, heavy grade line into a double track, low grade railway, fully equipped with all modern facilities, permanent structures and a track superstructure of sufficient weight to meet the requirements of the heaviest existing class of traffic and equipment. In addition to the second track work, the ruling gradient was reduced from 1 per cent. to 0.4 per cent., with a material reduction in curvature and in rise and fall.

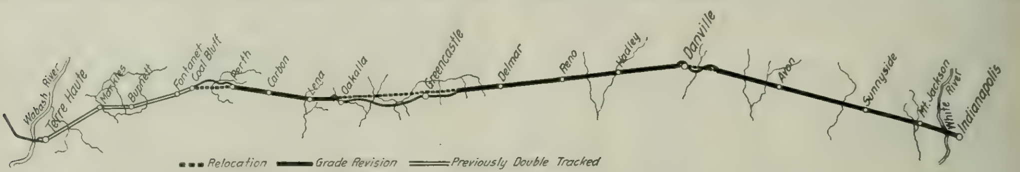

Fig. 1—St. Louis Division Reconstruction; Big Four.

Going westwardly from Indianapolis, the old single track line traversed a rolling country and, because of the relatively heavy maximum gradient, was much broken, there being many summits and sags. The alinement was, in general, excellent, there being only three points where curvature was detrimental. These were the crossings of White Lick creek, near Danville, Ind., and the Little Walnut and Big Walnut creeks, in the vicinity of Greencastle and near Perth, respectively. From the latter point, the old line followed a contour location, passing down the valley of Otter creek to the Wabash bottoms. At Danville a relocation of 2.7 miles long was made, the old track being crossed twice within a mile and 39 deg. of curvature eliminated. At Greencastle a relocation 11.1 miles long, involving the elimination of 518 deg. of curvature and crossing the old main track once, was adopted. The greatest departure from the old line was opposite the small station of Oakalla, where the new and old locations were a mile apart. Near Perth, where the old line followed the contour location up the valley of Otter creek, a double curve was eliminated by heavy cuttings and embankments. Except at the points mentioned, the new track was built adjacent to the old right-of-way, but owing to the modification in grade line not a single foot of the original roadbed was left undisturbed.

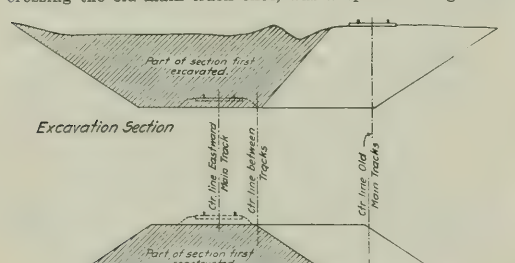

Fig. 2—Typical Cross Sections, Showing Method of Making Offset Location.

To accomplish the grade reduction and double tracking with minimum disturbance to the heavy traffic on the existing line, the method of "offset" location was adopted, as with the Cairo division work described Feb. 26. This offset location was laid as close to the old main track as possible in order to minimize the need for additional right-of-way, improvements adjacent to the original right-of-way making land very costly in some localities; and also in order to utilize, so far as possible, the original cuttings and embankments, thus minimizing the earth work. The new grade line intersected vertically the grade of the old track 35 times, and at no place had the same direction, the maximum differences in elevation being about 30 ft. in cuttings and 22 ft. in embankments. In addition to this, because of errors in the original location, numerous "swings" existed in the old track, and the elimination of these irregularities in alinement necessitated crossing the old track eight times with the offset location, the offset distance varying from zero to 68 ft. Thus, the new double track cross-section partially overlapped, and in some places completely covered, the old track section in embankments, and partially or entirely absorbed it in the cuttings, depending on the offset distance. The general method followed in the location was to adjust the offset distance to the difference in grade in such a manner that a part of the new section, wide enough to support one new main track, could be built without encroaching upon the existing track. A typical cross-section (Fig. 2) illustrates this method.

Upon the completion of track superstructure over any one

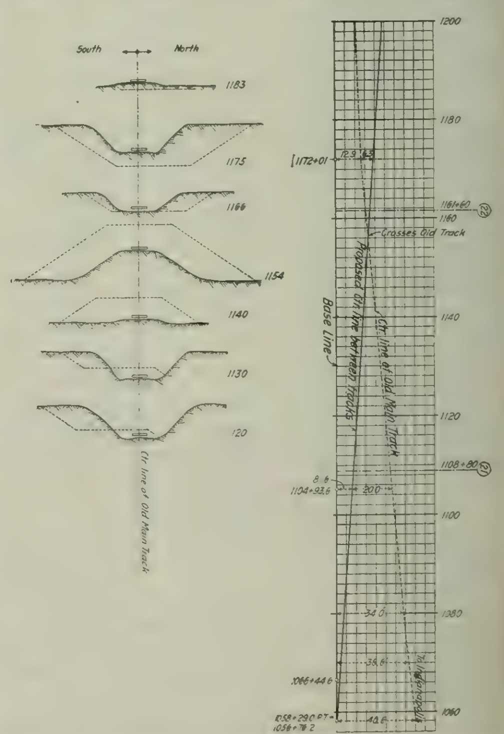

Fig. 3—Method of Locating New Tangent from Base Line.

stretch of embankment or excavation, or in some cases both, the old track was connected to the new track at points where the grades were coincident, and the new track was operated as a part of the old single track line. In some cases it was deemed advisable to throw the operated main to a temporary location to give more room for the new section, or to widen slightly the new section on the shoulder to avoid interference with the operated main. However, the nicety of adjustment obtained was such that very little of the new main track had to be built in a temporary location and only in three short stretches was the old main track disturbed prior to its being removed altogether.

It should be mentioned that the need for continuing the operation of the busy line without undue delay added greatly to the difficulty of the work. The St. Louis division not only has a heavy freight movement, but also a fast passenger line, being the through connection for the New York Central Lines' traffic to St. Louis and the Southwest. During all the time of reconstruction there was a passenger train movement alone of 16 to 18 trains a day. At no time during the progress of the work was it necessary to lengthen the schedules because of construction conditions.

The method of determining the offset location is of interest. The long tangents were fixed by running a base line and taking offsets to the existing track, which had numerous swings, as already mentioned. The base line thus obtained was plotted to show graphically the position of the old main track. From this the final position of the new tangent was obtained, which was then laid out on the ground, minor adjustments being made in the field. This method of adjusting the offset location to the old track is illustrated in Fig. 3.

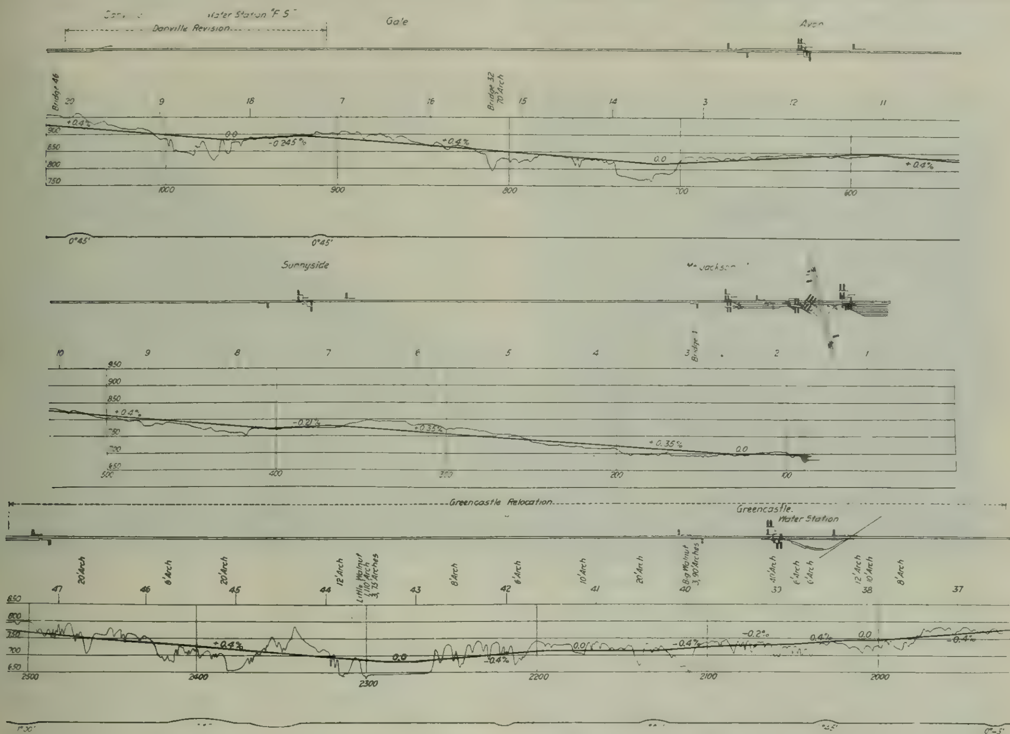

Fig. 4—Plans and Profiles of Sections of St. Louis Division Reconstruction.

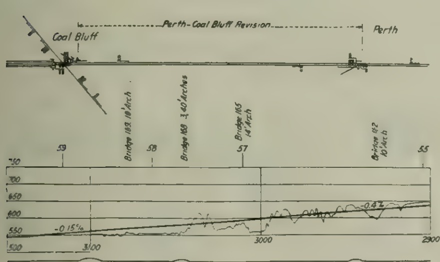

Fig. 4a—Perth-Coal Bluff Revision.

The features of the Greencastle relocation were: (1) the extremely heavy earth work involved; (2) the crossings of the two branches of Walnut creek—Big Walnut and Little Walnut; (3) the elimination of a grade crossing with the Chicago, Indianapolis & Louisville; (4) the relocation of the Greencastle station facilities, the station being moved a mile from its original location, and (5) the elimination of the small station of Oakalla.

Two principal methods were adopted by the contractors in building the embankments: (1) the ordinary method of dumping from trestles, either with standard or narrow gage equipment, and (2) raising an independent unloading track. The latter method was particularly applicable to the offset locations where a large part of the material could be dumped from the old main track, the contractors being allowed to operate over this track under proper protective precautions. Some of the larger fills were made in two lifts. A trestle some 20 ft. high was first built, and the fill brought to this level; then another trestle, equally high perhaps, was built on top of this and the rest of the embankment deposited from it. This

method gave good results, as it made a compact fill. A large part of the work was carried on both day and night, a feature of the night work on the Greencastle relocation being the installation of a complete electric lighting plant.

The total earth involved in this work was about 6,500,000 cu. yds., there being at one time as many as 27 steam shovels in operation, with the necessary dump cars, engines, unloaders, etc., together with a large force of teams. Almost every known method of handling earth was involved, including steam shovel outfits with narrow gage cars or standard gage cars of the "Western" type, of both 5-yd. and 12-yd. capacity; standard gage flat cars unloaded with Lidgerwood machinery and plow; teams drawing slips, wheelers, or wagons loaded by an elevating excavator; steam shovels of various weights from 55 to 90 tons, together with the incidental equipment necessary to the successful handling of heavy earth and rock work.

The character of bridge construction is similar to that on the Cairo division, being permanent and designed to carry the heaviest wheel loads. With but four exceptions the bridges are of reinforced concrete. For the smaller openings the simple arch, or box type, was used; for the larger structures, particularly where the grade line crossed a stream at a considerable elevation, arches of the spandrel type were adopted, with flanking arches forming the approaches. There are four bridges of this latter type; bridge 28, over White Lick creek; bridge 41, over White Lick creek, and the two Walnut creek bridges. The bridge over Little Walnut creek (Fig. 6) is of particular interest on account of its being on quite a severe skew. While not so high as the one over Big Walnut creek, it is similar in design, such differences as exist being due to the skew. The Big Walnut bridge, which is shown in the illustration (Fig. 7), consists of three 90-ft. spans, with a rise of 35 ft. The total length is 358 ft. and the tops of the parapet walls are 70 ft. above the bed of the stream.

Over the two branches of Eagle creek, immediately west of Indianapolis, and over the National road—a highway—lack of headroom necessitated the use of steel girders, the first two

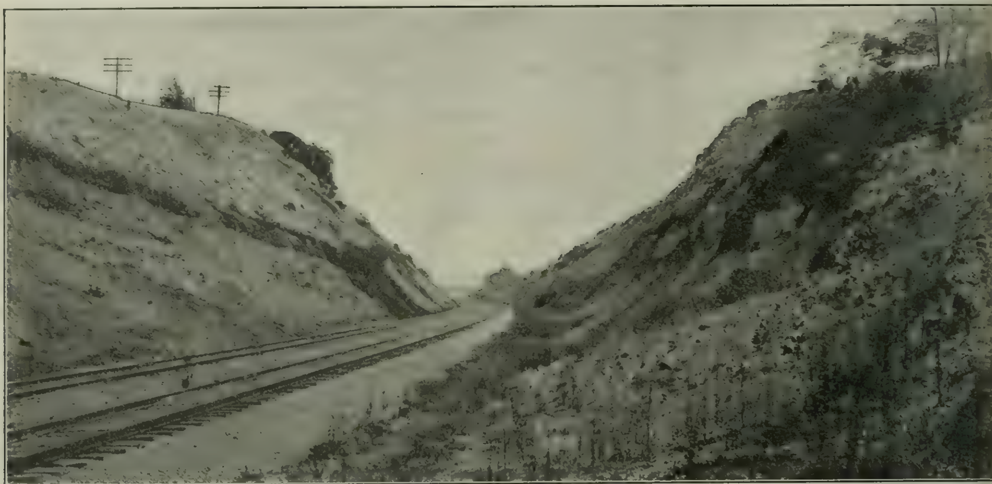

Fig. 5—Plummer Hill Cut, on Greencastle Relocation.

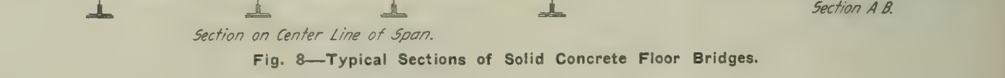

Fig. 8—Typical Sections of Solid Concrete Floor Bridges.

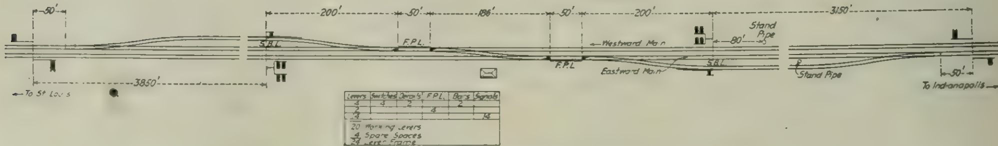

Fig. 9—Typical Plan of Signaling; Lena Station.

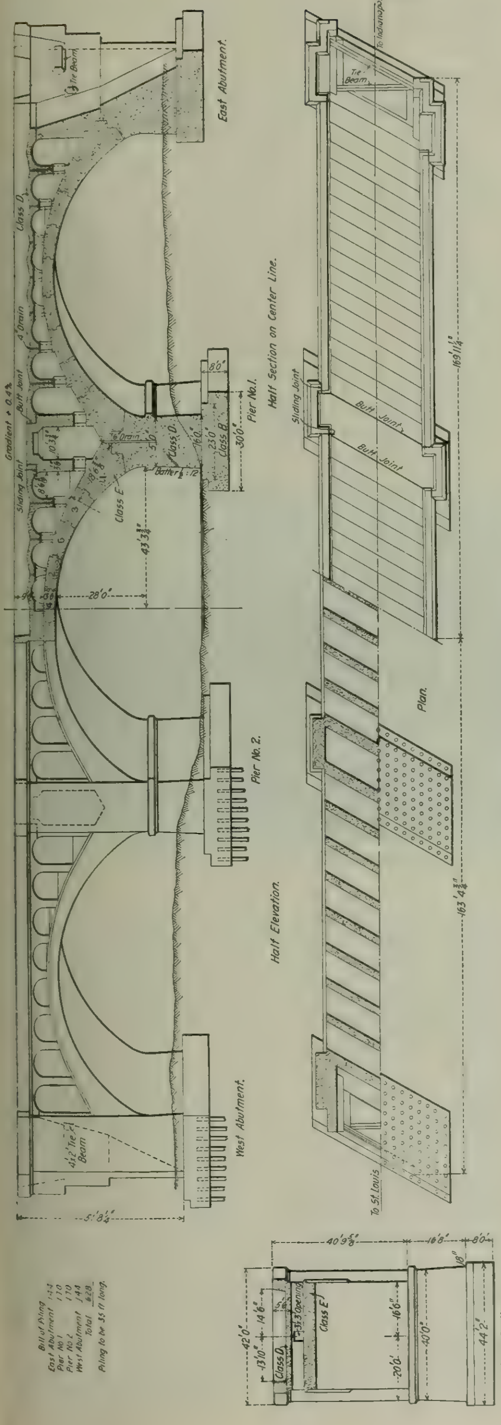

Fig. 6—Skew Bridge Over Little Walnut Creek.

being the deck type, and the last the through type. All three were given solid concrete floors. (Fig. 8).

At the overhead crossing of the Monon, lack of clearance necessitated through steel girders, and for the same reason an I-beam floor of the ordinary type was used, the rails running in a channel formed by the plates and Z-bars.

Several interesting structures provide for both a waterway and a highway in a single span. An instance is the crossing of the Crawfordsville road at Greencastle, which is spanned by a 30-ft. arch. Beneath the road, and extending diagonally

Fig. 7—Big Walnut Creek Bridge.

through the arch, a 5-ft. x 10-ft covered box conducts a small stream beneath the highway and railway at the same time.

Between Indianapolis and Coal Bluff, 60 highways cross the line of the railway. Of these 25 now cross at grade, 16 are overhead and 19 are undergrade. Twenty-three grade crossings on the old line were eliminated. The Railroad Commission of Indiana alluded to this elimination of grade crossings in its Bulletin No. 4, covering the second quarter of 1908, as follows:

"In this connection we desire to praise the Big Four Railway for taking out 23 crossings and putting in concrete bridges and subways in-

Fig. 10—Water Station and Tower at Lena.

stead, in the reconstruction work done by them between Indianapolis and Terre Haute."

The overhead crossings are of reinforced concrete of the same type as referred to in the Cairo division article, and also previously described in this journal.

To facilitate operation ample passing tracks were provided

at intervals as appeared advisable, due consideration being given to gradients. It will be noted from the typical plan herewith (Fig. 9), and the photograph (Fig. 10), that there are signals for high speed operation of the main tracks in both directions, the distant signals being placed 4,000 ft. in advance of the home signals and worked electrically. This is a feature of operation which is being used with notable success on the Big Four, the method being somewhat as follows:

The plan shows a trailing cross-over between mains. An eastbound passenger train of the second class, for example, has reached the block ahead of the block here shown. Following this second-class passenger train is an eastbound first-class passenger train. The second-class train is crossed over to the westward main at the preceding block station, which has a facing crossover, and proceeds to the station here shown under signal protection. The first-class train proceeds on the eastward main to the block station here shown and if it does not pass the second-class train before reaching this station the second-class train is kept on the westward main until the first-class train clears the block following. By this means some of the features of a four-track railway are introduced, so that traffic can be handled with great despatch under these conditions.

The advance block is also a notable feature, permitting a tonnage train to proceed until a descending gradient is reached, obviating the necessity of starting and stopping on a hill. The sidings are so arranged that a train which must take a siding will enter at the tower, the switch being thrown by the towerman, and the indication to the engineman that his train is to enter the siding is given by signals. Permission to proceed is likewise given by signals, a dwarf signal being put at the far end of the siding. When cleared, this signal opens an electric lock in the distant switch so that the brakeman may throw the switch and allow the train to proceed.

General improvements were made in the passenger and freight station facilities, particularly at Greencastle, where the new location necessitated an entire reconstruction. The illustrations show this new station.

Ample water station facilities were provided, one being at Lena, 8 miles west of Greencastle, one at Delmar and one at Danville. The first-named receives its supply from a reservoir which was made by equalizing the embankment of the railway by a dam, providing a supply which is ample to carry the service over the dryest seasons. At Danville the water is taken from the bed of White Lick creek, and at Delmar it is pumped from deep wells. Tanks of 100,000 gals. capacity, with the necessary pumping stations and water cranes, have been installed.

The construction work, which was completed last fall, was done under the direction of W. M. Duane, who recently resigned as chief engineer of the Big Four, and F. W. Smith, construction engineer. Joseph Mullen was in immediate charge as division engineer.

Fig. 11—New Passenger Station at Greencastle.

TIE TREATMENT WITH CRUDE OIL ON THE MEXICAN CENTRAL.

After five months' work the tie treating plant of the Mexican Central at Aguascalientes, Mexico, has reached an output of 3,500 ties per day. The treatment, which now consists of Ebano oil, is interesting for the reason that with one exception, in the United States, the Aguascalientes plant is the first in the history of railway operation to make a distinct success of the crude oil process for the treatment of ties. Although it is too soon to judge from actual experience of the effect of the oil, it is expected that the treatment will prolong the life of each tie from eight to twelve years. The process as used there consists of placing the ties in cylinders which are then filled with oil and subjected to heat and pressure. After seven hours the oil is forced out of the cylinders and the ties removed. The average tie treated absorbs about seven kilos of oil, or more than three gallons. The oil comes from Ebano and contains a large amount of solid matter, and it is this which is forced into the wood. The ties are Mexican pine, known as "Celaya," and then come from the region about 200 miles northwest of Mexico City. One cubic foot of this timber weighs 32 lbs. when air dried. Mexican pine is rather porous, as may be seen by its weight, and is somewhat brashy compared with good United States timber.

The average penetration into the pine ties treated here is about two inches. In harder woods it is less, but in all cases the oil acts as a water seal and will keep out moisture for years.

About a year ago the Mexican Central Railway undertook some experiments to determine the practicability of using crude petroleum from the wells at Ebano, near Tampico. This oil is the same as that which has been used during several years as locomotive fuel. The content of asphalt is very high, the viscosity of the oil being such that, as in the case of other heavy oils, it is necessary to force it to the burners under air pressure after being heated to about 120 or 140 deg. F. in the tender tanks.

An average analysis of the Ebano oil shows the specific gravity at 15 deg. C. 98 to 99 or ordinarily 12.4 deg. Baume. Viscosity at 21 deg. C. 48,900 degs. Flashpoint 106 deg. F. Naphtha and illuminating oils about 20 per cent. and asphalt about 60 per cent.

Before permanently changing the zinc chloride plant to oil a large number of experiments were carried out with a view

to determining the probable cost of the new method with different degrees of saturation of the timber, as well as the probable length of time necessary, or the probable capacity of the existing zinc chloride plant when converted. A miniature treating plant was constructing, with an experimental cylinder large enough to accommodate two ties and connected by pipes to several of the shop power house auxiliaries. An oil pipe led from the pressure side of one of the fuel oil feed pumps to this cylinder, arranged for blowing back through a by-pass around the pump to the suction side and supply tank. Other pipes connected the cylinder with the compressed air mains and the condenser. Heater pipes with heating surface about proportional to that in the large tie plant cylinders were also connected through a reducing valve with the steam mains.

The results of experiments made in a small cylinder are not in all respects applicable to large cylinders of several hundred ties capacity, the principal difference in this case lying in the fact that the oil being very heavy the heating of the oil among the ties will be slow because of the slow circulation. In the actual plant the steam pipes being placed around and between the tracks, the heating of the oil at any distance from these pipes is liable to be slow. The results of the experiments were, however, used to some extent in determining a proposed method of treatment and the general plan of the changes to be made in converting the plant to oil, all subject to modification as experience with the actual plant should indicate. As the experiments are of considerable interest as indicating what results may be sought for in the design of new plants, a summary of the methods and results is given. The different experiments were modifications in detail of the following general methods:

The valve in the condenser line was opened long enough to rid the cylinder and tie of air, after which oil was admitted, heated and held by the oil pump at from 90 to 140 lbs. pressure for from 2 to 6 hours, this being followed by vacuum. Short time or low pressures gave, of course, much less penetration than longer time, the results varying between the following extremes. One hour under 140 lbs. oil pressure at 200 deg. F. followed by 35 min. vacuum gave a penetration of one-half inch. The same conditions but with four hours' oil pressure gave a penetration of 2¾ inches from each side or over 95 per cent. of the volume of the tie saturated. Nearly complete saturation was obtained by preceding the injection of oil by a vacuum in order to remove the air, some of which it was observed gathered in a bubble in the center, preventing further penetration. When the preliminary vacuum was used this bubble was reduced to about ½ inch diameter.

These methods gave a tie rich in oil, but the process was correspondingly costly. The Mexican pine checks considerably when exposed to the Mexican climate and it was desired to secure considerable penetration without leaving the portions treated so rich as to make the probable life of a tie greater than its purely mechanical life under the rail. Trials were then made in which air under about forty pounds pressure and upwards was forced into the tie followed by modifications of the methods already mentioned. Sawn sections indicated that the oil being forced into the cylinder at a higher pressure as the air was blown out, further compressed what air was entrapped in the tie into a small bubble at the center and extending nearly throughout the length. This bubble upon expanding into the succeeding vacuum effectually cleared the pores of the timber of surplus oil, leaving the tie section so clean that sawn sections upon being rubbed would scarcely stain the finger. By varying the time that the tie was held under oil pressure more moderate depths of saturation were secured at very low cost for oil left in the tie. It was noted that the penetration was fairly uniform from the sides throughout the tie's length except where cracks or sun checks occurred, in which case the oil, of course, penetrated in all directions around the extent of the check. Penetration of the timber through the ends and following the fibers which it is sometimes assumed is extreme, was not indicated by sawn sections. Trials made with timber having a fragment of bark on one side or edge showed that the penetration was radial, the sawn section showing an almost perfect triangle of untreated timber under the bark.

A table is given below which shows the principal results of a few of the more interesting tests. In addition to the methods shown in the table other trials were made with preliminary, intermediate, and after steaming of the ties, but it was found that nothing was gained by these methods. As this plant as well as the one or two other existing oil treatment plants is at a high altitude the pressures and vacuums have been reduced to absolute ease of comparison. Comparisons of different methods may be made from the table. For example, it may be noted that tests Nos. 6 and 7 were identical in all respects with the exception of the compressed air treatment. In test No. 7 the air pressure applied was ten pounds more than in No. 6, and was held fifteen minutes longer with the result that while the penetration was only ¼ inch less the saving in oil was over a gallon per tie. In other words, with nine per cent. less of the volume of the tie treated, the saving in oil was about 30 per cent.

During the experiments it was noted that any desired pressure could be obtained by the expansion of the oil when heated to a sufficient degree, usually below that generally supposed to be undesirable on account of injury to the wood fibers. The applicability of this method of getting pressure in the large cylinders was somewhat doubtful and it was found upon trial that a pressure pump was necessary. This indicated slow heating of the oil between the ties in the large cylinders where the circulation was slow, and suggests the desirability in the design of new plants of providing outside enclosed tanks of proper capacity (the volume of a cylinder minus the volume of a run of ties) with sufficient heating coils to heat the oil to a temperature nearly corresponding to the proposed cylinder pressure. The oil may then be run into the cylinders rapidly by means of high pressure air on these outside cylinders, the slower oil pump being used only for obtaining the higher pressure during saturation.

The conversion of the existing zinc-chloride plant to oil involved the rearrangement of certain of the usual piping from the solution tanks to the cylinders and the substitution of larger pipes to accommodate the slow flowing oil, the usual track pits for receiving and handling the oil, the removal of boilers to a safe distance, the installation of outside pressure

Results of a Few Representative Tests.

Test No.	1.	2.	3.	4.	5.	6.	7.	8.	9.
Time in preliminary vacuum (27 in.), minutes	Omitted.	Omitted.	Omitted.	Omitted.	6.0	Omitted.	Omitted.	30.0	Omitted.
Air pressure, absolute, lbs.	"	72.0	72.0	72.0	Omitted.	42.0	52.0	Omitted.	Omitted.
Time under air pressure, minutes	"	60.0	45.0	.....*	Omitted.	45.0	60.0	Omitted.	Omitted.
Time under oil pressure, hrs.	1.0	4.0	5.0	5.0	5.0	6.0	6.0	4.0	2.0
Temperature of oil, deg. F.	210.0	200.0	240.0	240.0	210.0	210.0	220.0	.....†	200.0
Oil pressure, absolute, lbs.	137.0	137.0	172.0	172.0	172.0	152.0	152.0	.....†	71.0
Time in vacuum (27 in.), minutes	35.0	60.0	40.0	45.0	60.0	60.0	60.0	45.0	90.0
Penetration at point under rail, in.	0.5	1.5	1.5	1.0	2.5	2.5	2.25	2.5	1.12
Per cent. of volume treated to total, per cent.	28.0	70.0	70.0	50.0	97.0	97.0	88.0	97.0	60.0
Absorption of oil, per cu. ft., gals.	1.1	0.42	0.61	0.53	2.36	1.36	0.95	2.71	1.31
Absorption of oil per tie of 2.7 cu. ft., gals.	2.97	1.13	1.65	1.43	6.37	3.67	2.56	7.32	3.54

*Air pressure applied, air valve closed and oil run in slowly, the air being blown off as the pressure became equal to the desired oil pressure.
†152 lbs. pressure held for 3 hrs. with a temperature of 170 deg. F. Pressure was then released and cylinder heated to 230 deg. for 1 hr. before applying vacuum.

tanks, as above indicated, and proper fire protection. On account of the tendency of asphalt base oils to foam badly and overflow when heated, the last involved a system of perforated steam pipes over all open tanks so arranged as to entirely envelop the tanks in steam by operating any one of several quick opening valves placed both at convenient and at safe distances.

As the process has been used for but a short time no figures indicating the life of ties so treated are available. However, reports from other points which are using a somewhat similar treatment indicate that most excellent results are to be expected.

The Santa Fe commenced experimenting with crude oil for treating ties in 1901, and a few experimental ties were placed in track in February, 1902. These ties are still in good condition. At the meeting of the Maintenance of Way Association in March, 1907, Mr. Faulkner, of the Santa Fe, described their experiments as follows:

"We took thoroughly well seasoned ties with the cells more or less open and filled them with crude Bakersfield oil, which has a low gravity and an asphaltum residuum of about 77½ per cent., the balance being mainly light oils. This oil was heated to 180 deg. and forced into the ties under a pressure of 150 lbs. to the square inch. With this temperature a good proportion of the light oils had evaporated, leaving only an asphaltum residuum, which at that temperature was as fluid as creosote. Each tie took up about 4 gallons of oil, and it appears to have hardened in the cells under atmospheric temperature, so that after five years' service the ties are in first-class shape so far as preservation and wear is concerned. We do not claim that there are any antiseptic properties in the crude oil, but believe that by stopping up the open wood cells the substance which solidifies under ordinary temperatures would prevent heat, moisture and air from getting into the wood and thus prevent decay-producing organisms from beginning their work." The Santa Fe then prepared to erect in New Mexico new tie treating plants arranged for the use of crude oil at 150 to 200 lbs. pressure and a temperature of 180 deg. They also introduced the oil under a vacuum and at the end applied a low vacuum before drawing the ties out of the cylinder. In this way, the ties are reasonably cleaned, easily handled and the amount of oil used is considerably reduced.

THE BELT CONVEYOR IN RAILWAY BUILDING.

BY C. KEMBLE BALDWIN,
Chief Engineer, Robins New Conveyor Co.*

Every railway engineer is interested in apparatus which will enable him to handle material cheaply, quickly and with little labor. While many machines possess all of these qualifications, they are not adapted to railway building because they are too cumbersome, and are not sufficiently flexible to allow them to conform quickly to the varying conditions encountered.

The belt conveyor has a large field in railway work when once the engineers realize the many uses to which it may be put. Contractors who invest large sums of money in cars, derricks, steam shovels, cableways, etc., are beginning to realize that they may materially reduce their labor cost and their general handling cost by the use of the belt conveyor.

Belt conveyors are adapted to this class of service for the following reasons:

(1) They have large capacities.

(2) They require but little power when handling large quantities.

(3) They are light in weight.

(4) They will carry material horizontally and on an incline.

(5) The supporting structure is inexpensive and may be quickly erected, or it may be made up in self-contained portable sections.

(6) The entire apparatus may be quickly knocked down and cheaply transported from place to place.

(7) Because of its flexibility, a few hours' time is sufficient to change the length from 50 to several hundred feet.

The following brief description of the various parts making up the apparatus will be of assistance in considering the above claims made for the belt conveyor.

Idlers.—The troughing idlers which support the loaded belt consist of three or more pulleys turning on hollow shafts formed of cold-drawn steel seamless tubes. The tubes are carried by cast-iron brackets bolted to planks. The brackets have slotted bolt holes to permit the adjustment of the idlers on the plank to train the belt. The pulleys are lubricated by grease cups on the ends of the tubes forcing grease through the tubes to the bearings.

These idlers turn up the edges of the belt, forming a trough which not only prevents the material from falling off, but which centers the load on the belt, and supports the load between idlers. The return belt is carried flat by a series of pulleys turning on shafts of steel tubing, supported at the ends by clamp boxes and lubricated by grease cups on the tube ends.

The troughing idlers are spaced from 3⅓ to 5 ft. apart, depending on the weight per cubic foot of the material carried, and the amount being handled. The return idlers are usually spaced 10 ft. apart.

Belts.—Rubber-covered belts are most satisfactory for this class of service. Briefly, they are made as follows: The duck is coated on both sides with rubber, known as "friction." The frictioned duck is cut into the proper width and the belt is laid up to the desired number of plies. The rubber cover is then put on and the belt subjected to heat and pressure in the vulcanizing press.

The object of the duck is to give tensile strength to the belt. The friction sticks the plies together and the cover protects the duck from moisture and abrasion. It is necessary, therefore, that the belts be designed for the proper strength, and that the cover be proportioned to the service. If large quantities of rock are to be handled, a cushion of ⅛ in. to ¼ in. of rubber should be put on the upper side of the belt to protect the duck from the cutting action of the rock.

Driving Machinery.—The belt conveyor has an advantage over other types of conveyors, in that it may be driven at either end or from any point in its length. When properly designed the drive may be located at the tail or loading end and will prove as satisfactory as when at the discharge end. The largest heavy-duty conveyor ever built—1,000 ft. from center to center, handling about 400 tons of material per hour—is driven from the loading end. The power is applied to one or more of the pulleys over which the conveyor belt passes, thus imparting motion to the belt.

Discharging Devices.—Should it be necessary to discharge the material from the belt at any point between the two ends, either fixed or movable trippers may be used. The fixed tripper consists of two pulleys, one located above and ahead of the other. The belt passes over the upper pulley, then over the lower, in such a manner that the material is discharged from the belt into a chute which will carry it to one or both sides of the conveyor. The movab'e tripper is similar to the fixed tripper in form and operation, except that the two pulleys and the chute are mounted on a frame carried by four flanged wheels. It may, therefore, be moved the length of the conveyor either by crank or by power taken from the conveyor belt.

Having briefly described the various parts making up the belt conveyor, the various claims made for this piece of apparatus in railway work will be taken up in order.

CAPACITY.

The following table gives the capacity of conveyors from

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*Old Colony Building, Chicago.

20 in. to 36 in. wide, in cubic yards per hour; also the maximum advisable speed, and the size of the largest pieces:

1. Width of belt.	2. Maximum size of pieces.	3. Capacity in cu.yds.at belt speed of 100 ft. p. m.	4. Maximum advisable speed in ft. p. m.	5. Capacity in cu.yds. at the max. advisable speed.	6. Power constant C.	7. H. p. required for each movble or fixed tripper.	8. W't of conveyor pr ft. in lbs. without structure.
20-in.	5 in.	47	300	141	.136	1¼	22
22-in.	6 "	58	300	174	.133	1½	25
24-in.	8 "	69	300	207	.131	1¾	29
26-in.	9 "	81	350	284	.127	2	32
28-in.	12 "	93	350	325	.121	2¼	34
30-in.	14 "	107	400	428	.117	2½	35
32-in.	15 "	122	400	488	.115	2¾	39
34-in.	16 "	137	450	617	.114	3	44
36-in.	18 "	155	450	698	.112	3¼	47

From the first five columns of the table it is evident that the belt conveyor is capable of handling all the material the largest steam shovel can dig, and more. When a steam shovel loads cars, much time is lost in shifting the cars and waiting for a new train to be pushed in. This necessarily cuts down the output of the shovel and increases the cost per yard. When conditions are such that a belt conveyor may be used in connection with a shovel there is no excuse for the shovel not handling its maximum quantity. The material being carried away in a continuous stream, there are no delays other than those due to the moving of the shovel and conveyor. In New England the coal hoisting towers on the docks take coal with grab buckets from the vessels and discharge to cable cars which carry the coal to storage. Usually the capacity was determined by the capacity of the cable road. Many of these plants have been increased 50 per cent. in capacity by replacing the cable road with belt conveyors of a capacity larger than that of the hoist. This caused the hoist to work to its maximum to load the conveyors, there being no delays waiting for cars. This applies as well to steam shovel operation.

POWER.

Conveyor belts should never be run at a speed greater than that required to carry the desired load, and the power should be figured for the maximum load at the chosen speed. The following formula will give the power required:

$C =$ Power constant from column 6 of table.

$T =$ Load in tons per hour.

$L =$ Length of conveyor in feet between centers.

$H =$ Vertical height in feet material is lifted.

For level conveyors,

$$H.P. = \frac{C \times T \times L}{1000}$$

For inclined conveyors,

$$H.P. = \frac{C \times T \times L}{1000} + \frac{T \times H}{1000}$$

Add for each movable or fixed tripper the horsepower in column 7 of the table.

Add 20 per cent. to horsepower for conveyors under 50 ft. in length.

Add 10 per cent. to horsepower for conveyors between 50 ft. and 100 ft. in length.

The above figures do not include gear friction.

Assume a 30-in. level conveyor 150 ft. long, carrying 300 tons per hour at a speed of 200 ft. per minute. It would require

$$\frac{.117 \times 300 \times 150}{1000} = 5\tfrac{1}{4} \text{ H.P.}$$

Or a 36-in. level conveyor 300 ft. long carrying 630 tons per hour at a speed of 300 ft. per minute would require

$$\frac{.112 \times 630 \times 300}{1000} = 21\tfrac{1}{4} \text{ H.P.}$$

If the conveyor is inclined, add the horsepower required to lift the load to the required height, using the formula for inclined conveyor.

From this data it is evident that the belt conveyor will move very large quantities with very little power. Electric motors, steam or gasolene engines may be used according to convenience.

WEIGHT.

Column 8 of the table gives the weight of the various widths of conveyor per foot. This weight includes 2 ft. of belt and the proportion of the weight of troughing, return and guide idlers. The weight of the driving mechanism will depend on the length and duty of the conveyor. From these figures it will be noted that when the large capacity is taken into consideration the apparatus weighs remarkably little.

ARRANGEMENT OF CONVEYORS.

Fig. 1 A shows in outline the simplest form of level conveyor receiving material at one or more points and discharging over the end pulley.

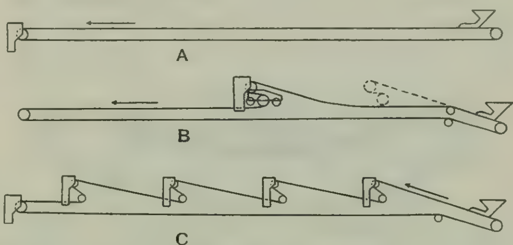


Fig. 1—Styles of Conveyors.

In Fig. 1 B the material is received at one end and discharged at any point by a movable tripper.

Fig. 1 C is a level conveyor with a series of fixed trippers.

Fig. 2 A shows a simple inclined conveyor. Practically any material in a railway excavation may be handled at an angle of 20 deg. to the horizontal. Inclined conveyors should not be run at high speeds, as the material must be given the same

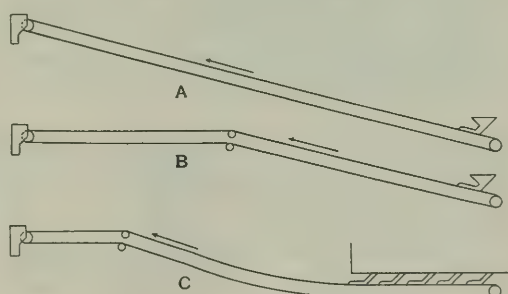


Fig. 2—Styles of Conveyors.

speed as the belts, and the higher the speed the more the slip at the loading point and the greater the wear at the belt.

Fig. 2 B is the combination of an inclined and level conveyor.

Fig. 2 C illustrates the combination of a curved and level conveyor. The radius of the curve depends on the size of the belt, location of the drive and local conditions. From 200 to 250 ft. radius is usually safe on belts of the wider sizes.

Fig. 3 A shows a combination of level conveyor, fixed dump, inclined conveyor and a series of fixed trippers.

Fig. 3 B shows a conveyor starting level, carrying material down hill on an incline and curve, up hill and then level.

These diagrams show the extreme flexibility of this appa-

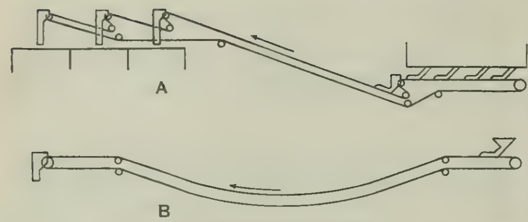


Fig. 3—Styles of Conveyors.

ratus. It may be laid on the surface of the ground without being leveled other than may be necessary to prevent sharp bends in the belt.

SUPPORTING STRUCTURE.

Fig. 4 shows a typical cross-section of a belt conveyor. The structure consists of two stringers extending the full length of the conveyor. The planks of the troughing idlers are spiked on top and the spaces between the planks are covered with a dirt-tight decking of matched boards to prevent material from falling through to the return belt. The clamp

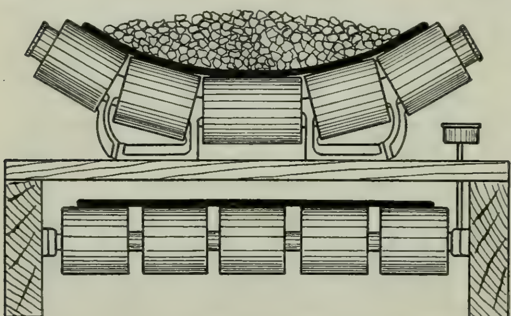


Fig. 4—Typical Cross-Section of Belt Conveyor.

boxes of the return idlers are bolted to the inner side of the stringers, the grease cup being placed above the decking.

When the conveyors are close to the ground they may be blocked up with timbers placed under the stringers. When they are elevated the stringers rest on the caps of the bents. When the span is great the stringers may be trussed.

In cases where the conveyors must be moved frequently they may be made up in portable sections as illustrated in Fig. 5.

On one end section is placed the driving pulley with its gears and motor, or the motor may be on a separate skid and belted. The other end section carries the take-ups and pulley. The intermediate sections each carry the proper number of troughing and return idlers. The sections are fastened together at their ends by bolts passing through the angle irons on the sides of the stringers. It will be noted that the bottoms of the stringers are clear and unobstructed so that the sections may be easily moved on rollers.

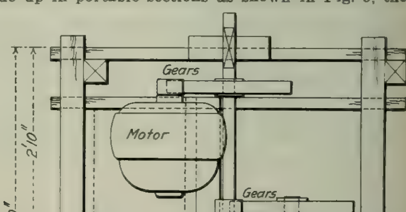
Portable conveyors 30 to 50 ft. in length are frequently used. In such cases the stringers are usually trusses and the motor is located between the upper and lower belt so that the structure is the same width its entire length. Eight conveyors of this type were used last year handling 35,000 cu. yds. of material in the excavation for a large building in Chicago.

EASE OF ERECTION, DISMANTLING AND TRANSPORTATION.

Owing to the simplicity of the supporting structure it may be cheaply and quickly put up. The erection of the machinery consists of setting the conveyor ends, spiking down the troughing idlers, placing the return idlers and stretching and splicing the belt.

The belt conveyor does not require the absolutely perfect alignment necessary to the operation of the chain conveyor, therefore the structure may be roughly and quickly built. When knocked down the conveyor consists of a bale of belt, the idlers, and the machinery of the conveyor ends. The pieces being small and light, they may be quickly loaded on cars and take but little room. The belt conveyor is used almost exclusively in South Africa because, for one reason, its weight is only about one-sixth that of a chain conveyor of the same capacity, thus saving largely in transportation charges and in the weight of the supporting structures.

When made up in portable sections as shown in Fig. 5, the



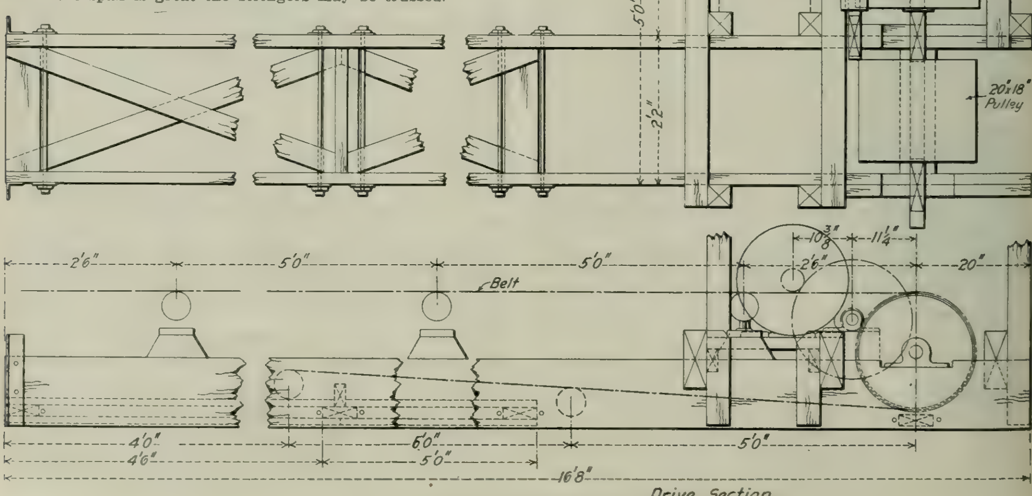


Fig. 5—Section of Portable Conveyor.

sections may be cheaply loaded onto flat cars, and quickly assembled at the new location.

FLEXIBILITY.

Figs. 1, 2 and 3 show the variety of arrangements in which the belt conveyor may be used. The fixed or movable tripper may be used on the horizontal portion of Fig. 2 B or 2 C and many other combinations are possible to suit local conditions.

If the conveyor be made up in portable sections as illustrated in Fig. 5, it may be lengthened or shortened by adding or removing the desired number of sections and splicing in or removing the proper amount of belt. This will require about the same amount of time as the placing of the same length of portable railway track, and the capacity will be much greater.

USES.

The above brief discussion of the construction and arrangement of the belt conveyor will give a general idea of the apparatus, and below will be found a list of places where this conveyor has been successfully used.

At Gravel Banks.—Elevating gravel to the screens; stacking the rejections; loading cars with gravel.

In Stone Crushing Plants.—Elevating stone to the crushers; elevating crushed stone to screens; conveying crushed stone to storage bins; conveying crushed stone from bins to cars.

In Excavations.—Stacking material from steam shovel; conveying material out of cut and stacking it on sides of bank; conveying material back of shovel and loading train of cars by means of a tripper.

In Concrete Making.—Conveying stone, sand and bags of cement from cars to storage bins; conveying stone, sand and cement from bins to mixer; conveying mixed concrete from mixers to forms.

In many cases where large quantities of earth and rock are being handled the belt conveyor adapts itself very well to the work, as it may be run on an incline of 20 deg. and requires a very light trestle for support. The conveyor may be quickly erected and as quickly removed. The same conveyor may later be used in handling concrete material and mixed concrete. In fact, each job suggests new uses for the apparatus, owing to its extreme flexibility.

Some years ago the writer, with great difficulty, induced a large contractor to use a 30-in. belt conveyor for handling material in the excavation for a large building. The ground was plowed up and both the earth and rock were moved to the conveyor by wheeled scrapers. After the excavation was completed the conveyor was used to carry concrete materials from bins to mixers. This same conveyor has been used on 15 to 20 contracts within the past eight years and several other conveyors have been added to his equipment.

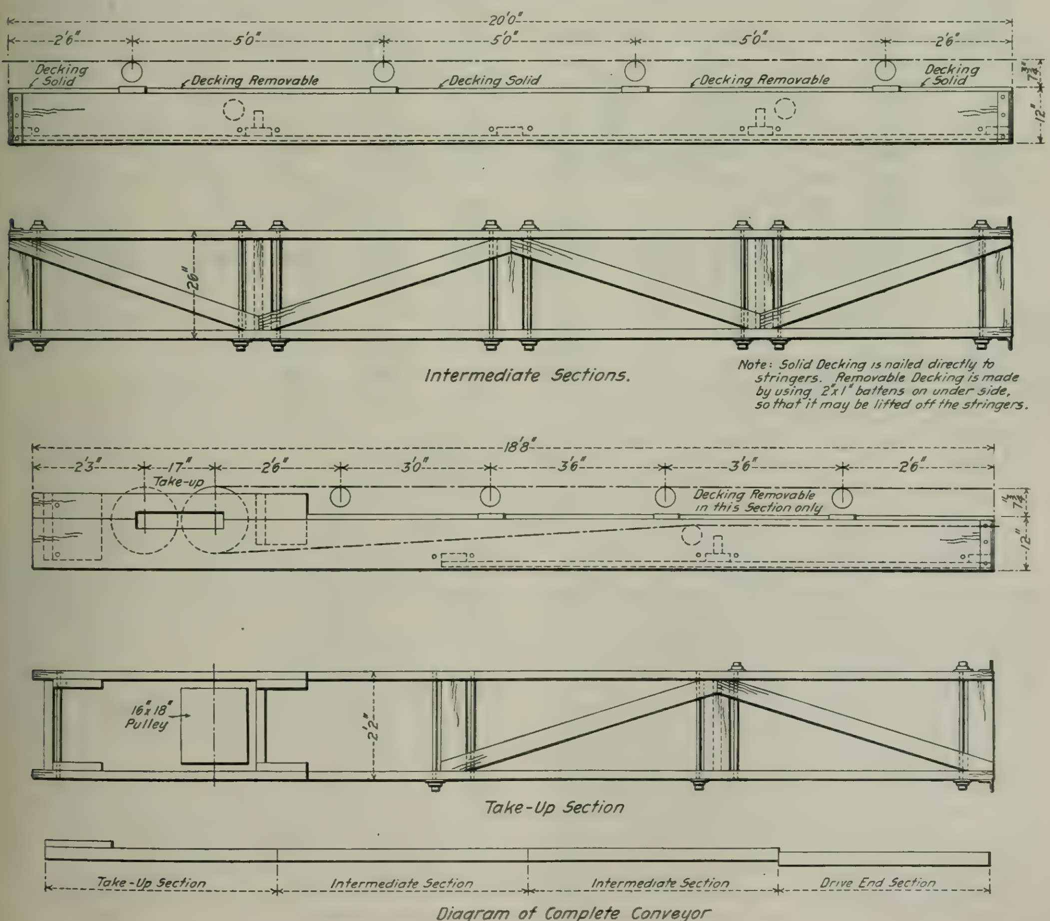


Fig. 5 (a).—Sections of Portable Conveyor.

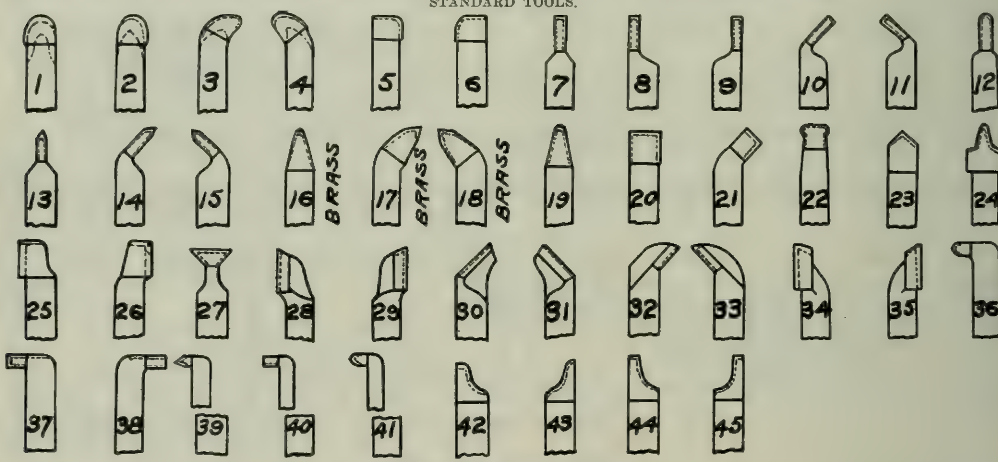
A PRACTICAL MACHINE TOOL SYSTEM FOR A RAILWAY SHOP.

BY W. J. EDDY,
General Tool Inspector, Erie Railroad.

In this day of specialization and of successful introduction of the piece-work, bonus and individual effort systems in railway shops, to secure a maximum output of the machines with the expenditure of as little power as possible, it is necessary to have all machine tools for cutting metals ground to the correct angles of clearance, top and side rake, etc. These angles have been tested so thoroughly by F. W. Taylor, and reported in the proceedings of the American Society of Mechanical Engineers, that it is unnecessary to touch upon them here. However, it has been proved beyond a doubt that machine tools ground to certain angles of clearance, etc., will give the greatest output with the least resistance.

Size of Steel.		*Nos. of Machines Using Size of Steel.*	*Size of Steel.*		*Nos. of Machines Using Size of Steel.*
⅝ in. x 1¼ in.	A	6—8—11—12—14—33—34—45—46—55—205—212.	1½ in. x 2¼ in.	F	1 Driving Wheel Tire Lathe.
¾ " x 1½ "	B	4—5—43—44—56—57—202—203—218.	¾ " x ¾ "	G	38—49 Horizontal Boring Mills.
¾ " x 1¾ "	C	16—32—36—200—201—209—217.	1 " x 1 "	H	50—51 Vertical Boring Mills.
½ " x 1 "	D	13—17.	1¼ " x 1¼ "	I	31 Vertical Boring Mills.
1¼ " x 2 "	E	2—3 Journal and Truck Wheel Tire Lathe.	1 " x 2 "	K	216 48-in. Planer.

STANDARD TOOLS.



Symbols for Ordering Tools.

L I A = Lathe Tool No. 1 ⅝-in. x 1¼-in. Steel.
P 2 C = Planer Tool No. 2, ¾-in. x 1¾-in. Steel.
B 3 H = Boring Mill Tool No. 3, 1-in. x 1-in. Steel.
S 5 A = Sharper Tool No. 5, ⅝-in. x 1¼-in. Steel.

Machine Tool Chart; Erie Railroad.

It is useless to suppose that these angles will be maintained by the different individual workmen in a machine shop, as each has his own ideas as to the best angle and shape to which a tool should be ground. As a result of an investigation conducted by the writer, it developed that no two men in the shop would grind tools to the same angle for performing the same operation, which resulted in more or less unnecessary time being consumed by one or the other.

In order that correct schedules of work done could be made out which would be as fair for one as for another, and that each would have similar tools ground to the same angles for the same operations, a system of grinding machine tools to the correct angles was established. This system consists of having all tools ground on a machine in the tool room. A supply of these tools is kept in stock and they are checked out to the operators. In order to reduce as far as possible the different sizes of tool steel used, each machine in the shop was checked up and in some cases the tool posts changed to use the standard sizes of tool steel. The number of different sizes of steel used was reduced from 16 to 10.

A machine tool chart was prepared to provide suitable data by which a machine operator could intelligently order tools. These charts, one placed at each machine, are mounted on sheets of tin and the face of the print varnished to facilitate cleaning. The chart gives a simple plan outline of 45 standard tools, numbered regardless of the different sizes of steel.

The letters A, B, C, etc., were given to the different sizes of steel. Opposite these letters the numbers of the several machines using the particular sizes of steel are given. The machine operator determines from the chart the tools which are necessary for any operation. For instance, if his machine uses ⅝-in. x 1¼-in. steel, which is designated by the letter A, and the particular work requires numbers 3, 10 and 14, he obtains from the tool room, L, 3, 10 and 14, A tools. The tool room attendant knows by these symbols that the operator is running a lathe and wants tools 3, 10 and 14, of size ⅝-in. x 1¼-in. steel. The same tools are kept in stock ground for boring mill, planer and shaper work. The machine tool rack in the tool room is so sectioned and marked as to make it comparatively easy and simple to obtain any of the 45 standard tools, ground for use on either a lathe, planer, boring mill or shaper.

After a close study of the work done in the shop, it was decided that the 45 tools shown on the chart were all the standard tools necessary. If, however, a special tool is required, it may be made by securing a written order from the machine foreman.

A chart showing the method of grinding each of the different standard tools and giving the correct angle for either lathe, planer, shaper or boring mill tools has also been prepared. This chart is kept at the grinding machines. A direct saving of 45 per cent. was effected in one year through the use of this system. An indirect saving is shown by the increased output of machines, due to sharp tools ground to the most efficient angles.

THE TELEPHONE IN TRAIN DESPATCHING.*

It will be contended by many that the telegraph operator does his work unconsciously and is therefore not subject to a mental strain. But despatchers and operators who have been using the telephone for despatching work, in nearly every case speak of the reduced strain. They can do the same amount of work by telephone in one-half of the time formerly required. The abandonment of the telegraph key for calling the stations has been a great physical relief to the despatchers, and the operators have been relieved of all calling of the despatcher. The stations answer the signal given by the selector bell much more promptly than they do the sounder. The fact that the noise of the telegraph instruments is removed will also have an effect upon the work of the despatchers and operators.

The calling of stations by the despatcher while conversation is being carried on with other stations saves time. There is greater accuracy in transmitting orders by telephone as the despatcher writes down each word as it is spoken instead of sending it from memory by telegraph. The improved line construction and telephone apparatus available to-day is far superior to that used even five years ago. It has been stated that all voices are not transmitted equally well by telephone. This is true, but trouble from this cause is seldom experienced and it will be possible to obtain employees with suitable voices easier than it is to get employees who can send good Morse. The telegraph operator is subject to paralysis of the arm. There is no such effect or any other physical trouble caused by the continued use of the telephone, and its introduction enables many telegraph operators already affected with paralysis, but otherwise efficient employees, to continue to carry on their work in a satisfactory manner.

The despatchers and the operators have become better acquainted since using the telephone and this has resulted in closer co-operation in the performance of their work. The fact that they are talking with each other seems to have eliminated the caustic remarks and comments so frequently sent by telegraph. The remark of a despatcher after using the telephone for several months to the effect that he "had not been mad once since using the telephone" is well worth repeating, as it indicates an improved condition. By equipping trains with portable telephone sets the despatcher may be reached from any point between stations in case of breakdown.

The first of the present type of telephone despatching circuits was installed by the New York Central in October, 1907, between Albany and Fonda, 40 miles. The Chicago, Burlington & Quincy was the next, in December, 1907, Aurora to Mendota, 46 miles. At the present there are over twenty telephone despatching circuits in use on the C. B. & Q., covering 1,534 miles of road (1,381 miles single track).

The construction of the line is important. Hard drawn copper wire of sufficient size to withstand wind and sleet should be used and the line should be a metallic circuit, i.e., two wires should be used. The wires forming the circuit should be properly transposed and so located in relation to other circuits as to prevent inductive disturbance from other wires or mechanical injury. The introduction of considerable amounts of cable in the circuits should be avoided as it reduces the volume and affects articulation. When cable must be used, lead covered paper insulated telephone cable having the wires twisted in pairs to prevent inductive disturbances should be used, not only on account of it affecting the transmission less than the rubber insulated cable, but also on account of its lower first cost. Cable of this type can be furnished to withstand the potentials used on telegraph circuits and on account of its low capacity, as compared with rubber insulation, will improve the operation of telegraph service as well as that of the telephone circuits. Adjacent telegraph or telephone circuits, if used in emergency as patch circuits, should be in first-class condition. Copper wire weighing 210 lbs. per mile usually has been used. This is of sufficient size to render a very high grade of telephone transmission. With from 35 to 50 poles per mile a circuit of this kind will, with few exceptions, withstand severe wind and sleet storms.

Circuits like those now being used will cost $85 per mile or a division of 150 miles $13,000. These figures do not include the telephones and selective apparatus, the prices of which vary according to the type used. The average life of the copper wire is considered to be fifty years. By applying suitable apparatus to two telegraph wires two duplex telegraph circuits and one metallic telephone circuit may be obtained which will permit of four telegraph messages and one telephone message being transmitted simultaneously. Such a circuit as this has been in use on the Union Pacific between Omaha and Cheyenne since last June and has been rendering excellent service. When the telephone circuit is not being used for official conversations between division headquarters, it is used for the transmission of messages which otherwise would be sent by telegraph. The following traffic was handled over this circuit in a month:

Messages by telegraph	59,020
Messages by telephone	30,703
Conversations by telephone, 2,539; time consumed by conversations, 126 hrs., which is equivalent in messages to	3,780
Total	93,503

The telephone messages are handled at a less expense than by telegraph. The telephone operators handle as high as 450 messages a day and this could be increased if the line were not used so much for conversations.

For train despatching service due consideration must be given to the length of the line, the kind and size of wire, the number of stations connected to the line, the kind of telephone, transmitter, receiver, induction coil and circuit, together with the kind and amount of current supplied. The number of stations connected to lines now in service varies from ten to forty-four. In regular commercial telephone service there are usually but two people talking or listening on the line at a time, while in despatching service it is customary to have from three to five operators in addition to the despatcher all connected to the line at the same time and in addition an unknown number of other stations listening to their conversation. Various methods of rendering efficient service under these severe conditions have been proposed and tried. Some have attempted to equalize the telephonic current passing through the receivers at the various stations, others have increased the volume of transmission, and still others by a combination of the two have attempted to secure more satisfactory results. In some cases increased volume of transmission has been accomplished at an increase in battery consumption and a decrease in the clearness of articulation. In others the volume of transmission has been decreased to obtain clearer articulation. The great difficulty is that there is no standard. No two users of a telephone will agree as to the relative volume of articulation obtained on two different circuits. Even with skilled observers differences in volume of transmission are often taken for differences in quality of articulation and vice versa, or the amount of difference when judged in per cent. will vary within a wide range. A comparison of a laboratory standard and a working line is a physical impossibility if the tests are to be made by the same parties and under the same conditions. Comparisons made by observing the service on one line and then several days later observing the service on the same or a different line cannot be considered fair. Further, changes in atmospheric or physical conditions may occur in an instant.

The limit of commercial transmission is taken as that obtained over a 1,000 mile circuit of No. 8 BWG copper using standard telephone sets and circuits. It is, of course, impossible to make tests over an actual line of this kind, so

*From a paper read before the St. Louis Railway Club, by W. E. Harkness, Engineer Western Electric Co., New York.

artificial lines have been constructed and comparisons are made with these as a basis. To reduce the chances of error still further these artificial lines have been compared with standard No. 19 gage paper insulated telephone cable and reduced to terms of miles of No. 19 gage cable. This establishes a unit of comparison, and all comparisons are expressed in these units. In this way, it has been determined that transmission over 1,000 miles of No. 8 BWG copper circuit is equivalent to that obtained through 30 miles of standard No. 19 gage paper insulated cable. * * * Numerous attempts have been made to measure the relative transmission obtained from telephone instruments, but no instrument has yet been devised which will distinguish between good and bad articulation as accurately as the human ear. For a number of months work has been carried on with the idea of developing apparatus which will transmit with sufficient volume and clear articulation and at a minimum consumption of battery to satisfy the most critical. It is expected that this apparatus will be available for use within a short time.

Various types of telephone sets are being used at the stations. The New York Central and the Canadian Pacific are using a special transmitter arm so arranged that the transmitter and receiver are fixed on the arm, and the operator upon placing his ear to the receiver has his mouth in line with the transmitter. This arrangement permits an operator to have the use of both hands. A foot switch is used to close the transmitter battery. This is used to prevent a waste of battery and the introduction of noise on the line when an operator is listening on the circuit. The Burlington and a number of other roads have been using a simple form of transmitter with which a head telephone is used, thus giving the operator considerable freedom of movement. The telephone equipment is connected to the circuit by moving the head telephone from a switch hook upon which it is hung when not in use.

A key operated by hand is provided to close the transmitter battery during conversation. This key is arranged to open the transmitter circuit when released by the operator, thus permitting him to listen on the circuit without a waste of battery or causing a noise on the circuit. A foot switch could be used with this equipment if desired. The use of the transmitter key has not been found objectionable as it is not necessary to hold the key when receiving, thus having both hands free for writing. When talking the operator is not required to write so there is no necessity for him to have both hands free. With this apparatus the operator is not compelled to speak directly into the transmitter, but this apparently has not caused serious trouble.

The desk stand arranged for a head telephone has also been used, principally on account of its low price. On the D. L. & W. this is now standard. It is liable to injury by being knocked off the desk, but has the advantage of being located so as to be convenient to several people.

The Santa Fe and Union Pacific have used a set between the transmitter arm and the desk stand or what is commonly called a "flexiphone." This consists of a desk stand stem attached to an arm which can be raised or lowered so that it can be used while seated or standing and in addition can be rotated in a horizontal plane. The despatcher's equipment is practically the same on all of the railroads and consists of a chest transmitter, supported by a band passing around the despatcher's neck, and a head telephone.

It has been suggested that a loud speaking receiver be used by the despatcher. This arrangement while available and capable of giving a large volume of sound is not satisfactory on account of the quality of the sound rendered being less distinct than that obtained from a regular receiver held close to the ear. This is largely due to the reflection of the sound waves in the horn which must be used to amplify the sound. Another objection to this device is that noise in the room or from outside will prevent the despatcher hearing distinctly. A device of this kind is to be tried on one of the eastern roads for use in block towers in connection with the reporting of trains from tower to tower. Another design is being prepared for one of the western roads for trial on a despatching circuit. The use of a double head telephone has been considered and should be of benefit where the despatchers or operators are located in noisy locations. The use of a transmitter which could be mounted on the despatcher's desk which could be spoken to in place of having to speak directly into the mouthpiece as at present has also been suggested. This arrangement, while possible, would be found unsatisfactory for two reasons. First: It would render a poor quality of transmission, and second: it would necessarily have to be very sensitive to transmit the voice from a distance and it would therefore pick up other sounds in the room which, when transmitted on the circuit, would affect the service.

The cost of the telephone apparatus depends largely upon the type used and will vary from $17 to $36 per station. An average of $25 per station may be used for rough estimates. The selective apparatus in general use may be divided into two classes, electromechanical and mechanical, the Gill representing the electromechanical type and the Wray-Cummings the mechanical.*

The selector when operated closes a bell circuit and causes the bell at the station to ring until stopped by the operator answering the call. Where the bell at a station rings continuously until the call is answered and a station is called by mistake and the call is not answered for hours owing to the absence of the operator, there is a waste of battery, and one arrangement permits the despatcher to stop the ringing of the bell at any time after it has started. Another arrangement permits the bell to ring for a certain length of time and then automatically causes it to cease. One of the selective systems has what is known as an "Answer-back," an audible signal received by the despatcher when he has called a station and the bell has started to ring.

The cost of the total station equipment, including telephones, selectors, test panels and installation will vary according to the apparatus used from $60 to $96 per station. Combining these figures with those covering the cost of the despatcher's equipment and the line construction a despatching circuit of 150 miles, to which is connected 30 stations, will cost approximately $15,000, or at the rate of $100 per mile.

W. W. Ryder (C. B. & Q.): The telephone has been used by us fifteen months. During this time the service has been watched very closely and with increasing satisfaction.

That there may be no misunderstanding of orders given by the despatcher over the telephone, due perchance to haste, it is the custom to have the despatcher copy the order in his order book as he talks it off, thus gaging or reducing his rate of speech to his ability to write it down, and to the ability also of the receiving operators to make their copies; but even this speed is greater than that obtainable by the telegraph.

Each operator is compelled to repeat his order word for word to the despatcher, and also to listen to each of the other operators receiving the order while they in turn make their repetitions. The operators in repeating are allowed to read as rapidly as is intelligible, or at a rate far in excess of what they could make on the telegraph key, thereby saving much time for themselves as well as the listening despatcher. All names of stations, where given as meeting points in an order, and all figures are spelled out letter by letter both in the transmission of the original order and in all repetitions.

While a call is being made the circuit can be used at the same time for conversation, and during even the short time elapsing between the call and response oftentimes several offices will cut in and report trains or give the despatcher other information. These various savings in time—never at the expense of accuracy—greatly aid the despatchers in keep-

*The Wray-Cummings apparatus was described in the *Railroad Age Gazette* February 19, page 359.

ing their train sheets up-to-date and this condition is secured with much less physical effort.

Equally serviceable is the telephone in handling way office communications other than train orders, including Western Union messages, and here the question of quickened service is still more noticeable. Actual experience demonstrates the fact that it is possible to handle a much greater volume of business to and from the way offices by telephone. In one case where more attention has been paid to this feature than elsewhere the increase regularly amounts to more than 75 per cent.

The telephone works even better in bad weather than in good. The lower the static capacity of a telephone line the more satisfactory the service, and damp weather tends to reduce this static capacity. Then, too, adverse weather conditions such as frequently make the telegraph absolutely unusable, have no effect on the adjustment of the telephone. It stands ready for immediate use in all kinds of weather.

There is hardly a town anywhere on the line in which there are not bright young men who with the proper training would be perfectly competent to act as telephone operators, and this without the considerable study necessary to pick up the art of telegraphy. And it is far better policy to make use of men in their home towns or who have grown up along the line, as they usually have a local pride or interest in the success of their work. Our telegraph service was at its best when this condition existed to a considerable extent, and personal interest and discipline have lessened in proportion as we have been compelled to import telegraph talent. Now the use of the telephone is enabling us to return to the basis above outlined with resulting improvement.

The initial cost of a telephone circuit is greater than that of a telegraph circuit, and the maintenance expense will probably be somewhat greater, but the benefits derived from the change more than offset the increased expense.

NEW RAILWAY LAWS IN INDIANA.

The legislature of Indiana, recently adjourned, passed seven general laws affecting railways and three affecting electric lines. These latter deal with matters which are chiefly of local interest; interurban lines are given additional authority in connection with the purchase of equipment; toll road companies are authorized, under certain conditions, to grant rights of way to interurban or street railways, and a third bill regulates the making of contracts between railways and street railways.

Of the bills affecting railways generally, the most radical are those concerning headlights, bells and ash pans. Senate Bill No. 44 directs the railway commission to investigate locomotive headlights and authorizes it to enforce compliance with its orders by the railway companies. This bill was a substitute for others which had been introduced to compel the use of electric arc lights. House Bill No. 60 requires automatic bell ringers after January 1, 1910, on all locomotives, under penalty of a fine of from $100 to $300. Senate Bill No. 293 requires, after the first of January next, on all locomotives, ash pans which can be emptied without the man going under the engine—penalty $200 to $400. This is similar to the federal law on the same subject.

House Bill No. 379 requires all passenger and freight trains to be equipped with medical emergency boxes. House Bill No. 39 authorizes the railways to charge 10 cents additional fare when a passenger pays on the train, and the requirement that this excess shall be refunded is rescinded. The bill declares it unlawful for any person to ride as a passenger on any railway without payment, on demand, of the cash fare or ticket fare prescribed by law. Senate Bill No. 31 requires that after January 1, next, every switching engine shall be uniformly equipped with front and rear foot boards; and with grab irons. The law specifies the height and other particulars; penalty $100.

House Bill No. 274 re-enacts the law of 1907, regulating train crews. It requires that all flagmen shall have had at least one year's experience in train service, and the brakeman or flagman of a train shall not be required to act as porter.

RAILWAY SIGNAL ASSOCIATION.

The Railway Signal Association held its regular March meeting at Chicago on Monday, the fifteenth, President L. R. Clausen in the chair. In the forenoon the members listened to a paper by Mr. Creighton, of the General Electric Company, on lightning. Mr. Creighton illustrated his address by the use of high potential discharge apparatus, consisting of Leyden jars and transformers. It is very difficult to obtain definite data on lightning, as to the true potential or the amount of current or the frequency of discharge, and hence it is difficult to design an efficient arrester. However, recent laboratory experiments indicate that the average current of a lightning discharge is ten thousuand amperes; this is a direct stroke. But direct strokes seldom interfere with signal circuits, owing to the shortness of these circuits. Mr. Creighton explained briefly the present ionization theory of lightning, and described various kinds of discharges. Arcs following lightning discharges are due wholly to vaporization of the electrodes and cannot be maintained in air. Forty volts is the minimum potential necessary to maintain an arc. Lightning arresters successful in laboratory have proved useless in actual working, because working conditions cannot be produced artificially. No single test will show the value of an arrester. The frequency of lightning varies between a half million and a million cycles per second. Mr. Creighton performed experiments showing the behavior of choke coil arrestors. He showed that a discharge tends to leak from coil to coil. He also experimented with other varieties of arresters to test their efficiency. Arresters should be close to the apparatus to be protected and the connection to the ground should be short. The best ground connection consists of several ordinary iron gas pipe sections, driven down three to five feet, six feet apart. In dry ground salt will increase conductivity and will last several years.

In the afternoon there was a debate on the question, Resolved, that the scheme of signal practice, presented at the annual meeting at Washington last October, is the best devised to date. The first speaker was W. H. Elliott, of the New York Central. He explained by diagrams the main features of the scheme (diagram shown in *Railroad Age Gazette*, October 23, 1908). He declared the system to be a logical development of the best present practice; the upper quadrant and double light features being introduced as additional safeguards. The first speaker on the negative side was Thomas S. Stevens, of the Atchison, Topeka & Santa Fe, who presented another scheme of signaling based on having two arms on every post, the upper arm always giving home-signal information and the lower always distant signal information. (See committee report of A. R. E. & M. W. Association, *Railroad Age Gazette*, March 19, page 586.)

Mr. Stevens declared that the system presented at Washington was too much at variance with present practice and with the recommendations of the American Railway Association. Also it was not thoroughly consistent, especially in regard to aspect No. 9. Mr. Anthony, of the Pennsylvania, for the affirmative, rejoined with a general defense of the system presented at Washington, and pointed out inconsistencies in Mr. Stevens' scheme. Mr. Clausen, for the negative, presented a third scheme, the fundamental feature of which is a signal having only one arm. In other words, he proposes to adapt the present system of three-position signaling to all requirements, using the upper quadrant indications. He defended this as the simplest and most easily understood system possible to

devise. He attacked the system presented at Washington chiefly on the ground of complication and the use of unnecessary indications. After the four principal speakers got through there was general discussion until after six o'clock, when the chief debaters presented their concluding arguments. A vote was then taken and resulted in a victory for the negative side; affirmative vote 33, negative 79.

The secretary announced the recent death of Harry C. Hope, of St. Paul, formerly president of the association, and appropriate resolutions were passed.

ABUSE OF THE M. C. B. REPAIR CARD.*

BY EUGENE CHAMBERLAIN,

Chairman Freight Car Repair Pool, N. Y. Cent. & Hudson River R.R.

Current M. C. B. rule 76 requires that when repairs of any kind are made to foreign cars, a repair card shall be securely attached to designate locations of the repairs, this card to specify fully the repairs made, reasons for same, date and place same were made and name of road making the repairs, etc. Obviously, the repair card was adopted for the purpose of establishing a close relationship between the car owner and the road making repairs and thus eliminate tracing upon the part of the car owner to determine the responsibility in the event of wrong repairs having been made, and at the same time relieve intermediate or delivering roads from any responsibility.

The object was most worthy, and if all roads actually making repairs to foreign cars fully complied with rule 76, identification by owners would be easy, and prompt adjustment in the event of wrong repairs possible. Unfortunately, however, it is claimed that rule 76 is not being complied with by all railway companies who are parties to the M. C. B. rules, thus producing a very unsatisfactory condition and practically annulling the purpose for which the repair card was created. It has been discovered on some roads that the card is often attached to cars by attempting to force the tacks into the timber with the thumb, with unsatisfactory results. When the car finally reaches home, minus the card, and it is found that wrong repairs have been made, the owner must pay the cost of repairs or employ an additional force of clerks to trace and locate the malefactor. The length of time required for the car to reach home is often great, and the stubs that have accumulated with the bills from foreign roads reach such proportions that the function of selecting the particular stub to check against the card on a car requires time and patience not usually allotted to the busy railway man. If you are fortunate enough to finally locate the stub for the car in question, and upon examination of the car discover that the metal parts are so corroded or tarnished that you are unable to distinguish between alleged new work and the old, one is apt to give the billing road the benefit of the doubt and pass the bill for payment; also in cases where you are in receipt of a bill for repairs and the car itself bears no repair card or evidence of the work described, you still have left the choice of two evils, that of passing the bill without finally locating the work, or refusing payment.

While unquestionably rule 76 has been and is to-day being flagrantly violated, one would be without standing in court should he without positive proof allege dishonesty upon the part of any railway in the non-application of repair cards. It is possible that the fault may lie in the indifference of repair men. The fact remains that bills are being rendered for repairs to cars that bear no repair card, and in some instances no evidence of repairs having been made. In the light of experience, it would appear that the repair card in its present form is not what it should be, and even if rule 76 be fully and honestly complied with by all roads, the weakness still remains and is about equally divided between the possible loss when attached or failure to attach the repair card to the car, and the difficulty of determining by examination of the car whether specific repairs have or have not been made, especially when cars are long absent from home.

Assuming that all roads are, or intend to be, perfectly honest in complying with rule 76, what in the rule will prevent a road from removing a pair of wheels in perfectly good condition, that have been in service but a year under a foreign car, and placing this pair of wheels for further service under one of its own cars, and billing the foreign road for a pair of new wheels to replace those which it claims were shelled out, and attach a repair card to the car in evidence of work done? Again, what in rule 76 will prevent any road taking the initials and numbers of any and all foreign euipment which may be standing upon their sidings in perfectly good condition, attaching repair cards thereto without doing any work at all and rendering bills for alleged repairs? It is rumored that a certain railway established the practice of applying side doors to the majority of foreign cars passing one repair point, brake-shoes at another repair point, air-brake hose at another, etc. This scheme worked well until the side door specialist became over zealous and began to apply side doors to coal cars, which fact the car owners discovered when about to pass the bill. Whether this be true or not, the possibilities are certainly present.

It has been suggested that many so-called combination car users' defects, as described in M. C. B. rules 49 and 56, are somewhat dangerous for the car owner, in view of the fact that they can be speedily converted into the owners' defect by a slight error on the part of a repair man in omitting to repair the end sill, where both that and a longitudinal member are damaged and require replacement on the same end of a car. The loss of the repair card takes from the car owner the only means of identifying the actual repairs made. Should the owners, upon examination of the car, discover that a new end sill had been applied in conjunction with the longitudinal sill, they would doubtless refuse payment for the latter. These queries are simply submitted as food for thought and are in no wise intended to convey the idea that any railway in the country would adopt any other than fair and honest measures; but I am reminded that any rule which would make absolutely impossible nefarious practice would be an excellent one to adopt as a substitute for present rule 76.

It is human nature to criticise or pick flaws in any rules provided for the government of men or business, and I am only one of the great army that comes before you without a remedy which practice has proven faultless. The remedy will come in due time through the united effort, thought and action of the railway men of this country, to whom I bare my head in recognition of their unquestioned fairness and honesty of purpose. In the meantime, and still operating under the present rule 76, let us aim to obey it to the letter and if necessary establish an inspection that will leave no doubt in our minds that the provisions of the rule are being absolutely complied with on the road we are representing.

*From a paper read before the New York Railroad Club, March 19, 1909.

A society of automobilists in England asked the Board of Trade not to permit a proposed local railway to be built unless it would eliminate some crossings of highways at grade shown on its plans. The impertinent Board of Trade replied that in the whole United Kingdom in 1907 50 persons were killed and 30 injured by trains at railway crossings—many of them attempting suicide, and most of them by their own fault; while in the city of London alone in nine months of that year 105 persons were killed and 2,945 injured by automobiles; which was the Board of Trade's way of saying that the motor-car people should take the beam out of their own eye before asking the railways to take the mote out of their eye.

General News Section.

The Federal Board of Mediation, Messrs. Knapp and Neill, have informed the firemen of the Pennsylvania Railroad that the grievances submitted by the firemen do not constitute a ground for action by the Board.

William Barclay Parsons, who a few years ago held the position of Advisory Engineer to the Royal Commission on London Traffic, is now to make a study of the London transportation problem, in so far as it affects the Underground Electric of London.

The inspectors of the Bureau of Explosives connected with the American Railway Association have lately discovered explosives in the baggage of passengers, in a few cases, and one passenger, a miner, and presumably ignorant of the requirements of the law, has been arrested and held for trial.

Robert Thurston Kent has resigned as Engineering Editor of the *Iron Trade Review*, Cleveland Ohio, to become Managing Editor of *Industrial Engineering*, Pittsburgh, Pa., a new paper devoted to mechanical engineering. Mr. Kent has been with the *Iron Trade Review* since 1905, and prior to that time was Associate Editor of the *Electrical Review*, New York.

A committee composed of two representatives of each railway entering Chicago has been appointed to complete plans for the organization of a club, to be called the Chicago Railway Club. W. B. Barr, General Freight and Passenger Agent of the Chicago Terminal Transfer, is Chairman of the committee, and E. L. Bevington, Secretary of the Transcontinental Passenger Association, is Secretary.

The Managers of the Alaska-Yukon-Pacific Exposition, to be held at Seattle beginning June 1, announce that the transportation building will before long be ready for the exhibits. The major portion of the cost of this building was provided by eastern locomotive builders. It is promised that the exhibits of locomotives and cars, and also all kinds of equipment for electric roads, will be on a liberal scale.

At the Windsor street station in Montreal, March 17, four persons were killed by a runaway train, which, after running uncontrolled for about five miles crashed into the station at high speed. About a dozen other persons were injured, some of them fatally. The train became uncontrollable because of the blowing out of a plug on the engine, which allowed the cab to be filled with steam. The engineman and fireman jumped off and the other men of the train were unable to stop it.

The New York Public Service Commission, First district, has begun proceedings to collect from the Brooklyn Heights Railroad a fine for disregarding an order of the commission requiring the road to run a certain number of cars over the Williamsburg bridge between New York and Brooklyn. The commission ordered the company to run, during the rush hours, 24 local cars every 30 minutes; but the company, after obeying the order for a time, reduced the number of cars to 14 each 30 minutes.

Daniel Willard, Vice-President of the Chicago, Burlington & Quincy, made an argument March 17 before the committee on railways of the Illinois Senate against various bills for the regulation of railways that are pending. The bills in question provided, among other things, against liability contracts between employers and employees, against extortion and unjust discrimination by railways, for "full crews" on various kinds of trains, for foot boards on switching locomotives, etc. Mr. Willard estimated that the bills now pending in the two houses of the Illinois legislature would, if passed, cost his road alone $210,000 a year. The bill against liability contracts between employers and employees would break up the pension system which the Burlington established in 1888 and under which 24,000 employees are now insured death benefits amounting to $21,000,000. This company, he said, would, if the proposed legislation were passed, save $80,000 a year in the expense of administering this fund, but where would the men get such good insurance for 6 cents a day? The bill against discrimination contained provisions which would cost his road from $100,000 to $110,000 a year, and he suggested that the matters which it deals with would be better left to the State Railroad Commission and the Interstate Commerce Commission. The bill requiring a minimum crew of five men on switching engines would cost his road $12,000 a year. It was backed by union labor probably because it would make more jobs. The bill for crews of certain sizes on pasenger and freight trains would cost his road $82,000 a year. With regard to the bill for foot boards on switching engines, he said that, with the proposed law, a cattle train halted in a yard where there happened to be no switch engine might be greatly delayed because the road would be unable to press into service a road engine for switching. He mentioned cattle trains because the Burlington hauls 188,000 carloads of stock a year. The federal law for a nine-hour day for telegraphers is costing the Burlington system $70,000 a year more than it formerly paid for this service. The Board of Directors of the Burlington had recently approved the expenditure of $12,000,000 for additions and improvements, and he was sure would go ahead with them if there should be no more unfavorable railway legislation. In Illinois alone it was intended to begin improvements amounting to from $3,500,000 to $4,000,000 within the next 60 days. If, however, restrictive and burdensome legislation was to continue, these improvements were sure to be interfered with or prevented.

Lehigh Valley Freight Piers at Jersey City Damaged by Fire.

A fire on March 19, which originated on the 600-ft. freight pier B, of the Lehigh Valley at Jersey City, N. J., destroyed that pier and damaged the river end of Pier C, and also a barge loaded with cotton. There were about 60 carloads of freight piled on piers B and C, and 60 freight cars partially loaded, standing on the tracks along the two piers. All of the cars were removed except one loaded car, which was destroyed. The loss to buildings is estimated at between $80,000 and $100,000, and freight about $50,000.

Vote of Thanks for Secretary Fritch.

The excellent work of the committees of the Maintenance of Way Association for this year's convention has been already mentioned. Not less commendable is the work of editing the reports, filled as they are with illustrations and data varying widely in character. Everybody acquainted with the facts will indorse the resolution passed at the close of the convention, that—"the association appreciates the splendid services which Mr. Fritch has rendered in filling the arduous duties of his position, and that a vote of thanks be tendered him by the association at this time."

Proposed Modifications in New York Railway Law.

Bills have been introduced in the New York state legislature to amend the Public Service commissions law by including telephone, telegraph and ferry companies under the jurisdiction of the two commissions (one for each of the two districts of the state). There are two bills. One relates to the telephone and telegraph companies, giving to the commissions power of regulation over those corporations similar to that now held over railway and street railway concerns. A second bill amends the present law generally with regard to many details. This bill not only clears up the slight ambiguity in the present law, but gives the commissions authority to order joint rates and transfers on street railways, to compel the giving of transfers between independent companies, and to regulate the issuance of transfers by any company.

Boats and vessels operated by or in connection with any

railway where both are used under a common control for continuous carriage are placed under the jurisdiction of the commissions. The commissions are authorized to prosecute an action in the name of the people to vacate the charter and the franchises of any public service corporation within their jurisdiction, in case the corporation has forfeited its privileges by failure to exercise its powers within the time prescribed by law, or where part of a franchise has not been used, to forfeit it for the same cause as to the unused portion.

The section prohibiting passes and reduced fares on railways is amended so as to permit the transportation of children under five years of age free, children under twelve years of age at half fare, and to authorize school commutation tickets at less than adult rates, and where commutation or mileage tickets are sold to prevent unreasonable discrimination as against any person or locality.

The provision relative to through routes and rates is amended to provide that the corporations shall agree as to the division of rates, or that the commissions shall have jurisdiction to determine in case of disagreement, and when the commissions think that through cars should be operated over steam railways and street railways meeting at common points they are to receive jurisdiction after a hearing to issue orders accordingly.

Changes in the provisions regarding gas and electric companies also are important. The commissions' powers of control over those corporations never were so rigid as over railways and street railways. This bill stiffens those provisions so that they are as rigid as those dealing with the railways.

In the existing law are provisions compelling corporations seeking to issue additional securities to obtain permission from the commissions, but those provisions did not include short term notes. As a result there has been a distinct tendency for transit corporations to issue twelve-month notes, refunding them by another issue of twelve-month notes, for which issue no permission was required. A provision has been inserted in this legislation prohibiting the issue of short term notes to refund similar notes.

At the request of Speaker Wadsworth and at the desire of the up-state commission, stage lines, which were put under the jurisdiction of the commissions by the proposed legislation last year, are omitted from the bills this time. The commission for the 1st District wanted them included because of the Fifth avenue stage line, but was not especially anxious about it, since that company can be regulated under the transportation corporations law.

Inspection Trip of the A. R. E. & M. W. Association.

The convention of the American Railway Engineering and Maintenance of Way Association adjourned on March 18 and on Friday morning, the 19th, a party went on an excursion to Buffington and Gary as the guests of the United States Steel Corporation. Members of the association and their friends to the number of about 550 made up the party. They left Chicago over the Lake Shore and the train was composed of ten Pullman cars arranged with tables for luncheon en route. The first stop was at the large cement plants at Buffington, Ind., 22 miles from Chicago, near Lake Michigan, and the party was here shown the methods used in making cement out of slag from the blast furnaces. The two plants here form practically one large one, but they were built at different times and are run separately. Plant No. 3 was started January 1, 1905. It contains 16 kilns, each 70 ft. x 80 ft., and has a daily output of 5,000 barrels of Universal Portland cement; and the stock house has a storage capacity of 310,000 barrels.

Plant No. 4, directly north, was started October 27, 1907, and is now in operation. This plant has 12 kilns, 75 x 120 ft., with a daily production of 6,000 barrels and storage room for 400,000 barrels. These plants are operated entirely by electric power generated by waste gases from the blast furnaces at the Illinois Steel Company, South Chicago, and transmitted by high tension alternating current, which is transformed at the plants for distribution. The raw materials used are limestone and granulated blast furnace slag.

After visiting these plants the party boarded the train and luncheon was served while running from Buffington to the Gary & Western Railway junction east of Gary, passing the sites of plants of the American Locomotive Company and the American Car & Foundry Company. The latter site occupies 210 acres, bounded on the south by the Calumet river and on the north by the Kirk yards of the Steel Corporation; and the eastern line is nearly parallel with the western boundary line of the town of Gary. Directly west of the proposed car shops is a tract of 90 acres which has been set aside for the future works of the American Bridge Company. The tract to be used by the American Locomotive Company occupies 130 acres between the Baltimore & Ohio and the Lake Shore main lines, with its east boundary near the eastern line of the corporate limits of the town of Gary.

On arrival at the Indiana steel plant the party left the Pullman train and boarded a train of flat cars for a general trip covering the whole plant, including the blast furnaces, the open hearth furnaces and the great steel rail mill. The construction of the plant was begun in March, 1906, and it commenced rolling rails the first of the present month. It has been described and illustrated in great detail by a number of the trade papers, but it may be convenient to refer to some of the principal figures relating to its capacity. The ore is taken from the lake boats by five 10-ton Hulett unloaders, with a capacity each of 250 tons an hour, and the ore bins have a capacity of 20,000 tons. The blast furnaces, eight in number, are rated at a daily capacity of 450 tons each. Three of them are now producing iron, one is ready for blast and four are under construction. The total annual capacity of the eight furnaces will be 1,200,000 tons of pig iron. These furnaces are arranged with dust catchers and gas washers, so that all of the gas is utilized either for heating the hot blast stoves or for power in gas engines. There are 16 blowing engines, each 2,000 h.p., and four 3,000 h.p., intended as spare engines for emergency. The electric power plant is located between the blowing engine house and the open hearth furnaces, and the installation consists of 17 horizontal twin tandem double-acting gas engines directly connected to 250 k.w. Allis-Chalmers generators and two General Electric Curtis turbo-generators of 2,000 k.w. capacity. Of the open hearth furnaces there are at present convenient twenty-eight 60-ton furnaces and for each open hearth furnace there are five gas producers. The rail mill and billet mill will each have a capacity of 100,000 tons a month. There is also a 60-in. universal plate mill and a 160-in. sheared plate mill. The merchant mills and axle works are now being built. The merchant mills, six in number, will have an annual capacity of 200,000 tons. The largest individual electric motors in the world are employed in these mills. The rail mill has, among others of large size, three 6,000-h.p. induction motors. The rail mill has already filled a large order for the Burlington and one for the Great Northern, and at the time of this inspection it was rolling a new 100-lb. section for the Pennsylvania Railroad.

After completing the inspection of the steel works, the party was taken to the new yard of the Chicago, Lake Shore & Eastern, where the new roundhouse, machine shop and car shops of that road were inspected; and the return to Chicago was made over the Lake Shore, reaching there at 6 o'clock.

Pennsylvania Electric Equipment.

The East Pittsburgh works of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., and the Westinghouse Machine Co. are now at work on the first apparatus represented by the $5,000,000 contract which the Pennsylvania Railroad Co. placed with the Westinghouse people some time ago for the electrification of the Pennsylvania terminals and tunnels in New Jersey, New York and Long Island. This initial contract consists of two 12,000-h.p. turbo-generator outfits, two 4,000-h.p. equipments of the same type, and one hundred 200-h.p. electric railway motors.

The turbines will be constructed in the shops of the Machine company, and the generators will be made at the factory of the Electric company. When completed, they will be installed in the power-house of the Pennsylvania Railroad at Long Island City. The two large machines will furnish the power for some of the locomotives and the smaller ones will generate

the electric current for lighting the New York terminal station and the tunnels under the North and East rivers.

In the Long Island power house there are already installed three 9,000-h.p. Westinghouse turbo-generators, which were furnished some years ago. At that time they were considered the first turbo-generator units of any considerable size placed in service in this country.

The electric railway motors will be mounted on 50 passenger cars for the Long Island Railroad.

The Pennsylvania engineers in New York City and Altoona, in conjunction with the electric railway designers of the Westinghouse company, have about completed the design of the electric locomotives which will be used on the New York extension. Many novel features are embodied in the design. It is expected that work on these locomotives will be started early in April.

Traffic Club of New York.

At the regular monthly meeting on March 30, Oscar P. Austin, Chief of the Bureau of Statistics, Department of Commerce and Labor, Washington, D. C., will deliver an illustrated lecture on "Queer Transportation Methods in Curious Corners of the World."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday, in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Altanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Montana Demurrage Bureau had 34,338 cars reported in February, 1909, with a total average detention of 1.29 days and with 80.33 per cent. of the cars released in free time.

At Carson City, Nev., the federal grand jury has returned an indictment against the Southern Pacific on a charge of giving illegal rebates to the California Sugar & White Pine Agency.

The Central Passenger Association has voted to grant the request of merchants and others in Indianapolis who desire to have all passengers passing through that city allowed a stop-over of ten days.

The Baltimore & Ohio announces that it will make another reduction in the rates on import freight from the Atlantic seaboard westward, from 67 cents per 100 lbs. (first class) to 64 cents. This is another step in the rate war which was begun by the Boston & Maine several months ago.

After a number of conferences of presidents, the controversy between the New York, New Haven & Hartford and the trunk lines, concerning the action of the New Haven in making low rates on freight to the West through Canada, has been referred to a committee consisting of Messrs. Brown (N. Y. C.); Hays (G. T.); Truesdale (D., L. & W.), and Walker (O. D. S. S.).

The Trunk Line Association announces that, beginning with April 26, when lake navigation will be open, the rate on grain from Lake Erie ports to New York harbor will be reduced from 5½ cents a bushel to 4 cents. Corresponding reductions will be made to Boston, Philadelphia and Baltimore. The announcement says that the new rates will be maintained 60 days. The Lackawanna first made this reduction and then the other lines followed. The purpose seems to be to forestall the competition of the water lines to Montreal, which last season was severe.

By the new passenger tariff which the New York Central has issued, to go into effect April 1, fares between all stations on the Hudson division between New York and Albany are calculated at the uniform basis of 2.17 cents a mile.

The Southern Demurrage and Storage Bureau had 52,649 cars reported in January, 1909, as compared with 47,773 cars in January, 1908. The total car days' detention in January this year amounted to 113,836 as against 112,257 in the previous year. The total average detention in January, 1909, was 2.11 as compared with 2.35 in 1908.

For the second time the Washington reporters tell us that the southern railways, as a result of conferences with shippers and with the Interstate Commerce Commission, have agreed to pay the overcharges which are due to shippers of lumber on account of the judicial decision that the rates for about two years were 2 cents higher than was reasonable. It is said that the amounts now refunded amount to about $3,000,000.

The Kansas House has passed a bill to reduce sleeping car rates. It provides the following maximum rates: For a lower berth for a trip not exceeding 150 miles, $1; for a trip of more than 150 miles and not exceeding 300 miles, $1.50; for a trip of more than 300 miles and not exceeding 400 miles, $2; for an upper berth, rates not to exceed three-fourths of the foregoing rates. The tourist sleeper rate would be 75 per cent. of the standard rates. For seats in parlor cars, a rate of 25 cents a hundred miles is fixed. The penalty for violation is a fine from $100 to $1,000 and from 30 days to six months in jail.

Clarence C. Gray, a member of the Minnesota Shippers' Association, has brought a suit against the Minneapolis & St. Louis to recover $6 for an alleged unlawful delay of six days in the transportation of a carload of corn in October, 1908, and in addition for an attorney's fee of $100. The action is brought under the Nolan reciprocal demurrage act, which provides that for every delay of 24 hours by a railway in promptly for-

warding a car the road shall pay $1 to the injured party. Counsel for the Minneapolis & St. Louis has filed an answer attacking the constitutionality of the act and alleging that it interferes with interstate commerce; and its validity will be tested in the resulting litigation.

The coal operators and miners in Iowa are protesting against reductions in rates on coal from points in Illinois to points in Iowa that have been announced by the Wabash, the Chicago & North Western, the Iowa Central and the Chicago, Milwaukee & St. Paul. The Wabash has made a rate of $1.50 per ton on coal in carload lots from Illinois coal fields to Des Moines, with proportionate rates to intermediate points. The North-Western, Iowa Central and St. Paul have made rates based on $1.60 per ton from Chicago to Des Moines 358 miles. The Iowa distance tariff rate is $1 per ton for a 100-mile haul, and the operators and miners in Iowa contend that the railways, in making the reduction in interstate rates without corresponding reductions in state rates, are discriminating against the mines in Iowa. Similar complaints have been made in the past and have always been answered by railway officers by a reference to the Iowa railway law, which requires them when they make a reduction in rates on any part of their line to make corresponding reductions on all other parts of their lines. Consequently, if they should make reductions in state rates from eastern Iowa corresponding to the reductions that they have made in interstate rates they would be obliged to make similar reductions in rates on coal throughout the state, and this would cause heavy losses in revenue.

By a new passenger tariff which the New York Central has issued, to go into effect April 1, fares between all stations on the Hudson division between New York and Albany are calculated at the uniform basis of 2.17 cents a mile, which is the present rate through from New York to Albany. The new tariff corrects inconsistencies in the construction of the local fares on the Hudson division, by reason of which the sums of locals were slightly less than the through fares between New York and Albany. These inconsistencies resulted in continual complaints. In some cases the new basis works an advance over the present fares; in others a reduction. The fares between New York and intermediate points north to Rensselaer, inclusive, will be slightly increased, and the fares from Albany to points south of Tivoli, inclusive, will be correspondingly decreased. Between New York and all points on this division round-trip tickets are sold at a slight reduction from double the one-way fares, and these round-trip fares are not disturbed. For example, under the new tariff the fare between New York and Fishkill one way will be $1.28 instead of $1.16 as at present. The round-trip fare will continue to be $2.25. A large proportion of the local travel to and from New York on the Hudson division is round-trip business. The maximum legal fare on the Hudson division is 3 cents a mile.

The Missouri, Kansas & Texas has announced a rate of 85 cents per 100 lbs. on dry goods from Galveston, Tex., to Oklahoma City, Okla. In connection with the low water rate from New York to Galveston, resulting from the steamship rate war, this will make a combination rate of $1.10 on these articles from New York to Oklahoma City. The through all-rail rate from New York to Kansas City is $1.47, and the merchants of Kansas City have protested against the rate given to Oklahoma City as a discrimination against them, and the Kansas City Commercial Club has declared a boycott against this road. It is reported that the Kansas City Southern will make a rate of $1.02 from Galveston to Kansas City. This, in connection with the ocean rate from New York to Galveston, will make a water and rail rate from New York to Kansas City of $1.27. C. Haile, Vice-President of the Missouri, Kansas & Texas, has asked the shippers at Kansas City to rescind their boycott in order that his road may have a chance to make a readjustment more satisfactory to the merchants of that city. The Chamber of Commerce and the Merchants Association of Guthrie, Okla., have adopted resolutions condemning the action of the Kansas City Commercial Club and threatening a boycott against the shippers at Kansas City unless they withdraw the boycott against the Missouri, Kansas & Texas. Similar action, it is reported, has been taken by 26 other commercial organizations in various parts of Oklahoma. The situation is a good illustration of the difficulty that railways constantly meet in making adjustments of rates satisfactory to competing commercial centers.

Officers of the railways in Missouri have decided to restore the 3-cent fare on state passenger business in that state on April 10. It is not improbable that further conferences between the officials of the state and the officers of the roads will be had regarding the litigation which resulted in Judge McPherson's decision holding the 2-cent fare law unconstitutional and which the state has anounced it will carry to the Supreme Court of the United States.

While the rate clerks of the railways are going ahead checking in passenger rates in Missouri on a 3-cent basis, Governor Hadley and Attorney-General Major, of that state, are daily issuing excited bulletins telling what they will do to the railways if the 3-cent fare is restored. In a statement issued on March 18, Governor Hadley said: "It is enough to say that if the 3-cent rate goes back at this time we will put our war paint on and begin beating our war drums. If the railways are disposed to treat Missouri unfairly they can rest assured that the Missouri authorities will allow them no quarter." He added that he and Attorney-General Major had agreed upon a plan of campaign against the railways. On the same day Mr. Major issued a long statement, saying that an investigation of state freight rates on coal had disclosed that some railways are interested in and perhaps control different mines and fix discriminatory rates, a condition which will not be permitted to exist. On March 21 Mr. Major issued another long statement, in which he said that the bill introduced in the legislature giving the State Railroad Commission power to fix maximum passenger rates within the limits prescribed by law was a precautionary step to put the state in a position to control the passenger fare situation as completely as can be done under the 2-cent fare law. He said he did not believe the roads would adopt 3-cent fares. A bill prohibiting railway companies from engaging in any business other than that of transportation has been introduced in both branches of the state legislature. It was drawn by Governor Hadley and Attorney-General Major. Mr. Major announced that he has decided to call a conference of the attorney-generals of Missouri, Illinois, Nebraska, Kansas, Arkansas and Iowa to plan a concerted campaign against advances in passenger rates above 2 cents a mile.

INTERSTATE COMMERCE COMMISSION.

Carstens Packing Co. vs. Oregon Short Line.

Carstens Packing Co. v. Oregon Short Line et al. Opinion (842) by Commissioner Lane. Case No. 1668.

Complainant made shipments of cattle from Nampa, Idaho, to Tacoma, Wash., but in order to combine these cars with others instructed that the shipments go forward on combination rates based on Ontario, Ore. This combination was higher than the through rate. Since the reasonableness of the rates charged is not in issue, the commission has no authority to grant relief.

Discriminations Against Indianapolis.

Indianapolis Freight Bureau v. Cleveland, Cincinnati, Chicago & St. Louis et al. Opinion (844) by Commissioner Clements. Case No. 1041.

Complainant alleges unjust discrimination in rates on various articles from Indianapolis to East St. Louis, Ill., and St. Louis, Mo., as compared with rates on the same articles from Chicago. While recognizing the differences in competitive conditions as between Indianapolis and Chicago, the commission is convinced that the disparities between existing rates from these respective points of origin are too great on some commodities, and prescribes a proper relative adjustment on iron and steel articles, castings, burlap and gunny bags, furniture and chairs, iron beds, and wooden ladders.

Complainant challenges the reasonableness of the Official Classification rule providing for the application of fourth class ratings on castings, japanned, in carloads, and third class on less than carloads. Formerly carload-shipments of such articles were charged fifth class rates and less-than-carload ship-

ments, fourth class. The application of the higher ratings is condemned and the carriers ordered to apply fifth class ratings on carload and fourth class on less-than-carload shipments. These ratings were applied during a long period of time and the advance results solely from conformance with a rule which follows an arbitrary line of demarcation for the convenience of the carriers in applying a general classification basis. This does not constitute a sound transportation reason for such marked differences in rates, and no other conditions appear as a warrant therefor.

Complainant alleges unjust discrimination against Indianapolis in that a rule permitting the use of two cars at the highest minimum weight and the lowest rate provided for one car to accommodate shipments of light and bulky articles is applied at Chicago, while the same is denied on similar shipments from Indianapolis to western trunk-line territory and to Mississippi river crossings. The commission is of the opinion that the application of this so-called two-for-one rule from Chicago and its non-application from Indianapolis results in such great disparities between the freight charges from these respective points as to work an unjust discrimination against the place last mentioned, but the rule in the form in which it is applied at Chicago will not be extended. However, a rule similar in substance, but so restricted and modified as to prevent its improper manipulation, should be extended to Indianapolis or else the unlawful discrimination should be removed by a readjustment of the minimum weights on the various articles referred to in the complaint so that they will conform approximately to the actual loading capacity of cars. This feature of the complaint will be retained, and if at the end of three months from this time the carriers have been unable to remove the discrimination, the commission will then make such order as may appear necessary and proper.

The complainant alleges the exaction by defendants of unreasonable class rates from Indianapolis to Ohio river points and to Chicago, respectively, as compared with rates between Chicago and the Ohio river. The mere fact that there is a greater percentage disparity between rates on two classes from Indianapolis than on two other classes, or that a disparity greater in one case than in another exists between the corresponding classes from Indianapolis and Chicago, does not afford a just or proper basis or reason for the rearrangement of rates and disturbance of conditions, commercial and otherwise, throughout a large territory when it is manifest that the established system is the outgrowth of actual conditions and the result of a gradual development. No showing has been made that the present rates are unreasonable or unjust in and of themselves, or that they yield to the carriers' exorbitant earnings for the transportation service. This prayer of the petition is denied.

The commission is not convinced that the present proportional rates published from Indianapolis to Ohio river crossings for application on through traffic to southeastern territory are unreasonable. It is evident that proportional rates from more distant points must be less per mile to permit such points to compete in the common market, and the commission does not feel warranted in condemning a system of rate making whereby wholesome competition between producing centers is preserved when no showing is made that the rates complained of are unreasonable or do in fact result in unjust discrimination, or that the more advantageous geographical location of one point has been disregarded and vitiated by an abnormal adjustment.

Exception to Combination of Locals Rule.

Harlow Lumber Co. v. Atlantic Coast Line et al. Opinion (843) by Chairman Knapp. Case No. 1397.

Complainant alleged that a through rate of 32 cents per 100 lbs. upon lumber, in carloads, from Warsaw, N. C., to Chappaqua, N. Y., was unreasonable, because it exceeded the combination of local charges to and from New York, but it appeared that for reasons stated complainant could not have taken advantage of the combination of local charges, except at an expense as great or greater than the through rate. The record does not therefore disclose a typical through rate in excess of the combination of locals such as has been condemned in general terms by the commission. Reparation denied.

Car Capacity and Minimum C. L. Weights.

J. Rosenbaum Grain Co. v. Missouri, Kansas & Texas et al. Opinion (842) by Commissioner Cockrell. Case No. 1771.

Defendants collected from complainant 18½ cents per 100 lbs. on 60,000 lbs. of wheat shipped in a car of 55,000 lbs. maximum capacity from Kansas City, Kan., to Galveston, Tex., for export, and thus collected on 5,000 lbs. more than the maximum loading capacity of the car. This was an unreasonable charge and reparation is awarded. The tariff provision of the defendants prescribing a minimum weight on all shipments of wheat for export from Kansas City to Galveston is unreasonable and in direct conflict with the administrative rulings of this commission.

STATE COMMISSIONS.

In compliance with an order by the Indiana Railroad Commission work has begun on the construction of a connecting track between the Pennsylvania and the Chicago, Cincinnati & Louisville in Richmond, Ind. This display of activity on the part of the Pennsylvania Company ends a long fight with the State Railroad Commission. The commission found that 90 per cent. of the output of the factories in Richmond could be loaded directly on cars of the Pennsylvania lines, while shippers had to cart their products to the freight house of the C., C. & L. Cars of the C., C. & L. will now be run over the Pennsylvania tracks to the factories for loading.

Restoration of Two-and-a-Half-Cent Fares in Virginia.

The State Corporation Commission of Virginia, on March 16, delivered an opinion permitting the railways of the state to increase their passenger fares from 2 cents a mile to 2½ cents. The commission is not unanimous in its opinion, Commissioners Prentis and Willard voting for the increase as asked by the roads and Commissioner Rhea dissenting and urging that the old rate is not unreasonable. He holds that before any increase whatever is permitted the roads should give assurance that they will place on sale and keep on sale books to be sold at 2 cents a mile, interchangeable. He also expresses the belief that the roads should give this assurance before any action is taken looking to the termination of the present rate cases in the federal courts.

The order of the commission provides that mileage books and party rate tickets at reduced rates be retained, the mileage books to be interchangeable, good on any road in the state. The opinion makes no reference to this, but it is embraced in the order of the commission. The new rule is designed to go into effect April 1. The opinion holds that the railways have shown that under the 2-cent maximum rate the revenues of the roads have decreased, while the actual interstate traffic has increased. Many interstate passengers, desiring to save the half cent a mile, have bought tickets to points at the boundaries of the state and then in continuing their journeys have bought the rest of their tickets at other points.

The Southern Railway Company announces that when these advanced rates are put into effect on its lines, as is expected to be done on April 1, the entire system of mileage books which is in use on its lines in the states of North Carolina, South Carolina, Georgia, Alabama and Tennessee will be extended to Virginia.

New York: Buffalo, Rochester & Eastern Refused a Certificate.

The New York Public Service Commission, Second district, voted, on March 16, not to grant the application of the Buffalo, Rochester & Eastern for a certificate of public convenience and necessity to build a railway in general paralleling the New York Central & Hudson River between Buffalo and Troy. Commissioners Stevens, Decker, Sague and Olmsted voted against granting the certificate; Commissioner Osborne declined to vote. This application has been before the commission for more than a year, and was supported by a considerable local sentiment along the proposed route.

The commission voted against the building of the new road because there was not sufficient financial backing; because the

cost would have been so great that the road would have had to earn returns on a greater capitalization than any other in the country, earning about $48,000 a mile, where, in 1906, no road in the country earned $40,000 a mile gross; because, therefore, a greater tonnage would be required than that of any railway in the country; because the eastern outlet of the road would be in no condition to handle additional business, and the western terminus have no additional business to furnish; because existing railway facilities could handle the present business adequately and care for such increase as developed; because no public benefit as to cheaper transportation would result, and because the local business to be accommodated would not warrant the building of a new road—a conclusion admitted at hearings by the applicant.

The commission showed that the Boston & Maine, the sole Eastern connection of the proposed line, in full tide of business of 1907, was unable to take care of the business offered it by its western connections and that this inability was one of the causes of congestion and delay in the business of that year of railways in New York state. An average of 770 loaded cars a day was the utmost the Boston & Maine could handle, while the business the Buffalo, Rochester & Eastern would be compelled to offer it to pay necessary charges would be fully as much more.

The commission stated that the cost of building the 297 miles of the proposed road was placed by the applicant at $85,559,018, but that an examination of the evidence and the report of the commission's engineers placed the cost approximately at $100,000,000. "The financial ability of the applicant as shown on hearings was that it has a total authorized capital stock of $3,500,000," says the commission, "of which only $350,000 has been subscribed by persons whose aggregate financial resources do not exceed from $10,000,000 to $15,000,000. None of these persons is shown to have experience in the building, operation or management of steam railways or any connection with or control over financial resources other than as stated."

Ralph D. Gillette is President and A. D. Robinson Secretary of the proposed road. Both live at Westfield, Mass.

COURT NEWS.

In the United States Circuit Court at Buffalo, N. Y., Judge Hazel has imposed a fine of $20,000 against the Standard Oil Co. in the long pending suits concerning illegal rates charged for the transportation of oil from Olean, N. Y., by way of Rochester to points in Vermont.

The statement on page 475 of our issue of March 5 that "the Supreme Court of Pennsylvania has decided that the state law stipulating the length of time goods may be kept in storage is invalid, so far as it applies to goods in cars that are engaged in interstate commerce," was incorrect. The decision was not by the Supreme Court of Pennsylvania but by the Superior Court, a court intermediate between the District Court and the Supreme Court, and was rendered in the case of the Pennsylvania Railroad vs. M. O. Coggins & Co. on an appeal from the decision of the District Court. It was a case where the Pennsylvania sued for demurrage and the defendant claimed that under the state law of Pennsylvania he was entitled to more time than was allowed by the rules which the Pennsylvania Railroad had filed with the Interstate Commerce Commission. The decision in brief is that on interstate business the demurrage rules filed with the Interstate Commerce Commission shall govern and that the rules as established by the state of Pennsylvania do not apply.

The Supreme Court of Texas has rendered a decision holding that any rate which is not in itself reasonably remunerative cannot be forced on a railway. The decision was rendered in a case brought by the Gulf, Colorado & Santa Fe against the State Railroad Commission, which had prescribed a rate on lumber that the Santa Fe alleged was confiscatory. The Railroad Commission filed a demurrer to the railway's bill, contending that when the rates on a railway as a whole afford a reasonable profit no particular rate could be classed as unreasonable. The Supreme Court rejected this view. This is a decision of obvious importance as applied to the situation in Texas, for it holds in effect that a railway is entitled to earn a profit on the transportation of each and every kind of traffic, if not actually upon each and every shipment. It has been the policy of the Texas Commission for years to make innumerable small reductions, no one of which it believed could be attacked alone as confiscatory.

Noble C. Butler, Special Master in Chancery of the Federal court at Terre Haute, Ind., has made a finding, holding that a schedule of rates fixed by the Railroad Commission of Indiana to be applied by the Vandalia is so low that the earnings under it would not pay operating expenses. The commission ordered substantial reductions in all freight rates on the Vandalia between Indianapolis and the Illinois state line. The Master says that if the schedule fixed by the commission had been applied it would have resulted in the following losses by the company in the years mentioned: 1904, $7,232; 1905, $6,428; 1906, $7,331.

May Charge Extra for Delivering Express Packages.

The Indiana Supreme Court has sustained the rule adopted by the express companies to make an extra charge for delivering packages in cities beyond certain bounds.

Hearing in Harriman Lines Case.

Testimony in the suit brought by the government to dissolve the alleged illegal combination of the Union Pacific, the Southern Pacific and affiliated lines was taken in Chicago last week. Traffic managers of a large number of industrial concerns at Chicago, Detroit, Quincy, Moline and other interior jobbing points were questioned as to the effect on competition between the Union Pacific and Southern Pacific of the common control of these properties. They generally stated that the solicitation of their shipments by the representatives of the two roads is less keen than it was before 1901.

J. W. Morse, who was formerly a General Agent of the Union Pacific, said that prior to the consolidation competition was active between the Union Pacific and the Southern Pacific for transcontinental business, but that after they came under common control it became less sharp. A number of witnesses said that after W. G. Neimyer became General Agent of both lines at Chicago the representatives of the two roads seemed to become equally willing that traffic should move by either line. The testimony of a number of witnesses showed that the amount of rebates given to secure transcontinental business was substantially reduced after the alleged combination. F. B. Montgomery, Traffic Manager of the International Harvester Co., and O. F. Bell, Traffic Manager of the Crane Company, said that competition between the two lines seemed to have grown less active, but Mr. Bell said that service on the two roads had shown an improvement in recent years.

P. P. Heinricks, Traffic Manager of P. Becker & Co., of Chicago, a concern that sells leather hand bags and trunks, said that owing to the recent increase in freight rates to the coast charges on these goods had become prohibitive.

J. C. Stubbs, Traffic Director of the Harriman Lines, was a witness on March 19, being called by the government to identify an argument made by him at an arbitration conference in Chicago in December, 1898, before the Union Pacific acquired control of the Southern Pacific. The question being arbitrated was whether the Canadian Pacific should be given a differential under the United States lines on transcontinental business, and in his argument Mr. Stubbs, then as now Vice-President of the Southern Pacific, mentioned the Union Pacific as an active competitor of the Southern Pacific. With reference to his argument at that time, Mr. Stubbs said that he then appeared not as a witness but as an advocate and that some allowance should be made for that fact. He said that the natural and most practicable route for transcontinental shipments over the Union Pacific to the coast is over the Southern Pacific from Ogden to San Francisco.

Hearings were held at St. Louis March 22 and 23, and have been announced for April 27 at Salt Lake City.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.
See also issues of March 5 and 12.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$185,537	$91,506	$307,255	$39,390	$55,096	$7,394	$105,099	$7,200	$214,179	$93,076	$463*	$11,489	$81,124	$72,032
Ann Arbor	301	95,635	30,270	134,323	17,944	22,771	2,956	58,948	4,672	107,291	27,032	1,723*	11,369	13,940	13,770
Atlanta, Birmingham & Atlantic	642	120,596	38,136	173,497	26,364	35,273	12,447	78,908	8,362	161,354	12,143	......	8,000	4,143	‡21,583
Buffalo & Susquehanna	373	167,217	14,116	187,467	29,215	48,869	2,334	84,534	7,394	172,346	15,121	39*	4,000	11,082	22,245
Central Vermont	411	168,537	56,788	247,163	24,579	41,658	6,510	141,061	7,572	221,380	25,783	530	9,025	17,288	4,880
Chicago & Erie	270	236,090	56,621	329,761	30,988	78,831	11,759	175,371	8,482	305,431	24,330	442	11,083	13,689	96,814
Chicago, Indiana & Southern	329	241,919	15,621	265,603	27,243	52,469	6,941	100,406	7,213	194,272	71,331	101*	12,500	58,730	24,016
Chicago, Indianapolis & Louisville	616	231,808	89,842	359,955	47,294	71,499	11,211	148,708	13,525	292,237	67,718	.....	21,500	46,218	7,536
Chicago, Rock Island & Gulf	493	191,058	65,825	268,385	52,561	19,628	5,807	108,432	8,996	195,424	72,961	37	6,261	66,737	‡87,716
Cincinnati, Hamilton & Dayton	1,036	403,777	113,610	579,217	66,255	123,966	19,695	299,071	22,220	531,207	48,010	......	24,629	23,381	11,688
Cincinnati, New Orleans & Tex. Pac.	337	504,495	125,844	662,813	82,214	121,609	17,586	192,419	17,689	431,517	231,296	2,222*	19,642	209,432	182,553
Duluth, South Shore & Atlantic	593	126,800	56,061	196,966	28,387	27,755	7,717	92,657	5,842	162,358	34,608	717*	16,000	17,891	‡7,642
El Paso & Southwestern	867	488,467	85,459	599,081	78,556	82,583	10,093	185,582	30,674	387,488	211,593	414*	17,167	194,012	71,685
Fort Worth & Denver City	454	252,322	132,159	404,194	67,470	71,933	6,056	137,130	14,802	297,391	106,803	259	9,318	97,744	‡39,398
Grand Trunk Western	336	277,659	125,579	435,101	27,832	64,871	18,961	186,028	14,014	311,706	123,395	1,184*	32,000	90,211	48,676
Hocking Valley	347	322,547	61,755	399,522	44,822	104,535	7,713	148,774	12,803	318,647	80,875	976*	18,495	61,404	61,539
Houston & Texas Central	789	302,686	99,454	434,727	57,684	74,337	16,534	196,839	19,607	365,001	69,726	......	19,632	50,094	‡70,040
International & Great Northern	1,159	483,521	128,755	655,330	135,653	125,771	15,778	299,268	20,185	596,655	58,675	......	19,000	39,675	22,845
Iowa Central	558	186,223	36,741	235,457	13,933	56,002	8,496	116,154	8,987	203,572	31,885	......	7,371	24,514	‡62,332
Long Island	392	187,299	279,468	488,512	70,938	103,111	10,173	305,074	18,288	507,584	19,072*	36,186	21,713	4,599†	‡93,028
Minneapolis & St. Louis	1,027	200,609	69,412	299,242	20,292	51,046	10,668	135,574	11,232	228,812	70,430	183*	16,182	54,065	‡4,211
Minneapolis, St. Paul & S. S. Marie	2,395	467,653	210,313	730,666	76,978	101,930	20,094	306,646	23,566	529,214	201,452	18,098	53,385	166,165	‡27,010
New York, Chicago & St. Louis	556	625,070	103,034	751,853	51,538	105,654	46,303	359,401	15,522	578,418	173,435	1,880*	26,000	145,554	51,187
New York, Ontario & Western	546	503,851	66,503	591,312	65,377	122,708	9,842	254,225	13,627	465,779	125,533	1,442*	15,417	108,674	‡7,481
Northwestern Pacific	373	58,813	78,916	156,935	34,256	33,991	2,076	81,511	9,997	161,831	4,896*	......	8,955	13,851†	52,662
Oregon R. R. & Nav. Co.	1,327	447,767	212,847	720,071	60,161	64,882	26,375	271,306	29,928	452,652	267,419	......	71,304	185,749	‡272,423
Pere Marquette	2,354	783,519	229,358	1,096,667	128,998	174,363	28,283	482,952	31,477	846,073	250,594	50	47,377	203,267	31,713
Philadelphia & Reading	1,007	2,540,392	466,289	3,144,289	235,286	757,130	34,799	1,046,382	59,404	2,133,001	1,011,288	24,708	61,262	974,734	270,803
Rutland	468	107,249	61,663	195,834	27,338	32,603	6,396	86,025	4,947	157,309	38,525	......	8,756	29,769	15,232
San Antonio & Aransas Pass	727	177,201	68,901	263,653	50,221	38,824	4,335	120,808	8,530	222,718	40,935	......	8,500	32,435	11,172
San Pedro, Los Angeles & Salt Lake	1,099	331,251	217,676	585,730	61,940	99,730	29,160	209,674	17,837	418,341	167,389	3,190*	24,470	139,729	109,906
Seaboard Air Line	2,611	973,736	304,138	1,424,963	194,320	208,838	58,144	480,209	47,793	989,304	435,659	943*	50,500	384,216	151,856
Southern Pacific—Pacific System	5,589	3,262,747	1,974,965	5,671,543	721,121	838,130	118,572	1,750,954	198,713	3,627,490	2,044,053	22,114*	245,239	1,776,700	194,119
Stephensville, No. & So. Texas	43	6,876	1,313	8,879	695	863	168	2,305	678	4,710	4,169	......	92	4,077	......
Toledo & Ohio Central	441	205,400	46,223	262,461	35,851	45,576	4,882	108,819	4,903	200,031	62,430	3,034	13,599	51,865	1,473
Wheeling & Lake Erie	442	325,654	32,339	379,173	29,112	119,421	7,111	161,800	14,643	332,086	47,087	546	20,791	26,842	23,451
SEVEN MONTHS OF FISCAL YEAR.															
Alabama Great Southern	309	1,319,698	600,063	2,121,904	282,026	411,784	52,291	705,073	58,178	1,509,352	612,552	4,936*	80,306	527,310	213,102
Ann Arbor	301	689,391	289,178	1,046,703	147,142	144,918	21,362	406,871	28,771	749,064	297,639	16,500	79,581	234,558	‡21,690
Atlanta, Birmingham & Atlantic	642	829,261	283,366	1,184,053	144,796	209,322	64,224	444,821	46,908	910,071	273,982	......	47,000	226,982	21,834
Buffalo & Susquehanna	373	1,191,696	124,648	1,359,663	234,280	303,534	17,560	501,852	48,437	1,105,663	254,000	779*	28,000	225,221	95,601
Central Vermont	411	1,290,781	632,124	2,079,847	307,895	345,760	53,435	961,746	48,411	1,717,247	362,600	6,446	63,175	305,871	‡76,008
Chicago & Erie	270	1,816,660	464,368	2,489,765	254,866	572,851	80,353	1,174,635	54,171	2,136,876	352,889	2,043	79,163	275,769	209,782
Chicago, Indiana & Southern	329	1,450,407	149,536	1,654,389	184,344	321,654	53,596	636,946	48,714	1,245,254	409,135	13,301	100,042	322,394	88,591
Chicago, Indianapolis & Louisville	616	2,029,396	808,863	3,127,003	490,182	484,561	86,832	1,024,736	95,515	2,181,826	945,177	......	150,500	794,677	‡31,197
Chicago, Rock Island & Gulf	493	1,246,118	443,369	1,776,981	420,487	144,100	42,469	675,941	60,766	1,343,763	433,218	1,169*	22,294	409,755	‡125,079
Cincinnati, Hamilton & Dayton	1,036	3,313,654	1,027,003	4,829,082	557,877	911,585	151,378	2,042,739	148,141	3,811,720	1,017,362	......	175,023	842,339	224,748
Cincinnati, New Orleans & Tex. Pac.	337	3,460,169	857,911	4,550,917	514,710	905,237	116,008	1,372,976	121,618	3,030,549	1,520,368	12,179*	137,494	1,370,695	483,515
Duluth, South Shore & Atlantic	593	923,733	558,896	1,580,825	248,707	191,502	63,111	599,495	46,805	1,149,620	431,205	8,807	117,783	322,229	‡75,292
El Paso & Southwestern	867	3,274,988	553,221	4,016,089	487,521	555,252	65,808	1,093,340	159,592	2,361,513	1,654,576	12,755*	108,709	1,533,112	......
Fort Worth & Denver City	454	1,871,439	1,068,672	3,074,972	475,526	432,109	51,668	921,538	101,050	1,981,891	1,093,081	4,067	61,719	1,035,429	‡46,479
Grand Trunk Western	336	2,054,636	1,056,197	3,301,427	279,284	445,844	142,552	1,246,858	80,367	2,194,905	1,106,522	6,011*	224,000	876,511	375,364
Hocking Valley	347	3,216,933	527,059	3,857,692	382,395	914,459	53,233	1,127,544	83,824	2,561,455	1,296,237	47,100	140,077	1,203,260	145,089
Houston & Texas Central	789	2,693,859	877,990	3,789,027	499,566	502,727	105,136	1,366,830	136,152	2,610,411	1,178,616	.....	75,272	1,103,344	60,573
International & Great Northern	1,159	3,655,982	1,041,229	5,008,083	802,237	765,165	107,902	1,939,029	142,617	3,756,950	1,251,133	......	157,000	1,094,133	824,217
Iowa Central	558	1,365,935	319,382	1,770,551	157,578	323,953	61,761	775,732	60,551	1,379,575	390,976	......	51,749	339,227	‡274,525
Long Island	392	1,521,853	3,174,852	4,894,819	583,422	711,499	100,668	2,184,339	124,013	3,703,941	1,190,878	584,834	151,995	1,623,717	493,690
Minneapolis & St. Louis	1,027	1,719,587	680,417	2,577,231	228,568	325,912	70,118	915,182	83,716	1,623,496	953,735	278*	108,486	844,971	57,286
Minneapolis, St. Paul & S. S. Marie	2,395	5,309,636	1,853,321	7,518,769	728,683	818,497	138,669	2,255,147	158,925	4,099,921	3,418,848	185,897	536,543	3,068,202	573,589
New York, Chicago & St. Louis	556	4,389,515	895,566	5,464,291	542,804	529,874	306,770	2,188,472	92,040	3,659,960	1,804,331	6,616*	211,510	1,586,205	‡287,541
New York, Ontario & Western	546	3,713,085	1,021,882	4,931,512	543,423	848,007	68,559	1,791,003	102,108	3,353,100	1,578,412	20,453*	107,917	1,450,042	‡79,035
Northwestern Pacific	373	741,170	976,726	1,859,645	385,852	253,683	15,841	650,023	65,662*	1,371,061	488,584	......	63,785	424,799	18,900
Oregon R. R. & Nav. Co.	1,327	5,346,741	2,051,562	7,845,145	790,949	513,244	150,675	2,074,066	202,602	3,731,536	4,113,609	15,435*	333,065	3,765,109	‡417,920
Pere Marquette	2,354	5,534,080	2,129,990	8,322,956	989,824	1,216,663	183,339	3,251,586	201,959	5,843,371	2,479,585	9,570	356,961	2,132,194	193,939
Philadelphia & Reading	1,007	18,331,306	3,635,518	22,933,116	1,781,438	4,691,409	251,722	6,979,387	388,940	14,092,896	8,840,220	197,342	426,952	8,610,610	‡844,194
Rutland	468	899,133	636,993	1,721,695	249,691	223,595	43,500	651,935	40,336	1,209,057	512,638	......	65,419	447,219	92,679
San Antonio & Aransas Pass	727	1,740,318	510,521	2,372,374	331,126	256,145	29,629	868,188	60,830	1,545,918	826,456	......	61,700	764,756	194,254
San Pedro, Los Angeles & Salt Lake	1,099	2,391,193	1,429,120	4,082,025	670,245	546,901	168,060	1,348,760	121,800	2,855,766	1,226,259	16,897*	168,494	1,040,868	340,130
Seaboard Air Line	2,611	6,365,139	1,968,004	9,210,641	1,351,893	1,346,826	332,833	3,235,132	334,804	6,601,488	2,609,153	9,979*	353,500	2,245,674	471,635
Southern Pacific—Pacific System	5,589	20,214,250	15,488,218	47,845,505	5,755,381	5,966,052	789,915	12,787,020	1,390,477	26,688,845	21,156,660	62,708*	1,623,905	19,470,047	2,574,803
Stephensville, No. & So. Texas	43	61,960	11,047	75,330	5,154	5,086	1,128	16,602	3,970	31,940	43,390	......	641	31,299	......
Toledo & Ohio Central	441	2,258,071	389,296	2,735,629	373,229	411,480	38,486	863,044	38,001	1,724,240	1,011,389	24,287	97,597	938,079	114,196
Wheeling & Lake Erie	442	2,866,344	303,958	3,383,986	408,531	783,265	39,085	1,159,167	101,072	2,491,120	892,866	6,094	152,840	746,120	91,147

*Deficit. †Loss. ‡Decrease.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.
(See also table on preceding page.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atlanta & Birmingham Air Line	237	$53,193	$19,232	$76,826	$11,193	$6,917	$896	$32,218	$1,548	$52,772	$24,054	.....	$4,813	$19,241	$6,066
Central Branch	388	89,146	27,790	126,590	30,067	17,969	4,074	53,820	4,120	110,050	16,540	.....	9,500	7,040	‡42,725
Charleston & Western Carolina	340	83,696	20,742	111,246	23,632	17,094	2,633	48,383	3,978	95,720	15,526	.....	4,100	11,426	‡8,378
Chicago & Alton	998	599,534	293,599	978,802	86,916	121,978	42,987	370,486	38,028	660,395	318,407	$1,310*	30,000	287,097	‡11,973
Chicago, Cincinnati & Louisville	285	84,587	17,706	108,037	15,581	25,652	7,633	56,872	5,917	111,655	3,618*	.....	3,250	6,868†	14,841
Chicago Great Western	818	439,297	123,973	614,824	58,190	135,098	35,917	326,414	37,040	592,659	22,165	1,252*	18,058	2,855	‡88,160
Chicago, Peoria & St. Louis Ry. of Ill.	255	102,761	20,903	129,691	17,090	28,891	6,033	64,903	5,118	122,035	7,656	.....	4,300	3,356	7,054
Colorado Midland	338	140,024	23,530	197,256	19,870	28,483	9,674	81,445	5,796	145,268	51,988	744*	6,099	45,145	37,262
Detroit & Mackinaw	348	64,230	19,717	89,480	13,744	16,152	1,755	31,820	2,679	66,150	23,330	223*	6,863	16,244	‡4,972
Duluth, Missabe & Northern	282	64,866	28,589	97,740	48,976	42,737	1,521	60,765	11,812	165,811	68,071*	1,685*	4,513	74,269†	‡9,535
Evansville & Terre Haute	310	102,982	44,717	164,192	16,412	30,428	3,627	59,394	5,934	115,795	48,397	425*	9,035	38,937	‡4,688
Fort Worth & Rio Grande	196	108,011	27,902	141,848	9,749	10,564	3,449	39,107	5,546	68,415	73,433	.....	1,900	71,533	65,339
Georgia	307	161,259	57,128	234,011	25,996	30,183	8,235	101,076	6,637	172,127	61,884	.....	1,123	60,761	37,603
Georgia Southern & Florida	395	99,077	52,622	169,074	21,799	25,213	5,284	67,842	8,541	128,679	40,395	1,760	8,381	33,774	14,980
Kanawha & Michigan	177	120,221	22,521	147,788	28,004	47,316	2,213	49,833	3,430	130,796	16,992	10*	6,575	10,407	14,444
Louisiana Ry. & Nav. Co.	343	83,910	11,293	100,875	25,308	13,074	3,649	48,708	6,246	96,985	3,890	.....	3,750	140	‡8,677
Mason City & Fort Dodge	386	100,397	28,653	137,229	10,535	23,927	1,685	86,471	979	123,597	13,632	141	8,937	4,836	‡39,938
Midland Valley	324	55,114	23,582	83,449	15,924	18,695	1,720	31,301	4,653	72,293	11,156	.....	8,000	3,156	‡2,064
Missouri Pacific	3,492	1,137,119	303,309	1,621,554	227,021	250,829	52,531	782,691	58,572	1,371,644	249,910	2,982*	77,105	169,823	‡5,971
Mobile, Jackson & Kansas City	403	114,775	26,013	149,697	24,359	16,312	1,772	41,512	9,688	93,643	56,054	.....	3,309	52,745	38,346
Nevada & California	379	79,958	21,186	108,798	7,833	9,264	771	33,718	1,841	53,427	55,371	1,045*	6,000	48,326	19,456
New York, Susquehanna & Western	151	130,942	43,276	199,244	12,968	21,478	1,642	76,102	3,674	115,864	83,380	667*	15,089	67,624	‡3,948
Peoria & Eastern	352	144,863	45,770	208,761	18,500	40,704	5,037	103,030	4,977	172,248	36,513	.....	8,800	27,713	‡57,235
Pittsburgh & Lake Erie	191	719,940	87,598	837,228	88,798	70,003	12,240	240,673	19,697	431,411	405,817	347*	17,000	388,470	200,703
Quincy, Omaha & Kansas City	262	45,872	16,072	66,583	12,280	12,870	1,667	37,589	3,690	68,096	1,513*	.....	2,450	3,963†	‡2,221
St. Joseph & Grand Island	319	83,222	28,305	120,139	18,495	14,254	5,665	48,284	3,561	90,259	29,880	105	5,142	24,843	‡17,164
St. Louis & San Francisco	4,727	1,848,425	715,697	2,826,633	343,807	393,790	70,760	1,062,118	77,042	1,947,517	879,116	.....	120,681	758,435	‡62,168
St. Louis, Brownsville & Mexico	454	63,402	33,128	103,307	19,793	13,792	3,001	37,613	5,592	79,791	23,516	273	3,001	20,242	5,567
St. Louis, Iron Mtn. & Southern	2,608	1,338,074	406,587	1,925,108	291,527	254,418	46,358	669,296	58,361	1,319,960	605,148	4,866*	63,161	537,121	130,618
Santa Fe, Prescott & Phoenix	257	67,717	27,249	100,621	17,729	7,321	2,541	24,718	4,760	57,079	43,542	.....	.....	43,542	9,334
Texas Central	268	66,809	31,377	105,781	18,310	13,851	1,129	32,725	5,068	71,083	34,698	.....	3,058	31,640	5,800
Toledo, Peoria & Western	248	54,069	27,216	85,939	15,451	19,538	2,035	36,954	3,279	77,257	8,682	.....	4,000	4,682	‡19,851
Toledo, St. Louis & Western	451	190,262	31,790	241,504	30,604	33,956	3,960	103,084	7,933	179,537	61,967	.....	11,500	50,467	‡11,660
Trinity & Brazos Valley	455	175,804	11,793	190,613	44,055	26,875	4,535	103,033	13,321	191,819	1,206*	.....	3,300	4,506†	53,639
Western Maryland	543	401,423	49,826	471,300	41,844	73,024	5,719	164,693	12,827	298,107	173,193	.....	16,500	156,693	29,868
Wisconsin, Minnesota & Pacific	271	33,800	12,379	50,505	5,570	5,074	280	21,801	262	32,987	17,518	29*	3,443	14,046	‡1,492

SEVEN MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atlanta & Birmingham Air Line	237	$382,255	$146,053	$556,109	$84,167	$40,242	$8,929	$217,086	$14,036	$364,460	$191,649	.....	$33,693	$157,956	$35,952
Central Branch	388	758,205	206,663	1,038,218	171,118	129,454	22,865	348,542	26,840	698,819	339,399	.....	66,500	272,899	30,497
Charleston & Western Carolina	340	589,183	163,791	805,017	162,630	105,224	17,303	305,444	23,600	614,201	190,816	.....	28,700	162,116	14,075
Chicago & Alton	998	4,692,710	2,377,820	7,678,017	717,366	844,380	273,288	2,399,186	215,762	4,449,982	3,228,035	$6,734*	210,000	3,011,301	658,071
Chicago, Cincinnati & Louisville	285	588,762	174,696	802,571	192,546	176,675	53,952	349,387	41,726	814,286	11,715*	.....	22,750	34,465†	‡3,878
Chicago Great Western	818	3,452,440	1,174,021	4,995,690	682,197	885,217	254,873	2,154,554	217,654	4,194,495	801,195	5,172*	128,219	667,804	‡148,839
Chicago, Peoria & St. Louis Ry. of Ill.	255	709,421	203,639	959,212	135,376	213,353	42,588	392,061	33,520	816,898	142,314	.....	31,900	110,414	26,422
Colorado Midland	338	1,001,063	237,968	1,427,038	174,768	186,871	68,568	575,936	40,936	1,047,079	379,959	2,227*	52,599	325,133	37,417
Detroit & Mackinaw	348	431,670	178,128	648,178	109,809	102,436	13,266	219,403	19,572	464,486	183,691	2,433*	51,067	130,191	‡46,666
Duluth, Missabe & Northern	282	6,521,481	209,174	6,765,276	524,875	555,150	8,770	857,933	88,681	2,035,409	4,729,867	38,246	275,064	4,493,049	‡529,470
Evansville & Terre Haute	310	810,365	355,435	1,293,761	183,442	175,446	25,403	297,480	43,752	825,523	468,238	2,150*	63,245	402,843	3,058
Fort Worth & Rio Grande	196	497,684	212,468	748,685	89,467	70,415	18,974	240,455	36,361	455,672	293,013	.....	6,171	286,842	229,535
Georgia	307	1,160,927	449,360	1,713,261	337,132	234,442	57,731	700,493	50,663	1,380,461	332,800	.....	11,737	321,063	12,240
Georgia Southern & Florida	395	638,615	359,841	1,129,511	100,388	196,863	35,076	418,812	60,560	811,699	317,812	10,518	58,375	269,955	98,173
Kanawha & Michigan	177	1,120,581	196,113	1,347,902	260,517	343,940	16,657	401,545	20,005	1,042,664	305,238	130*	46,534	258,574	198,274
Louisiana Ry. & Nav. Co.	343	490,902	77,056	612,746	166,458	79,637	21,912	273,094	36,589	577,690	35,056	.....	23,250	11,806	‡52,867
Mason City & Fort Dodge	386	806,374	271,586	1,145,598	132,499	156,044	12,000	480,775	5,030	786,348	359,250	3,198	44,936	317,512	‡30,093
Midland Valley	324	405,771	156,635	595,555	141,243	131,839	12,033	106,308	30,584	512,007	83,548	.....	52,083	31,465	‡108,866
Missouri Pacific	3,492	9,235,258	2,459,579	12,930,497	1,739,264	1,894,761	332,866	5,274,636	422,109	9,663,636	3,266,861	11,744*	539,735	2,715,382	318,151
Mobile, Jackson & Kansas City	403	686,221	186,019	930,566	142,998	107,474	11,286	288,703	61,631	612,092	318,474	.....	23,912	294,562	137,924
Nevada & California	379	418,432	154,380	625,436	87,197	82,021	5,802	222,207	13,889	411,116	214,320	2,284*	46,067	165,969	‡355,854
New York, Susquehanna & Western	151	921,899	357,126	1,445,715	162,905	153,552	10,326	515,320	28,245	870,348	575,367	14,906*	74,571	485,889	17,516
Peoria & Eastern	352	1,122,971	412,515	1,675,226	208,005	255,058	35,522	654,326	31,890	1,184,801	490,425	.....	62,612	427,813	‡73,628
Pittsburgh & Lake Erie	191	6,182,449	730,271	7,132,134	866,746	635,957	91,121	1,659,961	149,175	3,402,960	3,729,174	2,140*	114,526	3,612,509	‡753,297
Quincy, Omaha & Kansas City	262	322,808	129,416	489,624	123,457	80,563	11,012	223,645	20,924	459,601	30,023	.....	17,660	12,363	18,393
St. Joseph & Grand Island	319	667,324	237,635	981,853	146,465	101,528	36,589	318,384	25,859	628,825	353,028	275	26,219	327,084	‡43,413
St. Louis & San Francisco	4,727	14,034,203	5,567,169	21,203,229	3,321,425	2,928,405	444,904	7,296,199	653,159	14,644,092	6,559,137	.....	897,186	5,661,651	‡238,590
St. Louis, Brownsville & Mexico	454	426,253	198,682	672,174	118,494	89,834	19,396	249,082	37,130	513,936	158,238	688	31,361	126,189	3,038
St. Louis, Iron Mtn. & Southern	2,608	9,868,349	2,731,601	13,765,643	1,881,255	1,805,330	302,834	4,558,620	407,861	8,955,900	4,809,743	19,262*	444,635	4,345,846	537,106
Santa Fe, Prescott & Phoenix	257	537,858	186,004	770,633	130,211	64,391	16,461	182,689	32,944	426,696	343,936	.....	.....	343,936	‡49,628
Texas Central	268	459,666	257,881	762,759	96,197	96,835	7,102	257,252	30,172	487,558	275,201	.....	15,012	260,189	9,969
Toledo, Peoria & Western	248	395,316	236,659	666,108	107,588	128,539	14,553	245,188	22,865	518,733	147,375	.....	28,000	119,375	11,935
Toledo, St. Louis & Western	451	1,612,017	292,642	2,047,742	232,609	277,702	39,243	688,431	55,108	1,293,093	754,649	.....	80,500	674,149	‡97,753
Trinity & Brazos Valley	455	1,192,310	101,690	1,313,623	236,599	186,301	30,707	605,552	80,314	1,139,473	174,150	.....	22,099	152,051	432,249
Western Maryland	543	2,890,560	512,796	3,565,566	382,303	522,706	49,232	1,128,665	82,969	2,165,875	1,399,691	.....	115,500	1,284,191	32,572
Wisconsin, Minnesota & Pacific	271	291,013	108,528	430,194	88,398	44,516	2,014	155,728	2,100	292,756	137,438	62	18,631	118,869	19,161

*Deficit. †Loss. ‡Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Howard Mannington, Secretary of the Ohio Railroad Commission, has resigned to become Secretary of the Ohio Coal Operators' Association.

M. W. A. McGonegal, Vice-President and General Manager of the Duluth, Missabe & Northern, has been elected President, succeeding W. J. Olcott, resigned.

H. E. Covertson, Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed a Traveling Auditor of the Peoria & Eastern, with office at Indianapolis, Ind.

R. A. Purcell, Claim Agent of the Chicago & Alton, has been appointed a Claim Agent, with office at Bloomington, Ill., succeeding J. W. Johnson, resigned to go with another road.

H. M. Atkinson, temporary Receiver of the Atlanta, Birmingham & Atlantic, and S. F. Parrott, President of the Atlantic Compress Co., have been appointed permanent Receivers of the Atlanta, Birmingham & Atlantic. Mr. Atkinson succeeds P. S. Arkwright.

Arthur Hale, of the American Railway Association, now has the title of General Agent. This title agrees well with the functions of the office, as described in our issue of January 1, last, when he was appointed. Presumably he will retain the committee chairmanships which he now exercises.

Hon. Lloyd Wheaton Bowers, General Counsel of the Chicago & North Western, has been appointed Solicitor-General of the United States, succeeding Henry M. Hoyt. Mr. Bowers was born in 1859 at Springfield, Mass. He graduated from Yale University in the class of 1879 and afterwards studied law at the Columbia Law School, receiving the degree of LL.B. in 1882. After practising law for about two years in New York he moved to Winona, Minn., where he engaged in the general practise of law. He was appointed General Counsel of the Chicago & North Western in 1893, with office at Chicago.

Chas. E. Pugh, Second Vice-President of the Pennsylvania, has been elected the First Vice-President, in charge of the pension, insurance, real estate and purchasing departments, succeeding J. P. Green, retired. J. B. Hutchinson, Assistant to the Second Vice-President, has been appointed the Assistant to the First Vice-President; Samuel Rea, Third Vice-President, has been elected the Second Vice-President, in charge of the Engineering and Accounting departments; A. J. County, Assistant to the Third Vice-President, has been appointed the Assistant to the Second Vice-President; C. M. Bunting, Assistant to the First Vice-President, has been appointed the Assistant Comptroller, with office at Philadelphia; J. B. Thayer, Fourth Vice-President, has been elected the Third Vice-President, in charge of the Traffic department, with office at Philadelphia; Henry Tatnall, Fifth Vice-President and Treasurer, has been elected the Fourth Vice-President, in charge of the company's finances; J. F. Fahnestock, Assistant Treasurer, has been elected the Treasurer.

John Pugh Green, First Vice-President of the Pennsylvania, who would have retired in July under the pension regulations, resigned previous to the regular annual election of officers. He was born in Philadelphia on July 31, 1839, and was educated in the schools of that city, graduating with honor from the high school. After graduation he took up the study of law and passed a creditable examination and was admitted to the bar in 1860. He entered the private service of Thomas A. Scott, then First Vice-President of the Pennsylvania, on January 10, 1865. He remained in that position until January 1, 1866. He later spent some time looking after Colonel Scott's interests in California, and in July, 1869, became chief clerk to Mr. Scott, which position he held until in 1874, when, Mr. Scott, having been elected President, he was promoted to the position of Assistant to the President. In October, 1882, Captain Green was made Fourth Vice-President; on June 30, 1888, Third Vice-President; on March 1, 1893, Second Vice-President, and on February 10, 1897, First Vice-President. As First Vice-President he has special supervision of the Secretary's, Treasury and Accounting departments, and of the employees' saving fund. He also assists the President, specially in matters connected with the operation and management of the railways controlled directly or indirectly by the company west of Pittsburgh, and in all matters relating to other railways in which the company may have an interest. He occupies the same position in the Northern Central, the Philadelphia, Baltimore & Washington and the West Jersey & Seashore, and is a director of the Pennsylvania Company, and of the Pittsburgh, Cincinnati, Chicago & St. Louis, and of various companies affiliated with the Pennsylvania railway system.

William W. Atterbury, General Manager of the Pennsylvania, has been elected Fifth Vice-President, in charge of transportation. He was born at New Albany, Ind., January 31, 1866. After receiving a liberal preparatory education, Mr. Atterbury was graduated from Yale University, and began railway work in 1886 as an apprentice in the Altoona shops. From 1889 to 1892 he served as assistant road foreman of engines on various divisions of the Pennsylvania and the Philadelphia, Wilmington & Baltimore. In 1892 he was promoted to Assistant Engineer of Motive Power in the Pennsylvania Company's Northwest System, and, in 1893, to Master Mechanic of the Pennsylvania Company at Fort Wayne, Ind. At this time he married Miss M. H. Hoffman, of Fort Wayne. On October 26, 1896, Mr. Atterbury was advanced to General Superintendent of Motive Power of the Pennsylvania Lines East of Pittsburgh and Erie. He was appointed General Manager of the Pennsylvania Lines East of Pittsburgh and Erie on January 1, 1903, and on March 24, 1909, he was elected Fifth Vice-President, in charge of transportation. Mr. Atterbury is a member of the Rittenhouse, Union League and many other clubs of Philadelphia, Pittsburgh, Washington and Baltimore. He is also a member of the American Academy of Political and Social Science, the American Society of Mechanical Engineers and the American Society of Civil Engineers.

W. W. Atterbury.

Operating Officers.

M. McD. Duff has been appointed the Assistant to the Manager of the steamship lines of the Canadian Pacific, with office at Montreal.

A. G. Smart has been appointed a Trainmaster of the Chicago, Burlington & Quincy, with office at McCook, Neb., succeeding G. H. Pearce, assigned to other duties.

W. H. Spice, Trainmaster of the New York Central & Hudson River at West Albany, has been appointed a Freight Agent, with office at Utica, N. Y., succeeding S. H. French.

The offices of the Superintendent, Timekeeper, Train Despatcher and Fuel Agent of the Chicago, Lake Shore & Eastern were removed on March 15 from Chicago to Gary, Ind.

F. A. Gascoygne has been appointed the Superintendent of Car Service of the Eastern lines of the Canadian Pacific, with office at Montreal. J. D. Altimas has been appointed a Car Accountant, with office at Montreal.

H. M. Carson, Assistant to the General Manager of the Pennsylvania, has been appointed the General Superintendent of the Northern Central Railway and the Erie division of the

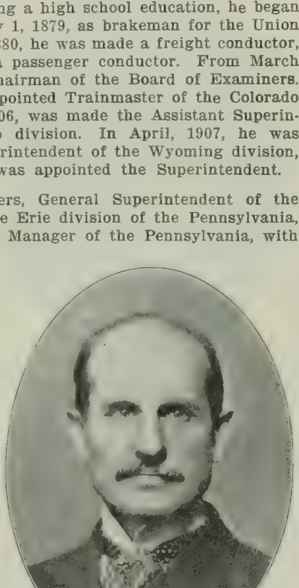
Pennsylvania, with office at Williamsport, Pa., succeeding W. H. Myers.

G. K. Jeffries, Superintendent of the Richmond division of the Terre Haute, Indianapolis & Eastern Traction, has been appointed the General Superintendent, with office at Indianapolis, Ind. Alexander Gordon succeeds Mr. Jeffries, with office at Greenfield.

James A. Boyers, whose appointment as Assistant Superintendent of the Nashville, Chattanooga & St. Louis has been announced in these columns, was born in 1853 at Nashville, Tenn. In 1871 he began railway work as a brakeman on the Nashville, Chattanooga & St. Louis, and later became conductor. After about 18 years' work as passenger conductor he was appointed Acting Trainmaster, which position he held until his present appointment.

William C. McKeown, whose appointment as the Superintendent of the Union Pacific at Cheyenne, Wyo., has been announced in these columns, was born on July 16, 1860, at Joliet, Ill. After receiving a high school education, he began railway work on January 1, 1879, as brakeman for the Union Pacific. In November, 1880, he was made a freight conductor, and in February, 1890, a passenger conductor. From March to July, 1905, he was Chairman of the Board of Examiners. In July, 1905, he was appointed Trainmaster of the Colorado division, and in May, 1906, was made the Assistant Superintendent of the Colorado division. In April, 1907, he was made the Assistant Superintendent of the Wyoming division, and on March 1, 1909, was appointed the Superintendent.

William Heyward Myers, General Superintendent of the Northern Central and the Erie division of the Pennsylvania, has been elected General Manager of the Pennsylvania, with office at Philadelphia. He was born in San Antonio, Texas, April 9, 1856, and was educated in private schools and at the School of Mines of Freiberg, Germany. He began railway work on the Pennsylvania January 17, 1876, as rodman in the office of the General Superintendent at Altoona. He was appointed Assistant Supervisor at Downingtown in June, 1876; Supervisor at Lancaster in April, 1879; Assistant Engineer of the Tyrone division in January, 1881; Assistant Engineer of the Middle division in September, 1881; Assistant Engineer of the Philadelphia division, January 1, 1884; Superintendent of the Bedford division, April 1, 1889; Superintendent of the Belvidere division, September 1, 1889; Superintendent of the Schuylkill division, January 1, 1891; Superintendent Middle division, January 1, 1899. Mr. Myers was appointed General Superintendent Philadelphia & Erie division and Northern Central on August 1, 1900. On March 24, 1909, Mr. Myers succeeded W. W. Atterbury as General Manager of the Pennsylvania.



W. H. Myers.

John G. Rodgers, Superintendent of the New York, Philadelphia & Norfolk, has been appointed the Assistant to the General Manager of the Pennsylvania, with office at Philadelphia. He was born November 14, 1862, and was educated at Lehigh University. He began railway work on the Pennsylvania in 1882. Mr. Rodgers served through the various grades in the construction department until he reached the position of Assistant Engineer of Construction, from which he was transferred on January 16, 1888, to the Altoona Maintenance of Way office. He arose through the various ranks in that department until January 1, 1900, when he resigned as Supervisor of the Philadelphia division to accept the position of Superintendent of the New York, Philadelphia & Norfolk, which position he held until his appointment on March 24, 1909, as Assistant to the General Manager of the Pennsylvania.

Traffic Officers.

F. P. Metzner has been appointed a Traveling Passenger Agent of the Vandalia, with office at Terre Haute, Ind.

R. E. Woodruff has been appointed a General Agent of the Erie, with office at Chicago, succeeding James P. Sherwin, deceased.

W. E. Steakley has been appointed a Traveling Freight Agent of the Nashville, Chattanooga & St. Louis, with office at Atlanta, Ga.

A. Baker has been appointed the Tariff Inspector of the Texas & Pacific and the Denison & Pacific Suburban, with office at Dallas, Tex. This is a new position.

H. J. Owens, Commercial Freight Agent of the Missouri Pacific-Iron Mountain System at Dallas, Tex., has resigned, effective April 1, to engage in private business.

Z. T. George, Traveling Freight and Passenger Agent of the Wabash, has been appointed a General Agent, with office at San Francisco, Cal., succeeding C. S. Orcutt, resigned.

J. F. Hennessey has been appointed a Traveling Freight and Passenger Agent of the Ft. Smith & Western and the St. Louis, El Reno & Western, with office at Ft. Smith, Ark.

John E. Henderson, Traveling Freight Agent of the Chicago, Indiana & Southern, has been appointed an Agent of the North & South Despatch, with office at Detroit, Mich. Edward W. Sievert succeeds Mr. Henderson, with office at Chicago.

J. J. Puller, whose resignation as Assistant General Passenger Agent of the Seaboard Air Line has been announced in these columns, has been appointed Sales Manager of the Pittsburgh Screw & Bolt Co., Pittsburgh, Pa., with office in Pittsburgh.

David O. Ives, Chairman of the Official Classification Committee of the Trunk Line Association, has been appointed Secretary of the New England Board of Trade and Transportation, effective May 1. He has been with the Official Classification Committee but a little less than a year.

W. G. Knittle, General Agent, Passenger department, of the Cleveland, Cincinnati, Chicago & St. Louis, at Cincinnati, Ohio, has been transferred to Grand Rapids, Mich., succeeding H. R. Daly, who is transferred to Indianapolis, Ind., succeeding C. C. Clark, who succeeds Mr. Knittle.

F. E. Ayers, Contracting Freight Agent of the North and South Despatch at Chicago, Ill., has been appointed an Agent, with office at Indianapolis, Ind. J. D. Pierce succeeds Mr. Ayers, with office at Chicago. John E. Henderson has been appointed an Agent, with office at Detroit, Mich.

Charles W. Fish, whose appointment as General Freight Agent of the National Railways of Mexico was previously announced in these columns, was born in 1863, in Natchez, Miss. After a public school education in Girard, Ill., he began railway work in 1882 as a telegraph operator on the Missouri Pacific. He was later a clerk and then traveling accountant. In January, 1888, he was made Traffic Manager and Local Agent of the International & Great Northern, and six years later became General Freight and Passenger Agent of the Texas Mexican; and also Commercial Agent of the National of Mexico. In 1901 he was made Assistant Auditor of the National Railroad of Mexico, and in May of that year was made Auditor. In May, 1904, he was appointed General Freight Agent of the National Lines of Mexico, which position he held until his recent appointment.

Engineering and Rolling Stock Officers.

E. J. Bohanon has been appointed a Roadmaster of the Chicago, Rock Island & Pacific, with office at Little Rock, Ark., succeeding Austin Ball, resigned.

J. B. Berry, the Chief Engineer of the Chicago, Rock Island & Pacific and the Supervising Engineer of the St. Louis & San Francisco, has been appointed also the Supervising Engi-

neer of the Colorado Southern, New Orleans & Pacific. M. C. Byers, the Chief Engineer of the St. Louis & San Francisco, has been appointed also the Chief Engineer of the Colorado Southern, N. O. & P., succeeding C. H. Fisk, resigned.

The offices of the Roadmaster and the Assistant Superintendent of Bridges and Buildings of the Chicago, Lake Shore & Eastern, were removed, on March 15, to Gary, Ind.

George Boyce has been appointed the Superintendent of Telegraph and Signals of the Chicago, St. Paul, Minneapolis & Omaha, with office at St. Paul, Minn., succeeding Henry C. Hope, deceased.

W. H. Foster, Master Mechanic of the New York Central & Hudson River, in charge of the Harlem division, with office at North White Plains, N. Y., has been transferred as Master Mechanic to High Bridge and put in charge of the Hudson and the New York & Putnam divisions, succeeding L. H. Raymond, resigned. H. B. Whipple succeeds Mr. Foster, with office at North White Plains. W. A. Deems has been appointed a Master Mechanic, with office at Tupper Lake, N. Y.

OBITUARY.

B. B. Linn, an Attorney and for a number of years a Claim Agent of the Nashville, Chattanooga & St. Louis, died on March 18, at Paducah, Ky. He was 65 years old.

Maricus C. Woodruff, Right of Way Commissioner and a Claim Agent of the Chicago Great Western, died on March 19 at Dubuque, Ia. He was formerly editor and publisher of the *Dubuque Times* and a member of the Iowa State Railroad Commission. He was 78 years of age.

William S. Taylor, President of the Fentress Coal & Coke Co. of Philadelphia, and formerly identified with a number of railway enterprises, died March 12 at Philadelphia. He was at one time Treasurer of the Kansas City Southern and was for some time President of the Kansas City, Fort Scott & Southern.

H. B. Hamblin, General Freight Agent of the Chicago, Burlington & Quincy, died at Pasadena, Cal., on March 23. He began railway work in 1875 as Agent on the Burlington & Missouri, now part of the Chicago, Burlington & Quincy, at Lincoln, Neb. In 1882 he became General Agent at Omaha, and in 1886 was made General Freight Agent of the Chicago, Burlington & Northern, now part of the Burlington. Four years later he was made Assistant General Freight Agent of the Chicago, Burlington & Quincy, with office at Chicago. On February 20, 1905, he was made General Freight Agent of the Illinois and Iowa districts, and was later appointed General Freight Agent.

Prince Michael Khilkoff, a member of the Council of the Empire of Russia, and formerly Minister of Communications, died suddenly at St. Petersburg on March 21. Prince Khilkoff, who belonged to an old but comparatively poor family, emigrated to the United States when a young man, renouncing the title to which he was subsequently restored. In the United States he worked at a bolt machine at $7.50 a week. Later he was employed in many minor capacities on American railways, beginning as an assistant stoker. Some years later he returned to Russia and was appointed Minister of Railways. The prince, in his ministerial capacity, visited the United States in 1896. When the Russo-Japanese war broke out, in 1904, predictions that Japan might be victorious in the struggle were based chiefly on the fact that the Siberian railway was a single-track line and that it would be unable to transport a necessary number of men to the Far East and supply them after their arrival with ammunition and equipment. He assumed personal charge of the railway operations. A large part of the ill-constructed line was double tracked under his administration, trains ran on their schedules, and at the time of the Peace of Portsmouth over a million Russians, well equipped, were lined up against their opponents on the line from Kwen-Tu-Ling to Kirin. Prince Khilkoff took a prominent part in putting down the railway strike in 1905, but resigned his office in the fall of that year because the government failed to meet the promises made to the railway employees, his resignation being accepted on November 8. He was then appointed a member of the Council of the Empire.

Alfred B. Farnsworth died in Grand Rapids, Mich., March 7. He was for many years General Eastern Passenger Agent of the Chicago, Rock Island & Pacific Railway in New York.

Alfred B. Farnsworth.

To those whose experience extends back to before there was an agreed distribution of the immigrant business among the lines, before the Trunk Line commissions, and long before the interstate commerce act, there will come with the mention of A. B. Farnsworth's name a lively recollection of the spirited competition and battles fought along lower Broadway, and at old Castle Garden over the securing of this traffic. In those days Mr. Farnsworth was always to be found in the forefront. Strong, vigorous, energetic, resourceful, always courteous, but firm as a rock—he had a strength that few could resist. But with a disposition to fight for business he combined a geniality, a spirit of fairness, and a companionable, loyal good-fellowship, which won for him the respect and affection of his strongest business antagonists. A close personal friendship existed between him and the late E. St. John, for many years in charge of the passenger traffic and later General Manager of the Rock Island road. When Mr. St. John left the road to assume the management of the Seaboard Air Line, Mr. Farnsworth for a time went with him, but he shortly returned to the Rock Island and became identified with the industrial and immigrant departments of the system, where he was prominent in the development of the famous Oklahoma district of the southwest. A few years ago he retired from business and returned with his family to Grand Rapids, the home of his youth. Mr. Farnsworth was born in Detroit 65 years ago. He leaves a wife and one daughter, Mrs. H. H. Atkinson, of Grand Rapids.

John H. Starin, head of the Starin City, River & Harbor Transportation Line, died at his home in New York, March 22. He was born in Samsonsville, N. Y., in 1823, and after studying medicine, came to New York. He soon abandoned medicine and became engaged in the drug business. Later he was appointed, through the friendship of Commodore Vanderbilt, a Soliciting Freight Agent of the Hudson River Railroad, now part of the New York Central & Hudson River. At the time of his appointment there were no car floats for the transfer of freight cars around New York harbor. Mr. Starin soon became engaged in the lighterage business, and after building his own shipyards at Staten Island, began to use car floats for the transportation of loaded and empty freight cars around New York city. During the civil war he did a large transport business for the government, and after the war became one of the largest owners of tugs and car floats in New York. He was well known for his excursion barges, and was the owner of Glen Island, a popular summer resort in Long Island Sound. Mr. Starin was twice elected to Congress, and was at one time a candidate for governor. He was a member of a number of clubs, including the Union League and the New York Yacht. He was also at one time a member of the Chamber of Commerce and opposed the extension of elevated lines, being a strong advocate of subways. At the time of his death he was in control of the freight lighterage business in New York harbor of the New York Central & Hudson River, Morris & Essex Railroad, the Delaware, Lackawanna & Western, and the Central of New Jersey. He is survived by two daughters and one son.

Railroad Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—Authorization has been given for the double-tracking of the line between Wyaconda, Mo., and Bucklin, 69 miles. Company expects to complete also this year about 50 miles of double track on the Illinois and Missouri divisions.

The Belen cut-off, from Texico, N. Mex., west to Belen, has been opened for operation.

Baltimore & Ohio Southwestern.—Reports from Mitchell, Ind., indicate that new rails are being placed between that place and Tunnellton.

British Columbia, Alberta, Saskatchewan & Manitoba.—See St. Mary's & Crawford Bay.

Buffalo, Rochester & Eastern.—The New York Public Service Commission, Second district, has refused to issue a certificate of necessity to this company, organized in 1907 to build from Buffalo, N. Y., east to Rochester, and thence to Troy, about 300 miles. See item in reference to this company under New York State Commission.

Calumet Traction.—Incorporated in Indiana with $100,000 capital to build from Hammond, Ind., east via East Chicago and North Calumet to various towns in Lake county. The headquarters of the company will be in Hammond. The directors include W. J. Reilly, East Chicago; W. P. Ijams, Terre Haute, and E. J. Keating, Hammond.

Canadian, Liverpool & Western.—Incorporation is being asked to build east and west across the Province of Quebec to a connection with the Grand Trunk Pacific and to some point on the Atlantic coast. The incorporators include: G. McClenahan, Montreal; T. B. Rankin, G. S. May, W. Johnson and D. G. Stewart, of Ottawa.

Canadian Northern.—The Manitoba Government has agreed to guarantee bonds of this company for $13,000 a mile for the following lines: From its line near Hallboro, Man., westerly or northwesterly, 110 miles; from a point near Oak Point, northerly, 50 miles; from a point near Makinak, northerly and northwesterly, 50 miles.

Canadian Pacific.—The following improvements will be made during the present year on the western lines: New terminal yards at Moose Jaw, Sask., $150,000; steel bridges at Wardner, B. C., and Elko, $200,000; 19 large wooden trestles in the vicinity of McLeod, Alb.

Chicago, Cincinnati & Louisville.—See item regarding this company under State Commissions.

Chicago, Milwaukee & Puget Sound.—This company has sold to the Union Pacific Company a half interest in its line from Black River Junction, Wash., to a crossing of the Puyallup river, three miles from Tacoma, about 26 miles. The companies will jointly build a line about 100 miles long from a point near Tacoma to Gray's Harbor on the Pacific.

Chihuahua & Pacific.—See Mexico North Western.

Cleveland, Cincinnati, Chicago & St. Louis.—According to press reports, work is to begin on the Evansville, Mt. Carmel & Northern, from Mt. Carmel, Ill., south to Evans ville, Ind., 43 miles.

Cleveland Short Line.—See Lake Shore & Michigan Southern.

Christiana & Coatesville (Electric).—This is the new name of the Philadelphia, Coatesville & Lancaster, operating 20 miles in Pennsylvania. Company was recently organized, with $400,000 capital. It is the intention to build an extension from Christiana, Pa., east to Parkesburg, 5 miles.

Crow's Nest & Northern.—An officer writes regarding building from Crow's Nest, B. C., north along the north fork of Michel creek, 15 miles, that contracts for grading, track laying, bridges, etc., will be let about July, 1909. The work will include about 245,000 cu. yds. of excavation, the building of two Howe truss bridges and nine framed trestles. (March 5, p. 480.)

Cumberland & Northern.—Incorporated in Kentucky, with $100,000 capital, to build from Artemus, Knox county, Ky., north to Beattyville, about 75 miles. J. H. Gresham, Pres.; S. P. Condon, Vice-Pres., and E. L. Thomas, Sec. and Treas., all of Knoxville, Tenn.

Evansville, Mt. Carmel & Northern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Gilmore & Pittsburg.—MacArthur Bros. Construction Co., New York, has been awarded a contract for building this line from Armstead, Mont., west to Salmon City, Idaho, with a 20-mile branch from Junction, Idaho, northwest to Gilmore, about 120 miles in all. There will be about 2,500,000 cu. yds. of excavation work exclusive of the 750-ft. tunnel.

Girard Coal Belt.—See Pittsburg & Kansas City (Electric).

Gulf Line.—An officer writes regarding the proposed extension from Bridgeboro, Ga., southwest to Camilla, that surveys have been made, but financial arrangements are not yet complete. (March 12, p. 524.)

Indianapolis, New Castle & Toledo (Electric).—Bids soon to be asked for building portion of line between Indianapolis, Ind., and New Castle, to cost about $450,000.

Interoceanic.—Preparatory to widening the gage, a number of cut-offs will be built between Mexico City, Mex., and Vera Cruz. Work on one of the most important of these cut-offs, from Rubin, V. C., to Vigas, was started over a year ago and will soon be completed. New steel bridges are also being placed.

Kansas City, Kansas & Southwestern (Electric).—Projected from Topeka, Kan., east to Kansas City. Press reports indicate that bids for fencing, culverts, cement work, etc., have been received. E. M. Lampkin, of the Marlin Construction Co., President, Kansas City, Mo.

Lake Erie & Pittsburg.—See Lake Shore & Michigan Southern.

Lake Shore & Michigan Southern.—An officer writes that the Lake Erie & Pittsburg is being built from a junction with the Cleveland Short Line near Newburg, Ohio, to a connection with the Pennsylvania Lines West, at a point west of Ravenna. The line is expected to be open for operation this fall. The Cleveland Short Line will be open for operation about the same time to a junction with the L. S. & M. S. west of West Park, Ohio. These improvements, when finished, will provide a line from Lorain, Ohio, via Elyria over the L. S. & M. S., the C. S. L., L. E. & P., Pennsylvania, B. & O., and the P. Y. & A., to Youngstown, Ohio.

Lake Superior & Long Lake Railway & Transportation Company.—This company has applied for a charter to build from Black River Siding, Ont., on the Canadian Pacific, to Owl lake. It is the intention to operate steamers on Owl lake, also to build from the northerly end to Long lake, and operate steamers on that lake to a connection with the National Transcontinental (Grand Trunk Pacific). The line is to carry contractors' supplies for Davis & Sons, of Ottawa, who have contracts for 200 miles of work on the National Transcontinental. R. A. Pringle, Solicitor, Cornwall, Ont. (March 12, p. 524.)

Louisiana & Arkansas.—Press reports say that surveys are now being made for a branch from Minden, La., west to Shreveport, 30 miles. It is expected to have the work finished this fall.

Manufacturers' Railway.—An officer writes regarding the plan of enlarging the terminal facilities at St. Louis, Mo., that work is under way locating a number of delivery yards for use of the general public. The present yard capacity is about 1,200 cars, which is to be doubled. (March 12, p. 524.)

Mexico North Western.—Incorporated in Canada as the Mexican Transportation Co., with $1,000,000 capital stock, later changed name to Mexico Transportation Co. and increased its authorized share capital to $40,000,000. Application has been made to the Canadian Parliament to again change the name to the Mexico North Western. The company is acquiring control of the Chihuahua & Pacific, extending from Tabalaopo, Mex., west to Minaca, 200 miles, and

from La Junta northwest to Temosachic, 87 miles; also the Sierra Madre & Pacific, extending from Temosachic, Mex., to the Madera, 32 miles, making a total of 319 miles. The company intends, in the immediate future, to acquire further lines and build a number of extensions amounting to about 402 miles, which it is expected will be in operation by January 1, 1911, making the total mileage of the two railways about 721 miles. One terminal will be at El Paso, Tex., and the other at Chihuahua, Mex.

MONTANA, WYOMING & SOUTHERN.—An officer writes that construction will begin April 1 on the 163 miles from Sheridan, Wyo., northeast to Miles City, Mont., and that contracts will be let at once. The work will include 6 steel bridges. T. J. Robb, Ch. Engr., Sheridan. (February 19, p. 381.)

NATIONAL RAILWAYS OF MEXICO.—Reports from Mexico City indicate that the first of a number of cut-offs planned will be built between Metepec, Tlaxcala, Mex., and San Lorenzo, about 28 miles. Surveys have been made and plans are now awaiting government approval. The roadbed will be built so as to permit future widening of the gage.

NEW YORK CENTRAL & HUDSON RIVER.—Double-tracking the Rome, Watertown & Ogdensburg division, between Utica, N. Y., and Stittville, 10.2 miles, is now under way. Final decision has not yet been reached regarding similar work between Richland and Lacona, six miles, and between Watertown and Adams, 15 miles.

OKLAHOMA & GOLDEN CITY.—Surveys now under way between Golden City, Mo., and Stockton. On completion of this section work will begin southwest from Golden City. (March 19, p. 656.)

OKLAHOMA, VERNON & PACIFIC.—Incorporated with $125,000 capital stock to build from Vernon, Tex., southwest to Eastacado, 125 miles. Surveys made. Connection will be made with the St. Louis & San Francisco at Vernon. Incorporators include: L. G. Hawkins, B. J. Parker, T. J. Youngblood, D. J. Gibbs and B. Housels, all of Vernon.

PENNSYLVANIA.—See item regarding this company under State Commissions.

PHILADELPHIA, COATESVILLE & LANCASTER (ELECTRIC).—See Christiana & Coatesville.

PITTSBURG & KANSAS CITY (ELECTRIC).—An officer writes that this company has bought the property of the Girard Coal Belt Railway Co., including a 12-mile line, connecting Girard, Kan., Dunlap, Franklin and Croweburg. The new owners propose to connect this line with the Joplin & Pittsburg Railway, at Pittsburg, Kan., and build an additional 20 miles to connect Mulberry, Burgess and Curranville. When these improvements are finished, it will provide an interurban service in Missouri to Carthage, Joplin and Webb City, and in Kansas to Galena, Columbus, Weir City, Cherokee, Pittsburg and Girard. J. W. Ground, President, 311 First National Bank building, Kansas City, Mo., and W. W. Calhoun, Secretary, Carthage, Mo.

ROSCOE, SNYDER & PACIFIC.—An officer writes that grading is completed on the 19-mile extension northwest from Snyder, Tex., and that track laying will begin this spring. (Dec. 13, p. 1650.)

SAN DIEGO, EL PASO & ST. LOUIS.—An officer writes that the New Mexico corporation, capitalized at $4,000,000, is now making surveys in New Mexico from El Paso, Tex., northeast through New Mexico. A. Courchesne, President; H. B. Stevens, Vice-President, and L. P. Atwood, Ch. Engr., El Paso, Tex., are of the New Mexico corporation. (Feb. 26, p. 436.)

ST. MARY'S & CRAWFORD BAY.—Application is being made to the Dominion parliament for power to change the name of this company to the British Columbia, Alberta, Saskatchewan & Manitoba, and for an extension of time in which to build between Hartney, Man., and the Pacific coast, about 1,600 miles.

SIERRA MADRE & PACIFIC.—See Mexico North Western.

SUNBURY, LEWISBURG & MILTON (ELECTRIC).—Being organized by people identified with the York Bridge Co., York, Pa., which already controls the new Sunbury & Selingsgrove electric lines and the new bridge over the Susquehanna river from Sunbury, Pa., to Shamokin Dam. An officer writes that the company proposes to build from a connection with the S. & S. at the western end of the bridge, north through Winfield and Lewisburg to Milton, about 15 miles. B. A. Musser, Sec., Selingsgrove, Pa.

UNION PACIFIC.—See Chicago, Milwaukee & Puget Sound.

VALLEY ELECTRIC.—Organized in Oregon to build into the Mount Hood country. E. T. Folts, Pres.; A. M. Kelley, Vice-Pres., and H. B. Langville, Sec., Hood River, Ore.

WABASH.—Press reports say that this company has submitted new plans for track elevation work in Fort Wayne, Ind. As soon as the plans are approved by the city authorities it is expected work will be begun.

WAYNESBURG & MONONGAHELA.—Press reports say that a contract has been given to a New York contractor, and work is to begin at once on the projected line from Waynesburg, Pa., north to Monongahela, 30 miles. P. Langsdorf, Pres.; C. Koehler, Treas., both of McKeesport, Pa.; J. C. Sheldon, Sec., Buffalo, N. Y.; W. J. Sheldon, Vice-Pres. and Gen. Mgr., Waynesburg.

Railroad Financial News.

ATCHISON, TOPEKA & SANTA FE.—After numerous unofficial statements that the company was about to issue $25,000,000 additional convertible bonds, Walker D. Hines, acting chairman of the executive committee, on March 17 made the following explanation:

"Some time ago the company began the consideration of a plan to issue additional convertible bonds with the view of raising new capital while market conditions were favorable, although the company had no immediate need for the money. After the details of the plan had been decided on, it was learned that the legislature of Kansas, under the laws of which the company is incorporated, had passed a stock and bond act regulating future capital issues. While this act has not yet taken effect and would not have applied to the contemplated issue if made at once, yet after deliberation it was decided that it was not advisable to make the issue on the eve of the act taking effect, but that it was preferable to postpone the entire matter and at some convenient time make application to the Kansas Board of Railroad Commissioners for the certificate contemplated by the new act."

CHICAGO & MILWAUKEE ELECTRIC.—A decree of foreclosure has been entered against the company's property in Milwaukee county in favor of George Rockwell, and the Rockwell lien is placed ahead of that of the Metropolitan Trust Co., of Chicago, which brought foreclosure proceedings some time ago.

CHICAGO GREAT WESTERN.—*The Commercial and Financial Chronicle*, New York, publishes the following tentative plan of reorganization:

Proposed Authorized Issues.

First mortgage 50 year 4 per cent. authorized issue....		$60,000,000
Reserved to retire M. C. & Ft. D. 4s......	$12,000,000	
Reserved to retire W., M. & P. Div. 4s...	5,811,000	
Immediate issue to be sold to provide for payment of claims, improvements, etc..	15,000,000	
Reserved for future purposes, possibly...	27,189,000	
New preferred stock issue limited to		Not stated.
Issuable to retire present debenture stock at 110	$30,940,000	
For assessments on preferred A and common stock............................	10,135,000	
New common stock, limited to.........................		Not stated.
Issuable in exchange for present stock (common and A and B preferred) on payment of assessments	$44,252,000	

Proposed Terms of Exchange.

Holders of each $100 of	To pay assessm't.	Receive new stock Preferred.	Receive new stock Common.
Debenture stock ...($28,127,000)	None.	$100	....
Preferred A ....($11,336,900)	None.	....	$120
Preferred B ....($23,104,000)	$15	15	60
Common stock .....($44,465,000)	15	15	40

CHIHUAHUA & PACIFIC.—See Mexico North Western.

GRAND TRUNK PACIFIC.—The company has asked the government of Canada to advance $10,000,000 on the security of the 4 per cent. bonds of the Grand Trunk Pacific. An officer of the company says that the government has been asked to act

as banker, so as to save the discount that would be a loss to the company if the bonds were sold in London just at present.

Metropolitan Street Railway (New York).—Judge Lacombe in the United States Circuit court on March 18 signed the foreclosure decree under the general collateral trust mortgage securing $12,000,000 bonds. The principal and interest due under the mortgage amounts to $13,589,271. The sale of the property is set for June 1.

Mexican Transportation Co.—See Mexico North Western.

Mexico North Western.—The Mexican Transportation Co., incorporated in Canada February 18, 1909, with $1,000,000 stock, has changed its name to the Mexico Transportation Co. and increased its authorized stock to $40,000,000, of which $15,000,000 has been issued. An application is to be made to the Canadian parliament to change the name to the Mexico North Western, and also to empower the company to guarantee the bonds and stocks of any corporation the majority of whose capital stock is controlled by it. First mortgage 50-year, 5 per cent. bonds, amounting to £3,000,000 ($15,000,000) have been issued, and the Bank of Scotland in London, England, have received subscriptions at 90 for £2,400,000 ($12,000,000). The amount authorized to be issued of these bonds is £5,000,000 ($25,000,000).

Through the purchase of both $2,860,000 stock and $2,360,000 bonds, the new company has acquired control of the Chihuahua & Pacific, operating 287 miles in all and extending from Chihuahua to Minaca and to Temoschic. The company has also acquired control of the Sierre Madre & Pacific, which runs from Temosachic to Madera, 32 miles. For further particulars see this company under Construction.

Mexico Transportation Co.—See Mexico North Western.

National Railroad of Mexico.—The $10,000,000 5 per cent. collateral notes of 1903-1909 are to be paid at the office of Speyer & Co., New York, on April 1.

New York & Harlem.—The semi-annual dividend usually paid on April 1 from the rental paid by the Metropolitan Street Railway under its lease of the street railway division of the New York & Harlem has not been declared. The New York & Harlem owns 136 miles of road extending from Chatham, N. Y., to New York City, this road being leased to the New York Central & Hudson River for 401 years, the lease dated 1873. The N. Y. & H. also owns the Fourth Avenue Street Railway of New York City and in 1896 leased its street railway property to the Metropolitan Street Railway for 999 years. For some years past the Metropolitan has contested certain franchise taxes amounting now, it is said, to about $800,000. The non-payment of a dividend by the N. Y. & H. is because of the possibility, it is understood, of the Metropolitan being forced to abandon its lease and thus possibly make the N. Y. & H. responsible for the accumulated taxes. The semi-annual dividend of 5 per cent. payable in January and July from the rental paid by the New York Central & Hudson River is in no way affected by the present action of the N. Y. & H.

New York Central & Hudson River.—See item in regard to the Buffalo, Rochester & Eastern, under State Commissions.

New York State Railways.—Articles of incorporation have been filed with the Secretary of New York State for this company, which is to operate the electric railways owned by by the New York Central & Hudson River, in New York. The capital is given as $23,140,200. (Jan. 8, page 90.)

Pennsylvania.—The stockholders, on March 23, voted to give the Board of Directors, at their discretion, authority to increase the bonded indebtedness of the company to the extent of $80,000,000.

Sierra Madre & Pacific.—See Mexico North Western.

Wheeling & Lake Erie.—The receiver has asked Judge Taylor in the United States Circuit court for permission to sell $1,429,976 receiver's certificates to provide for the rehabilitation of the property. If permission is granted, the receiver is to sell $750,000 at once and hold the remainder until July 1.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Louisiana & Pacific has ordered 3 locomotives from the Baldwin Locomotive Works.

The Crow's Nest & Northern will be in the market this summer for a number of locomotives.

The Pacific Lumber Company, San Francisco, Cal., has ordered one locomotive from the Baldwin Locomotive Works.

The Iowa Central, reported in the *Railroad Age Gazette* of February 5 as asking prices on 12 locomotives, has ordered this equipment from the Baldwin Locomotive Works.

The Minneapolis & St. Louis, reported in the *Railroad Age Gazette* of January 22 as later to be in the market for from 10 to 14 locomotives, has ordered 14 from the Baldwin Locomotive Works.

CAR BUILDING.

The Milwaukee Northern will soon be in the market for 4 interurban cars.

The Chicago & Milwaukee (Electric) is in the market for 12 pay-as-you-enter cars.

The Crow's Nest & Northern will be in the market this summer for a number of cars.

The Conestoga Traction Co., Lancaster, Pa., has ordered 18 interurban cars from the J. G. Brill Co.

The Atchison, Topeka & Santa Fe has ordered 9 baggage and 4 coaches from the Pullman Company.

The Chicago, Indianapolis & Louisville has ordered 5 coaches from the Jeffersonville plant of the American Car & Foundry Co.

The United States Express Co. has had plans for 25 refrigerator and 10 horse cars prepared by the engineering department of the C. R. I. & P. D. H. Rawson, Supt., Chicago, will place the order.

The Southern, reported in the *Railroad Age Gazette* of March 19 as asking prices on 114 passenger cars, will divide this equipment as follows: 85 passenger coaches, 6 baggage-express, 6 mail-baggage, 6 passenger-baggage, 6 postal, 2 dining and 3 chair cars.

The Omaha & Council Bluffs Street Railway, Omaha, Neb., reported in the *Railroad Age Gazette* of January 22 as preparing specifications for 25 large cars, a portion of which would be built in company's shops, has ordered the building of 15 cars in its own shops and 10 cars from the American Car Co.

The Missouri, Kansas & Texas is asking prices on 7 thirty-ton ventilated box cars; 50 thirty-ton stock cars; 78 fifty-ton steel underframe flat cars; 111 fifty-ton steel underframe gondola cars; 13 refrigerator cars for passenger service; 13 thirty-ton, 40-ft. refrigerator cars; 18 fifty-ton steel underframe Hart convertible cars; 8 forty-ton side dump ballast cars; 40 thirty-ton furniture cars; 459 thirty-ton box cars and 19 cabooses.

IRON AND STEEL.

The Cuba Railroad is in the market for 16,000 tons of rails.

The Atlantic Coast Line is reported to be considering rail purchases.

The Michigan Central is said to be in the market for 1,500 tons of bridge material.

The Missouri Pacific is said to be in the market for 4,000 tons of structural steel.

The Marshall & East Texas has ordered 2,000 tons of rails from the Illinois Steel Co.

The Manistee & Northeastern has ordered 4,000 tons of rails from the Illinois Steel Co.

The Pennsylvania is said to have ordered 10,000 steel wheels from the Carnegie Steel Co.

The Boston & Maine has ordered 510 tons of structural steel from the Boston Bridge Co.

The Northern Pacific is reported to be receiving bids on 2,500 tons of bridge material.

The Chicago Traction Co. is said to have ordered 30,000 steel wheels from the Carnegie Steel Co.

The Florida & East Coast is said to be in the market for 100 bridge spans and a quantity of rails.

The Harriman Lines are reported making inquiries for 13,000 tons of rails for the lines in Mexico.

The Baltimore & Ohio is said to have ordered 180 tons of structural steel from the McClintic-Marshall Construction Co.

The Grand Trunk Pacific has ordered 105,695 tons of rails from the Dominion Iron & Steel Co., and 69,123 tons from the Algoma Steel Co.

The Pennsylvania has ordered 2,400 tons of steel for use in track elevation at Chicago, and 6,500 tons for similar work in Philadelphia from the American Bridge Co.

The Chicago & Alton, reported in the *Railroad Age Gazette* of March 12 as being in the market for 9,000 tons of rails, has ordered 2,500 tons from the Illinois Steel Co.

The Great Northern, reported in the *Railroad Age Gazette* of March 19 as being in the market for 2,000 tons of structural steel, has placed this order with the American Bridge Co.

The Chicago Railways Co., reported in the *Railroad Age Gazette* of March 19 as being in the market for 500 tons of structural steel, has placed this order with the American Bridge Co.

The Northern Pacific, reported in the *Railroad Age Gazette* of March 19 as being in the market for from 3,000 to 5,000 tons of structural steel, has ordered 8,000 tons from the American Bridge Co.

The Chesapeake & Ohio, reported in the *Railroad Age Gazette* of March 12 as having ordered 500 tons of bridge steel from the Pennsylvania Steel Co., will use this material for the first, second and third crossings of Mud river on the line between St. Albans, W. Va., and Barboursville.

General Conditions in Steel.—There is probably no one question so talked of now in steel circles as the proposed tariff changes. One manufacturer is quoted as having said that the reduction in steel duties would serve to prevent any immediate recovery in prices from the present level. There seems to be a general feeling that the proposed cuts are radical and that they will be lessened before the bill is finally passed. It is thought that the proposed reduction of the duty on rails, if it be passed at the present figure, will lead to a demand for lowering the price of rails for domestic consumption. It is interesting in this connection to note that the Dominion Iron & Steel Company received the order for 15,000 tons of A. M. C. E. section rails for the Grand Trunk Pacific, the best British bid being reported at $34, exclusive of duty.

RAILROAD STRUCTURES.

AMARILLO, TEX.—Plans are being prepared by the Gulf, Colorado & Santa Fe for a two-story office building to have dimensions of 40 ft. x 80 ft. The building is to provide headquarters for the new General Manager, C. W. Kouns, and his staff, and will cost $25,000.

ATCHISON, KAN.—The Missouri Pacific has prepared plans for enlarging the Central Branch shops at Atchison. Work will begin early in the spring. The additions will cost $100,000.

BARTLESVILLE, OKLA.—The Atchison, Topeka & Santa Fe is preparing plans for a new passenger station to cost $25,000.

BRANDON, MAN.—Sealed bids for a six-stall roundhouse will be received by Frank Lee, Div. Engr., Canadian Pacific, Winnipeg, until March 10.

EDMONTON, ALB.—The Canadian Pacific and the City Council are said to have plans ready for building a combined highway and railway bridge to cost about $300,000. Mayor Lee may be addressed.

JERSEY CITY, N. J.—See item on Lehigh Valley freight piers in another column.

LOUISVILLE, KY.—The union passenger station at Seventh street and the Ohio river was destroyed by fire on March 18. It is likely that a new structure will be built at once. The estimated loss is $400,000.

MONTREAL, QUE.—Press reports from Montreal, Que., indicate the proposed formation of a union terminal company and the erection of a union passenger station.

Press reports indicate that the Canadian Pacific has planned enlarging its shops.

ST. BONIFACE, MAN.—Bids will be received by P. E. Ryan, Sec., Transcontinental Railway Commission, Ottawa, until April 8, for building a steel and concrete bridge and approach spans over the Red river. Contractors will submit separate bids for sub-structure and superstructure work. Plans and specifications may be obtained at the offices of S. R. Poulin, Dist. Engr., St. Boniface, Man., and H. D. Lumsden, Ch. Engr., Ottawa.

VANCOUVER, B. C.—The Canadian Pacific is said to be planning to build car and locomotive shops.

WICHITA, KAN.—The Atchison, Topeka & Santa Fe is said to have plans ready for a new passenger station. It is to be of concrete construction, one story high, 48 ft. x 222 ft.

WINNIPEG, MAN.—Bids are wanted April 8 by P. E. Ryan, Secretary of the Transcontinental Railway Commission, Ottawa, Ont., for building a steel bridge over the Red river.

Supply Trade News.

The Union Switch & Signal Co., Swissvale, Pa., has declared a regular quarterly dividend of 3 per cent., payable April 10.

J. J. Puller, until recently Assistant General Passenger Agent of the Seaboard Air Line, has become Sales Manager of the Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.

The St. John Construction Co., Chicago, has been incorporated with a capital of $50,000 to construct railways, etc. The incorporators are E. M. St. John, A. G. St. John and H. C. St. John.

The Taylor Safety Rail Co., Pine Bluff, Ark., has been incorporated with a capital of $25,000. The incorporators are: L. T. Salee, A. W. Troupe, B. P. Taylor and A. A. Lelurin.

Wilhelm Schmidt's superheating system is now in use on 4,034 locomotives on 108 railways. In our review on Mr. Garbe's book, "Die Dampflokomtiven der Gegenwart" (page 198, Jan. 29), the number was given as 2,700.

The Ernst Wiener Co., New York, reports, among the most recent orders, one for a narrow-gage railway in Columbia, S. A., consisting of over six miles of track, the necessary switches, a number of freight and passenger cars and two locomotives.

The Electric Welding Co., Pittsburgh, Pa., has taken over the sole agency of the Cummings system of steel reinforcement for reinforced concrete formerly held by Goff-Horner & Co., Frick building, Pittsburgh. In addition, it will also handle the Dudley deformed bar.

William P. Henszey, a member of the firm of Burnham, Williams & Co., Philadelphia, Pa., proprietors of the Baldwin Locomotive Works, and one of the best known designers of locomotives in the world, died of pneumonia on March 23 at his home in Philadelphia. He was 77 years old.

The Eureka continuous crossing described on page 676 of the *Railroad Age Gazette* of March 19 is made by the Central Railway Equipment Co., Canton, Ohio. An officer of the Wheeling & Lake Erie, in whose Canton yards one of these crossings has been installed, recently told the manufacturers that there had been no trouble with it, even during a snowstorm.

Fire destroyed a portion of the works of the Wright Wire Co., Worcester, Mass., on March 20, but it will be able to take care of orders as it has large, complete stocks located in buildings not reached by fire, and at various warehouses at other points. It will also operate overtime at the Palmer factories and expects the early resumption of several departments at Worcester.

The Isthmian Canal Commission is asking bids in Circular 497-C until March 19 for engine test instruments and miscellaneous articles, including small tools, pipe fittings, etc. In Circular 498-A bids are asked until March 24 for cement hoppers, cement screens and pumps; in Circular 497-A, until March 25, for repair parts for dredges, including grate bars, furnace dead plates, chain sheaves, gears, pinions, ratchets, etc.

At a meeting of the Board of Directors of the International Car Co., New Orleans, La., held on March 19, Seeley Dunn, Vice-President, was elected President, succeeding W. H. Bofinger, Sr., deceased. W. F. Bofinger, Jr., was elected Vice-President, succeeding Mr. Dunn. W. H. Bofinger, Jr., was elected a director to succeed W. H. Bofinger, Sr. The Vice-President will have jurisdiction over the purchasing department and will perform such other duties as are assigned to him by the President.

The J. G. Brill Co., Philadelphia, Pa., is building a new wood mill. Early this year there was a severe fire, and while it did not damage the wood-mill, the company is erecting a considerable extension to the present one in addition to the buildings which are going up to replace the ones which were burned. The work is being pushed as rapidly as possible, as the shops are now well filled with work and present orders will keep the plant busy at full capacity until the first of August.

Edward Rosing has been elected Secretary and Treasurer of the B. M. Osbun Co., Chicago. The Osbun company represent the Frick Co., makers of machinery; August Mietz, manufacturer of the Mietz & Weiss kerosene oil engines; Dayton Hydraulic Machinery Co., manufacturer of centrifugal pumps, and the Atmospheric Condensation Co., manufacturer of the Pennell flask-type steam condenser. The company is equipped with an able engineering department for laying out power plants, which is at the disposal of its customers.

The California Metallic Packing Co., Bee building, Sacramento, Cal., recently organized, has taken over the entire rights of the metallic packing known as the "K and Y" and "K and M" improved, sometimes called "The California Metallic Packing." This packing has been used by the Southern Pacific for a number of years on a large number of its locomotives. It is also adaptable for steam, water and air engines. The officers of the company are: President, Rufus Maker; Treasurer, John F. Fenton; Secretary and Office Manager, George R. Tuttle; Manager of Sales Department, H. S. Kozminsky.

The Ingoldsby Automatic Car Co., St. Louis, Mo., has for the last year and a half had about 400 Ingoldsby patent dump cars in service. Of this number 350 are used between Sunrise, Wyo., and Pueblo, Colo., for hauling iron ore. The average loadings of these cars has been 62½ net tons, and according to the report of the owners no repairs have been made on the equipment except in case of wreck. A feature of the Ingoldsby car is that it requires but one man to unload or to close and lock a car, the unloading being done in 10 seconds and the closing and locking in 40 seconds. The company has recently received orders for 104 new cars.

The Link-Belt Company, Philadelphia, Pa., reports the following as among orders recently received by the Philadelphia plant: Cuba—coal handling machinery for iron works, banana carrier, fueling barge equipment, automatic barrel elevator, mud conveyor. Florida—elevators, conveyors and miscellaneous machinery for handling phosphate rock, belt conveyor for lumber company. Massachusetts—coal handling machinery for large textile mill. New Jersey—coal conveyor. New York—freight carrier for paper mill, two bucket carriers for crushed coke, elevating and conveying machinery for refuse. Nova Scotia—coal handling machinery. Pennsylvania—coal elevator and conveyor, two chip handling conveyors, elevator for crushed stone, carhaul machinery. Virginia—elevators, conveyors and miscellaneous machinery for handling phosphate rock.

Among the orders recently booked by the Crocker-Wheeler Company, Ampere, N. J., are one for a 600-kw., 250-volt d.c. generator for William Rahr & Sons Co., Manitowoc, Wis.; another for a 500-kw. generator for the Shenango Furnace Co., Sharpsville, Pa. The Anderson Lumber Co., Passaic, N. J., has ordered a 125-kw. generator and switchboard and 160 h.p. of induction motors. These motors are all of the squirrel cage type. A 225-h.p. wound rotor type induction motor has been ordered by the Youngstown Sheet & Tube Co. for operating its wire mill at Struthers, O. The American Car & Foundry Co. has ordered a 100-h.p. shunt motor. The Pittsburg Steel Co., Monessen, Pa., has ordered two 75-h.p., 500-volt motors to drive drawn benches. The Newton Machine Tool Works, Philadelphia, Pa., has ordered a 22-h.p. adjustable speed motor with 1:2 speed ratio. An order for nine crane motors has been received from the King Bridge Co., Cleveland, Ohio.

The McKeen Motor Car Co., Omaha, Neb., shipped on March 19 two more of its standard 55-ft., 75-passenger, all-steel, 200-h.p. gasolene motor cars to California, where 15 cars of this design are in service on the branches of the Southern Pacific and private lines. The cars will make the trip to California coupled together and under their own power. This is the sixth shipment of McKeen motors cars to California in less than one year. Two were shipped to the Los Angeles & San Diego Beach last April; six to the Southern Pacific in August; three to the Southern Pacific in October; one to the Silver Peak Railroad in October; four to the Southern Pacific in February. All these cars made the trip on their own wheels and under their own power. The McKeen company now has 25 cars under construction, all of which are sold. Several have been chosen instead of electric cars for interurban lines on account of the great saving in initial investment, as well as the cheapness of operation. Five of the new 70-ft. cars, which seat 105 passengers, are also on order.

The business of the Western Electric Co., New York, in February ran at the rate of about $45,000,000 a year. Last month's sales were about 15 per cent. ahead of the sales in the corresponding month a year ago and the first quarter of the company's fiscal year, which ended February 28, 1909, ran about 30 per cent. ahead of the first quarter of 1908. A large part of the improvement continues to lie with the machinery department, though telephone business also shows a steady increase. As in January, a number of the Hawthorne shops are operating at full capacity and the electric light machinery shops are operating overtime. The most recent large order of importance was for two generators totaling 1,800 h.p. for the Albany shops of the New York Central & Hudson River. At present the company has somewhat over 16,000 employees. The use of the intercommunicating telephone in shops, factories and private residences is growing greatly. The increase in the number of the customers on the books during the first quarter was 40 per cent. The company is operating at about 70 per cent. of its capacity. The reduction in steel has had little effect upon the business. The policy of the Western Electric has been to maintain prices on its finished products.

TRADE PUBLICATIONS.

Air Receivers.—The Ingersoll-Rand Co., New York, in Form No. 9002, describe air receivers, pressure tanks and moisture traps.

Post Hole Digger.—The R. H. Vesey Manufacturing Co., Chicago, has issued a circular illustrating and describing the Ideal post hole digger.

Electric Train Lighting.—The University of Wisconsin has

just issued a bulletin entitled "Investigation of Methods of Railway Train Lighting."

Telephones.—The Western Electric Co., New York, is mailing a small booklet which describes new metal type intercommunicating telephone sets.

Paints.—A very attractive two-page folder recently issued by the Goheen Manufacturing Co., Canton, Ohio, calls attention to its carbonizing coating for iron and steel.

Signaling.—The Union Switch & Signal Co., Swissvale, Pa., has just issued bulletin No. 38 on the Union electro manual block system and bulletin No. 39 on the Union electric crossing gate.

Thermit.—The Goldschmidt Thermit Co., New York, has just issued a book of instructions for the use of thermit in railway shops. A number of half-tone and line illustrations show the use of thermit in locomotive frame welding.

Compressors, Excavating Machinery.—The Ingersoll-Rand Co., New York, in pamphlet 36-A illustrate and describe air compressors of various types and rock excavating machinery, including the "Sergeant," "Little Giant," "Electric-Air" and "Gordon" drills in pamphlet 47-A.

Creosoted Materials.—Wyckoff Pipe & Creosoting Co., Inc., New York, has just issued catalogue H, containing some interesting and valuable information on wood preservation, and the Wyckoff creosoted wood conduit, creosoted cross arms, poles, ties and bridge timbers, etc.

Switchstand.—Frank M. Foster, Columbus, Ohio, has just issued catalogue No. 1, which contains a detailed description of his type A interlocking switchstand. Four transparencies show the lever in the different positions. This switchstand was described in the *Railroad Age Gazette* of March 19.

Coaling Stations.—The Roberts & Schaefer Co., Chicago, recently mailed a number of sheets for insertion in loose-leaf bulletin No. 15, which is devoted to coaling stations, showing illustrations of a number of installations made by this company. Similar sheets will be sent out about once each year.

Blowers and Exhausters.—The American Blower Co., Detroit, Mich., is mailing a hand book of blowers and exhausters for forges and furnaces, which contains a large amount of valuable data on this subject, being useful to the prospective purchaser in selecting the proper size and type of equipment.

Hydraulic Jacks and Boiler Makers' Specialties.—A. L. Henderer's Sons, Wilmington, Del., have just issued a catalogue of hydraulic jacks and punches, tube expanders, pipe vices, screw punches and pumps. This catalogue is of the loose leaf variety, containing a large number of half-tone illustrations, price lists, etc.

Paint.—The Arkon Carbon Co., Chicago, is distributing a pamphlet describing its high grade carbon paint for the protection of metals. Accompanying the pamphlet are reports of tests made by two prominent engineers upon the qualities of Arkon Carbon metal protective paint, which show highly satisfactory results.

Railway Chemical Sprayer.—The Railway Chemical Sprayer Co., Owensboro, Ky., has issued a folder describing its method of killing weeds and all vegetation along railway track. A portion of the publication is a reprint from an article in the *Railroad Age Gazette*, which described fully the work done along 500 miles of the track of the Illinois Central.

Iron and Steel.—Joseph T. Ryerson & Son, Chicago, have just issued a handsome catalogue, which contains a full description, with half-tone illustrations, of their iron and steel warehouse and offices. The catalogue is printed on heavy glazed paper and contains some photographs which show various machines and general layout of the plant.

Portable Tools.—H. B. Underwood & Co., Philadelphia, Pa., have just issued a 1909 catalogue of portable tools for railway repair and machine shops. This catalogue contains descriptions and illustrations of a large number of portable tools, such as universal boring, turning and facing machines; portable pipe bending machines; crank pin turning and reboring machines, and locomotive pedestal leg facing machines. An added pamphlet describes rotary flue cleaners.

American Ingot Iron.—The American Rolling Mill Co., Middletown, Ohio, has issued literature giving the results of comparative corrosion tests of steel, charcoal iron and American ingot iron. The tests were made on samples of the same size and thickness immersed in 25 per cent. sulphuric acid for one and one-half hours. The loss to the steel sample is given as 90.7 per cent.; to the charcoal iron sample, 56.3 per cent., and to the American ingot iron, 1.55 per cent. Other pamphlets describe the corrugated metal culverts made of American ingot iron, metal roofing, conductor pipe, etc.

Valves.—The Nelson Valve Co., Chestnut Hill, Philadelphia, Pa., has just issued a new 1909 catalogue of Nelson valves. This catalogue contains 220 pages, printed on heavy paper and bound in heavy cloth board, being a very complete text book on this subject. The catalogue shows a large variety of gate, globe angle and check valves, of various metals. Among the new features included are the newly patented bronze swing check valves, hydraulically and electrically operated gate valves. Steel gate and globe valves for high pressures and superheated steam, and open hearth steel fittings are also included. The engravings show both interior and exterior views, and the descriptions, which in each case are printed on pages facing the illustrations, facilitate easy and critical study of each valve. Both test and working pressures are given, affording a definite basis for selection. This catalogue is one which should be in the hand of every man interested in the use of valves, and will be sent to any one making inquiry.

Water Softeners, Steel Tanks, Boilers and Structural Work.—"The Products of Kennicott" is the title of a large catalogue, 9¼ in. x 12½ in., just issued by the Kennicott Water Softener Co., Chicago Heights, Ill. The publication consists of a number of bulletins bound by brads through a perforated back, each being descriptive of one of the manufactured products. The first section is devoted to a history of the company and an illustrated description of the manufacturing plant at Chicago Heights. Water softeners are described in a 24-page section, including views of some of the notable installations. These include plants in nearly every civilized country and are used by various industrial enterprises, such as ice plants, tanneries and extract makers, water works, distilleries, etc. Several pages are devoted to the use of Kennicott softeners by leading railways and some figures give the results in the economy of fuel and the increased road service of locomotives. Description of the type "K" softener, with accompanying photograph cut away to show the sectional construction, is given in concise detail. Bulletin No. 31 describes the operation of the type "A" water softener. Bulletin No. 32 describes the operation of type "B" softener. A 10-page bulletin is devoted to the Bonus-Kennicott water tube boilers. Steel water tanks and car tanks are fully described in a 16-page section. A partial list of the users of Kennicott water softening machines covers a four-page insert and includes industrial companies making various things and a large number of railways. Any section or a complete catalogue will be sent by the company upon request.

A Modern Blueprint Plant.

An interesting exhibit at the Chicago Coliseum during the Maintenance of Way convention was a blueprint plant in operation, exhibited by the C. F. Pease Blue Print Machinery & Supply Co., Chicago. This consisted of automatic equipment for producing blueprints by one continuous operation. The apparatus occupies a space about 5½ ft. x 8 ft. and with it one man can easily print, wash and dry a 50-yd. roll of blueprint paper per hour. The outfit is claimed to be especially efficient where large quantities of blueprints are required in the shortest possible time, although the makers claim great economy by this process to any one using 30 or more 50-yd. rolls of blueprint paper per month.

The operation of this apparatus is so quick that within 10 minutes from the time the tracing enters the printer the finished print, washed, potashed and dried, is delivered in the automatic rerolling device at the back of the machine ready to cut off. While with the ordinary blueprint process the job is only fairly begun when the exposure has been made, by the Pease process the prints are thoroughly washed and dried ready for use in practically the same time that it takes to print them, making a very large saving in labor. By this continuous process of washing and drying the shrinkage is reduced to a minimum and, in fact, with some grades of paper it can be entirely eliminated. This

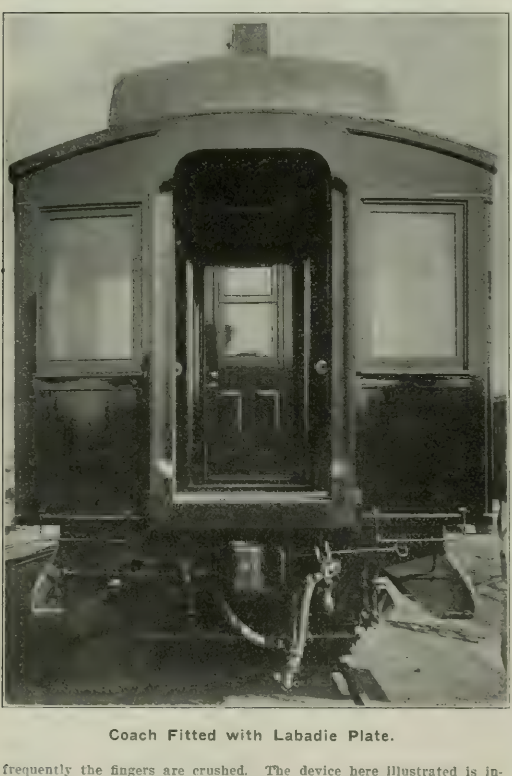
is due to the fact that the paper is only wet on the treated side and passes over the dryer before it has a chance to become water soaked.

With this same apparatus, by the addition of the Pease developer and the use of specially sensitized paper, a very fine quality of blue line prints can be made direct from the tracing without a negative, as fast as blueprints are made. These blue line prints, known as Pease direct white prints, are made on a very high grade of paper, giving them great strength and excellent wearing qualities. Absolute permanence is claimed for them, the strongest sunlight having no effect upon them, and there is practically no shrinkage. This work is especially valuable for profiles and progress charts and is being used to good advantage by auditing departments for tabulation work, which can be produced direct from typewritten copy on a special transparent paper.

A cutting and trimming table shown with this machine is also unique and should be of value in any blueprinting room. The cutting and trimming device at the end of the table is provided with a parallel clamp worked with a foot treadle which holds the paper or print securely while the revolving cutting knife, rotated positively by mechanical means not dependent upon friction against blade or paper, is used. This device trims paper very accurately and rapidly. This company also has other printing apparatus for use in smaller plants.

Labadie Vestibule Diaphragm Face Plate.

While cars are in motion, the slack running in and out at frequent intervals creates an aperture between the vestibule face plates, and on rough track or short curves the passenger, without realizing his danger, may grasp the inner edge of the face plate with thumb and fingers and



Coach Fitted with Labadie Plate.

frequently the fingers are crushed. The device here illustrated is intended to prevent such accidents. The improved face plate has a rabbetted edge or recess extending from within 6 in. of the platform to the curvature at the top of the face plate, the recess having a depth toward the outer edge of 4 in., the balance of the width, $1\frac{1}{2}$ in., being left for dust and water closure. Each recess or rabbetted part has a depth of 1 in., making a space of 2 in. in which the passenger may place his fingers with safety. The object of this recess device is not only to save railway payments for personal injuries, but also to save the curtain devices. When the vestibule traps are closed and the trainmen cannot get within the vestibule to unhook the curtains and the cars are separated, the curtains are pulled apart until they break and are thus rendered inoperative.

The old face plates are utilized by being removed from the car, heated red hot so as to permit of being shaped by a bulldozer, and pressed between the formers which create the recess or rabbetted edge. By manufacturing a number at a time the cost is materially reduced. The expense of converting the old irons into the new device averages $3.50 per car. The process does not reduce the width of the original

Labadie Recessed Face Plate.

face plate, as the great pressure applied when creating the recess is sufficient to expand the metal enough to take care of the angle of the recess.

This device has been adopted by the Texas & Pacific and other southern roads. The illustrations show the improved diaphragm as applied to the car and a detail of the diaphragm. This device is patented by Victor Labadie, who is connected with the Texas & Pacific Ry. Address 181 Live Oak street, Dallas, Texas.

Keuffel & Esser Convention Exhibit.

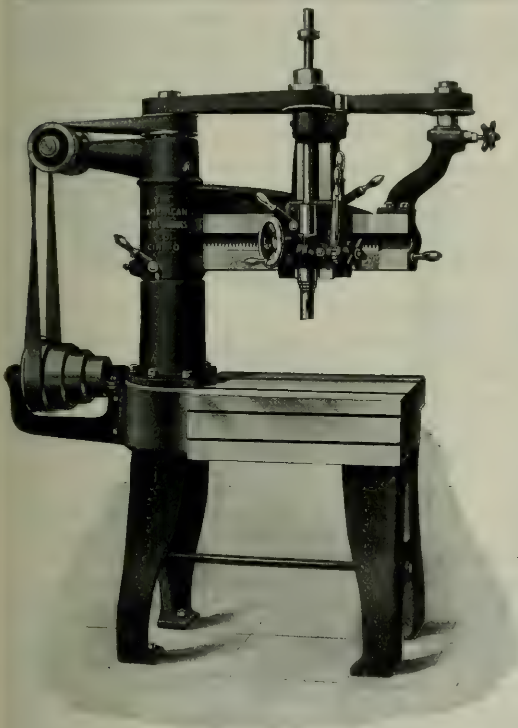
An attractive exhibit of surveying instruments, leveling rods, ranging poles, steel and metallic tapes, slide rules and a general line of mathematical instruments was made at the maintenance of way convention in Chicago by the Keuffel & Esser Co., New York, through its Chicago house. The surveying instruments were of the latest pattern and a good many of them had never before been shown in this country. Attention was especially directed to the new extra-fine engineer's city transit, mountain and mining tachymeter, triangulation instruments, municipal triangulation theodolite and the Wisconsin transit, on which neither time nor labor has been spared to meet the wants of engineers. This concern has had for several years a lens-grinding department and therefore can furnish the highest grade of lenses.

The measuring tapes exhibited had the new "Keco" finish, which produces a dense, even black tape line with brilliant bright-steel graduations and figures. This finish is claimed to wear well, guard against rusting and obviate the necessity of greasing the line to protect it. The slide rules shown had special adjustments to prevent the slide becoming too loose or too tight.

American High Speed Sensitive Radial Drill.

The high speed sensitive radial drill shown in the accompanying cut, is designed to combine the efficiency of the sensitive drill with the convenience and high productive capacity of the radial, and with the idea of simplifying all the operations of the machine. The levers are placed in a convenient position and movement of the head and arm is such as to facilitate rapid manipulation. The work to be drilled is placed upon the table and does not have to be reset for each individual hole.

There are no gears in the driving mechanism from the countershaft through to the main spindle, it being driven by a 2 in. double belt running at high speed, transmitting power direct to the spindle. The spindle belt is kept at proper tension by adjustment of the star knob seen in the illustration. All the driving and idler pulleys are equipped with special ball bearings, consisting of a double set of hardened and ground ball races and cones, one set being located at each end of the pulley journals. They are designed to be dust proof and to form a retainer for the lubricant. The spindle is of high carbon crucible steel, accurately ground and provided with dust proof self-lubricating



American High Speed Sensitive Radial Drill.

ball thrust bearings. There are six changes of speed, ranging from 300 to 900 r. p. m. in geometrical progression, obtainable through a two-speed countershaft and three-step cone pulley. An adjustable stop collar is provided at the top of the spindle, which collar may be used as a depth gage. The spindle is fed by a long hand lever on a ratchet wheel, the latch handle being self-releasing when in the uppermost position. A convenient star wheel provides for quick return of the spindle.

The column is of tubular section, heavily ribbed internally, and of sufficient stiffness to withstand all strains. It extends through the arm into the cap at the top of the drill and is firmly bolted to the top of the table. The arm is of parabolic beam and tube section design. The lower line side of the arm is parallel to the table, thus enabling the full capacity of the drill to be used at any point along the arm. The arm swings easily on the column and may be clamped in any position by a convenient binder lever. This arm has no movement vertically, since provision is made on the head for variable heights of work.

The head is of special design and may be moved rapidly along the arm by a hand wheel through angular rack and spiral pinion, and clamped at any point along the arm by the hand lever shown at the right of the head. The head consists of the main saddle which slides upon the arm and carries an auxiliary sliding head on a vertical dove tail. This allows a vertical movement of the head and makes elevating and lowering of the arm unnecessary. The vertical slide may be securely locked by a lever shown at the left of the head. Provision is made for taking up any wear of all slides.

The table is accurately planned and is of full box construction, heavily ribbed and mounted upon substantial legs, forming a rigid and convenient arrangement. The top and front slides are fitted with T-slots, planed from the solid, and the back end is planed for use in squaring up work. The two-speed countershaft is of special design for high speed work. The boxes in the hangers are of improved gravity and wick oiling type, obtaining oil supply from large reservoirs, and attention is necessary only at long intervals. The countershaft carries a three-step cone pulley, with a pair of friction pulleys, 10 in. in diameter by 3 in. face; and should run 310 and 387 r.p.m.

These machines are made with 2-ft. and 3-ft. arms and the following tabulation shows some of the principal dimensions:

	2-ft. Arm.	3-ft. Arm.
Spindle speeds, r.p.m.	300 to 900	300 to 900
Drills to center of circle outside of column	49 in.	73 in.
Minimum dist. from spindle center to column	6¼ in.	6¼ in.
Max'm distance from spindle to table	19 in.	19 in.
Height of table above floor	35 in.	35 in.
Working surface of table top	20 x 28½ in.	20 x 40½ in.
Working surface of table side	6¼ x 28½ in.	6¼ x 40½ in.
Max'm height to highest point of spindle	7 ft. 7½ in.	7 ft. 7½ in.
Traverse of spindle at one setting	5½ in.	5½ in.
Vertical traverse of head slide	8 in.	8 in.
Traverse of head on arm	18¼ in.	30¼ in.
Dist. from underside of head to table	15¾ in.	15¾ in.
Width of drive belt on machine	2 in.	2 in.
Width of drive belt on countershaft	2½ in.	2½ in.
Floor space (full swing)	66¾ x 87½ in.	78¾ x 111¾ in.
Speed of countershaft (2-speed) r.p.m.	310 and 387	310 and 387

The manufacturers claim that under ordinary conditions, the 2-ft. arm machine accomplished the following drilling in cast iron: ¾-in. drill, 375 r.p.m., 73-7 ft. cutting speed, 0.028 in. per minute, at rate of 10½ in. per minute and consuming 3¼ h.p. at the drill. This machine may be equipped with a tapping attachment.

The American Tool Works Co., Cincinnati, Ohio, makes these tools.

The "Normal Danger" Patent.

In affirming, on March 16, 1909, the decree in favor of the Hall Signal Co., sustaining the validity of U. S. patent No. 470,813 granted to A. J. Wilson, March 15, 1892, the opinion of the United States Circuit Court of Appeals at New York was handed down by Judge Coxe. It contains the following passages:

The patent relates to the so-called normal danger system as distinguished from the normal safety system, it being contended that the patentee was the first to make the former a safe, reliable, simple and workable system—having marked advantages over the systems of the prior art. * * *

Under the normal safety system, when the engine driver approaches a block the semaphore at the entrance is in an inclined position by day and shows a green light by night indicating that the track ahead is clear, and that he may safely proceed unless the signal rises to a horizontal position, or shows a red light. In other words he is to assume that the track ahead is clear and safe until the contrary appears by the appearance of a danger signal.

The normal danger system, on the contrary, always shows a red light at night and a horizontal semaphore by day, indicating danger; the safety signal appearing only on the approach of a train and when the block to be protected is clear. In the first system the assumption is that all is safe ahead till "danger" appears, and, in the second, that all is unsafe ahead until "safety" appears.

In the one, if there be no movement of the signals, the engine driver keeps on, in the other, unless there be movement of the signals, he stops. To quote from the pamphlet said to have been written by the president of the defendant: "Consistency argues that all the signals shall indicate danger, except where they are cleared for the passage of a train."

From the viewpoint of safety it seems to us that the preponderance of evidence is clearly in favor of the complainant's system. If, through climatic or other influences, the signals cease to operate, it seems obvious that it is much safer that they should clog in the danger rather than in the safety position. In the one case the failure of the signal to operate might result in the unnecessary stopping of the train; in the other it might result in a rear-end collision. It is not at all improbable that laymen may give greater weight to this feature of the system than practical railway men, but it seems to us that an improvement which reduces, in any degree, the chances of derailment and collision, and thus safeguards life and property, is entitled to greater consideration than one which deals only with economics.

We do not intend to intimate that the Wilson system does not,

from a practical point of view, compare favorably with the normal safety plan; quite the contrary appears. As the electric current is in operation during the comparatively short time that the signal stands at clear, it is obvious that there is very much less consumption of battery material. As one of the witnesses points out, the expense of maintenance increases only in proportion to the amount of use, whereas in the normally clear system the expense is greatest when apparatus is least used.

Scientific men, versed in the art of railway signaling, had early recognized that the logic of the situation was all with the normal danger theory. Thus, in 1842, Sir William Cooke writes, "I think it highly desirable that the ordinary or quiescent condition of the station signal should be a state of danger, and not a state of safety, so that a train should never run into a station without special guarantee that it was prepared to receive it." This was before the days of automatically controlled block signaling, but it shows that early in the art of railroading it was recognized that the ideal position of the signal was one indicating normal danger.

The difficulty was not with the theory but with the means to make the theory practicable. This was an easy task when applied to a manually operated system, but the record shows that its practical application to an automatic system was obstructed by impediments which it was found impossible wholly to remove, although many skilful and scientific men were at work on the problem.

At the date of Wilson's invention, in 1891, the art of railway signaling was in an embryonic condition. Men of genius and skill, cognizant of the advantages of the normal danger plan, were endeavoring to produce a practical system, but none, prior to Wilson, succeeded in perfecting a plan to which hard headed railway men were willing to intrust the lives and property committed to their care.

The defendants rely upon patents granted to five inventions—Robinson, Spang, Pope, Gassett and Westinghouse—to defeat or fatally limit the claim in suit. William Robinson, in 1872, received a patent, relating to a normal safety system and in 1879 he received a British patent for a normal danger system. It is not pretended that either of these patents anticipates, but, if we comprehend the defendant's contention, it is that Robinson possessed the knowledge, as demonstrated by the description and drawings of his patents, to convert the plan of the earlier patent into a successful normal danger system.

A sufficient answer is that patents are not defeated by what prior inventors might have done. They, like other men, must be known by their works, and no one pretends that the plan described by Robinson in the British patent 3479, in 1879, was operative. At least, no one ever attempted to operate it. No reliable protection is shown and it is doubtful whether it could be operated in connection with a block system.

Robinson is conceded by all to have been one of the most accomplished signal engineers of his time. The fact that he failed to convert his 1872 system into a normal danger system is mute but persuasive testimony that it was not an obvious thing to do.

* * *

Four patents, Nos. 164,227, 164,228, 168,059 and 208,995 were issued to Henry W. Spang, from 1874 to 1878, describing with great particularity eight normal danger plans which never went into use. Being radically wrong in theory, they could never be made practically useful. The initial errors in Spang's system were insufficient length of the clearing section and lack of efficient protection for the train while on that section. The defendant's counsel deny this, but we are not convinced by their argument. We agree with the judge of the circuit court in holding that the protection afforded by the Spang patent, 164,227, was insufficient "owing to the magnetization of a magnet which in this type of signaling was necessary in order to hold the signal in its danger position." * * *

Frank L. Pope in 1873 was granted a patent, No. 143,529, covering a normal danger system or, more accurately, two such systems. Here too we have the fatal defect of clearing sections, but 50 feet in length and wholly unprotected. The plan was never put into actual use and is admitted to be wrong in principle.

Oscar Gassett, in 1882, was granted a patent, No. 251,867, for a normal danger system, which like all the others which preceded it, was never a practical success. * * * It is enough that a patent which was respected by competitors for 13 years and which covers a system which has been in successful operation during its entire life cannot be invalidated by the ambiguous language of a patent which has added nothing of value to the art. * * *

When Wilson took up the work it had virtually been abandoned by the others; they had tried and failed and there was no reliable normal danger plan then in existence. That Wilson solved the problem we have no doubt; the systems installed under his patent are successful and are rapidly growing in popularity. We do not consider him a pioneer in the sense that he discovered a new art. The idea of a normal danger system was old, but he was the first to harness it and set it to work. So much he has contributed and to this extent he is entitled to protection.

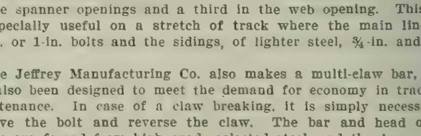
In approaching the question of infringement, it must be remembered that the controversy is confined to the first claim which covers the broad invention and has no connection with the second claim which relates to the specific means described and diagrammatically shown. Having found that Wilson was the first to devise a successful normal danger system affording full protection to the train in front and rear for every inch of track, it is manifest that a construction should be placed upon the claim as broad as the invention and that he who uses the invention without license should be held to infringe no matter what else he may use.

Jeffrey Lock Jaw Track Wrenches.

The Jeffrey Manufacturing Co., Columbus, Ohio, has introduced, through its forge and foundries department, a new design of railway track wrench which is a practical and economical tool. It is a simple and practical development to meet the demand for a wrench, the jaws of which will not spread. Those familiar with the severe service of track work will appreciate a tool which will meet this demand. The designs shown herewith are the first of a variety of designs in which the wrench will be made to provide for practically every different kind of service for which the open end wrench is used. The wrench is a combination reinforced spanner and box wrench, and the accompanying illustrations show this feature and the manner in which the web binds the jaws together to prevent spreading. This web not only prevents spreading, but also allows the insertion of a hexagon box wrench opening, in addition to the open end spanner on the opposite face. The web opening may be of the same or different size from the spanner opening. The wrenches shown in the accompanying half-tones are furnished in two kinds of finish, either unhardened or with fall case hardening. Each wrench is sold with a guarantee of replacement of any wrench which fails in track service through spreading of its jaws.

Jeffrey Lock Jaw Track Wrenches.

A twin head wrench, shown in the accompanying line cut, is also made by this company. It is designed especially for use in track work on a line using different size of bolts. A solid web extends between the two openings, making a very substantial construction. This twin head wrench will take three different sizes of nuts, two in the spanner openings and a third in the web opening. This form is especially useful on a stretch of track where the main line uses ⅞-in. or 1-in. bolts and the sidings, of lighter steel, ¾-in. and ⅞-in. bolts.



Jeffrey Twin Head Wrench.

The Jeffrey Manufacturing Co. also makes a multi-claw bar, which has also been designed to meet the demand for economy in track tool maintenance. In case of a claw breaking, it is simply necessary to remove the bolt and reverse the claw. The bar and head of this device are forged from high grade selected steel, and the jaws of tool steel, oil tempered, to give the necessary strength and toughness.

ALPHABETICAL INDEX TO ADVERTISERS—CLASSIFIED DIRECTORY ON THE NEXT PAGE.

†Once a Month. *Every Other Week.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

ALPHABETICAL INDEX, PAGE 5.

Accountant.
Whitehead, H. C.

Acetylene Lighting.
Commercial Acetylene Co.
Rushmore Dynamo Works.

Air Brake Fittings.
Fairbanks, Morse & Co.
National Tube Co.
Simmons Co., John.
Western Railway Equipment Co.
Westinghouse Air Brake Co.

Air Brake Hose—(See Hose).

Air Brakes.
Westinghouse Air Brake Co.

Air Compressors.
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Franklin Railway Supply Co.
Gardner Governor Co.
Independent Pneumatic Tool Co.
Murphy & Co., Christopher.

Air Hoists—(See Hoists).

Anti-Friction Metal—(See Babbitt Metal).

Anti-Rail Creepers.
Railway Specialty & Supply Co.

Anvils.
Eagle Anvil Works.

Architects.
Dodge & Day.

Asbestos.
Asbestos Protected Metal Co.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Asphalt.
Standard Asphalt & Rubber Co.

Augers Pneumatic — (See Pneumatic Tools).

Axles.
Block-Pollak Iron Co.
Cleveland City Forge & Iron Co.
Gould Coupler Co.
Johnson & Co., J. R.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Manganese Steel Rail Co.
Pittsburgh Forge & Iron Co.
Standard Steel Works Co.

Babbitt Metal.
Brady Brass Co.
Damascus Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Baggage Checks.
American Railway Supply Co.

Baggage Racks.
Rostand Mfg. Co.

Balanced Main Valves.
American Balance Valve Co.
Hammett, H. G.

Ballast Cars—(See Cars, Ballast).

Ballast Unloaders.
Bucyrus Co.
Fairbanks, Morse & Co.
Marion Steam Shovel Co.

Batteries, Electric.
Edison Mfg. Co.
Electric Storage Battery Co.
Railroad Supply Co.
Westinghouse Machine Co.
Willard Storage Battery Co.

Battery Chutes and Vaults.
Buda Foundry & Mfg. Co.

Bearing Metal—(See Journal Bearings).

Bell Ringers.
Ward-Packer Supply Co.
Western Railway Equipment Co.

Bells, Locomotive.
Lawrenceville Bronze Co.
National Tube Co.

Bending Rolls.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Blocks and Tackle.
American Hoist & Derrick Co.
Boston & Lockport Block Co.

Blowers.
American Blower Co.
Monarch Engineering & Mfg. Co.
Sirocco Engineering Co.

Blow Torches, Large Portable Oil.
Macleod & Co., Walter.

Blue Printing Machines.
Kolesch & Co.

Blue Print Papers.
Kolesch & Co.

Boiler Compounds.
Dearborn Drug & Chemical Works.
Jewell Engineering Co.
Johns-Manville Co., H. W.
Ward-Packer Supply Co.

Boiler Covering—(See Covering, Pipe and Boiler).

Boilers.
American Locomotive Co.
Baldwin Locomotive Works.
Carlin's Sons Co., Thomas.
Fairbanks, Morse & Co.
Hannoversche Masch.-Actien-Ges'aft
Hicks Locomotive & Car Works.
Vulcan Iron Works.
Yale & Co., Julian L.

Boilers, Steam and Water Heating.
Lord & Burnham Co.

Boiler Tubes.
Krupp (Prosser & Son).
National Tube Co.
Parkesburg Iron Co.
Simmons Co., John.
Tyler Tube & Pipe Co.
Worth Bros. Co.
Yale & Co., Julian L.

Boiler Washout Systems.
National Boiler Washing Co.
Yale & Co., Julian L.

Bolsters, Steel.
American Steel Foundries.
Atha Steel Casting Co.
Barney & Smith Car Co.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Commonwealth Steel Co.
Gould Coupler Co.
Pressed Steel Car Co.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Car Co.

Bolt and Nut Machinery.
Acme Machinery Co.
Ajax Mfg. Co.
Niles-Bement-Pond Co.

Bolts and Nuts.
Q. & C. Co.
Railway Specialty & Supply Co.

Boring Bars—(See Portable Tools).
Underwood & Co., H. B.

Boring Machines, Horizontal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring Machines, Metal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring and Turning Mills.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Brakebeams.
American Steel Foundries.
Chicago Railway Equipment Co.
Cleveland Car Specialty Co.
Barney & Smith Car Co.
Davis Solid Truss Brake Beam Co.
Pressed Steel Car Co.
Standard Steel Car Co.

Brakejaws.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.
U. S. Metal & Manufacturing Co.
Western Railway Equipment Co.

Brake Levers.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.

Brakeshoes.
American Brake Shoe & Fdry. Co.
Buckeye Steel Castings Co.
Franklin Railway Supply Co.
Georgia Car Co.
Railway Materials Co.
Transue & Williams Co.
Wheel Truing Brake Shoe Co.
Yale & Co., Julian L.

Brakeshoes, Wheel Truing.
Wheel Truing Brake Shoe Co.

Brass Castings—(See Castings, Brass).

Brasses, Car and Engine—(See Journal Bearings).

Bridges, Buildings & Roofs.
Atlantic Equipment Co.
American Bridge Co.
Baltimore Bridge Co.
Interstate Engineering Co.
King Bridge Co., The.
Louisville Bridge & Iron Co.
Males Co., The.
McClintic-Marshall Constrn. Co.
Missouri Val. Bridge & Iron Wks.
Phoenix Bridge Co.
Riter-Conley Mfg. Co.
Scherzer Rolling Lift Bridge Co.
Shoemaker & Co., Lewis F.
Snare & Triest Co.
Virginia Bridge & Iron Co.
White & Co., J. G.

Bridges, Second Hand.
Johann, F. A.

Bridge Timber—(See Timber).

Bronze.
Brady Brass Co.
Damascus Bronze Co.
Lawrenceville Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Buckets, Automatic Grab.
Browning Engineering Co.
Link-Belt Co.

Bulldozers.
Ajax Mfg. Co.
Niles-Bement-Pond Co.
Williams, White & Co.

Bumping Posts.
Fairbanks, Morse & Co.
McCord & Co.
Mechanical Mfg. Co.

Cables, Electric.
Brixey, W. R.
General Electric Co.

Cableways.
Brown Hoisting Machinery Co.
Flory Mfg. Co., S.

Caboose, Jacks, Cast-Iron.
Dickinson, Inc., Paul.

Calculating Machines.
Kolesch & Co.

Car Axles—(See Axles).

Carborundum.
Carborundum Co.

Car Cleaner.
Ward-Packer Supply Co.

Car Closets.
Duner Co.

Car Couplers—(See Couplers).

Car Curtains.
Curtain Supply Co.
General Railway Supply Co.
National Lock Washer Co.
Pantasote Co.

Car Doors.
Ostermann Mfg. Co.
U. S. Metal & Mfg. Co.
Western Railway Equipment Co.

Car Flooring.
American Mason Safety Tread Co.
General Railway Supply Co.
Wood, Guilford S.

Car Heating.
Chicago Car Heating Co.
Consolidated Car-Heating Co.
Franklin Railway Supply Co.
Gold Car Heating & Lighting Co.
Johns-Manville Co., H. W.
Safety Car Heating & Lighting Co.

Car Lighting.
Bliss Electric Car Lighting Co.
Commercial Acetylene Co.
Electric Storage Battery Co.
General Electric Co.
Gold Car Heating & Lighting Co.
Safety Car Heating & Lighting Co.

Carlines, Pressed Steel.
Cleveland Car Specialty Co.

Car Movers.
Appleton Car Mover Co.
Fairbanks, Morse & Co.
Hubbard & Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Platforms, Steel.
Commonwealth Steel Co.
Standard Coupler Co.

Car Repair Material, Second-Hand.
Jennings, Geo. W.

Car Replacers.
Buda Foundry & Mfg. Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Roofing.
Asbestos Protected Metal Co.
Bird & Son, F. W.
Bunker, Ed. A.
Chicago-Cleveland Car Roofing Co.
Drake & Weirs Co., The.
Excelsior Car Roof Co.
General Railway Supply Co.
Johns-Manville Co., H. W.
Standard Paint Co.
Standard Ry. Equipment Co.

Car Sills.
Carter Lumber Co.
Frost-Trigg Lumber Co.
Stone, F. B.

Car Trimmings.
Wood, G. S.

Car Trucks—(See Trucks).

Car Upholstery.
Aikman & Co., C. M.
Chase & Co., L. C.
Pantasote Co.
Collins & Aikman.

Car Wheels.
Barney & Smith Car Co.
Fairbanks, Morse & Co.
Griffin Wheel Co.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Lobdell Car Wheel Co.
Mt. Vernon Car Mfg. Co.
Railway Steel-Spring Co.
Standard Steel Works Co.
Wiener Co., Ernst.

Car Window Fixtures.
Curtain Supply Co.
Edwards Co., O. M.
General Railway Supply Co.
National Lock Washer Co.

Cars.
American Car & Equipment Co.
Atlantic Equipment Co.
Barney & Smith Car Co.
Bradley & Sons, O.
Buda Foundry & Mfg. Co.
Cincinnati Equipment Co.
Climax Mfg. Co.
Continental Car and Equipment Co.
Fairbanks, Morse & Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
German-American Car Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Hotchkiss, Blue & Co.
Illinois Car Co.
Lima Locomotive & Machine Co.
McGuire-Cummings Mfg. Co.
Middletown Car Works.
Milwaukee Car Mfg. Co.
Mt. Vernon Car Mfg. Co.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Ralston Steel Car Co.
Rodger Ballast Car Co.
Russell Car & Snow-Plow Co.
Standard Steel Car Co.
White Enamel Refrigerator Co.

Cars, Ballast.
Continental Car & Equipment Co.
Fairbanks, Morse & Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Males Co.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Rodger Ballast Car Co.
Standard Steel Car Co.

Cars, Dump.
Cincinnati Equipment Co.
Continental Car & Equipment Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Hunt Co., C. W.
Jeffrey Mfg. Co.
Lima Locomotive & Machine Co.
Milwaukee Car Mfg. Co.
Oliver Mfg. Co., Wm. J.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Ralston Steel Car Co.
Rodger Ballast Car Co.
Russell Car & Snow-Plow Co.
Standard Steel Car Co.
Wiener Co., Ernst.
Wonham & Magor.

Cars, Inspection.
Buda Foundry & Mfg. Co
Fairbanks, Morse & Co.
General Electric Co.
Kalamazoo Railway Supply Co.
Kenly Co., W. K.
Light Inspection Car Co.
Stover Motor Car Co.
Wiener Co., Ernst

Cars, Logging.
Buda Foundry & Mfg. Co.
Continental Car & Equipment Co.
Wiener Co., Ernst.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

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CONTENTS

Through courtesy of W. H. Williams, Third Vice-President of the Delaware & Hudson Company, we print this week a statement of the operations of the Merchants & Manufacturers' Association of Pittsburgh, while he was its traffic manager. This document is important for two reasons: it shows how much railway traffic service can be bettered, without real cost to anybody, by organized attention to details, and it emphasizes the fact that trouble is a good deal more likely to be caused by bad service than by the rates charged, especially in merchandise traffic. During a long period of time, extending, roughly, from the spring of 1905 to the fall of 1907, it was frankly impossible to correct many serious deficiencies of service, simply because there were not cars enough or tracks enough to move with expedition all the business that offered. Now, however, traffic managers all over the country have the best opportunity which has presented itself since 1894, to abolish minor causes of annoyance, and look after all the petty details which make the difference between a contented shipper and a dissatisfied one.

THE TRACK APPLIANCE EXHIBIT AT CHICAGO.

This exhibit may be generally divided as materials and appliances for economy and for safety. It needed the large floor space of the Coliseum, which it occupied from March 15 to March 20, during the season of the Maintenance of Way association. It was epoch making, in the quality and the quantity of the materials shown, in their value to operating department officers as well as to those in the track department, and in the financial results of the exhibit. There can, therefore, be no question as to the continuance of this feature, with great improvements in future years. A list of the exhibits has already been published. It may be worth while to consider a few defects as well as a few of the notable features.

Samples and information about tie preservation were markedly incomplete and unsatisfactory. It must have been a distinct disappointment to the many interested in this topic that there were only two exhibits of treated ties, one by the Card process which uses 25 per cent. of creosote oil and 75 per cent. of zinc chloride, and the other by the Percival Company, the air-seasoned, open-vat method, used at Houston, Texas.

Six manufacturers of tie plates showed a great variety of shapes and sizes designed for endurance, for increasing the bearing area of the spike and for resisting side thrusts. The exhibit of malleable iron plates was especially interesting, inasmuch as this is an undertaking for economical results with the initial obstacle that for equal strength the malleable plate probably costs more than the rolled plate. Opposed to this disadvantage is the fact that the malleable plate can be made in some shapes which cannot be rolled, and also that malleable iron does not corrode as rapidly as rolled steel. This subject is worth watching.

One cement tie in good condition which had been in main line service for several years was shown, and this was the only information presented on this rather discouraging development. The Carnegie steel tie was well shown. It is still doing good service, with the limitations which have been frequently discussed in these columns. Among the newer designs is the Baird tie, a pressed steel trough with upturned flange and with an inverted piece of trough for rail bearing, riveted to the flanges. The Williams tie is the reverse of this—a pressed steel trough with the flanges down. Mr. Mechling showed a heavy steel angle bent to a U shape at each end, where wooden blocks for rail carrying are bolted on. A heavy cast iron tie was shown by Mr. Shaw. Taken as a whole, the exhibit of steel ties was not as full as it might have been made.

There were many important and interesting forms of frogs and crossings, showing generally an increasing use of manganese steel for the hard service parts. Thirty years ago the Hadfields found that a steel alloy with about 11 per cent. manganese, if quenched in water from a high temperature, made a tough product with unusual resistance to abrasion. The works at Hillburn, N. Y., now roll a material with manganese 11 per cent., carbon 1 per cent., phosphorus .065 and sulphur .03.

The interesting rail testing machine of the Pennsylvania Steel Company was again shown in operation. It consists of a circular track 20 ft. in diameter, on which is a revolving arm carrying a 33-in. wheel at each end. The wheels can be speeded to 60 miles an hour. The vertical pressure on each wheel can be graded up to 41,500 lbs. The horizontal push of the flange against the rail can be graded up to 47,800 lbs. This is a rapid method of getting facts about rail wear, flange wear, flat wheels, the strength of rail joints and fastenings, and perhaps other things.

The exhibit of block and interlocking signals was complete and satisfactory. These exhibits require large spaces and.

judging from the attention they received, these devices formed the most important group in the Coliseum.

The committee of the "Road and Track Supply Association" deserves great credit, and they have received the encouragement that will doubtless enable them to make an even more complete exhibit next year.

THE FUTURE OF RAILWAY TERMINALS.

The President of one of the larger railway systems of the country with very costly terminals at two great cities, referring in a quiet talk not long ago to his terminal problems, spoke of a condition which held him back and made him an arch-conservative in dealing with any surface plans. It was, in brief, the steady and active development of subterranean work as a factor and force in the terminal facilities of the future. The leading officer in charge of engineering of the same corporation expressed a like opinion. It was not long ago that an important contract was signed by the New York Central and the New Haven Company for joint use of the Grand Central terminal and the Mott Haven yards. What is not, perhaps, generally known is that tunnel and subway development in and about New York City was the most potent cause—there were others—in holding up the contract for a year or more; and when signed at last it provided that the New Haven, which may be called the lessee party, should pay in proportion to actual usage of the terminals. An absolute lease with fixed payments which, under old conditions, might have been of great value not many years hence, was rejected in favor of a sliding scale based upon actual passenger business which would reduce the rent should the new subways divert part of the Grand Central business.

Such a concrete case suggests very strikingly a change in the viewpoint as to the future of great railway passenger terminals in big cities and a change which in a few years may shift hypothesis into realism. Half a decade ago the question of railway terminals in the larger cities was regarded as perhaps the most serious, in both a fiscal and a physical sense, that fronted the railway companies. The cities had grown, were growing and are still growing. City travel had become congested. The "skyscraper" had focussed population more and more at certain central points of business. Meanwhile railway terminals had become outgrown too. It affected not merely stations but roadways; and new or expanded terminals entailed enormous costs for additional realty and for rights of way without any corresponding increase of income. People laughed at the seeming undue size of the Grand Central station when it was opened for traffic 40 years ago. The old station is now a mere corner in the later and compulsory enlargements. And in less degree but still on a great scale other cities faced the railways with the same terminal problem as the metropolis. It was mainly a passenger problem, but freight had its terminal problems also.

It is a characteristic of an age of swift mechanical progress that no such question is so vast but that it tends to its own answer. The sub-way—using the term in its biggest meaning—is now entering the limbo of the railway terminal. The old theory of the terminal was concentration—a fixed point at which business outward and inward should be delivered. The new potential rests on the theory of distribution. The old theory is that of the huge centralized station; the new hypothesis does not break it up but relieves it into a great series of urban way stations. Light and air and conveniences of level will ever be the attractive constants of the surface terminal. But the principle of subway distribution must attack them sharply. It is not amid the fumes of a pipe-dream of future terminal facilities that the railway man notes the speed with which the up-to-date tunnel is driven; the ease with which it overcomes obstacles of rock, silt and quicksand; the triumphs of electricity as a motive power, as a victor over smoke and cinder, and a giver of light. And from these his vision passes readily to a future of multiple levels of subway, amplified way stations and the elevator repeating underground to impressive depths its active function in the skyscraper above. Has science indeed thus far more than scratched those vast sub-city spaces in which the railway terminals will claim their ample share?

The prophetic vision as it looks ahead sees yet greater things. It descries local subways and express subways. It sees the through trains that pass under great cities without, perhaps, a single stop. It sees navigable waters quite as often tunnelled as bridged. It decries not merely the relief of overcrowded cities but quicker transit to the regions more remote. And, in a future not necessarily much farther away, it sees the Chicago freight subway amplified into a "necessary of life" in all the largest cities. Beginning with perishable goods it sees the problem of the freight terminal in the big city modified if not solved by the subway after the underground passenger terminal has passed into the realm of prosaic and everyday fact. The conquest of the earth's surface has begun to reach its final stages; the conquest of the tenuities of the air is still empirical; the conquest of the sub-terrene solidities, with the railways in the van of progress, already assumes shape with a practical as well as poetic vista ahead and with the railway terminal requirement of the great city as a starting point.

THE RAIL AND THE COUNTERBALANCE.

The recent discussions relating to flat spots on car wheels and locomotive drivers in connection with rail breakages, have brought out several instructive statements which have an important bearing on the rules for counterbalance. It is generally admitted that a good rail cannot be broken by ordinary flat spots or by the excess pressure due to counterbalance. But defective rails are broken or bent by such causes, as they produce maximum stresses to which the weaker rail yields and discloses imperfect structure or brittleness. Where flat spots on car wheels have been shown to be the cause of rail breakage the length of these spots largely exceeds the M.C.B. limit of 2½ in., which has been the rule for 30 years. Some recent experience in rail breakages by wheels follows:

On one road 40 rails of 85-lb. section were broken by a tender wheel having a flat spot 6 in. long. On another road 50 new rails of 100-lb. section were broken by a tender wheel with a flat spot 6 in. long 2½ in. wide and ½ in. deep. These spots referred to were not strictly flat, but the wheels were worn so that a portion of them 6 in. long was inside the proper wheel circumference. On the main line of a large eastern railway 360 rails were broken by a flat spot on the trailing wheel of an Atlantic type engine; and on the same road there were breakages of about 300 rails, most of which were attributed to a badly counterbalanced engine. A number of rail breakages have been traced to driving wheels which have spots worn more than $\frac{1}{16}$ in. below the proper circumference, and 16 in. to 32 in. long. These are on the large wheels of high speed locomotives. The action here appears to be due to excessive counterbalance, which causes the tire to wear irregularly on the circumference, giving the effect of the rotation of an ellipse. This is aggravated by undue rail pressure produced by the heavy counterbalance. The heavy counterbalance in turn is the result of very heavy reciprocating parts.

Such experiences show that the motive power department cannot be held entirely blameless in the reports of investigations into the causes of broken rails. While flat spots on the wheels of 50-ton cars or heavily loaded tenders may search out defective rails and break them, driving wheels which are not truly circular and which have an excess counterbalance when running at high speeds will break rails which would

otherwise have given good service. In connection with the efforts now being widely made to produce safe track, there is, therefore, some responsibility to be borne by those who have to do with locomotive design and maintenance.

As the locomotive has grown to such large proportions that it is necessary to resort to a duplication of engines on one boiler, and the reciprocating parts have become so heavy, there has been a tendency to balance a smaller proportion of the weight of those parts in the connected wheels. Prior to 1896 the general rule in this country was to balance two-thirds of the weight of the reciprocating parts and divide it equally between the coupled wheels. At that time the Master Mechanics' Association adopted a rule which made the over-balance proportional to the total weight of the engine. This weight is divided by 400 and the quotient subtracted from the weight of the reciprocating parts and the remainder distributed equally among all drivers on one side. The effect of this rule is to reduce the weight of the over-balance as compared with the old rule, and it has been generally used by the railways and by locomotive builders in most of the large engines built since it was adopted.

German engineers, especially those on the Prussian state roads, have gone still further, and now have simple locomotives running with the weight of the reciprocating parts entirely unbalanced. While this practice does not appear to affect the motion of the engine when new or recently repaired, and the bearings are closely fitted and there is little lost motion, when wear takes place and the bearings are loose there is much more rattle and pound, and the wear increases as the irregular motion due to lack of balance is unrestrained. The ordinary practice in Germany is to limit the effect of the over-balance to a certain per cent. of the weight on the axle. The Canadian Pacific has adopted a rule for counterbalancing locomotives by which the over-balance weighed at crank pin circle is not to exceed one per cent. of the weight on the wheel. With properly designed reciprocating parts, the present Master Mechanics' rule would use less than one per cent. of the weight on drivers as over-balance, and where this is exceeded some attention should be given to the reduction of the weight of the reciprocating parts; in fact, it appears that the application of the one per cent. rule is a good check on the design of those parts.

Where a portion of the reciprocating weight is divided between three or four pairs of drivers there should be little danger of the over-balance becoming excessive, and more careful attention should be given to the counterbalancing of high speed locomotives with only two pairs of drivers. One objection to the one per cent. rule is the difficulty in getting the exact weight on one pair of drivers on the ordinary track scales, as the weight is usually taken when the engine first goes out of the shop and before the equalizing rigging works easily. A diagram of a heavy consolidation shows the following weights on drivers: Commencing with the front pair, 58,000 lbs., 46,500 lbs., 51,600 lbs., 52,200 lbs. While the scales may have shown these weights at the time the engine left the shop, if the engine were now to be reweighed the distribution of weight would be different.

The use of one per cent. as a maximum is a good method of detecting excess over-balance, but good design in modern locomotives should keep that weight well below such requirements. If the reciprocating parts are heavy in proportion to the weight of the engine and they are not properly balanced, the result will be internal stresses which cause rapid wear of the driving machinery and, as we have seen in the case of German engines, will increase the cost of repairs. The effort to prevent excessive rail pressures by the use of a light over-balance may be carried too far, and with reciprocating parts properly designed the Master Mechanics' standard rule for counterbalancing will keep down the over-balance about as low as the usual maintenance appropriations will allow.

UNITED STATES STEEL CORPORATION.

The tonnage of all the products, except cement, shipped to customers by the United States Steel Corporation in the year ended December 31, 1908, amounted to only 58 per cent. of the 1907 figure. With this decrease in output, the corporation earned 4.04 per cent. on its common stock as compared with 15.6 per cent. in the previous year. This figure is taken after deducting from net earnings sinking, depreciation and replacement funds, etc., fixed charges and 7 per cent. dividend on preferred. The company is in a position to take full advantage of any improvement in the iron and steel business during 1909. It has been conservative in its depreciation charges, and for several years has been putting surplus back into the property so as to increase its capacity. It appropriated $50,000,000 out of surplus for building the Gary plant, now in partial operation (*Railroad Age Gazette*, March 26, 1909, p. 716). By such additions and improvements as this, and by the purchase of other companies, the capacity of the corporation has been nearly doubled since its organization, as shown in the following table:

Comparative Annual Productive Capacity.

	Capacity April 1, 1901.	By purchase of Union and Clairton Cos.	By purchase of T. C., I. & R.R. Co.	Due to additions & improvements.†	Capacity, Jan. 1, 1909.
	1000 tons	1000 tons	1000 tons	1000 tons	1000 tons
Blast furnace products	7,440	1,228	1,000	5,322	14,990
Steel ingots	9,425	1,258	500	5,887	17,070
Rolled and other steel*	7,719	1,103	400	3,678	12,900
Cement, bbls.	500,000	.....	.....	5,600,000	6,100,000

*and iron products for sale.
†Made by the Companies after their acquirement by U. S. Steel Corporation.

In the last year and a half, the open hearth steel capacity has been increased by 3,000,000 tons. Of this, 500,000 tons is through the Tennessee Coal, Iron & Railroad Co. This cannot be added directly to total steel capacity, as the product of Bessemer steel was reduced 746,000 tons by the substitution of the open hearth process at certain plants.

The cement business has grown from 500,000 bbls. capacity on April 1, 1901, to 6,100,000 bbls. on January 1, 1909. Last year 4,100,000 bbls. were shipped to customers, as against 2,300,000 bbls. in 1907. This was made possible because two new plants were put in operation late in 1907. Last year an extension was begun, which when completed will raise the annual capacity of the plants operated by the Universal Portland Cement Co. to 8,200,000 bbls.

In 1908, 16,663,000 tons of iron ore were mined, a decrease of 7,318,000 tons. The tonnage of the Tennessee company is included in both years for comparison. The amount of ore from the latter region decreased but slightly. The large proportionate decrease was in the Vermilion range, whose output was almost cut in two. Coke manufactured amounted to 8,170,000 tons, a decrease of 5,375,000 tons. Coal mined, not including that in making coke, was 3,000,000 tons, a decrease of 550,000 tons, and limestone quarried was 2,186,000 tons, a falling off of about one-third. Pig iron decreased from 11,234,000 tons to 6,811,000 tons. The production of Bessemer steel ingots was 4,055,000 tons, a decrease of 3,501,000 tons, and open hearth, 3,783,000 tons, a decrease of 2,004,000 tons. The total tonnage of finished steel products was 6,207,000 tons, a decrease of 4,358,000 tons. Among these products are rails, 1,050,000 tons, a decrease of 830,000 tons; heavy structural shapes, 314,000 tons, a decrease of 274,000 tons; finished structural work, 404,000 tons, a decrease of 316,000 tons; rail joints, 85,000 tons, a decrease of 110,000 tons, and axles, 24,000 tons, a decrease of 165,000 tons.

The inventories, as of December 31, 1908, of stocks, materials and stores on hand show a total of $143,180,000, an increase of $6,991,000. Of these, ores amount to $65,783,000, an increase of $6,798,000; pig iron, scrap, etc., coal and other fuel is about the same as at the end of the previous year; steel ingots, $751,000, an increase of $229,000; finished prod-

ucts, $26,000,000, an increase of $1,131,000; stocks abroad and on consignment, $1,255,000, a decrease of $551,000, and material in transit, $2,157,000, an increase of $354,000.

The gross receipts for the year were $482,308,000. This represents the aggregate business done by all the companies, including inter-company sales, as well as the gross receipts of transportation companies for services both to Steel Corporation companies and the public. The manufacturing cost, including ordinary maintenance and repairs and provisional charges for depreciation, was $384,700,000. Administrative and selling cost, etc., was $12,933,000; taxes, $5,361,000, and commercial discounts and interest, $2,707,000. The ordinary maintenance and repairs included above amounted to $27,-329,000, a decrease of $8,175,000. Of this amount, about $15,-991,000 was spent on manufacturing properties, and $2,178,-000 on blast furnace relining, an increase of $695,816. Maintenance of railway properties cost $6,049,000, and steamships and docks, $629,000. Extraordinary replacements are not included in operating expenses but are charged against a separate fund appropriated out of earnings. Last year the total extraordinary replacements amounted to $10,730,000, a decrease of $9,595,000. Of this amount there was spent on manufacturing properties $8,543,000; on coal and coke properties, $594,000; on iron ore properties, $380,000; on railways, $857,000, and on steamships and docks, $338,000.

The total net earnings of all properties after ordinary expenses, employees' bonus funds, and interest and fixed charges of subsidiary companies, were $91,848,000, a decrease of $69,-117,000. The appropriations for sinking funds, on bonds of subsidiaries, depreciation and extraordinary replacements amounted to $16,965,000, a decrease of $7,255,000. In 1907, $3,500,000 was deducted for special replacement and improvement funds, but no such deduction was made last year. Interest and sinking funds on Steel Corporation bonds amounted to $29,248,000, an increase of $1,250,000, leaving, after sundry adjustments, $45,729,000 applicable to dividends, a decrease of $58,837,000. The final surplus for the year was $10,343,000, no special appropriations for additions, discharge of capital obligations, etc., being made. In 1907, $54,000,000 was so appropriated.

The balance sheet shows assets of $1,474,143,000. This includes $15,937,000 stripping and development at the mines and investment in structural eerction and logging plants, of which $5,640,000 was added during the year. Deferred charges to operations, consisting of payments for advanced mining royalties and expenses chargeable to future operations, amount to $9,107,000, less $2,800,000 fund reserved from surplus to cover possible failure to realize on advanced mining royalties. Outside investments in real estate, etc., amount to $3,083,000; sinking and reserve fund assets amount to $23,-263,000. This includes $13,269,000 depreciation and extinguishment fund. Accounts receivable are $34,708,000; bills receivable, $6,202,000, and cash, $49,548,000.

The common stock is $508,302,500, and the preferred, $360,-381,100. In capital stocks of the subsidiary companies not held by the Steel Corporation, $640,000 is carried as a liability. The bonded and debenture debt, less amounts redeemed and held by trustees of sinking funds, is $593,231,000. This includes $1,350,000 Schoen Steel Wheel Co. first mortgage bonds, being the amount outstanding when the Schoen company was acquired by the Carnegie company in July, 1908. Bonds of subsidiary companies to the amount of $11,921,000 are held in the treasury subject to sale, but are not included in the balance sheet as either a liability or an asset. Mortgages and purchase money obligations of subsidiary companies amount to $4,163,000; current accounts payable and pay rolls are $20,858,000; bills payable, $840,000, and special deposits for loans to employees and others, $924,000. Sinking and reserve funds amount to $64,879,000, and bond sinking funds, with accretions, $38,074,000. The undivided surplus of the Steel Corporation and subsidiaries amounts to $133,415,-000, of which $25,000,000 is the working capital provided in organization, $80,079,000 is the balance of surplus accumulated by all companies, exclusive of inter-company profits in inventories, and $28,336,000 is the undivided surplus of subsidiaries representing profits on sales to other subsidiaries and on hand in the latters' inventories.

The Gary improvements have been made out of the $50,-000,000 fund referred to above. Of this amount, $18,848,000 was spent during 1908, leaving $7,203,000 unexpended. Of the total amount spent to date on the plant, $27,439,000 was for construction of the manufacturing plants, $4,827,000 for terminal railway work, and $10,531,000 for net real estate cost, and development and construction work in the town of Gary. Capital expenditures on Tennessee Coal, Iron & Railroad Co. properties during the year amounted to $3,461,000, of which $2,399,000 was for manufacturing plants. On other properties $27,228,000 was spent, of which $14,611,000 was on manufacturing properties, $3,104,000 on iron ore properties, $1,938,-000 on coal and coke properties, and $7,239,000 on transportation properties.

The total mileage of main line of railway owned is 873 miles. The railway equipment consists of 960 locomotives, 143 passenger train cars, 43,116 freight train cars and 2,423 work equipment. The marine equipment consists of 76 steamers and 29 barges.

NEW PUBLICATIONS.

Typical Construction Work. The Snare & Triest Co., Contracting Engineers, New York. 60 pages; $10\frac{1}{2}$ x $13\frac{1}{2}$ in.; bound in leather; 58 illustrations. New York, 1909.

This is a collection of photogravures. It shows construction work which is typical, both as to class and variety of the work handled by the Snare & Triest Company. In every page it is interesting and instructive, the large full-page illustrations showing work both in process of construction and after being completed. There are five views of the Queensboro bridge, New York, one of which shows the Manhattan approach during construction and the others different parts of the completed structure. This bridge was opened to partial traffic on Tuesday of this week. The large and costly Hoboken terminal of the Delaware, Lackawanna & Western is also illustrated in five different views, exterior and interior. Six coaling plants for the United States Navy, three at Dry Tortugas, Fla., and one each at San Francisco, Cal., Portsmouth, N. H., and East Lamoine, Me., are shown. There are some 58 illustrations in all, showing bridges, bridge terminals, railway construction, railway terminals, piers, ferry terminals, coaling plants, sheds, buildings, concrete construction and water works, besides some miscellaneous work.

Architect's and Builder's Pocket-Book. By Frank E. Kidder. Fifteenth edition. Revised; 35th thousand. New York: John Wiley & Sons. 1661 pages; 4 in. x $6\frac{3}{4}$ in.; illustrated; flexible cover. Price, $5.

The avowed purpose of the author of this volume is to make a reference book that would have the same value for the architect and builder that the best class of engineer's pocketbooks have for the civil and mechanical engineer, and this has been done. The book also possesses an advantage that is not always found in books of its class in that it is printed with a large clear type on paper thick enough to prevent the matter from showing through, and thus blurring the reading page.

It is, of course, impossible to review all of the features of such a book as this in detail, for it covers nearly the whole range of architectural and constructional knowledge. The first edition appeared in 1884 and contained 586 pages, so that the accretions of the several editions through which it has passed have brought it up to about three times its original size. Although it is definitely stated in the preface that the book was not written for engineers, the professions of the architect and engineer are so closely connected that any handbook that is of value to the former cannot fail to con-

tain much that is useful to the latter, and that is the case in this instance.

The opening pages resemble those of similar books on other subjects in that they contain the usual tables, geometrical formulae and data for mensuration. This constitutes the first part and occupies about 100 pages. The second part might be called a brief treatise on the strength of materials and the stability of structures. Here there is a somewhat greater elaboration of the subject than is usually found in hand books, and explanations and demonstrations are given that are ordinarily considered to belong to the domain of the text book. This completeness of explanation is carried through all of the details, and these comprise about everything that enters into building construction, especial attention being paid to such items, as the floor, roof, columns, arches, concrete and girders.

The last part, commencing at page 1107, contains a mass of miscellaneous data, ranging from excavations and stone work, to heating and ventilation and bolts and nuts. At the end of this part there are three things that cannot fail to be of great value and which are all too frequently omitted from books of this character. These are: a good bibliography of architectural works; a glossary of technical architectural terms, and the legal definition of a number of them; and, finally there is a comprehensive index, well worked out and seemingly complete. It is, therefore, well within bounds to place this book with the best of its class and, while intended for reference along special lines of work, it cannot fail to be of much assistance to any who have to do with the manipulation of materials in any kind of engineering construction.

Uganda Railway.—An illustrated pamphlet describing the Uganda Railway, in British East Africa. Published by the Railway Company, and distributed by Thos. Cook & Sons.

This is perhaps the most fascinating railway circular which has ever come into our hands. As is well known to most of our readers, the Uganda Railway extends from the port of Mombasa in British East Africa, on the Indian ocean, to Lake Victoria Nyanza, in the heart of equatorial Africa, and was built along the route so urgently advocated by Colonel Prout for strategic reasons, when he was governor-general of the equatorial provinces. The road is 584 miles long and reaches a maximum elevation of over 8,000 ft. at one point. Lake Nyanza itself is 3,650 ft. above tidewater, and for a continuous distance of nearly 200 miles the elevation of the railway exceeds one mile. In consequence of this, although it is built right under the equator, the climate is by no means bad, and in spots it is excellent.

At Nairobi, capital of the province, situated at an altitude of 5,550 ft. above sea level, the climate is reported to be most delightful, with the lowest temperature recorded about 49 degs. F., and the mean record about 69 degs., the average yearly rainfall being about 44 in. On a clear day Mount Kenia is so plainly visible that it appears to be 25 miles distant instead of 100. Its ragged peaks, covered with snow, are rendered more striking by contrast with the peak of Kinangop in the Aberdare range, which reaches the very respectable height of 12,920 ft. The road likewise passes within plain sight of Mount Kilimanjaro, which is 19,000 ft. high. The pamphlet recites with pride that these East African highlands are beginning to compete with Egypt as a winter resort.

On Lake Nyanza, which is the great gathering point for the three great highways of commerce in equatorial Africa, the Nile route to the north, the Congo route to the west and the Uganda route to the east, there are three excellent steamboats, one of 750 tons and two of 500 tons each, with triple expansion engines and twin screws, and these steamers make a journey of some 500 miles about the lake. The pamphlet states that the journey down the Nile to Khartoum is becoming quite fashionable, but it adds that on foot and by boat the time occupied in reaching Gondokoro, the frontier post in the Soudan, is from 30 to 37 days, and thence by steamer to Khartoum about 11 days. We imagine, therefore, that the devotees of fashion do not crowd the trail uncomfortably.

Besides the redoubtable altitudes, the east coast jungles and the fascination of the strange journey to the headwaters of the Nile, the Uganda Railway, in the language of the pamphlet, runs along the boundary of the biggest zoo in the world. There are unlimited wild animals all along the route, and the varieties of them—to say nothing of the names of them—are bewildering. The district is carefully protected by game laws, but the holder of a first-class license, which costs £50 and lasts one year from the date of issue, is authorized to kill or capture the following:

2 Elephants,	2 Kudus,
1 Buffalo,	12 Topis of various kinds,
2 Rhinoceroses,	2 Neumann's hartebeests,
2 Hippopotamuses,	1 Bongo,
2 Zebras,	10 Grant's gazelles,
1 Eland,	152 other divers and sundry animals, such as the duiker, the impala, the klipspringer and the paa.
4 Oryxes of different varieties,	
1 Sable antelope,	
1 Roan antelope,	

But no license is required to kill lions and leopards, because lions and leopards are classed as vermin!

Letters to the Editor.

THREE-PHASE ELECTRIC LOCOMOTIVE VOLTAGE.

New York, March 29, 1909.

To the Editor of the Railroad Age Gazette:

I have read with great interest your account of the last meeting of the New York Railroad Club and your editorial remarks on same. Permit me to point out one slight slip. You say that 3,000 volts appears to be the maximum pressure at which three-phase locomotives can be worked. This is not so and there is no pressure limit in the three-phase system. 6,600 volts is the pressure used by the Great Northern Railway and 10,000 volts by the Berlin-Zossen high speed installation. Even this is not necessarily the upper limit. In comparing single-phase with three-phase it is well to bear in mind that three-phase roads can use a pressure 1.73 times lower than single-phase roads and still have the same current density.

You mention the Midi of France which has just decided to use the single-phase system. Against this might be mentioned the Italian State Railways which have just decided to use the three-phase system for the lines out of Genoa. The former has light traffic, the latter heavy. C. L. DE MURALT.

REROLLED RAILS.

Pittsburgh, Pa., Feb. 18, 1909.

To the Editor of the Railroad Age Gazette:

In the *Railroad Age Gazette* of January 29 appears an article declaring that the New York, New Haven & Hartford will reroll 100-lb. worn rail into 90-lb. section. This proposition presents a proper opportunity to determine, in a practical way, the relative results from using more roll passes; that is, if the New Haven company cares to make the necessary inspection before and after the rerolling.

The difference in the average number of passes used is as follows: A new 100-lb. rail primarily receives 18 to 20 passes. When rerolled into 90-lb. section it receives at least six passes more, making 24 to 26 in all, while a new 90-lb. normal section receives only 18 to 20 passes, the same as for the original 100-lb. rail. Now, what will the difference in the structure amount to between the new 100-lb. rail and the same rail rerolled to 90 lbs.? And what difference will there be in the structure of a rerolled 90-lb. section (24 to 26 passes) and a new 90-lb. normal rail rolled in 18 to 20 passes?

Some very desirable evidence can be had by investigating

the condition of rails rolled under these circumstances, with the decided advantage of subsequently applying the remedy to rails rolled new.

A. W. HEINLE,
Metal-Rolling Engineer.

THAT DEPARTMENT OF DIPLOMATIC RELATIONS.

Chicago, March 6, 1909.

To the Editor of the Railroad Age Gazette:

A department of diplomatic relations? Certainly, if you will regard it as a temporary affair, a specialized bureau for the education and training of officials through tactful traveling representatives or otherwise. Like the Bureau of Indian Affairs in Washington, its policy should be gradually to work itself out of existence by a progressive assimilation of its activities with the every day requirements of administrative citizenship. The true mission of departments, or rather of branches of work, should be to build up the chief of the firing line—the division superintendent. Remember, too, the distinction between "diplomacy," consideration for one's self, and "tact," consideration for the other fellow. SENEX.

RAILWAY ENGINEERING IN ANCIENT TIMES.

To the Editor of the Railroad Age Gazette:

The account which you have printed of the Housatonic bridge of the New Haven road which was so dangerously weak that it was removed while it was still nearly new recalls another fact illustrative of the "engineering" once in vogue on that road. During the construction of what is now called the Harlem River Branch, the late A. M. Wellington took a walk over the line and found (so he declared in the *Railroad Gazette* office) the workmen setting up the trusses of a bridge *bottom up*. D.

Contributed Papers.

THE EIGHTH INTERNATIONAL RAILWAY CONGRESS.

L. Weissenbruch, Brussels, General Secretary of the Permanent Commission of the International Railway Congress Association, has issued the programme for the eighth session of the Congress, which is to be held at Bern, Switzerland, from July 3 to July 16, 1910.

The Permanent Commission, of which A. Dubois, of the Belgian State Railways, is President, consists of 57 members. The nine American members are: Stuyvesant Fish, Missouri Pacific; Frank Barr, Boston & Maine; Howard Elliott, Northern Pacific; Theodore N. Ely, Pennsylvania; Fairfax Harrison, Southern; Charles M. Hays, Grand Trunk; J. Kruttschnitt, Southern Pacific; L. F. Loree, Delaware & Hudson, and G. W. Stevens, Chesapeake & Ohio. The seven English members are: Lord Stalbridge and Sir Frederic Harrison, London & Northwestern; Sir George Armytage, Lancashire & Yorkshire; Evelyn Cecil, London & Southwestern; Sir Henry Oakley, Great Northern; H. Llewellyn Smith, Board of Trade; Walter Robinson, Great Western.

The subjects for discussion and the reporters on specific subjects are:

SECTION I.—WAY AND WORKS.

1. *Rail Joints.*—M. Chateau, Western of France; M. Kramer, Hungarian State Railway; Alexander Ross, Great Northern (England); M. Frahm, Royal Prussian Railways.

2. *Strengthening Track and Bridges.*—Herman Rosche, Aussig-Teplitz (Austria); M. L. Byers, Missouri Pacific; R. Coderch, Madrid & Saragosse (Spain); M. Maurer, Hungarian State Railways; P. A. Zahariade, Roumanian State Railways; E. Randich, Italian State Railways; J. Schroeder van der Kolk (Hague); M. Belelubsky (Russia); J. W. Jacomb-Hood, London & Southwestern; M. Frahm and M. Labes, Royal Prussian Railways (Berlin).

3. *Junctions and Swing Bridges.*—M. Tettelin and M. Cossmann, Northern Railway of France; C. L. Morgan, London, Brighton & South Coast; W. G. Besler, Central Railroad of New Jersey; L. Motte, Belgian State Railways.

4. *Long Tunnels.*—F. Sartiaux, Northern of France; F. Hennings (Switzerland); Francis Fox (England); M. Canat, Paris, Lyons & Mediterranean.

SECTION II.—LOCOMOTIVES AND ROLLING STOCK.

5. *The Use of Steel.*—D. F. Crawford, Pennsylvania Lines West; E. Szlabey, Hungarian State Railways; R. L. Ettenger, Southern Railway; O. Honigsberg, Austria Southern; Wilson Worsdell, Northeastern (England); M. Le Blant, Eastern of France.

6. *Improvements in Locomotive Boilers.*—N. Antochine (Russia); H. H. Vaughan, Canadian Pacific; M. Gerstner (Austria Hungary); G. Noltein, Moscow; C. Dassesse, Belgian State Railways; J. Papp, Hungarian State Railways; M. Nadal, Eastern of France; C. B. Dudley, Pennsylvania; H. Fowler and L. Archbutt, Midland Railway (England); K. Steinbiss, Royal Prussian.

7. *High-Speed Locomotives.*—William Garstang, Cleveland, Cincinnati, Chicago & St. Louis; M. Courtin (Karlsruhe).

8. *Electric Traction.*—Dr. Gleichmann (Munich); George Gibbs, Long Island Railroad; Dr. Wyssling (Zurich).

SECTION III.—WORKING.

9. *Large Stations.*—H. A. Jaggard, Pennsylvania Railroad; A. Kain, Hungarian State Railways; M. Jullien and M. Leverve, Orleans (France).

10. *Operation of Switches and Signals.*—L. H. N. Du Four, Netherlands State Railways; Dr. Ulbright (Dresden); E. C. Carter, Chicago & North Western; L. Weissenbruch and J. Verdeyen, Belgian State Railways.

11. *Passenger Tickets.*—Director von Stierlin, Wurtemberg State Railway, Stuttgart.

12. *Motor Vehicles.*—T. H. Riches, Taff Vale (Wales); C. P Clark, Buffalo & Susquehanna; L. Greppi, Italian State Railways.

SECTION IV.—GENERAL.

13. G. R. Jebb (Birmingham, England); W. E. Hoyt, Special Engineer (New York Central Lines); C. Colson, French Government Railways.

14. *Statistics.*—W. M. Acworth (London); Sir Thomas Rees Price, Central South African Railways; E. F. Knibloe, Buffalo Creek Railway; M. De Geynst, Belgian State.

15. *Motor Car Services.*—J. C. Inglis, Great Western (England).

16. *Perishable Freight.*—J. M. Culp, Southern Railway; M. Bloch, Orleans Railway (France).

SECTION V.—LIGHT RAILWAYS.

17. *Branch Lines.*—M. Quarre, Midi Railway (France).

18. *Working of Light Railways.*—M. Plocq (France).

19. *Locomotives and Rolling Stock of Narrow Gage Light Railways.*—M. Jesser, Austria Southern.

20. *Transshipment.*—C. de Burlet, Belgian State Railways.

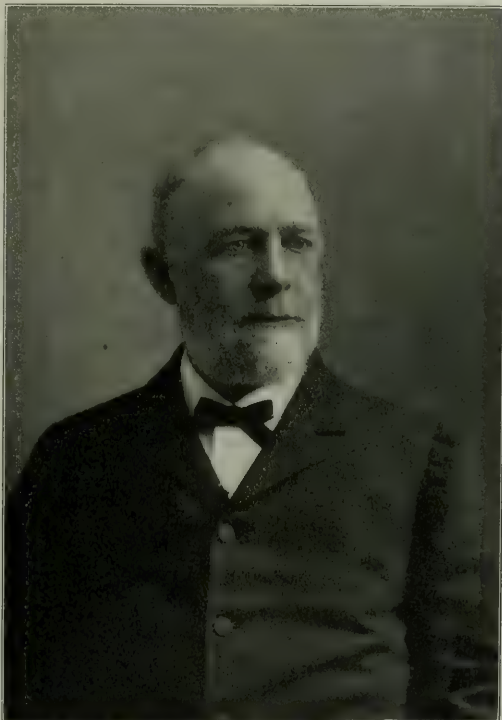
Freight Car Interchange and Demurrage.—W. F. Allen, Secretary, American Railway Association.

The number of persons who traveled on Belgian lines in 1907 amounted to 161,184,538, an increase of 946,952 over 1906. The total receipts from passenger traffic in 1907 were $16,604,589, an increase of $838,738 as compared with 1906. The increases are attributed to the travelers who have taken advantage of reduced rates offered under present conditions; to the abolition of the additional tax imposed on passenger travel or express trains; to the decrease in the price of commutation tickets, and to the increase of two days in the limit for which return tickets can be used. The government plans to do a good deal of extension and betterment work on its lines during the next year or so.

WILLIAM P. HENSZEY.

William Peddle Henszey, a partner of the firm of Burnham, Williams & Company, proprietors of the Baldwin Locomotive Works, died at his home, 313 South Broad street, Philadelphia, on Tuesday morning, March 23. He was in his seventy-seventh year, having been born September 24, 1832. Of Huguenot descent, his father was Samuel C. Henszey, at one time treasurer of the Western Saving Fund of Philadelphia.

He was educated in the public schools of Philadelphia, and in July 1848 was graduated from the old Philadelphia High School on Juniper street. He started in mercantile business, studied mechanical engineering, and on March 7, 1859 became a draftsman in the works of M. W. Baldwin & Company. Mr. Baldwin was a mechanic of the old type, who believed in personal instruction to his men and experimental development of design rather than in the more modern methods of theoretical development by means of drawings. What drawings there were were incomplete. Cardboard models were largely used. It is a tradition of the works that in those early years it was Mr. Baldwin's practice to go directly to the workmen in his shops, and with a piece of chalk sketch upon the floor his designs for parts required. Mr. Henszey had to learn from his seniors in the works, and from such books and engineering publications as were then available on the art and mystery of mechanical design.



William P. Henszey.

At that time, 50 years ago, M. W. Baldwin was getting old, and Matthew Baird was in charge of contracts for locomotives. George Burnham had the financial and office management, and Charles T. Parry was superintendent of the works. Until Mr. Henszey's time comparatively little attention had been given to symmetry of design. William Mason, of Taunton, Massachusetts, was the first locomotive builder to study graceful proportions and symmetrical forms while striving to attain the best engineering practice. Mr. Henszey appreciated Mr. Mason's work, and followed in the same line, combining correct mechanical design with appropriate, simple and graceful forms. His success was such as to give his work a distinct character. In collaboration with Mr. Parry, the "consolidation" type of engine was designed, and the first one constructed for the Mahanoy Division of the Lehigh Valley Railroad, displacing the flexible beam truck locomotive which Mr. Baldwin brought out in 1842-1846, and which had more than any other type contributed to Mr. Baldwin's reputation and fortune.

Alexander Mitchell of Wilkes-Barre suggested the general plan of an eight-wheeled locomotive with leading pony truck. Mr. Baird was opposed, but Mr. Parry and Mr. Henszey favored it and the locomotive was built in 1866.

When Mr. Henszey joined the Baldwin Locomotive Works, less than 1,000 locomotives had been built, while at the time of his death the number had reached over 33,000. In his own experience, therefore, he had seen the construction of some 32,000 locomotives and had had personal connection with the designs of all the important types.

As a designer he was noted not only for his good taste but for the speed of his work. Those competent to judge have remarked that Mr. Henszey could put lines on paper faster than any other draughtsman within their knowledge. The celerity of his work was not accompanied by any inaccuracy or want of taste; on the contrary, his designs were characterized by symmetry and grace. He early realized the importance of standardizing locomotive parts of a locomotive, and so securing uniformity of details. Instead of each locomotive being an individual machine, he endeavored to standardize the axles, driving and truck boxes, wheel centers, tires, eccentrics, pistons, etc. Nearly all the gages, etc., were originated by him and the works began the development of the system of standard gages and templets which has characterized to this day the construction of Baldwin locomotives. As early as 1839 Mr. Baldwin had felt the importance of making all like parts of similar engines absolutely uniform and interchangeable. It was not, however, until 1861 that a substantial beginning was made in organizing all departments upon this basis, and from it has since grown an elaborate and perfected system embracing all the essential details of construction.

During his long experience of fifty years, Mr. Henszey found abundant opportunity to exercise his skill as a designer in the improvement of locomotive details. During the earlier years of his work little or no attention was paid by him to the protection of his inventions by patents, but beginning in 1880 patents were taken, largely to define priority as compared with other inventors. A list is appended of a number of patents which were taken out by him from time to time:

March 18, 1880. Locomotive engine.—Locomotive with single pair of driving wheels and device for increasing weight on drivers.

September 17, 1880. Locomotive boiler.—Firebox "as wide or wider than distance across the driving wheels."

November 9, 1880. Narrow-gage locomotive.—Device for increasing the capacity of the firebox in a narrow-gage locomotive by depressing the frames between the driving wheels and allowing the firebox to extend laterally over the depressed portions

June 13, 1882. Reversing gear for locomotives.—A steam reversing mechanism consisting of a steam cylinder controlled by a hydraulic cylinder in which the liquid passes around the piston from one end of the cylinder to the other. A valve in the passageway checks the flow at any desired point.

September 3, 1895. Locomotive.—Atlantic type.

March 3, 1896. Steam locomotive.—An arrangement of the steam passages in a locomotive cylinder in which the steam is admitted to the valve through a passage surrounded or enclosed by the exhaust passage. This patent was declared invalid in 1903.

August 20, 1895. Frames for locomotives.—Design for frame of Atlantic type locomotives.

June 2, 1896. Electric locomotive.—In this device, the motors are mounted wholly on the frames of the locomotive, in order to avoid as far as possible the jar to which the wheels and axles are

subjected. The power is transmitted through an intermediate crank axle.

June 23, 1896. Electric locomotive truck.—The main features of this truck are the strengthening plate connecting the two side frames, the special arrangement of the equalizing bars, the construction of the boxes and the arrangement of the bolster.

September 8, 1896. Truck.—This is a truck intended particularly for electric locomotives and embodies a special arrangement of cross-framing. It also includes the hinging of the front and back pedestals in order to facilitate the removal of the wheels and axles.

September 12, 1899. Electric mine locomotive. David Leonard Barnes and William P. Henszey. -The main feature is the utilization of the motor casting as a portion of the frame of the locomotive.

October 23, 1900. Locomotive.—In this device two locomotives of the ordinary type are coupled back to back making a flexible wheel base. The throttle levers and reverse levers for both engines can be operated by one engine driver at his post on either locomotive.

It will be of interest to note that his first patent was for a locomotive with a single pair of driving wheels and a device for increasing the weight on drivers, and that it related to a locomotive of 4-2-2-type, the driving wheels being in front of the firebox, and a pair of trailing wheels behind the firebox. This locomotive was designed for the New York Division of the Philadelphia & Reading Railway, and was intended to take a light passenger train from Philadelphia to Jersey City in 90 minutes. The time-table on this basis, however, was never put into effect.

Reference may also be made to the patent taken September 3, 1895, for a locomotive of the Atlantic type. This patent embraced some of the important details accomplished in this design of locomotive. The first engine on this plan was designed and built by the Baldwin Locomotive Works for the Atlantic Coast Line in 1895. The conditions to be met were light rails and high speed, with a train of considerable weight, thus requiring a boiler and firebox of large capacity and necessarily of greater weight than it seemed advisable to carry in the ordinary manner on two pairs of driving wheels. The trailing truck was therefore added, which enabled the construction of a boiler of large heating surface, with a firebox of sufficient depth for good combustion, and of width which afforded ample grate area.

Mr. Henszey became a partner in 1870, eleven years after he had joined the works. His experience practically covered the development of the locomotive, from the simple machine of 1860 to the variety of types and the enormous weights of locomotives characterizing the practice of the present day. By his skill and efficiency he contributed largely toward the perfection of details involved in such development.

Like all real designers, Mr. Henszey was careful and accurate, so that when he reached conclusions it was not necessary for him to change. Another of his characteristics was a willingness not only to acknowledge errors of his own but to recognize merit in others. He was quick to appreciate all improvements in locomotive practice made by other manufacturers and designers.

In his personal character Mr. Henszey was noted for his unfailing amiability and benevolence. He was active in good works in every direction, and the world little knows of the many benefits which he conferred on deserving causes. Brought up in the Society of Friends, he never severed his connection with that body, but he also took part in the worship of other denominations, and aided liberally in the establishment and maintenance of churches in which he was interested.

TRAIN ACCIDENTS IN FEBRUARY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of February, 1909. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

TRAIN ACCIDENTS IN THE UNITED STATES IN FEBRUARY, 1909.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
3.	C., M. & St. P.	Powersville.	bc.	Ft. & Ft.	3	1
3.	Seaboard A. L.	Abbeville.	bc.	Ft. & Ft.	3	0
5.	Southern	Lumber City.	bc.	Ft. & Ft.	1	2
16.	Atl. C. Line	Tyty.	bc.	Ft. & Ft.	2	3
*18.	Ft. W. & D.	Sunset.	rc.	Ft. & Ft.	0	3
†*22.	Pennsylvania	Delmar.	rc.	P. & Ft.	8	2
22.	Nrflk & So.	Bayville.	rc.	P. & P.	0	10

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
2.	Seaboard A. L.	Richland.	unx.	Ft.	0	7
4.	C., M. & St. P.	Rushford.	unx.	Pass.	0	10
7.	Illinois Cent.	Coldwater.	ms.	Pass.	2	20
14.	La. Ry. & Nav.	Baton Rouge.	cow.	Ft.	1	6
†14.	Mo. Pac.	Union.	unx.	Pass.	1	6
15.	Pennsylvania	Newton Hmltn.	landslide.	Pass.	0	1
†16.	Illinois Cent.	Murphysboro.	b. rail.	Pass.	4	20
20.	Tex. & Pac.	Gloster, La.	unx.	Ft.	2	0
22.	Southern	Harbins, S. C.	unx.	Pass.	2	0
25.	C., M. & St. P.	Kellogg, Minn.	b. rail.	Ft.	1	1
26.	C., M. & St. P.	Van Horn, Ia.	b. wheel.	Pass.	1	10

The worst collision in this record, that at Delmar, Del., on the twenty-second, occurred about 3 a.m., and one engineman, one baggageman, one express messenger and four mail car employees were killed. In consequence of the large number of passengers going to Hampton Roads to see the naval vessels, which had just returned from their voyage around the world, the regular southbound passenger train was run in three sections, and the collision was between one of these sections and two engines standing on the main line waiting to take one of the sections southward, Delmar being the point where engines are regularly changed. According to one of the reports, the engines had been allowed to stand on the main line without being protected by red signals, because it was understood that the second section of the train would be 15 minutes behind the first one; whereas in fact it was only four minutes behind. The standing engines, the engines of the train and the express and mail cars of the train were badly wrecked. The wreck took fire at once, from coals which were spread from the fireboxes of the engines, and some or all of the persons killed were burned to death. There was a dense fog at the time.

The next collision in the list, that at Bayville, is also reported to have been an incident of the extra traffic to Norfolk on account of the battleships.

The derailment at Coldwater, Miss., on the seventh, was declared by an officer of the road to have been due to malicious misplacement of the switch at which the train was wrecked.

In the derailment near Baton Rouge, La., on the fourteenth, the engine of the train was running backward. With all of the cars in the train, it fell off a trestle to the ravine, 35 ft. below.

The train derailed at Newton-Hamilton, Pa., on the fifteenth, was the 18-hour express from Chicago to New York. The accounts say that at the time of the derailment the train was running about 45 miles an hour. In the landslide was a rock weighing 12 tons or more. There was a dense fog at the time. The cars of the train were all derailed but were not overturned, and all of the 51 passengers on the train were reported as having escaped with nothing worse than slight bruises.

Of the four serious electric car accidents reported in the newspapers in February, one, at Cleveland, Ohio, was accompanied by three fatal injuries. In this case a street car was struck by a locomotive and was broken in two. It appears that there was a derailing switch at the crossing, but, by reason of the view being obstructed by steam from a stationary engine, or some other cause, the conductor appears to have allowed the car to go on to the crossing in the face of the steam locomotive. One person was killed in the derailment of a street car, due to a broken axle, at Pittsfield, Mass.

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

HOLDING RAILWAY BANKS WITH GRASS.

BY L. H. PAMMEL, PH.D., AMES, IOWA.

Men have long made use of certain grasses to hold soils. Soil-binding grasses have been used in Holland to make more land. They have been used in the Cape Cod region to protect the lighthouses, and prevent the encroachment of shifting sand dunes. Prof. F. Lamson-Scribner says: "The digging out and undermining by swift currents, the beating of waves on lake and ocean shores and the perpetual shifting about of loose sands by the waves and winds, cost our country many millions of dollars annually."

Mr. Westgate says: "The problem of controlling the drifting sands of the cape has concerned the municipal, state, and national authorities for two hundred years; the extensive planting of beach grass as a means of protection dates back for more than a century. Many houses stand where a century ago small boats found convenient anchorage; in fact, certain areas


Hungarian Brome Grass.


Western Wheat Grass.

have been filled in several hundred feet during the last half century." The most effective grass here is the beach grass (*Ammophila arenaria*), which is of course not suitable for planting away from the Atlantic coast. Prof. Hitchcock also states that "the best grass is the beach grass which grows naturally along the sandy seashores of the North Atlantic coast. The same species grows along the shores of the Great Lakes and on the Atlantic coast of the United States as far south as North Carolina."

"The grass is transplanted in rows or squares in autumn or spring. Satisfactory results cannot be produced by sowing the seed of this or other plants directly upon the unprotected sand."

In some cases the railways have used seed screenings from seed houses and sowed them on the banks and fills. I need not say that railways should not sow an indiscriminate lot of screenings. These screenings contain a large number of objectionable weed seeds. Some states have laws on the presence of certain weeds along highways and railways, and others are likely to pass similar laws. It will cost more to remove these weeds finally than if some other material had been used; although the first cost is less, it is more expensive in the end.

To determine whether such planting would be feasible the Iowa Agricultural Experiment Station made an experiment a number of years ago on the Chicago & North Western Railway between Ames and Ontario. In the experiment undertaken we also used timothy, Hungarian brome grass (*Bromus inermis*), Canada blue grass (*Poa compressa*), sheep's fescue (*Festuca ovina*), blue grass (*Poa pratensis*), western wheat grass (*Agropyron Smithii*), Western brome grass (*Bromus marginatus*), orchard grass (*Dactylis glomerata*), a sedge (*Carex*), growing on the edge of the "fill," and red and white clover. It was not difficult to get a stand of the red and white clover. In fact, on the north side of the track the plant blossomed very well by the end of the season, but the cold weather destroyed many of the plants during the winter. Some, however remained, and by sowing an additional quantity of red and white clover seed in the spring of 1904 we had an excellent stand on the north side of the track. On the south side it was difficult to get a start owing to the dryness of the soil. The Hungarian brome grass, which was sown just as the other grasses were, made an excellent start on the north side, and here and there a patch on the south side.

The sedge was a total failure. The intense heat and dryness made it impossible for this plant to get a good start. The orchard grass grew well on the north slope, but its habit of growth makes it undesirable. Blue grass was nearly a failure on the south slope, but succeeded much better on the north and shady slope.

Brome grass and blue grass should be planted on the north side of the track. If properly managed this will make a good sod in the course of a few years, but the young plants should be protected with red and white clover. On the south side of the track western wheat grass and Canadian blue grass should be used.

This experiment has shown that the right of way can be


Western Wheat Grass on Chicago & North Western Bank Near Ames, Iowa.

planted with desirable plants which will hold the banks. It has also been shown that where a road runs east and west the north side of the fill needs to be planted with a type of plant different from that on the south side. We have found that Hungarian brome grass is one of the best grasses to sow on the north side. Here it is possible in the course of a year to get a good stand, and especially so in two years, if some of the plants are allowed to go to seed. The picture shows such a stand after a number of years on a steep fill near Ames. Brome grass will not do nearly as well on the south side, although it will do better than timothy or blue grass. One of the best grasses on the south slope is the Western wheat grass (*Agropyron Smithii*) which is a relative of quack grass, but much better than this because it is adapted to dry conditions. Western wheat grass is abundant on the plains east of the Rocky mountains as far east as the loess bluffs of

western Iowa. It may be found in numerous places along railways where it has been introduced. The plant has a bluish color.

Quack grass is objectionable because some of the northern states have legislated against the weed, and it is so destructive to agricultural crops. Railways cannot afford to jeopardize the agricultural crops on which their earnings depend.

These grasses should be sown in the early spring or, preferably, in late fall. The brome grass should be sown in the fall. In the early spring a little clover, 6 pounds to the acre, can be sown on top of the ground. The Western wheat grass seed cannot be purchased as there is none in the markets, but arrangements can be made in the summer, with someone where the grass grows, to have it collected.

STREET RAILWAY INTERLOCKING AT WASHINGTON.

At a number of street railway junctions in Washington, D. C., interlocking switch and signal plants are now being installed in which the signals (consisting of electric lights, showing green for proceed and red for stop) are fixed in waterproof boxes beneath the pavement, between the rails; and the signalman is in an octagonal tower of only 4 ft. inside diameter, which is perched on an ornamental column, on or near the sidewalk, and thus is raised above the heads of passing pedestrians.

Fig. 1 shows the arrangement of the tracks and the wiring at Delaware avenue and C street, N. E. All cars approach switches with speed under control, and a car approaching a signal (No. 2 for example) is stopped, unless the signal is plainly seen to show green.

The signal consists of two electric lights, one red and one green and these lights are placed under a small manhole cover in which are slots through which the motorman can see the lights. This "manhole" is between the rails of the track, so that the lights are exactly in front of the approaching motorman. The lights are enclosed in a heavy, water-tight, glass case. One light only shows at a time and the normal indication is red, stop.

To set a switch the towerman rotates a lever in the machine —called the control cabinet—which makes a contact, completing a circuit to a solenoid which actuates the switch. The lever is arrested when the stroke is a little over half completed, by the latch of the return indication magnet catching it. This latch is lifted after the switch has completed the stroke, when the control lever can be pushed over to the end of its stroke.

The two return indication magnets on each switch lever have circuits completed respectively by contacts made in the switch-throwing mechanism at each end of the stroke, so that until the switch has actually completed its stroke, the control lever cannot complete its stroke. Suitable mechanical interlocking being provided, it is therefore impossible to give the motorman a clear signal until the switch is in a safe position.

The switch being thrown, the towerman presses the lever controlling the signal for that switch, and, if it is not locked by reason of the towerman having set a switch or a clear signal for a conflicting route, he thereby clears the signal. At the start of the stroke the circuit to the red light is broken and at the end of the stroke the circuit to the green light is made. At the end of the stroke a latch drops and locks the signal lever in the reverse or clear position. The signal lever is worked against a compression spring which, when the signal lever latch is lifted, returns the lever to its normal position. The green or proceed light having been given, the motorman proceeds, and as the car is passing out of the limits of the crossing the shoe on the plow of the car actuates a signal lock contact, which contact completes a circuit through the signal lock coil; and this coil lifts the latch on the signal lever, allowing the lever to return to its normal position.

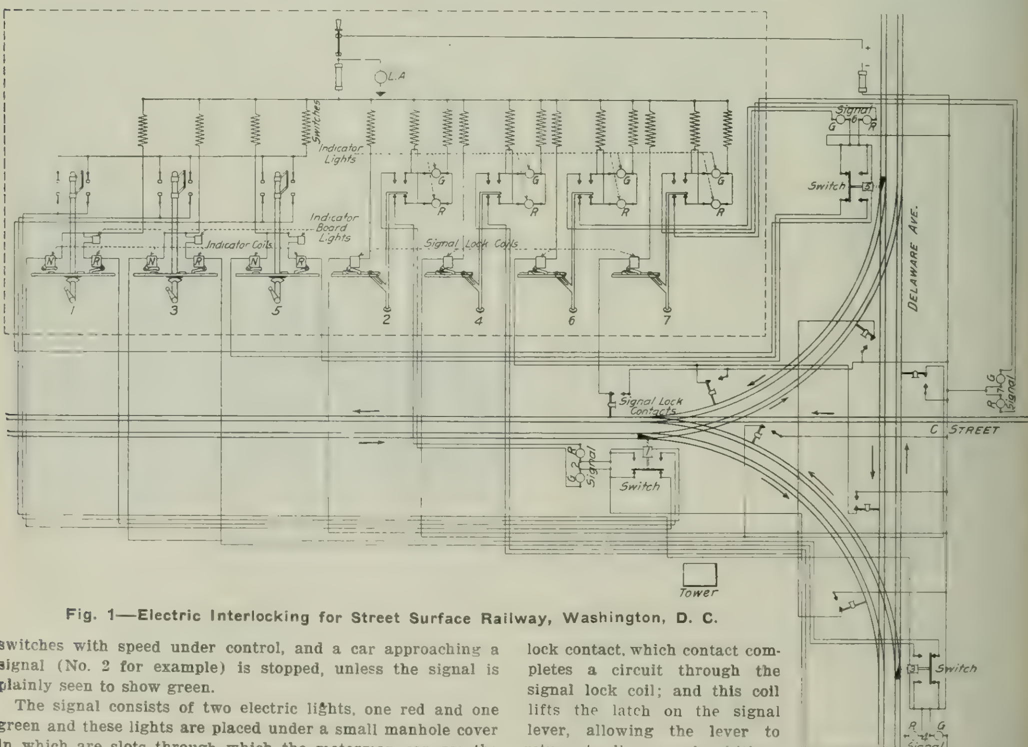


Fig. 1—Electric Interlocking for Street Surface Railway, Washington, D. C.

The mechanical interlocking insures that when a signal is cleared the switch lever for the switch controlled by that signal cannot be thrown until the signal is restored to normal, and, as just explained, this cannot occur until the car is over the crossing. This arrangement prevents the movement of the switch while a car is passing over it.

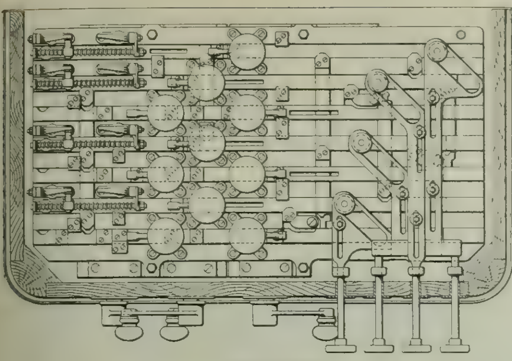


Fig. 3—Plan.

latch on each of the levers, Nos. 1, 3 and 5, which accomplishes additional locking when the levers are reversed.

The tower is mounted on a single specially designed artistic column with a granite base and with anchor bolts imbedded in concrete. The towers are octagonal and only 4 ft. in greatest inside measurement. Those at the Union station are specially designed to be harmonious architecturally with the general surroundings of the station.

The towerman climbs the column by means of concealed steps and enters the tower through a trap door in its floor. The tower is sufficiently high from the ground to give the towerman a good view of the cars and it is not in the way of pedestrians.

The column has a door in the side which allows telephone, brooms, switch irons, etc., to be put inside the column out of sight.

The first plant to be installed is that at Delaware avenue and C street, N. E., on the lines of the Capital Traction Company and the Washington Railway & Electric Company. The

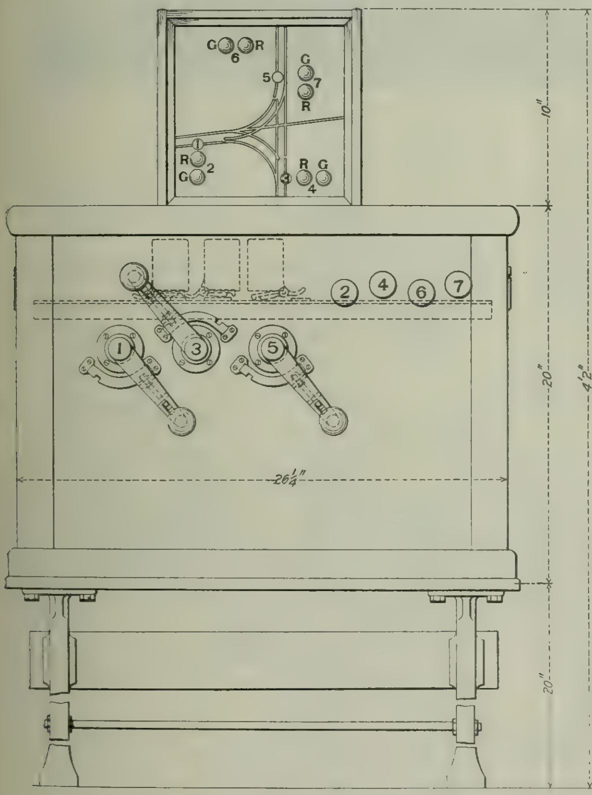


Fig. 2 —Front.

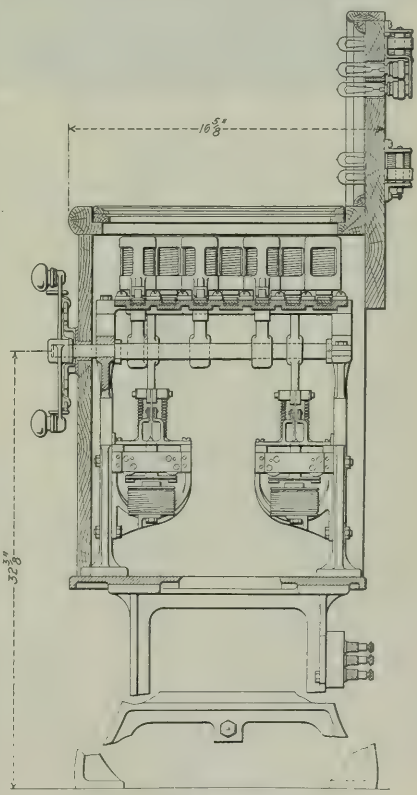


Fig. 4—Section.

Electric Switch and Signal Machine; Automatic Switch Company.

The switch-throwing mechanism is actuated by a solenoid, and, by means of a reversing cam-plate, movement is given to the switch, first in one direction and then in the other.

The control cabinet has a track model, as shown, which repeats the switch movements, and also has miniature lights which repeat the signal indications.

The interlocking required here is different from regular high speed steam railway practice in that one green light is given for the car to proceed whether the switch lies to the right or to the left. This modification is accomplished by a swinging

other junctions to be equipped are two at the plaza of the Union station, one at North Capitol street and Massachusetts avenue and one at First and B streets, S. E.

This apparatus is made by the American Automatic Switch Company, New York city. The advantages of providing absolute fixed signals to govern the movements of cars at a busy junction or crossing are obvious; and the superiority of an arrangement like this, with the switchman eight feet above the ground, as compared with a man standing on the pavement with hand flags or lanterns, needs no demonstration.

NEW LOCOMOTIVES FOR THE FEDERATED MALAY RAILWAYS.

Included among the more interesting types of locomotives recently built for main line service on Indian or Far Eastern roads are a number of 4-6-2 engines, with double bogie tenders, which are being delivered by Messrs. Nasmyth, Wilson & Co., Ltd., of Patricroft, near Manchester, for duty on the meter gage lines of the Johore State Railway.

a deflector and guard plate, the latter being required to protect the copper sheet from abrasion.

The boiler is fed by two self-acting, re-starting combination No. 8 injectors, located on either side of the back head. They take steam through a 1¼-in. pipe leading down from near the top of the dome, and deliver through pipes carried forward above the crownsheet and turned down so as to discharge just above the center line of the boiler and, therefore, well below the surface of the water.

Meter Gage Pacific Locomotive for the Federated Malay Railways.

The boiler and firebox roofsheet are of mild steel and the firebox, which is of the Belpaire shape, is of copper, with staybolts of the same material. The roofsheet is not, however, of the Belpaire form, but is semi-circular and carries the crownsheet by means of sling and radial screw stays, the sling stays being located at the front in the usual place. It will be noticed that this method of staying and forming the crownsheet brings the outer stays into the roofsheet at a rather sharp angle—so sharp, in fact, that it is impossible to secure a full thread all the way across the sheet, and this was one of the main arguments brought against radial staying in the United States, which resulted in arching the crownsheet so as to secure full threads in both sheets. The tubes are of solid drawn brass and are given a camber of 1⅝ in. at the center. Camber is seldom used in American boilers and when it is employed such an amount as this would be considered excessive. As the buoyancy of the tube itself is quite sufficient to serve as its center support without the introduction of the extra support of the camber, the bend in the tubes serves merely as a preliminary buckle to permit of a lessening of the stresses on the tubesheets due to expansion, and it is for this that this camber is used. The cross-section of the boiler at the smokebox shows, too, that the upper rows of tubes are kept well away from the sides of the shell—so far, in fact, that it has been necessary to introduce stays to brace the unsupported flat surface of the front tubesheet. This provides for a free downward circulation and the delivery of the feedwater to all parts of the boiler unimpeded by the upward currents rising from the tubes. At the back head there are also stays that extend out through the water space and take hold of the rear course of the shell. These are somewhat longer than those ordinarily used in the United States, where they are usually attached to the outside side sheet, which not only makes a lighter stay, but does not offer the same obstruction to circulation.

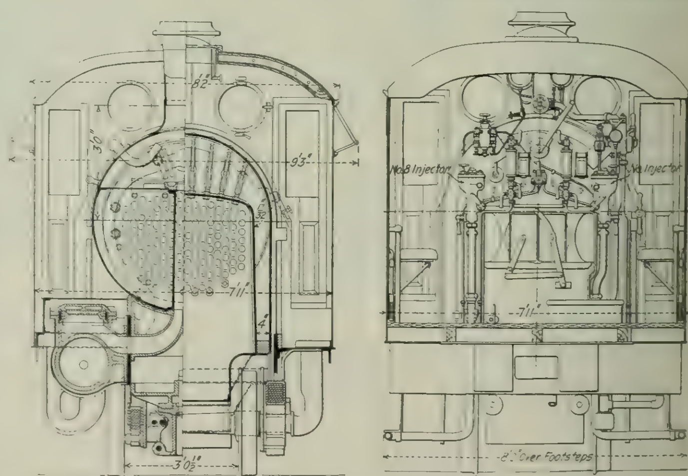
The firedoor is formed in the usual manner and is fitted with

A duplex 2¾-in. Ramsbottom safety valve is placed on top of the roofsheet.

The cylinders are outside the frames and have their steam chests on top. They are inclined 1 in 16 so as to secure the proper clearance for the front truck wheels. This truck is of the swing link pattern.

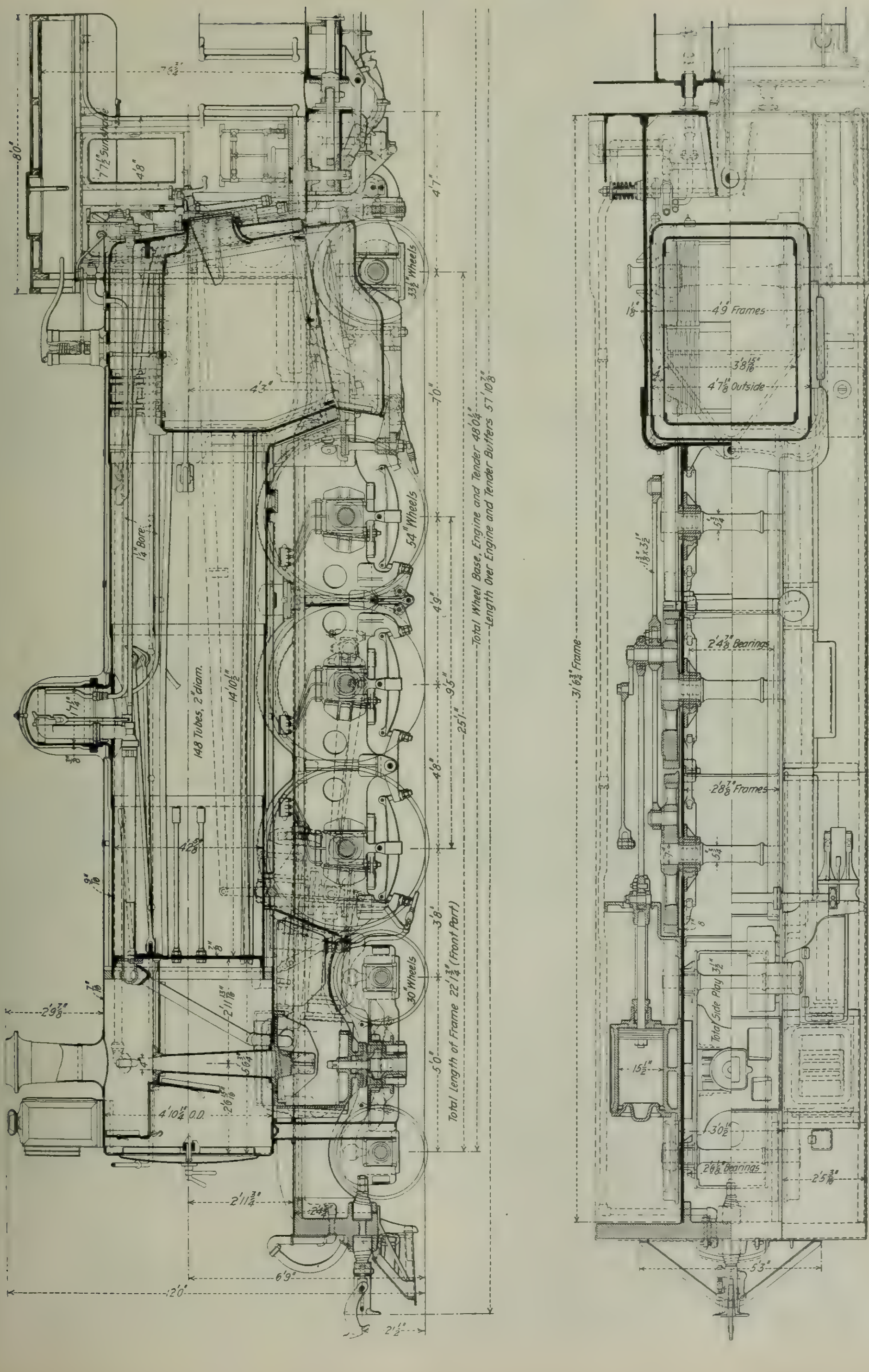
The Walschaerts valve gear is used, and is operated by the usual reversing screw.

The trailing truck is of the Bissel type, with 3-in. lateral play, and is controlled by helical springs that are placed out-



Half Sections and Rear Elevation.

side the frames. The suspension springs, which are under the axle boxes, are fitted with adjustable links. The spring suspension and equalization is divided into three sections. There is that of the front truck, which is by itself in the usual manner. Then the first and second pairs of drivers are equalized together with underhung springs and equalizer bar between. Finally, the rear drivers are equalized with the trailing truck. This is a modification from the method of equalizing all of the drivers with the rear truck that will probably produce unequal wheel loads at times. The driving boxes are



Sectional Plan and Elevation; Pacific Locomotives for the Federated Malay Railways.

each fitted with three oil pipes for maintaining the lubrication when the engine is in motion—one for journal lubrication and one each for the front and back wedges.

A wedge brake, operated by a steam cylinder, is set between the two rear pairs of driving wheels, but no brakes are used upon the front drivers or upon any of the truck wheels.

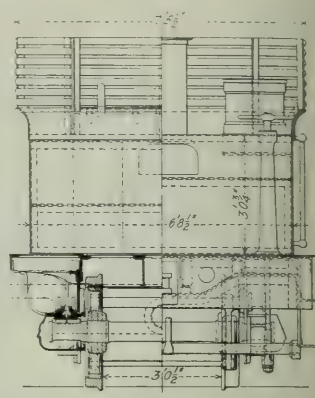
The main frames are of the plate form and are thoroughly stayed throughout and fitted with a cast-steel distance piece in front of the firebox, and have the rear portion widened out. The cab is roomy and is provided with an upholstered seat for the driver and adjustable sun shades. The front buffer beam is of cast iron and is fitted with a central combined buffer and drawgear. The distinctively American features about the locomotive are the pilot and the headlight.

The tender is of steel, with an underframe built up of channels and angles, the former being used for the center sills. The tank is rather smaller than that used for the same size cylinders in the United States, but the fuel space, that has been increased above the normal capacity by the racks is quite up to ordinary capacities.

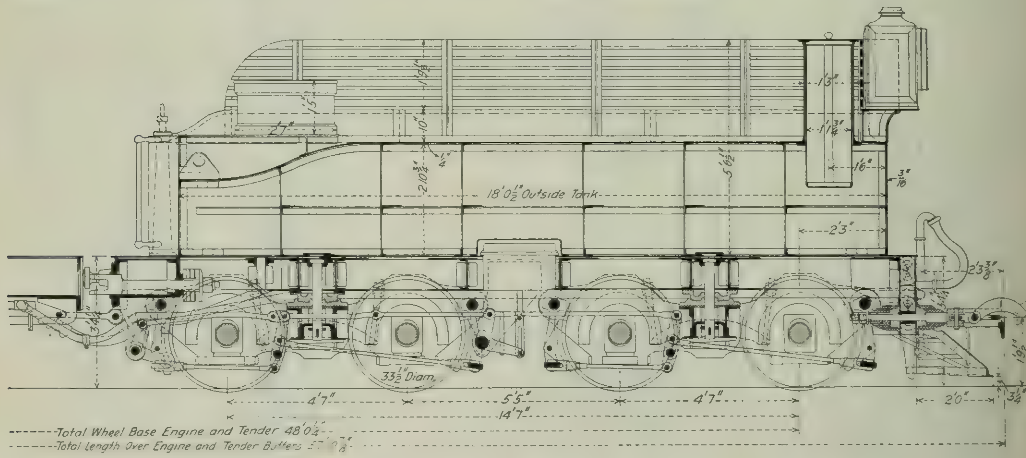
The draft gear at the rear of the tender is the same as that at the front of the engine, and a pilot and headlight are also provided at this point for use in running backward. Between the engine and tender the draft gear differs radically from American practice, where there is used nearly rigid connection, in that the drawbar is cushioned by rubber discs, while on each side there are buffers supported by volute plate springs.

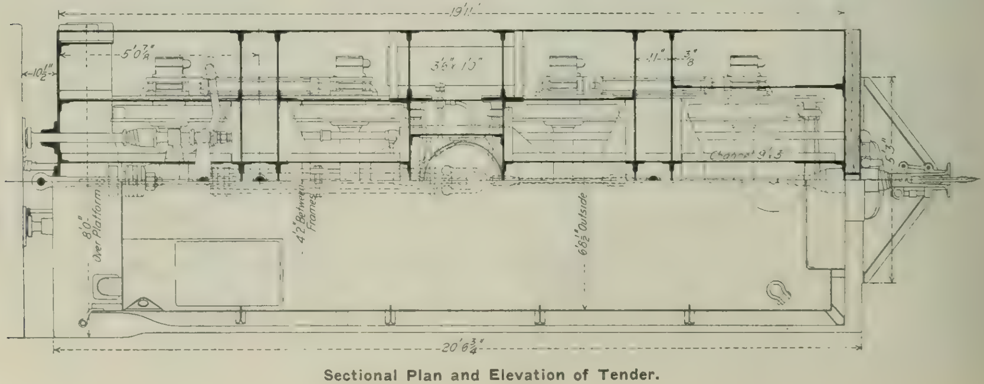
The tender is fitted with both the hand and vacuum brake, and it will be seen that the foundation rigging is not interfulcrumed or floating. The stem from the diaphragm takes hold of the horizontal arm of a bell crank, while the vertical one actuates the brake levers. The connection to the rear is under tension, while that to the front is in compression. Further, the live levers are pivoted so that with new shoes on each wheel they must be worn down successively before all can be brought to a bearing. This is a feature of European practice that has persisted in places for many years, to the exclusion of the interfulcrumed type of brake that is in universal use in the United States.

These locomotives were built under the supervision of the chief inspecting engineer for the Crown



Half Front and Rear Elevation of Tender.





Sectional Plan and Elevation of Tender.

Agents for the Colonies, the consulting engineers being Messrs. Gregory, Eyles & Waring, of Westminster.

The following are some of the principal dimensions of these engines:

Cylinders, diameter	15½ in.
Piston stroke	24 "
Bogie wheels, diameter	2 ft. 6 in.
Coupled wheels, diameter	4 " 6 "
Trailing wheels, diameter	2 " 9½ "
Bogie wheel base	5 " 0 "
Fixed wheel base	9 " 5 "
Total wheel base	25 " 1 "
Boiler barrel, diameter at center	4 " 3¾ "
" " length between tube plates	14 " 10½ "
" " center line from rail level	6 " 9 "
Firebox, length	6 " 6½ "
" outside diameter	4 " 3 "
" inside diameter	3 " 0 "
Heating surface, tubes	1,152.5 sq. ft.
" " firebox	82.5 "
" " total	1,235.0 "
Grate area	18.5 "
Working pressure	180 lbs.
Tender.	
Wheels, diameter	2 ft. 9½ in.
Bogie wheel base	4 " 7 "
Centers of bogies	10 " 0 "
Total wheel base	14 " 7 "
Tank capacity	2,000 gals.
Fuel space	315 cu. ft.
Weight	29½ tons
Engine and Tender.	
Weight	77 tons
Total wheelbase	48 ft. 0¼ in.
Total length over buffers	57 " 10⅞ "
Tractive effort	16,359 lbs.

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 3.98$$

$$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}} = 715.29$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 65.75$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 6.68^{*}$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 52.70$$

$$\text{Displacement, 2 cylinders, cu. ft.} = 5.24$$

$$\frac{\text{Total heating surface}}{\text{Displacement, 2 cylinders}} = 23.57$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 3.53$$

*Per cent.

THE RAILWAYS OF BRITISH COLUMBIA.

THE GRAND TRUNK PACIFIC.

Last year's progress in railway building in British Columbia was disappointing by comparison with what had been expected, and the same remark holds good with regard to all the railways in Canada. Several years ago when the Grand Trunk Pacific and other important railway bills were up for discussion in the Dominion Parliament, members favoring the bills predicted a rate of speed in construction that has not been realized, and the result is a feeling of disappointment and depression in the districts which the new lines of railway are intended to serve. Under its agreement with the government the Grand Trunk Pacific is to be open for traffic between Winnipeg and Prince Rupert, on the Pacific, by the fall of 1911, the government upon its part undertaking to have ready its portion of the National Transcontinenttal railway from Winnipeg to the Atlantic. Neither the Grand Trunk Pacific nor the government portion of the new transcontinental line is, from present indications, at all likely to be completed by the time stipulated for by the Dominion Parliament.

The line from Winnipeg east to Lake Superior Junction, which has given much trouble in construction, will be completed, and the Grand Trunk Pacific connection from Fort William to Lake Superior Junction will also be in running order. But from Lake Superior Junction east to meet the line extending west through Quebec and Ontario progress promises to be much slower than was at first anticipated. From Winnipeg west, across the prairies, construction has met with few difficulties as far as Edmonton, and beyond it to the Yellow Head pass, but between that point and Prince Rupert work is far in arrears. It looks very much as if the Grand Trunk Pacific management would be quite content, for some years at any rate, to handle only the traffic from the agricultural areas of the prairies to navigation on Lake Superior. Difficulty in obtaining money on favorable terms is said to be the principal cause of the delay, both on the part of the Grand Trunk Pacific and of the Canadian government. In addition, it is stated that there is considerable friction between the English directorate of the Grand Trunk railway and the directors of the Grand Trunk Pacific, which is a Canadian incorporation. A very serious matter for the Grand Trunk is this. Two sessions ago the Canadian Parliament passed an act providing that the 33⅓ per cent. preference on British goods imported into Canada should apply only to goods of British origin and British manufacture, imported in British ships at Canadian ports of entry direct. After opposing this measure Sir Wilfrid Laurier's government accepted it with the modification that it should not take immediate effect, but should come into operation by proclamation of the Governor-General in council at any time, the government promising that such proclamation should be made out not later than the year 1911. This was to give the Grand Trunk Pacific and National Transcontinental time to get ready to handle the trade of the Grand Trunk that now goes to Portland, Me. If the Grand Trunk cannot get the government to hold over the enforcement of this tariff measure it will be a very serious matter for the railway, and in the present temper of the parliament and people of Canada it is doubtful if any delay will be permitted.

As regards Prince Rupert, the Grand Trunk Pacific railway's terminal on the Pacific, it is not by any means the ideal port and town-site that it was believed to be when it was first selected. The area of available land for tracks and building purposes is insufficient unless a very large amount of money is expended in making a further very unpromising looking tract suitable for town-site purposes. Then again, recent developments in the shipping trade of the Pacific have not been altogether encouraging for the new port. So far as the surveys and exploration have yet disclosed there is not much traffic to be expected for many years to come from that section of the Grand Trunk Pacific that lies between Prince Rupert and the Yellow Head Pass. The traffic will have to come from the country east of the Rockies. It will fall to the railway company to provide shipping from its new port, at least in the first instance, and this will involve large outlay for which the company may have a difficulty in securing funds. The Empress line steamers of the Canadian Pacific railway are said to be doing particularly well to Japan and China at present, and the Canadian-Australian liners are doing better than they have ever done, the passenger trade between Sydney, New South Wales and Vancouver showing up specially well, though the return cargoes from Australia are still very light. James J. Hill's experience in opening up a trade between Seattle and the Orient is not altogether encouraging to new beginners in the same line of business on the Pacific coast.

THE CANADIAN PACIFIC.

The Canadian Pacific has been doing a great deal of useful work on its lines in British Columbia, mostly in the way of betterment. Its lines on Vancouver island (the Esquimault & Nanaimo Railway, which it bought some years ago) are now in excellent condition and are being extended to the other side of the island where an important seaport will probably be established. In this case an up-to-date modern railway ferry will be brought into operation between Vancouver terminal on the mainland and Vancouver island. This would

effect a considerable saving of time for mails and passengers between England and the Orient, a branch of their service which the Canadian Pacific have been sedulously cultivating for some years past. At Field, in the very heart of the mountains, the gateway of a region of marvelous glaciers and sublime scenery, the Canadian Pacific Railway is carrying out a very heavy piece of engineering work. At this point the grade is very steep and has, as a consequence, added materially to the cost of working the entire Pacific division. To attain its present grade, the line zig-zags its way up the mountain sides. A tunnel of great length is now being driven in the shape of the figure "8." An eastbound train entering this tunnel at Field will gain the elevation needed, in the passage through the tunnel, and in a few minutes emerge high above Field, just as if had been carried up on an elevator. While the Canadian Pacific Railway engineers and officers are very proud of the new tunnel, it is probable that it will be used for freight trains mainly, as the scenery at Field is the most wonderful and the grandest between Montreal and Vancouver, and passengers will prefer to look upon the great works of God rather than the chiselings that the hand of man has made in them.

During the coming summer the Canadian Pacific Railway transcontinental service will probably again be accelerated, and so quickly is the traffic growing that there is every possibility of another daily train being required. The double-tracking of what is known as "the spout," between Winnipeg and Fort William, will have the effect of easing the whole traffic of the line from Lake Superior as far west as Banff. The work of double-tracking has gone on as rapidly as possible in the face of many difficulties—difficulties greater in sole instances than would be met with in building an entirely new railway. At Letherbridge, in Alberta, a new departure is being made. Here the Crow's Nest Pass branch passes through a long stretch of low-lying prairie that is subject to floods when the snow is melting or after heavy rains. To keep the roadbed on this section of the line in anything like good order has in the past been well-nigh impossible, and a heart-breaking job at that. The whole of this part of the country is for the future to be traversed on a sort of diminutive trestle work, which in some places may not be more than two feet in height and in others ten or twelve feet. Of the Hill railways, except in so far as they affect Vancouver, New Westminster, and the valley of the Lower Fraser river, there is not, as yet, very much heard in British Columbia. It is expected that before long the Canadian Pacific Railway will again have to enlarge its docks, sheds and terminal tracks at Vancouver for the trade is increasing by leaps and bounds, and the population of the city is rapidly catching up with that of Winnipeg.

New Westminster, with its population of about 12,000, is now practically a suburb of Vancouver, with which it has excellent and frequent communication by the British Columbia Electric Railway Company's lines. This company is an English concern, excellently well managed and yielding good returns to its shareholders. It operates the street railways in Victoria, Vancouver and New Westminster and is extending its line some sixty miles into the Chilliwack districts of the Lower Fraser valley. This is about the most fertile district in British Columbia and the company expects to do an enormous business in hauling vegetables, fruit, farm and dairy produce, firewood, etc., to Vancouver. At present Vancouver imports about 50 per cent. of its vegetables and fruit from California, Oregon and Washington. R. M. Horne Payne is chairman of the British Columbia Electric Railway Co. in London. He is also resident director in Europe of the Canadian Northern Railway.

THE CANADIAN NORTHERN.

Since Prince Rupert was fixed upon as the terminal of the Grand Trunk Pacific there has been much talk in British Columbia, and especially in Victoria, its capital, about the route to be taken by the Canadian Northern to the coast, and the point that it will select as its terminal. While no definite pronouncement has been made by Messrs. Mackenzie and Mann, the general impression is that from the Yellow Head pass the Canadian Northern will come straight down to the coast at Butte inlet. There it will cross at the Seymour narrows by a steam ferry to Vancouver island, and then on to Esquimault and right in to Victoria. While it is the seat of government, the provincial legislature, the judicature, and other public offices, Victoria of late years has become more and more a winter resort for wealthy Winnipeggers and visitors from the United States. Trade has passed it by for Vancouver. By bringing the Canadian Northern right into their city as its terminal point the Victorians see their chance of holding their own against Vancouver on the one hand and Prince Rupert on the other. The Canadian Northern in Nova Scotia, Quebec, Ontario, Manitoba and elsewhere has received the guarantee of the Dominion government, or one or other of the various provinces for its construction bonds, and the same will now be expected from the province of British Columbia for bonds to be issued for the extension from the Rocky Mountains to the coast. Among members of the legislature the feeling appears to be that the guarantee of the province should be given for the extension, but only on the condition that the Canadian Northern shall make Victoria, the capital, its terminal point.

There is much to be said in favor of Victoria as a shipping port as compared with Vancouver, and it is only four miles from Esquimault, which, until recently, was garrisoned by British soldiers as the depot of the British fleet in the Northern Pacific. Esquimault has now passed into the hands of the Canadian government and is garrisoned by men of the Canadian permanent force. The harbor is a good one and perfectly sheltered and the government would probably be perfectly willing to grant its use for general shipping. Were that so, Esquimault, with a clear run out to the ocean, would probably be the most useful and best patronized harbor on the Canadian Pacific coast. A steam ferry between the mainland and Vancouver island at Seymour narrows offers no difficulty, though in getting down to the narrows there would be some very heavy rock-cutting. Something like a generation ago Sir Sandford Fleming made a report on bridging the Seymour narrows, and again about three years ago an officer of the Canadian government made a similar report. The estimated cost was a sum of not less than $25,000,000! People in Canada talked, then, both of bridging these narrows on the Pacific, and tunneling under the straits of Belle Isle on the Atlantic coast, but a change has come over the spirit of the dream of large expenditures by a population of less than six and a half million people, and that bridge is not likely to be built just yet a while.

The Canadian Northern is apparently in no hurry to reach the Pacific coast, and it will be at Churchill on the west coast of Hudson bay long before it emerges from the Yellow Head pass into British Columbia. It will also probably be at the Athabasca landing, north of Edmonton, in a short time. From this point there is water communication into the great Peace river country, which is now beginning to attract settlement, and which is estimated to be capable of supporting a white population nearly as large as that of the prairie provinces, Manitoba, Saskatchewan and Alberta, when all of them come under occupation, agricultural or pastoral. The route from the Yellow Head pass to Butte inlet is said to be rich in its possibilities of traffic, a point that has hitherto been very carefully studied in mapping out all the Mackenzie and Mann lines. In the original Canadian Northern, from Port Arthur westward, there is hardly a mile of the road that does not contribute its share to the general volume of traffic, and when the Pacific coast end comes to be built, it will probably maintain the reputation of the rest of the system in this respect. Towards completing a transcontinental

line, and linking up the Canadian Northern, the Canadian Northern Ontario and the Canadian Northern Quebec railways, the gaps now to be filled in are from Ottawa to French River, Sudbury to a point on the main Port Arthur line, and finally the Pacific coast section.

THE GOVERNMENT AND THE INVENTORS.*

Of the hundreds of descriptions and plans of devices or systems for the promotion of safety in railway operation examined by the board so few possess any merit that it is evident that a large proportion of the inventors or proprietors of such devices are entirely unfamiliar with the conditions to be met in railroading, the development of safety appliances, the state of the art of signaling, and often with well known natural laws. This is manifested in three forms:

(1) In devices which, no matter how well designed or constructed, would be dangerous or of little or no value.

(2) In devices or systems which, no matter how well the details of design and construction were carried out, are fundamentally wrong in principle.

(3) In devices or systems which, while theoretically useful and workable, are designed without regard to the well known properties of materials or a consideration of the quantitative values of the forces and velocities involved.

Dangerous Devices.—As an example of the first class may be cited the highway crossing gate designed to be closed automatically by the approach of a train. It is obvious that such a device, no matter how perfect in operation, would be unsafe to use as the gates would descend or close when the train was within a given distance of the crossing, irrespective of whether or not pedestrians or vehicles were on the crossing, thus preventing their escape from the very danger that the invention is intended to avert. Other inventions of substantially the same class are those for the automatic throwing of switches by train approach, especially those intended to restore to the main track position by the passage of the train itself a switch that has been maliciously or carelessly left set for a siding or turn-out.

The board believes that switches, being movable portions of the track, are so subject to obstruction of their proper movement by foreign substances, such as stones, lumps of coal, snow, ice, bolts, nuts, and other parts dropped from cars or locomotives, that they should not be operated except by an attendant, for the reason that such attendant can detect abnormal or unsafe conditions which would prevent the proper operation of the switch. These conditions can not be detected by automatic apparatus controlled by approaching trains except under conditions where the throwing of the switch, the locking of the switch, the releasing of the signal, the clearing of the signal, together wth the necessary approach and detector locking, are all independent and occur in proper sequence. Even with such refinement it is considered doubtful if the reliability of operation of such devices would be sufficient to warrant their use in practice unless in special or unusual cases.

Devices Wrong in Principle.—The most typical devices of the second class referred to, namely, those that are wrong in principle, are signals that require the application of power to move them to the position to indicate "stop," and assume the "proceed" position by gravity or whenever the application of power to them ceases. Within this class falls also the large number of electrical appliances designed to operate on the so-called open-circuit principle. In these, the presence of electric current in the operating devices is required to give a "stop" indication or apply the brakes or accomplish the purpose for which the device is designed; whereas it is evident that all such appliances should be constructed on a principle directly opposite, namely, the closed-circuit principle, so that if the current supply should fail or a wire should break or become disconnected, or a short circuit or a cross should occur, the "stop" indication would be displayed or the brake applied, or other purpose of the design carried out. In other words, all devices or systems must be to the highest degree self-checking of their own failures, so as to render them as nearly as possible incapable of falsely indicating safety when danger exists, or if used in train control, incapable of permitting a train to proceed when it should be stopped. This principle is fundamental and no devices or systems designed on the contrary or open-circuit principle can be approved.

Impracticable Devices.—In the third class, or impracticable devices, we find many where it is intended to operate signals or mechanical trip train stops through the medium of cables or rods several thousand feet or a mile or more in length attached to treadles or other trips which are intended to be depressed or moved by engagement with some part of another moving engine or train, little idea evidently being entertained by the inventor as to the inertia of the parts, the effects of impact, the elasticity and strength of the materials employed, or the conditions due to accumulation of snow, ice, or sand.

Reliability.—Next to safety, reliability is the most important feature in safety appliances. By this is meant infrequency of failure of the device or system to respond to all the conditions under which it should act. For example, if a signal device indicates a clear track when the track is obstructed it is an unsafe device. If it indicates danger when there is no danger it is not reliable, and such unreliability soon becomes a source of danger, for if a signal, for example, frequently indicates "stop" when the conditions are all right for the train to proceed, its "stop" indication soon becomes discredited as a true indication of danger and may come in time to be disregarded even when correctly given, and hence lead to disaster.

Contact Devices.—Many devices or systems have been examined in which contact plates or rails are included in electric circuits carrying current which either continuously or intermittently is intended to be picked up by a contact brush or shoe on the moving vehicle. While a number of such systems are designed on theoretically correct principles, the practicability of making or maintaining a reliable contact can be determined only from long-continued experiment with various forms of roadway and vehicle contacts under such conditions of speed, vibration, clearance, shock, snow, and ice, as exist in actual railway working in all localities and at all times of the year. In considering any closed circuit arrangement which makes use of a continuous contact rail it must be borne in mind that a momentary loss of contact which might occur from very slight accidental circumstances might in an automatic train-stop device cause an emergency application of the brakes while running at high speed. This makes the reliability of such schemes extremely doubtful.

Equipment and Structure Clearances.—Inventors or designers of cab signals and automatic train stops often disregard the very definite relations that must necessarily exist between the dimensions of cars and engines and those of platforms, bridges, tunnels, road crossings, and other structures along the roadway. It should be remembered, for example, that the location of end ladders on freight cars must be definite and reasonably uniform in order to make their use safe for trainmen. Yet many devices of the overhead type are presented, by the use of which freight trainmen, would undoubtedly be subject to more danger than the use of the devices would prevent. The question of equipment and structure clearances should be carefully studied by all who approach this problem.

Continuous Track Circuit.—A number of block signal systems have been presented for the board's consideration which involve the use of much complicated apparatus and would doubtless cost as much to install and maintain as the best known systems now in use, and yet lack the very desirable protection afforded by the use of continuous track circuits with their ability to detect broken or removed rails.

*From the annual report of the Block Signal and Train Control Board to the Interstate Commerce Commission of the United States. For other parts of this report, see January 15, page 116.

This is a protective feature free to be used by anyone as far as patent rights are concerned, and it is especially desirable in view of the relatively poor quality of most of the steel rails now on the market.

Complaints.—No small portion of the correspondence of the board has had to do with complaints and demands for an investigation of alleged suppressions of important inventions by powerful corporations and associations to the serious detriment of the public interest and great pecuniary harm to individuals. The nature of the charges made indicates a necessity for investigation to determine whether they are justified in fact, it being considered equally important from the standpoint of the public to establish definitely that such accusations are untrue as that they are true.

There appears to be a very general belief that the inventor without means or influence can not get his inventions considered by railway officials, and in consequence appeals by such inventors to the government for aid to secure what is believed to be his rights have been both frequent and insistent.

The legislation under which the board acts, while providing the machinery for investigating the use of and necessity for block-signal systems and appliances for the automatic control of railway trains and other appliances or systems designed to promote the safety of railway operation, does not provide for the investigation of alleged suppressions of inventions, although it does indirectly aid the inventor without means or influence to get his invention considered when it has been found to possess sufficient merit to warrant a favorable report by this board.

It is believed to be in line with good public policy to provide means to satisfy the insistent demands for just treatment of the inventor, if such means do not already exist, and if they do, then to point out the way to make such means available and effective so as to satisfy the reasonable demands of the complainants.

Protests.—Another fruitful source of correspondence has been the protests of inventors on whose apparatus the board has felt obliged to report adversely, and it is interesting to note that not infrequently the most vigorous protests come from those whose devices have been found to possess a minimum of merit. This is largely due, it is believed, to a lack of knowledge of the technical requirements of modern railway operation. In a number of instances the inventor, on having the faults of his system pointed out, has attempted to correct them and has then resubmitted his plans with corrections for further consideration. In a few instances this has led to a favorable report. It is believed that should inventors of railway safety appliances avail themselves of the knowledge and experience of those skilled in the art, a much larger proportion of devices would be found to comply with practical railway requirements.

In a few instances where, on account of fundamental faults in a system, the board has reported unfavorably, the inventor or proprietor has insisted on a practical test of his device notwithstanding, claiming the right to such a test under the appropriation act accompanying the joint resolution under which the board was created. The policy of the board in such cases was defined by the commission in a case referred to it for consideration as follows:

If * * * satisfied * * * that this plan or method of train control to prevent accidents is inherently defective and could not on that account be prudently adopted, we are of the opinion that you are justified in declining to expend the time and money which a test would involve. A device which in the end must be rejected as fundamentally deficient would not seem to require a test for the purpose of demonstrating its lack of practical utility.

Reports.—The board has felt it to be necessary in considering devices to be particularly careful in reporting on the same not to mislead or unduly to encourage the inventor or proprietor, who, if encouraged, might enlist capital in a venture the results of which are likely to prove fruitless. At the same time, the board has aimed to encourage the development of promising devices when it is believed that a test of the same would add materially to our present knowledge and aid in determining the availability of different features for practical use.

Among the more recent developments which are engaging the attention of those interested in the subject of railway signaling are alternating current track circuits for electric roads, working without the use of insulated joints or inductive bonds, the transmission of signal indications by Hertzian waves or other oscillatory impulses, and the production of effects upon moving vehicles as the result of conditions existing upon the track by magnetic or inductive effects without mechanical or electrical contact, involving even such principles as the non-magnetic properties of manganese steel rails.

IMPROVING FREIGHT SERVICE ON THE NORTH WESTERN.

The Association of Transportation Officers of the Chicago & North Western has adopted a plan for the reduction of claims for loss and damage to freight. The plan adopted was formulated and recommended in a report by a committee composed of R. C. Richards, General Claim Agent; S. M. Braden, General Superintendent Lines West of the Missouri river; J. G. Quigley, Superintendent Ashland Division; W. Walliser, Assistant Superintendent Galena Division, and A. W. Towsley, Assistant Superintendent Wisconsin Division.

The number of claims and the disbursement made in settlement thereof, has, during the last ten years, increased alarmingly, as it has nearly everywhere. The cost per 1,000 ton miles for settling loss and damage claims for the years named was as follows:

1898	.02307	1905	.07210
1902	.04149	1906	.06261
1903	.06226	1907	.08805
1904	.08058	1908	.1332

If the claims of 1908 could have been settled on the same basis as in the year 1905 (.07210), the amount would have been $348,750.65, instead of $644,407.64, or a saving of $295,-656.99; or, approximately, 90 per cent. less.

The recommendations of the committee, as modified and adopted, are as follows:

"1. Increased supervision to see that employees are familiar with and comply with the rules and to generally supervise the receiving, waybilling, transporting and delivery of freight; and in order that this be properly done and to see that the employees are familiar with and comply with the rules, we recommend an experiment on the Galena, Wisconsin, Iowa and Madison divisions, on which the traffic is heaviest, and on which about 50 per cent. of the loss occurs, in the way of increased supervision by the appointment by division superintendents of additional trainmasters, whose duties it shall be to especially superintend the handling of freight and who shall be paid $150 per month and their actual expenses and who shall report to superintendents, as follows: Wisconsin Division, 2 men; Galena Division, 2 men; Iowa Division, 2 men; Madison Division, 1 man.

"That there shall also be employed on heavy way freight trains two men whose duties it shall be to load and unload and properly stow freight on such trains and that the conductor shall be responsible for the proper handling of freight.

"We strongly recommend that the superintendent, as far as possible, select the entire train and engine crew on way freight trains on his division and that changes in personnel in this service be avoided as far as practicable.

"That such competent persons as are necessary be appointed at such stations as Wood street, Sixteenth street (Chicago), Fortieth street (Chicago), Grand avenue (Chicago), State street (Chicago), Milwaukee, Des Moines, Omaha and Cedar Rapids, as inspectors, or chief inspectors, whose sole duty shall be properly to supervise the loading and unloading of freight, to examine each car of merchandise as it is loaded

to see that its contents are properly and securely stowed so as to stand ordinary handling, and to see that freight is properly crated and marked.

"When loss and damage occurs which is caused by carelessness or failure to comply with the rules, that this be immediately investigated by the assistant trainmaster and proper discipline administered.

"That the Claim Department furnish each superintendent monthly with a statement showing the amount charged out to his division in the payment of claims.

"2. Familiarizing employees handling the traffic, as to the rules of the company regarding the transportation of freight (which rules we think amply cover the matter). We believe that all such employees should be furnished with a copy of the book of rules known as G. F. D. 26600, and that when they are appointed to a position in which the necessity of a knowledge of such rules is evident, they be required to pass an examination to demonstrate their fitness, the same as enginemen and trainmen are required to pass an examination in the rules of the operating department.

"3. Administering proper discipline when freight is carelessly handled and the rules are not complied with; and that a record be kept which shall inform the division officers and the management of the company, not only of mistakes and carelessness, but also of good service * * * .

"4. Provide a schedule for the districting of cars loaded with way freight and adhere to the plan regardless of tonnage, being careful to so arrange the schedule as to produce the necessary flexibility to care for large or small tonnage of business.

"5. Reduce the tonnage now loaded in merchandise cars hereafter, to carry freight without damage, especially cars carrying way freight and district cars, mentioned in our fourth recommendation.

"6. Procure uniform, through waybilling on interline shipments; thereby doing away with the chances of making mistakes in rebilling consignments, as well as saving the cost of making hundreds of thousands of such waybills per year, and furnish a waybill of a distinctive color in forwarding astray shipments, and when such a bill is made, send a carbon to the superintendent of the division in order that he may have some knowledge of the number of shipments passing over his division, and, if possible, locate the cause of the freight going astray and take steps to prevent its recurrence.

The monthly report proposed in the last paragraph of the first recommendation divides all commodities into 18 classes, as follows: Boots and shoes; clothing, dry goods, notions, etc.; grain; candy and crackers; live stock; flour; fruits, vegetables and melons; furniture; junk; household goods; machinery and castings; meats and packing house products; stoves and car linings; tobacco and cigars; sugar; eggs, and miscellaneous.

These titles constitute the headings of the columns, and the losses and damages in each column are classified as follows:

1 Loss of Entire Packages	12 Damage due to Defective and Improper Packages
2 Loss from Packages	13 Damage by Train Accidents
3 Loss from Bulk Shipments	14 Damage Account Delay
4 Loss from Leaky	15 Damage by Defective Equipment—Leaky Roof
5 Concealed Losses	16 Damage by Rough Handling
6 Other Losses	17 Damage from Other Causes
7 Visible and Located Robberies	18 Concealed Damage
8 Failure to Seal and Take Record	19 Lack of Refrigeration
9 Error in Billing	20 Failure to Properly Heat Cars
10 Error in Receipting	21 Unfit and Unclean Cars
11 Error in Delivery	
Total Loss	Total Damage
	Total Loss and Damage

The report can also show the number of claims located at the principal stations, and there is space for the amounts paid out on these located claims.

Some causes of the increase in loss and damage claims as given by the committee are: Lack of interest by employees; lack of knowledge of the rules; failure to comply with the rules when known; failure to check property before receipting for it; receipting for more than is actually delivered; receipting for property in good order when it is in bad condition; giving clean receipts for property loaded by shipper and not checked by us; failure to properly check freight when delivered to the consignee; failure to promptly and properly report shortages, damages and overs; failure to promptly and properly notify consignees of the arrival of freight and keep a record of such notice; making greater advances on property than its value warrants; delivering property to persons other than the consignee without proper order; mistakes in billing caused by failure to compare waybills with shipping instructions; forwarding freight not marked with name of consignee and destination; improper loading, stowing and bracing freight; loading freight in leaky or dirty cars, etc.; carelessness in taking and transmitting verbal shipping instructions—especially on the telephone; improper use of air brakes; failure to give prompt notice of refused and unclaimed freight; failure to properly ice cars in warm weather and heat them in cold, etc.

BENJAMIN HICK'S LOCOMOTIVES.

(Illustrated from the Original Drawings.)

BY HERBERT T. WALKER.

In the earlier days of the Liverpool and Manchester Railway, when transportation by steam was still in the experimental stage, the firm of Rothwell, Hick & Rothwell, mechanical engineers, were doing a prosperous business at the Union Foundry, in the ancient city of Bolton-le-Moors, Lancashire. This district is classic ground in the history of the development of cotton machinery—the mule, the frame, the jenney, the carding engine—and within its borders the products of Arkwrights and Hargreaves' genius first saw the light, only to be destroyed again and again by mobs of furious workmen, who regarded machinery as nothing else but ruination to their hand labor. But in Benjamin Hick's day comparative peace reigned, and the British workman had begun to understand that machinery was not his enemy, but a friend, and, in fact, the only means by which he could earn a living.

In the early thirties, the Union Foundry was doing its full share in the production of cotton machinery, stationary engines and locomotives, and Benjamin Hick was in the front rank of his profession, although his name is not prominent in history, for he belonged to that large class of practical engineers, who, although not originating anything particularly new, did much to develop and perfect the high speed steam engine as we have it to-day. He was in close touch with John George Bodmer, the inventor of the balanced engine. Bodmer had hired shop room and power at the Union Foundry, where he built his first double-piston balanced stationary engine in 1834. As far as the present writer knows, Benjamin Hick was the only engineer to recognize the importance of this invention and to encourage Bodmer to proceed in its development; but, at that time no one could be brought to see the advantages of a more uniform rotative effort, due to an engine having a plurality of cranks or turning points, and balanced locomotives were not built until about 10 years later. Hick himself patented a three-cylinder locomotive in 1834, but there is no evidence that an engine on this plan was ever built.

Rothwell, Hick & Rothwell built at least seven locomotives for the United States, one of them being the "Pioneer," built in 1832 for the Petersburg Railroad, a drawing of which was published in the *Railroad Gazette*, of April 12, 1901, page 251.

About 1833, Hick retired from the above firm and founded the Soho Iron Works at Bolton, under the name of Benjamin Hick & Sons. Here the construction of locomotives was continued, many engines being built, including five for the United States during the years 1834-37. Hick designed and constructed for the Soho Iron Works the then most powerful hydraulic press in the world, which was made use of by James Nasmyth (the inventor of the steam hammer), who was indebted to Hick for his practical help in designing and building the machinery for the Bridgewater Foundry. Nasmyth acknowledged that Benjamin Hick was a man whose judgment

in all matters connected with mechanical engineering was held in the very highest regard. In 1848, when Faraday called on Nasmyth to furnish for one of his lectures at the Royal Institution some striking example of the power of machinery in overcoming the resistance to penetration in the case of some such material as cold malleable iron, a slab of steam-hammered malleable iron five inches thick was placed in Hick's press and the punched slab, together with the punched out disk, were sent to Faraday. Such a matter would be of no interest to-day, but great was the wonder of the Royal Institution audience when the punched plate was placed upon the lecture table.

About 1845, William Hargreaves, a relative of the inventor of the spinning jenney, joined the firm which was then reorganized as Hick, Hargreaves & Co., which title it has since retained, and the writer is indebted to the present members of the firm for the use of a few of the original drawings of Benjamin Hick's locomotives, and reproductions of three of them are presented herewith. John Hick, Benjamin Hick's son, made these drawings, and drove every engine on its trial trip. Fig. 1 shows the "Soho" freight engine, built in 1834. It is a rare example of a British engine, with outside steam pipes. The cylinders were 13 inches diameter by 18 inches stroke. Driving wheels, 66 inches diameter. The throw of the outside cranks was one inch longer than that of the inside cranks. The wheels were cast iron, with wrought iron tires. There is a note in Benjamin Hick's papers that he took out the "Soho" for the first time on November 21, 1834, and that the engine worked very well. It ran on a short railway which connected Bolton with Kenyon junction on the Liverpool and Manchester Railway. The Bolton and Kenyon road came into existence under rather peculiar conditions, for there were two separate companies, although the total length of the two lines was only 9¾ miles. On March 31, 1825, the Bolton & Leigh Railway Co. obtained an act to build their line, which they did on the understanding that the Liverpool and Manchester Railway would pass through Leigh, according to George Stephenson's original plan. The Liverpool and Manchester bill was defeated in 1825, but a new bill was introduced in the following year, proposing a more direct route, which would pass through

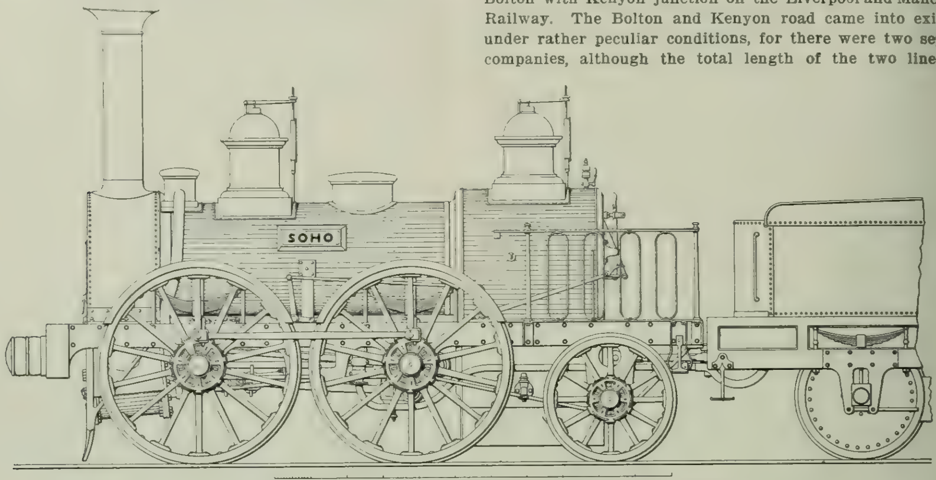


Fig. 1—Freight Engine; Boston & Kenyon Railway, 1834.

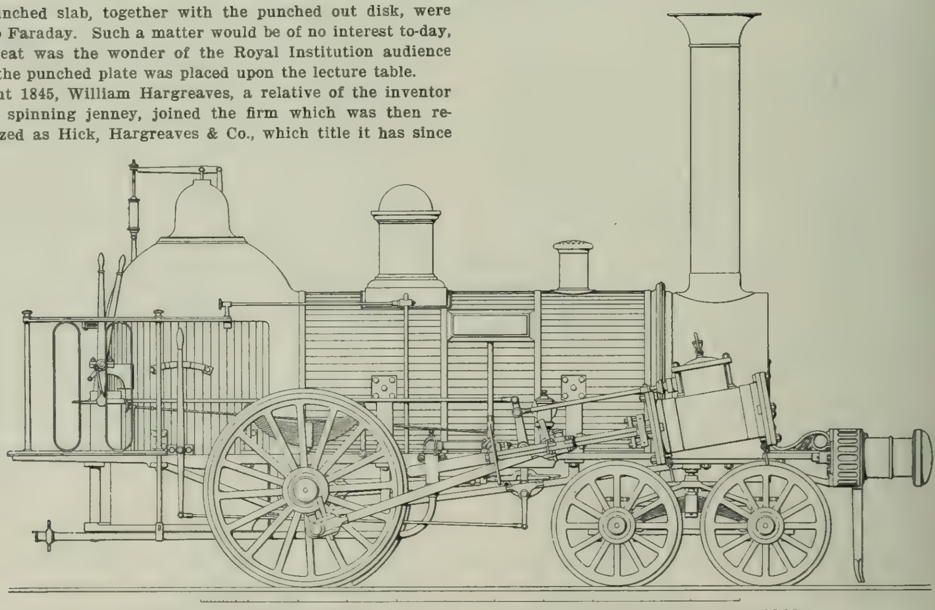


Fig. 2—Engine for the Lickey Incline; Birmingham & Gloucester Railway, 1840.

Kenyon, 2½ miles south of Leigh. This left the Bolton & Leigh road stranded, so that a link had to be supplied, and a new company was formed and obtained an act in 1829 to build a line from Kenyon to Leigh. The former was opened August 1, 1828, and the latter on January 3, 1831. The two roads were laid with fish-bellied rails, 35 lbs. to the yard, and ballasted with small coal. The grades were rather steep, averaging 1 in 42, and the line was partly worked by stationary engines. In 1840 the combined companies had 14 engines, Hackworth's celebrated "Sanspareil" being one of them, and some of the trains worked through to Liverpool. In 1845, these roads and the Liverpool and Manchester were amalgamated with the Grand Junction Railway, which a year later joined the Manchester and Birmingham to form a part of the present London and North-Western system.

Fig. 2 shows an engine built by Hick & Sons in 1840 for the Birmingham & Gloucester Railway, which is now a part of the Midland Railway, and the present writer is indebted to Mr. R. M. Deeley, locomotive superintendent of the latter road, for a list of the original Birmingham & Gloucester engines, which has been useful in preparing these notes.

The Birmingham & Gloucester Railway, which was opened in 1840, had a steep gradient called the Lickey incline, the rise being 1 in 37. When the engineer, Captain Moorsom, applied to British builders to furnish the motive power, they declined to undertake the contract, and Captain Moorsom, who was familiar with the working of American locomotives, placed an order with William Norris, of Philadelphia, who built altogether about 16 engines for the road in question. They were of the well-known Norris design, having outside inclined cylinders, a leading truck, and a pair of driving wheels in front of the firebox. The cylinders were variously 10½ inches diameter by 18 inches stroke, and 12½ inches diameter, by 20 inches stroke. Driving wheels, 48 inches diameter. Weight about 21,500 lbs.

Captain Moorsom had previously visited the United States and was favorably impressed with American engines, hence his prompt action in placing an order with Norris when he found that British builders, through want of energy or progressiveness, were unequal to the occasion. This proceeding brought him much trouble, for, of course, the American locomotives were sharply criticized by British engineers; but they had a few champions, headed by Captain Moorsom. The working pressure of the engines was 62 lbs. on the inch, but the critics claimed that the actual boiler pressure was over 100 lbs., which accounted for their hauling capacity. It is possible there was some truth in this assertion, for the present writer has been informed by old American engine-drivers that at least one firm, in order to acquire the reputation of building "smart" engines, constructed their spring balances in a way so that when steam was blowing off, the actual pressure in the boiler was far above that to which the index was set, and that some explosions resulted from this reprehensible practice. However that may have been, the Norris engines filled the requirements, but by a narrow margin, and it was soon found necessary to double-head the trains or use one engine as a pusher. A correspondent in the *Railway Times* of November 28, 1840, complained that two of the Norris engines were required to haul passenger trains of only 4 or 5 coaches up the Lickey incline, and wondered if horse traction would not be cheaper. The *Worcestershire Chronicle* of March 3, 1841, had the Birmingham & Gloucester Railway report for the previous year, in which it was stated that the company did not intend to have any more American engines, and that locomotives were then being made in England for the company on the same construction as Norris'.

It appears that about nine engines were so built, six by Nasmyth and three by Hick, one of the latter being shown in the accompanying engraving already referred to. A memorandum of Benjamin Hick's reads as follows: "April 20, 1840, John went to Birmingham to take particulars of engines for the Birmingham & Gloucester Railway, from designs by Captain Moorsom." These Hick engines of the American pattern were named "Breedon," "Spetchley" and "Eckington." The principal dimensions were: Cylinders, 10½ in. diameter by 20 in. stroke. Driving wheels, 48 in. diameter. A further note by Benjamin Hick, dated October 29, 1840, states that "John took the 'Breedon,' one of the Birmingham & Gloucester engines, to Birmingham."

It will be seen that Captain Moorsom followed the Norris design very closely, the working parts, especially the drop-hook motion, being distinctly American. Some of the other

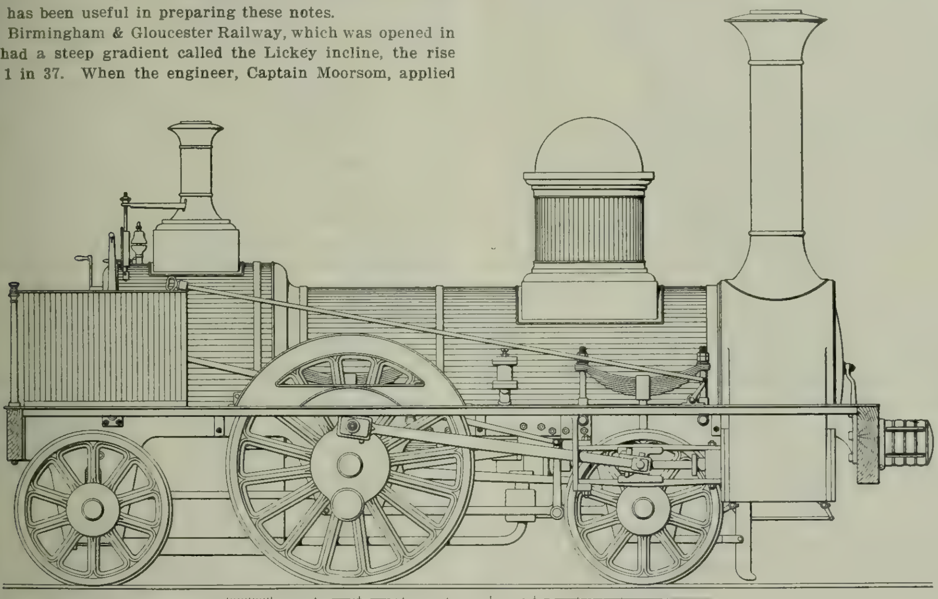


Fig. 3—Express Engine; Edinburgh & Glasgow Railway, 1847.

parts are of the English cut, such as the spring buffers, smokestack, Hick's standard lock-up safety-valve, with perforated cover, and sand dome—which was doubtless liberally drawn from on the Lickey incline. The spring buffers, which were uncommon in the year 1840, would seem to indicate that these engines were used as pushers.

Altogether, it is not seen why these engines should work any better than Norris', and it is probable the latter were generally satisfactory, and that Captain Moorsom desired to perpetuate the design, but gave the orders to English builders on more or less patriotic grounds.

Fig. 3 illustrates an express passenger engine built by Hick & Sons in 1847 for the Edinburgh & Glasgow Railway. The cylinders were 15 in. diameter by 22 in. stroke. Driving wheels, 66 in. diameter. The trailing axle boxes had a transverse spring.

The Edinburgh & Glasgow was opened in February, 1842. For five years it stopped at Haymarket, Edinburgh, 1¼ miles short of the present station. The grades and curvature of this road are favorable, except the Cowlairs incline at the Glasgow end, which has a rise of about 1 in 45, about three-fourths of a mile being in a tunnel. Trains on this incline were originally worked by stationary engines, but in 1843-44 heavy six-wheels coupled locomotives were put in service and worked well, but were found to be too heavy for the track, the rails of which were only 58 lbs. per yard. In 1847, the locomotives were withdrawn from service and the rope traction was resumed. In 1865 this road was amalgamated with the North British Railway Company, which has worked the line ever since.

MECHANICAL REFRIGERATION IN RAILWAY TRANSPORTATION.

BY JOSEPH H. HART,

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Mechanical refrigeration occupies an anomalous position in the railway world to-day, at least in comparison to its development along other lines. It is a recognized axiomatic condition among refrigerating engineers in general that ice can be manufactured and sold much cheaper than it can be harvested and stored and finally transported to market after its production under natural conditions. Thus natural ice under normal conditions is no real competitor of the artificial variety. Its existence in the market to-day is recognized as the result of specially favorable conditions of production, storage, or transportation, or to the fact that the artificial variety is not produced in sufficient amounts to satisfy the demand.

Again, in 90 per cent. of the commercial developments in which ice was formerly a prime necessity, mechanical refrigeration has resulted in its elimination and the substitution of the latter process as more efficient and equally satisfactory for the purposes at hand. This development has been almost universal in practically all modern applications, with the exception of its utilization in railway transportaton. In the latter field the necessity of refrigeration in the transportation of perishable products has increased by leaps and bounds, especially in the last few years, and the end is not yet in sight. Again, the recent heavy congestion in the freight departments of many of the railways, and the steady diminution in car-miles per day as the result of modern conditions, only tend to augment the difficulty. In spite of these conditions the great majority of railways still continue to use natural ice and often transport it long distances, and even in the small percentage of cases in which mechanical refrigeration is used, it is for the sole purpose of making the artificial variety, which is then used and often transported for refrigerating purposes in place of the natural product.

Practically no attempt has been made to utilize mechanical refrigeration directly with the consequent elimination of the ice in the utilization of the refrigeration, and this in spite of the fact that mechanical refrigerating engineers almost as a class believe the problem one of easy solution. The result has been that manufacturers of this class of machinery have come to regard the railways as difficult customers, and have diminished their attempts at new installations, and to a certain extent minimize the difficulties which must be met in this development, and hence do not thoroughly appreciate and understand them.

The railways, on the other hand, have approached the subject from an unbiased viewpoint, but a few unfortunate experiences in attempts at utilizing mechanical refrigerator cars have put them on their guard and have led them to believe that the claims of increased efficiency for mechanical refrigeration should be taken with a grain of salt, or that operative railway conditions were not thoroughly understood and appreciated. The fact of the matter is, that the mechanical refrigerator car is primarily a power plant requiring the best of care and attention for its operation and the maintenance of high efficiency. It is further complicated by the production of mechanical refrigeration, which requires a constant supply of cold water for the efficient operation of the condenser. Again, the minuteness of the unit, from an engineering point of view, has limited the efficiency, in comparison to the larger types, to such an extent that its utilization, even if mechanically perfect, becomes questionable. This is especially the case, in view of the fact that even stationary plants of equal refrigerating capacity have had their efficiency questioned in comparison to the natural process, except under abnormal conditions of operation, such as locality, or extremely favorable power supply. Under the circumstances, therefore, attempts at development of the mechanical refrigerator car have been ill-advised, to say the least.

The railways can well afford, however, to overlook this minor development, and investigate the whole field of mechanical refrigeration with a view to its efficient development in their line, since progress in other fields has been eminently satisfactory, and the difficulties met with here are not insurmountable from a broad engineering viewpoint. The real difficulty lies in the fact that practically all refrigerating engineers are absolutely unfamiliar with railway requirements and necessities, and, on the other hand, the average railway engineer knows nothing about mechanical refrigeration, the various types available, and the conditions for best operative efficiency.

To begin with, let us consider the subject of mechanical refrigeration from the point of view of the railway. In the first place, mechanical refrigeration is not a necessity in the operation of the average railway, as most refrigerating machine manufacturers and engineers seem to think, and they are right in demanding a very great increase in efficiency and convenience to warrant the universal installation of refrigerating plants with their high first cost and large operative expenses, in view of the fact that their operation would be extremely limited in regard to time of service and very variable in regard to load. The time limitation can be well illustrated by the statement that the refrigeration is used only for the transportation of fruits, vegetables and meats, and that this freight is essentially seasonable in character. The variable character of the demand can be shown from the single statement that last season 20,000 tons of ice had to be shipped a thousand miles into California to take care of a 5 per cent. increase in the citrus crop alone, and that this percentage increase was not a simple 5 per cent. increase in crop production, but represented simply the increase in the demand for refrigeration, a service furnished at the option of the shipper, and hence voluntary and very variable in character.

Perishable products are transported with ventilation or icing, or a combination of the two, ventilation alone

being used during the winter months, and the character of the shipment in summer being largely a function of weather conditions and dependent for choice upon the shipper. Icing and ventilation are both used during the summer months. Some commodities require ventilation as well as icing for their best preservation. Bananas take minimum refrigeration, requiring a mean temperature of 68 deg. F., whereas meats often are frozen, and other fruits require temperatures ranging from 34 deg. F. up to normal. Thus the character of the refrigeration, as well as its amount, is extremely variable. Ice has been used with considerable success, but with certain limitations thus far. It does not cool off the commodity quickly enough for its best preservation. Thus experiments undertaken by the National Bureau on shipments of oranges show that these are preserved best at a temperature of about 35 deg. F., and that in iced shipments from California to New York, the fruit often arrives at a temperature considerably over 40 deg. F. The ice has merely retarded the processes of decay, and preliminary cooling only has been going on during the entire time of shipment. Outside of this feature, the use of ice has proved very economical. It can be obtained often at minimum expense from an indefinite number of points along the right of way, if harvesting by the railway is desired, or it can be purchased to best advantage in the open market. Transportation charges are merely nominal, or at rock-bottom prices, and can be neglected if desired. Commercial ice is not a necessity, and very poor grades can be readily used. The peculiarly favorable position of the railways in regard to ice harvesting and freight control is responsible for the hold that natural ice has in this field in comparison to mechanical refrigeration, and is the cause which renders it so difficult of dislodgement. The transportation of the ice may or may not be a distinct source of profit, and a very large amount of money is invested to-day in modern refrigerator cars fitted especially for the use of ice and ventilation under present standard conditions. On the other hand, the transportation of perishable products by this means is recognized as extremely unsatisfactory, both from the railways' and the shipeprs' standpoint. Car shortage is always a matter of the gravest import and is always present as a serious problem, since the maximum demand is always many times the average working load. Delays in transit are always accompanied by serious loss, and the trouble of reicing under such conditions keeps the railway constantly under strain. The constantly increasing average delay at both ends of the consignment is also another serious problem, and the situation is becoming of graver significance with each succeeding year. Great progress over former conditions has been accomplished by the use of ice, and it has fitted itself into normal railway operation, with considerable dissatisfaction, it is true, but with a degree of certitude never even approached by mechanical refrigeration in this field.

On the other hand, the situation from a refrigerating viewpoint is equally interesting. Commercial ice, that is, clear, solid ice with good qualities, can be manufactured by large-size plants, of a size not abnormal and quite common in commercial work, at a cost of less than 50 cents a ton with continuous yearly operation, whereas the natural product costs nearly twice as much per ton when cost of harvesting, loss in storage, and transportation charges are considered. What is known as commercial ice is not necessary for transportation purposes, and ice to be used in this development can be manufactured at a considerable saving over the figure given. Again, ice itself is manufactured at considerable refrigerating loss and is not necessary for the utilization of the refrigeration, which is used directly in very many developments. In the preservation of perishable products, absence of moisture is fully as important a factor as low temperatures. Melting ice always causes an excess of moisture, and it is only partially removed by the ventilation which is much more than is necessary, with the consequent cut in freight capacity per car in transportation of this character. It is not too much to say that in this kind of transportation the gain due to icing is often almost compensated by the additional loss due to excessive moisture, and especially is this the case if sufficiently low temperatures are not obtained, as has been found to be the case in the great majority of cases in which pre-cooling has not been carried out. This explains the reason why simple ventilation occupies such a large position in the transportation of perishable products. Reicing becomes of the greatest importance often on account of conditions developed by the melting of the original ice charge and the presence of excessive moisture combined with a comparatively small rise in temperature. In the opinion of the average refrigerating engineer, the use of ice in conjunction with fruit especially is very objectionable, and equally good results would be obtained if means were available to keep the car abnormally dry under all conditions, both of weather and cargo. Sufficient attention has not been paid to this phase of the problem, and it is a particular advantage of mechanical refrigeration, that when used directly without ice as an intermediary, the moisture problem is solved as well, since the moisture is frozen out almost as efficiently as it can be removed by any form of dryer. In cold storage warehouses, brine is cooled by the refrigerating machine and then circulated through pipes in the cold storage chamber. No liquid of any kind comes in contact with the consignment or with the air circulating about this, and what moisture is present in the air is deposited to a large extent on the pipes carrying the cold brine. Cold brine is much more easily transferable and can be handled readily. Whereas it has a considerably smaller refrigerating capacity per pound in comparison to ice, it can be packed much closer and in out-of-the-way places, so that these factors compensate each other to a very great extent. The use of brine is becoming very general in comparison to that of direct refrigeration, on account of its large refrigerating capacity in case of shut-down, and problems connected with its use are thoroughly understood. Mechanical refrigeration is becoming very general, and in any of the standard types possesses great reliability. It is even used to the extent of several thousand tons capacity for the purpose of freezing the moisture out of the blast in iron furnace operation, and under the circumstances it seems inexplicable that it has practically no hold in railway refrigeration.

The situation in the railway world to-day in regard to mechanical refrigeration is about as follows: Until quite recently, fully 90 per cent. of all refrigeration was accomplished by the good old fashioned method of filling a box at one end of the car with ice at more or less irregular intervals or stations. A small portion of this ice was of the artificial variety, but the most of it was obtained wherever possible, and often only when needed. The mechanical refrigerator car was practically dead—a few, not much over a dozen, operated by private interests, were straggling around, their owners almost invariably ready to complain of unjust treatment or biased tests at the hands of the railways or special icing interests. A few commodities, notably the banana trade, had gone in boldly for mechanical refrigeration, and were operating under private interests with marked success. Pre-cooling plants were in a more or less experimental stage, where they still are, although their progress to date seems to warrant their ultimate installation as a general feature in this type of transportation development. Now, it can be said that the railways have become more fully alive to the possibilities of the situation. This has come about through the results obtained in the banana trade, and by means of pre-cooling station, as well as indirectly through certain developments in mechanical refrigeration.

The installation of a series of refrigerating stations throughout the country by the United Fruit Company for the refrigeration of bananas in transit in train-load lots was a step in the right direction, and has presented important economies. The refrigeration of bananas itself is a special

problem, since they are preserved best at a temperature in the neighborhood of 68 deg. F., and a variation of over 10 deg. F. in either direction is accompanied by disastrous results. Moisture is also a much more deadly enemy than usual, so that the use of ice was very objectionable, both on account of the non-control of the temperatures, and on account of the excessive moisture present with its use. Cold air was the refrigerant finally decided upon, with marked success. The installations are in reality a series of pre-cooling stations, the contents of the cars being cooled at one station and then carried on as far as the refrigeration lasts, without other cooling to the next pre-cooling plant. The necessity of heavy ventilation was also one of the reasons governing the selection of this type. In one of these stations large quantities of air are cooled by being carried over cold brine or ammonia piping, and this air is then conveyed through troughs to the train shed, where it is injected through canvas ducts into as many as fifty cars at one time. It takes a comparatively few hours to cool the contents of the cars by this means to the requisite temperature. A final charge of air is then inserted, traps are closed, and the train is ready to go as far as the refrigeration lasts, and often several days' travel exists between stations. Ventilation is necessary, and this cuts down the refrigerating effect greatly, otherwise much longer distances could be covered without recooling.

The pre-cooling plant exists in several government experimental stations, in plants under the management of the railways, and in some few cases individual enterprise has developed small ones. Then necessity has arisen from the fact that ordinary icing is inadequate, since many commodities have been found to travel all the way from California to New York before the initial step in preservation, the production of the requisite temperature, had been accomplished. The banana development has not been placed under this class, although it belongs there, because the use of ice is eliminated there entirely, and because air only is used. The average pre-cooling plant is simply a cold-storage warehouse, with facilities for rapid cooling rather than continuous preservation, and often possesses special facilities for cooling in bulk, or for rapid transfer to cars after cooling. No standard type exists as yet. Practically all are different either in minor or more important features. Thus there are plants in which the contents of the car are cooled in position in the car, after which the car is closed, and the ice bunker filled, whereupon it is ready for transportation. The advantage gained by this procedure is three-fold. The contents of the car attain the requisite low temperature for preservation before shipment, and maintain it throughout transit, thus accomplishing a large diminution in the loss entailed during transportation and a great improvement in the character of the shipment at destination, both for selling and further preservation purposes. The cutting down of the duty required of the ice, since it is used only for the maintenance rather than the production of the low temperatures in the car contents, results in a much smaller consumption of this commodity, re-icing becoming practically unnecessary, except under abnormal conditions, and the initial amount as well is much reduced. Again, owing to the lower initial temperature, conditions less favorable for the production of moisture by deterioration of the cargo, exist, and the necessity of much ventilation is eliminated. This acts in two ways, both to cut down the refrigeration loss due to ventilation, and to further increase the capacity of car by rendering available for cargo space which was formerly required for ventilating purposes. The extent to which this latter factor enters can be readily seen from the statement that the standard car for shipping oranges generally contains 384 boxes, the remaining space being required for satisfactory ventilation, whereas with pre-cooling a car can and does carry from 550 to 580 boxes, and does it better and more satisfactorily than is accomplished under normal conditions. This is a great advantage, but the detention of the car for pre-cooling purposes often takes several days, so the gain is more imaginary than real in its effect on car shortage and total car capacity.

In addition to the car unit pre-cooling plant there have come into existence, especially on the Santa Fe and Southern Pacific in California, a number of cargo unit cooling plants, which operate more satisfactorily in many ways. It has been found that the time required for satisfactory pre-cooling is directly proportional to the size of the package undergoing refrigeration. The chief delay in car unit pre-cooling plants is due to the time required to satisfactorily cool the interior portion of the contents of the car, especially when close packing has been undertaken on account of the advantage gained by this procedure. The chief difficulty in the operation of these plants is in getting men to work at loading in these low temperatures, and in the loss in refrigeration encountered during this latter process. However, the car unit pre-cooling plant possesses the inherent disadvantage of time loss, since lowering of temperature for pre-cooling still further is impracticable without freezing exterior of car contents, so that the cargo unit plant will undoubtedly become the common type except in developments similar to that existing in the banana trade. Pre-cooling plants, as far as their present development is any criterion, can be assumed to have come to stay and this situation undoubtedly presents mechanical refrigeration in a new aspect to the railway world. Two very efficient types of mechanical refrigerating plants exist on the market to-day, both using ammonia as the refrigerating agent. They are known as the compression type and the absorption system respectively, and have had very variable relative efficiencies. The absorption system possesses the possibility to-day of utilizing exhaust steam from other developments in a very efficient manner in its operation, and it will undoubtedly become much more prominent in this field in the future than it has in the past. The problem of suitable distribution of pre-cooling plants by the railways, and their operation by them, or their installation and maintenance by the communities which they benefit, is but in its inception, and is bound to present many additional subsidiary problems before its final solution. The fact that such plants operate only a limited portion of the year in the performance of this duty, and that their cost is such as to require often continuous operation to make them efficient devices, is one of the most significant features of their development.

Undoubtedly, however, this development is along right scientific lines and opens the door for the possible ultimate solution of the perishable freight problem. As has been said, the two systems of ventilation and icing are both in common use, and the latter is only necessary during stated periods. Maintenance of low temperatures, once attained, is now recognized as dependent simply upon insulation, and the time will undoubtedly come, when, with suitable pre-cooling, icing of any kind will be unnecessary, owing to the very satisfactory insulation of the cars in preventing advent of heat into their interior. Suitable devices for the maintenance of satisfactory hygrometric conditions in transit will be the next step in advance. There may, however, be an interim, during which small refrigerating plants, attached next to the engine, and used for refrigerating the entire train in emergencies, or even continuously, will be used, and their development is dependent simply upon the ability of refrigerating engineers to produce a satisfactory unit for this purpose. The single mechanical refrigerator car is undoubtedly an unsound scientific development and much less will be heard of it in the future than has been in the past. Developments of wide reaching sifinificance are scheduled for the immediate future in this field. The entire development cannot be foretold, of course, but the immediate lines are obvious and will lead on to far-reaching changes.

WORK OF THE PITTSBURGH MERCHANTS' & MANUFACTURERS' ASSOCIATION.

The Merchants' & Manufacturers' Association of Pittsburgh was organized for the purpose of advertising the many advantages of Pittsburgh as a market, and also to bring about closer co-operation between the shippers and the transportation interests. In pursuance of this policy, it created the position of traffic manager for the purpose of handling the questions arising with the transportation companies.

Among the questions originally suggested for consideration by the traffic manager were those of freight rates and freight claims. Upon consideration, however, the Board were unanimously of the opinion that it would be a mistake for the Association to undertake the collection of freight claims, realizing as they all did that many of the claims were purely "policy" claims; that is, those which might be said were filed more because of the effect on future routing of freight than because of any legal liability. It was also felt that were the Association to handle these claims and be unable to have all of them settled in favor of the various claimants the members of the Association would in time feel as badly towards the Association as they would against the railroad, because the claims were decided against them. While the Association did not take up the question of the legal liability regarding freight claims, it did from time to time take up with the railroads questions regarding the prompt settlement of claims, and in such matters the railroads endeavored to get prompt decisions.

Some inquiry regarding the freight rates clearly indicated that many of the members of the Association were not fairly in touch with the rate situation. For example, on westbound shipments from Philadelphia the first-class rate to Altoona and points west was 38c., while the eastbound rate from Pittsburgh to Altoona was 33c., and it was not felt that the rates were consistent with the mileage. Reversing the situation, however, it was found that the eastbound rate from Pittsburgh to Philadelphia was only 38c., and Pittsburgh could go practically as far East for 33c. as Philadelphia could go West for 33c., so that on eastbound shipments Pittsburgh operated under the same conditions as Philadelphia did on westbound shipments.

In another case attention was called to the fact that the rate to a town in West Virginia was higher from Pittsburgh than from Cleveland, Ohio, and it was felt that this was an injustice, inasmuch as geopraphically the town was much nearer to Pittsburgh than Cleveland. Inquiry developed the fact that the shortest distance by rail was about 10 miles less from Cleveland than from Pittsburgh. It was also learned that the practice of the Pittsburgh roads was to divide the Norfolk & Western into two groups, and that the rate from Pittsburgh to the eastern group was less than from Cleveland, while the rate from Cleveland to the western group was less than from Pittsburgh. The railroads were willing to name the same rate from Pittsburgh to all points on the Norfolk & Western that was given to Cleveland, but inasmuch as the Pittsburgh manufacturers and jobbers were already shipping a greater tonnage to points in the eastern group than they could possibly hope to sell to cities and towns in the western group, they decided it was to their advantage to continue working under the existing rates. On the other hand, occasionally a classification or rate was found to be unfair, and several such cases were subsequently adjusted. For example, while shipments of bolts, nuts, rivets and washers were made in carload lots, the shippers were required to forward them in boxes, kegs or barrels, the original cost of which was considerably more than the cost of gunny bags, and there was also an extra freight charge for the additional weight. The railroads changed their rules so as to permit the forwarding of these articles in gunny bags, thus saving the shippers about $40 per car on shipments to Kansas and other western points. The large differential in the freight rate for wrought and cast iron was overcome, and also lower rates were cheerfully given on leather shipments to Texas; also on other commodities to which attention was called.

The heavy tonnage of the Pittsburgh district, especially on account of the iron and steel business (the iron and steel being shipped not only to all points in the United States, but to practically all points on the globe), had in previous years through competition betweeen various lines resulted in giving to Pittsburgh favorable rates as compared with other iron and steel centers, and after reviewing the situation it was felt that only in exceptional cases would the rates need revision.

On making inquiry to determine why operating under rates equally favorable to those of other jobbing centers, Pittsburgh was not getting its fair proportion of the tonnage, it was found that in many cases the freight from Pittsburgh was reaching destination from 24 to 48 hours later than from other jobbing centers located at an equal or greater distance from Pittsburgh.

The Association then purchased a number of reply postal cards, one-half of which contained a letter to the consignee, and the other half, which was addressed to the traffic manager of the Association, was filled out by the consignee to show what the shipment consisted of, the date of the shipment, the name of the road and station to which delivered, the date of arrival at destination, the number of days in transit, and whether or not the articles and service were satisfactory. Some eighteen or twenty thousand of these postal cards were received the first year, and gave the Association full information regarding the time in transit by the various roads out of Pittsburgh to the cities drawing on Pittsburgh for their supplies.

Where poor time in transit was a rare occurrence, the matter was not taken up with the railroads, but where it was a chronic condition the matter was taken up, and where justified by the tonnage an understanding was had between the Association and the railroads that they would put on through cars, giving service equal to or better than that of other jobbing centers.

Immediately upon the inauguration of this improved service the Association wrote to merchants in the different towns affected thereby, calling their attention to the improved service and to the fact that an additional market was thus opened to them, and inasmuch as the improved service was of mutual benefit to the two cities, asked that they lend their co-operation to secure a sufficient tonnage to warrant the continuance of the service.

In addition, the merchants of Pittsburgh from time to time put their traveling men in the field to solicit business on the strength of the improved service, and in this way,—the railroads improving the service and the shippers co-operating to secure the tonnage to justify the maintenance of the same—they were able to materially enlarge the territory served by the Pittsburgh jobbers.

In quite a number of cases, where outlying cities and towns were served by two or more roads, it was found that jobbers were dividing their patronage among the various lines, and none of the roads had sufficient tonnage to be able to guarantee through car service, but by concentrating the shipments via one line it was possible to secure tonnage sufficient to justify through service and thus avoid handling freight at transfer stations, thereby reducing the cost and at the same time quickening the delivery at destination.

In some cases the tonnage was not sufficient to justify the maintenance of a through car service, and in these cases the merchants were satisfied that they were not entitled to a continuance of the service and it was withdrawn and the cars placed in through service to other points for experimental purposes.

In a number of cases, where the tonnage was not sufficient to justify the maintenance of through car service daily, an

understanding was reached with the railroads by which they agreed to operate such service either every other day or twice a week (and in a few cases only once a week), and on their part the shippers agreed to hold their freight and deliver it to the railroads on the agreed shipping dates. Any delay in forwarding the freight from Pittsburgh was more than overcome by avoiding the delays en route incident to passing the freight through transfer stations. Notwithstanding the restricted dates for shipping, this service was much appreciated by the consignees, in that it assured them of regular dates for delivery and prevented loss and damage to freight in transit, thus enabling them to give better service to their patrons.

Among other things developed in connection with the study of the through car service was the fact that most of the railroads had two or more stations in Pittsburgh which received freight for the same point, and that there was not enough freight at one station to justify through cars and this necessitated transferring it en route, causing a delay of at least 24 hours. To overcome this the shippers agreed to make the deliveries to only one station, thus insuring sufficient tonnage for a through car. This secured for the shippers quick delivery, and increased business, while it materially reduced the expense of the railroad company for handling and the losses en route.

Also it was found that frequently the consignee would report the freight as being 24 or 48 hours late when the railroad would insist that it reached destination on time, and investigation developed that the draymen who had contracted to handle the business for the consignee was not giving it proper attention, and was allowing the freight to lie at the station an unnecessarily long time and cause the transportation company to be charged with bills for delay for which they were in nowise responsible.

In tracing many shipments which failed to reach destination promptly, it developed that they had been poorly packed or improperly marked, or not marked at all. Upon calling the attention of the shippers to the delay which ensued through this improper packing and marking they renewed their instructions to their people to have the freight properly packed and marked.

Both the merchants and the railroads were agreeably surprised at the results obtained from the improved service. It resulted in the traffic of the Pittsburgh merchants with the several cities and towns being increased anywhere from 50 to 600 per cent. and in some cases, especially in the handling of fruit, the increase in less than carload business and the ability to make prompt and regular deliveries resulted in shipments in carload lots where formerly no sales were made by Pittsburgh merchants in either carload or less than carload lots—the supplies being obtained from other markets.

The results obtained by the through car service, namely, the very material increase in the shipments by the jobbers clearly indicated that the original conclusions of the Association were correct, and that the trouble was not one of rates, but was one of service, and the business materially developed as the service was improved without any change in the freight rate,—but in a large measure, this could only be brought about by close co-operation between the shippers and the transportation companies.

After putting on the through car to one point the tonnage rapidly increased until it amounted to about 18,000 pounds of less than carload freight per day, and one hardware merchant in that town stated that where formerly he had not spent a dollar in Pittsburgh that during the first year of the through car service he bought $50,000 worth of hardware in Pittsburgh.

At another point the deliveries originally averaged about 8 or 9 days, while the through car service gave third morning delivery. In three months' time the less than carload tonnage had increased from 3,000 to 12,000 pounds per day.

At another point the service was somewhat irregular, being sometimes first morning and at other times when passing through lines and transferred, second morning delivery. The first month the through car service was increased 2,126 pounds per day. The first week one firm started making shipments of fruit in less than carload lots, where formerly no shipments could be made owing to the irregular service. During the second week they commenced making shipments of fruit in carload lots, and have since developed a very desirable business.

Similar results were obtained at practically all other points where the improved service was inaugurated.

The railroads checked up the freight on hand at the local freight houses, and found it was moving very slowly; in many cases the merchants preferring to pay storage charges rather than move the freight away promptly. The attention of the merchants was called to the fact that this resulted in the piling of the freight on the platform to a height of 15 to 18 feet, and that it necessitated handling the freight several times in order to get the particular shipment called for, thus increasing the damage to shipments and very materially delaying the teams at the stations. As a result, the shippers agreed to assist the railroads, and caused their freight to be taken from the stations promptly, thus reducing the cost of handling and the losses at the freight houses, and benefiting the shippers by reason of discontinuance of delays to teams.

The railroads also called attention to the blockading of yards owing to slow loading and unloading of cars placed on team tracks or industrial sidings, and the shippers overcame a great part of this delay.

In connection with the soliciting of business, the merchants of Pittsburgh got up semi-annual excursions, and from 100 to 125 of the merchants would take a five or six day trip, visiting the cities and towns within a radius of 250 miles of Pittsburgh. A special train, consisting of baggage car, dining car, and eight or ten Pullman cars was chartered for the purpose, and stops were made at all important towns en route. Usually they were received at the depot by a committee of merchants, and after an informal reception visited the stores handling their respective lines of goods. Little or no attempt was made to solicit business on these trips, but the merchants were requested when in Pittsburgh to drop in and see the member of the firm who had called on them, and this acquaintanceship resulted in many merchants coming to Pittsburgh.

The Association also got up a series of inbound excursions, and for specified periods agreed to give the incoming merchants a reduction of 1 per cent. on all purchases made. They also made a special effort to see personally the incoming merchants, and in some cases provided some form of entertainment so as to make their stay pleasant and cause them to desire to return in the future.

One thing developed by these inbound excursions was the fact that where the merchants remained at home and made all their purchases from traveling salesmen they endeavored to divide their orders among all the salesmen regularly calling on them, but after the inauguration of the inbound excursion the merchant saved his orders for some time prior to making the trip, so as to take advantage of the much larger selection of goods which could be seen on display in the several stores.

One of the many advantages secured by the co-operation of the shippers of Pittsburgh was in the acquaintanceships formed among the merchants of Pittsburgh, many thus becoming acquainted who had been in business for 20 and 25 years within three or four blocks of each other, but without being acquainted. Following this acquaintanceship, the men joined together in working for the good of the city, and where one jobber could not supply all of the things desired by a customer, he took special pains to see that the customer was placed in touch and under favorable terms with other shippers in the city who were handling the class of goods desired.

RAILWAY CAPITAL AND VALUES.*

BY W. H. WILLIAMS,

Third Vice-President, Delaware & Hudson Company.

The present agitation for a physical valuation of the railways appears to be the result of a misconception on the part of the Interstate Commerce Commission some twenty-one years ago of Section 20 of the Act to Regulate Commerce. Section 20 contains a provision to the effect that the Commission may require the carriers to show in their annual reports "the cost and value of the carrier's property, franchises and equipments." Overlooking the permission thus granted, Prof. Henry C. Adams, statistician of the Interstate Commerce Commission, in his first, and again in his second annual report, after stating that satisfactory and conclusive information respecting the cost of railways in the United States could not be obtained, suggested an inquiry by the government for the purpose of obtaining "a trustworthy estimate of the relation existing between the present worth of railway property and its cost," and declared that "the work thus outlined is indeed a prodigious one."

Subsequently, the desire of Governor Pingree to find a means of increasing railway taxation in Michigan gave Professor Adams an opportunity to experiment with his project within the limits of that state.

In its annual report to Congress for the year 1903 the Interstate Commerce Commission devoted several pages to a discussion of such a valuation as proposed by Professor Adams, concluding with the non-committal recommendation "that Congress take this matter under advisement with a view to such legislative action as may be deemed appropriate."

Physical valuations of railway property have been made, or are under way, in Michigan, Wisconsin, Texas, Minnesota, Virginia and Oregon. The Interstate Commerce Commission made an investigation, in 1900, of the value of railway property as expressed by the market quotations for railway securities, and, again in 1904, in co-operation with the Census Office, prosecuted an elaborate inquiry concerning the "commercial valuation." The latter inquiry was under the direct charge of Professor Adams, and its results are to be found in Bulletin No. 21 of the Census Office. It is, perhaps, dissatisfaction with the results of these inquiries which has impelled the Commission to seek authority to make another and at least equally extensive and costly effort to obtain a valuation by another untried and different method, and in accordance with an entirely different series of definitions.

The first evidence of official interest in this proposal, outside of the office of the Commission, is to be found in a letter bearing the date of March 17, 1906, which President Roosevelt addressed to the Interstate Commerce Commision, as follows:

"It seems to me that it would be a very desirable thing to have a valuation made of the railway properties. I do not know how much time this would take or how much money it would cost, and whether or not there are objections to having it done, or even if it could be done without the action of Congress. At your leisure I should like your opinion on these points."

In reply the Commission forwarded to the President a letter from Professor Adams, recommending an inventory by competent engineers, classifying the physical elements of railway properties, and assigning to each its appropriate present value, such classification to conform to the classification of construction expenses prescribed by the Interstate Commerce Commission. For the valuation of the surplus or franchise value he recommended the plan used by himself in the State of Michigan. It was stated that the prime motive for the valuation would be its bearing upon the work of the Commission in the determination of just and reasonable rates. In this letter Professor Adams gave a year and one-half as the period probably necessary for such a task, and declared that the Michigan experiment cost the people of that state approximately $5.50 per mile. On the same basis of cost such an inquiry covering the whole United States would require an expenditure of not less than $1,750,000 (exclusive of any expenses on the part of the railway).

*An address before the New York Traffic Club.

On December 20, 1906, and again on December 4, 1907, Senator La Follette introduced a bill to amend the Act to Regulate Commerce so as to provide for the determination of the "fair value" of the railways. In the Commission's letter of March 25, 1908, to the chairman of the Senate Committee on Interstate Commerce, it strongly opposed the phrase "fair value," claiming that like the word "reasonable" it involved judicial determination, and therefore was not "exactly suitable as a direction to the official body in charge of this work concerning the manner in which it shall be prosecuted." They suggested the substitution of a phrase, indicating that Congress desired "an inventory valuation of railway property," *i. e.*, that the property of the several railways be listed in detail, and that each kind or class of property so listed shall have assigned to it a valuation to be determined from the point of view of the contracting engineer, and not from the point of view of a court or board of arbitration, which, from the nature of the case, cannot judge of what is "fair value," except in the light of some specific use to be made of the valuation.

It is to be noted that in the correspondence with the President the Commission advanced a specific use to be made of the valuation, while in their correspondence with the Senate Committee on Interstate Commerce, they objected to the determination of the "fair value," as it could only be used in the light of some specific use to be made of the results.

The recommendation of the Commission that the valuation of material in place be ascertained instead of "fair value" is best understood in connection with the following paragraph in the report on valuation of the roads in Michigan:

"Another potent reason justifying the plan selected, as afterwards developed, was the necessity of treating the problem strictly as an engineering problem in order to obtain uniform results. It was necessary to employ a large number of engineers expert in railway work, and while they could agree as engineers they could not agree as experts on taxation. It very soon became necessary to publish an order excluding all thought of taxation in connection with the results to be obtained. The commissioners required of us only the cost of reproduction and the present value of a road, reserving to themselves any adjustments of these values that might be thought necessary to secure uniformity of taxation."

This is tantamount to an admission of inability to secure a valuation possessing sufficient merit to make it useful for a specific purpose.

The plan advocated by the Commission corresponds so closely to that followed in valuing railways in Michigan that a study of the methods followed, and the results obtained in that state will throw considerable light on the larger project, its potential utility or lack thereof. The following allowances were made over the estimated cost of material in place:

Engineering and superintendence	4	per cent.
Legal expenses	0.5	"
Interest during construction	3	"
Organization	1.5	"
Contingencies	10	"

It should be borne in mind that this valuation was undertaken solely for purposes of taxation. The valuation was obtained in the following manner:

PHYSICAL PROPERTIES.

(1) The cost of reproduction was assumed to be what it would cost to reproduce the road at the average prices prevailing for the period of the preceding five years, entirely new in every particular, in, say, two or three years' time, if the entire railway were eliminated —its right of way, yards, stations, and terminals passed into other hands and occupied by just such woodlands, waste lands, farms, industries, and residences as those now existing in and on the adjoining country and property.

(2) The present value of the physical properties was assumed to be an amount equaling the cost of its reproduction minus the amount covering the depreciation in value from time, wear, tear, etc.

(3) In determining the land valuation, the land was classified according to population of the country through which it passed, and where possible, there was obtained the average value of property transferred within five years in the section traversed by the road, and to this an allowance was made for damages to adjoining property.

It was estimated the railways would have to pay from 100 to 125 per cent. in excess of the value as determined by adjacent property.

(4) No attempt was made to take into account the economic value of grades and curves or the absence of them—each road was appraised just as if it was a straight line, and as if its grade line were level throughout.

(5) Industrial tracks were scheduled as the property of the railway company, except where it could be shown that they did not belong to the company, but the right of way and adjacent buildings were not so scheduled unless the railway owned them outright.

(6) The rolling-stock was apportioned on the basis of the annual mileage of locomotives, passenger and freight cars and miscellaneous equipment. Where this could not be done it was distributed on the basis of main track mileage.

The "percentage condition" of rolling-stock was based on an inspection of 50 per cent. of the road's locomotives and passenger cars, and 20 per cent. of each class of freight cars.

(7) To expedite the work and insure more uniform results, a set of tables was compiled showing unit prices for all the different elements.

NON-PHYSICAL PROPERTIES.

I cannot do better than quote from Professor Adams' report to the Board of State Tax Commissioners, Lansing, Mich., under date of October, 1900:

"The rule submitted for the appraisal of the immaterial values of railway properties, or what I prefer to term the capitalization of corporate organization and business opportunity, is simple, as follows:

(1) "Begin with gross earnings from operation, deduct therefrom the aggregate of operating expenses, and the remainder may be termed the 'income from operation.' To this should be added 'income from corporate investments,' giving a sum which may be termed 'total income,' and which represents the amount at the disposal of the corporation for the support of its capital and for the determination of its annual surplus.

(2) "Deduct from the above amount—that is to say, total income, as an annuity properly chargeable to capital, a certain per cent. of the appraised value of the physical properties.

(3) "From this amount should be deducted taxes, rents paid for the lease of property operated, provided such property is not covered by the physical valuation made the basis of the annuity referred to under paragraph 2, and permanent improvements charged directly to income. The remainder would represent the surplus which, capitalized at a certain rate of interest, gives the value of immaterial properties."

In justification of the placing of a valuation on the non-physical property, Professor Adams stated in his report:

"It is understood that the object of the investigation instituted by the Michigan Tax Commissioners is to determine whether the properties imposed with specific taxes pay, upon their true value, a rate equal to the rate paid by property taxed under the general tax law. The suggestions here submitted pertain to railways organized as corporations and whose chief business is that of transportation. . . .

"It is submitted that this non-physical or immaterial element is not a simple commercial element, but includes among other things the following:

(1) "It includes the franchise—

(a) "to be a corporation;

(b) "to use public property and employ public authority for corporate ends.

(2) "It includes the possession of traffic not exposed to competition, as, for example, local traffic.

(3) "It includes the possession of traffic held by established connections, although exposed to competition, as, for example, through traffic that is secured because the line in question is a link in a through route.

(4) "It includes a value on account of the organization and vitality of the industries served by the corporation, as well as of the organization and vitality of the industry which renders the service; this value, consequently, is, in part, of the nature of an unearned increment to the corporation."

In Michigan the cost of reproduction, when new was estimated at $202,716,262, and the then present value was $166,398,156. The value of the non-physical properties was estimated by Professor Adams at $35,814,043, making the total then present value $202,212,199, or $504,063 less than the estimated cost of reproduction when new, or 0.2 of 1 per cent. It is, of course, evident that the method thus outlined makes the estimate of value of non-physical property wholly dependent upon the rates of interest used. Interesting evidence of this is to be found in the fact that while Professor Adams valued the franchises of the Michigan Central Railroad at $18,259,880, another economist of equal distinction, Prof. Emory R. Johnson, of the University of Pennsylvania, and a former Isthmian Canal Commissioner, computed the value of the same franchises as $3,227,000. The methods used in both cases were identical, except as to the rate of interest assumed to be applicable.

There is little, if any, difference in the basis used in the several states for determining the cost of material in place. That basis may, among other things, be critisised as follows:

(1) No allowance is made for discount on securities sold.

Discount is a partial capitalization of the commercial risk had in making the investment, and it increases or decreases in proportion to the probability of the earning power of money under existing conditions. Not only is this practice justified by long-established commercial usage, but also by judicial determination.

(2) The interest during construction (3 per cent.) is less than a fair and reasonable return on the investment.

(3) No allowance is made for working capital with which to carry on the business.

(4) No allowance is made for wear and tear of material during the period of construction. Assuming eight years to be the life of a tie, and three years the period of construction, a substantial percentage of the period of usefulness is over before the road is in operation. The use of the rails before the track is put in proper line and surface hastens the time when they must be removed.

(5) No allowance has been made for impact and adaptation. After the line is placed in operation, each fill will sink 1 ft. for every 10 ft. of height. The slope of cuts must be increased to prevent landslides and washouts. The ballast will pound into the roadbed, necessitating additional ballast to secure a standard cross-section.

(6) A uniform price for earthwork was used, thus ignoring the varying character of the soil and length of haul.

(7) A uniform price list for all materials was used, thus ignoring the source of supply and cost of delivery to point of use.

(8) No allowance was made for interference with work on account of labor troubles, condition of the weather, etc., which would vary materially in the different counties of the same state.

(9) No allowance is made for carrying charges until such time as the road was placed on a revenue basis.

The basis of the valuation of the non-physical property in Michigan is also subject to criticism, namely—no consideration has been given to the leasehold interests. In some cases the leased property is operated at cost, and all revenue goes to the operating company. In others the road is operated at a loss, while in the case of union depot and terminal companies they are usually operated on the basis of cost, and no allowance is made for interest on investment.

Therefore, it will be seen there remain to be determined many questions vitally affecting the value of the property without regard to its value as a "going concern."

There should be no difference in the basis of arriving at the value, as a "going concern," of the property of a railway and any industrial establishment, nor should there be any difference in the basis of valuation for taxation or other purposes. There is common to both the value due to location, good will, etc.

In the case of real estate a corner store will sell for more than the adjoining store, or, if leased, will bring a greater rental, although the two stores may be part of one building and built on the same kind of soil. That there are other intangible values attached to property was shown in the damages assessed in connection with the construction of the elevated railway in New York City. Damages were awarded on account of partial shutting off of light, interference with ventilation, or because of the increased dust and noise. In the manufacturing and commercial pursuits "good will" frequently is considered of greater value than the tangible assets. That it is which gives value to the trade-mark.

(*To be continued.*)

General News Section.

The Queensboro (Blackwell's Island) bridge, New York, was opened for pedestrians and vehicular traffic on March 30. No connections for surface or elevated lines have yet been made.

The Strang gasolene electric motor car "Irene," which has been in test service on the Chicago & Alton out of Bloomington, Ill., has been sent to the St. Louis, Iron Mountain & Southern, where it will be used in similar service. This car was described in the *Railroad Gazette*, May 29, 1908, p. 731.

The plans for contract No. 23 on the New York State barge canal from Kingsbend to Rochester, 5.63 miles, and contract No. 30, for locks and other improvements from Little Falls west to Sterling Creek, 14.62 miles, have been approved. The cost of the two contracts is estimated at $4,900,000.

It is announced in the city of Mexico that the National Railways will at once begin keeping the best possible check on their conductors, with a view to having cash fares properly and fully returned to the treasury; and, as usual, the reporter who goes around among the conductors reports that there is a big stir on the subject. The conductors are threatening to strike, and a grievance committee is to appeal to the higher officers of the road. Mexican conductors, like some conductors in the United States, seem to see no impropriety in thus taking a position which appears to involve approval of stealing. It was in Mexico City not long ago that an effective check was put upon misuse of cash fares by street car conductors by the use of a lottery. Each conductor had to give to the passenger a receipt and the receipt was a ticket entitling the holder to a chance of drawing a large cash prize. Such receipts of course would not be lightly thrown away.

Lectures at the University of Minnesota.

Edward P. Burch, Consulting Engineer, Minneapolis, is giving a course of ten lectures on "Electric Traction for Railway Trains" at the College of Engineering of the University of Minnesota. The lectures include: History of Electric Traction; Advantages of Electric Traction; Characteristics of Steam Locomotives; Characteristics of Electric Locomotives; Motor Car Trains; Electric Railway Motors; Power Required for Trains; Steam, Gas and Water Power Plants; The Transmission System; Electrification of Railways.

New York to Chicago in 16 Hours 30 Minutes.

A special train over the New York Central and the Lake Shore, which was run from New York to Chicago last Sunday to carry F. A. Vanderlip to the bedside of his dying mother, traversed the distance of 959 miles in 16 hours 30 minutes, equal to 58.12 miles an hour. The train started from Mott Haven yard, which is about five miles out from the Grand Central station, making the distance through 959 miles, as before stated. The record of the train, condensed, is as follows:

March 27:	
Left Mott Haven	11:40 p.m.
March 28:	
Arrived Albany	2:15 a.m.
Left Albany	2:18 "
Arrived Syracuse	4:55 "
Left Syracuse	5:03 "
Arrived Buffalo.*	7:34 "
Left Buffalo†	6:39 "
Arrived Cleveland	9:25 "
Left Cleveland	9:27 a.m.
Arrived Toledo	11:23 "
Left Toledo	11:26 "
Arrived Elkhart	1:23 p.m
Left Elkhart	1:26 "
Arrived Chicago	3.10 "

*Eastern time.
†Central time.

The unusual delays were as follows: Scarboro, to take on Mr. Vanderlip, five minutes; low speed through Poughkeepsie, two minutes; supplying car with water at Syracuse, six minutes; stop at Englewood, to leave Mr. Vanderlip, five minutes. This train, like all others, had to run at restricted speed from Whiting to the Chicago terminus, about 15 miles. The best runs made by the train were from Buffalo to Erie, 88 miles, in 77 minutes, equal to 68.57 miles an hour; and from Toledo to Elkhart, 132 miles, in 117 minutes, equal to 67.69 miles. The train consisted of five cars, weighing about 420,000 lbs. It was started out of New York on about an hour's notice, and, in the absence of special preparations, such engines had to be assigned to the train as were readily available, and this was the case throughout the run. Only one car was needed, of course, for the passenger, but the other cars were put on to make sure of the best possible brake power.

This is the best run on record for so great a distance, though the regular 18-hour trains have often made up much lost time. Most of the best runs on record are given in the *Railroad Gazette* of December 15, 1905, page 566, and on page 100 of the Locomotive Dictionary.

Proposed Passenger Subway for Illinois Central in Chicago.

Chicago newspapers report that the Illinois Central, in connection with the proposed electrification of its suburban service, has a scheme for a subway in the downtown district of that city. The road has only two suburban stations adjacent to the business district, both on the lake front, and therefore off to one side, necessitating considerable walking on the part of most of the passengers. The plan reported to be under consideration is for an underground loop which would give the suburban trains direct access to the retail stores and office buildings. One account has it that the subway will start at Forty-seventh street, some five miles out from the business section.

This mention of the Illinois Central's plan comes in connection with the publication of the preliminary findings of a municipal commission on the construction of street railway subways in the congested business district, which the papers say will be started within two years. As these subways are to be under all of the down-town streets, the papers, which at first were unable to find any room for the Illinois Central's loop, proceeded to expand the same into a great belt subway to link together all of the railways and in which all would have equal rights, contingent on the prior electrification of their terminals.

Illinois Central officers have declined to be quoted in connection with these newspaper reports, but the need of some such expansion of the road's city facilities for suburban business is becoming constantly more necessary and there is good reason for believing that it is being considered in connection with plans for electrifying the suburban service. The advantage to the road in its competition with the present excellent service of the street and elevated railways would be great and would undoubtedly enable it to regain traffic that it has lost to these competitors because of its present disadvantage in the matter of downtown terminals.

University of Colorado.

The fifth annual inspection trip of the senior and junior classes of the College of Engineering of the University of Colorado began on March 29. The trip covers the entire week, visits being made to the Minnequa works of the Colorado Fuel & Iron Co., the Portland Cement Company's plant at Portland, and various hydro-electric and steam plants at Shoshone, Leadville and Colorado Springs.

Responsibility of States for Railway Service.

One of the questions which the nation must soon solve is that of responsibility for railway success or failure. Under existing conditions that responsibility has certainly been taken away from the owners. They are not in full control either of the rates or of the expenditures. Does the responsibility lie with a state commission? If so, with which one, in the case of a road which operates in many states?

In one of the Rock Island states a 2-cent passenger bill was introduced some eighteen months or two years ago, and we were told by those in authority that no opportunity would be

given for the submission of figures or arguments—that the legislature had been elected on a 2-cent rate platform, and therefore the matter was closed. This act was independent of what was done by the railway commission of that state, and regardless of what had been done, or was being done, in all of the other states. If the theory is to prevail that rates shall be so adjusted as to yield a fair and attractive return to the owners, then revenues cannot be reduced piecemeal here and there without regard to what is being done by others who are active in the same cause.

The point I make is this: With the many state legislatures and state railway commissions working independently to so reduce railway revenues that too much money shall not find its way to or remain in the treasuries of the companies, and then add to these factors the right of the Interstate Commerce Commission to reduce interstate rates, and the right of the national congress to increase the cost of operation, who will be responsible if the net results are not such as to keep things moving?—B. L. Winchell.

Train Robbers at Denver.

On the night of March 24 robbers took about $400 from passengers in a sleeping car on the Denver & Rio Grande, while the car was standing in the yard at West Denver, only a short distance from the Union station. The car was part of train No. 4, which came in behind time, late at night, and it was set off in the yard so that it would not be necessary for the passengers to disembark until morning. Six of the seven passengers were robbed of their valuables; one, a woman, was allowed to sleep undisturbed, in response to the appeal of her husband.

Compromise in Utah Fuel Company Suit.

Attorney-General Wickersham announced at Washington this week that by a compromise of the case of the United States v. the Utah Fuel Company the government recovers $200,000 for lands fraudulently procured, although the frauds were perpetrated by men no longer connected with its management. The Utah Fuel Company, a subsidiary of the Denver & Rio Grande Railroad, pleaded guilty to the charge of conspiracy to defraud and paid a fine of $8,000, and also paid back to the United States $192,000 for the lands unlawfully obtained, 1,440 acres in extent.

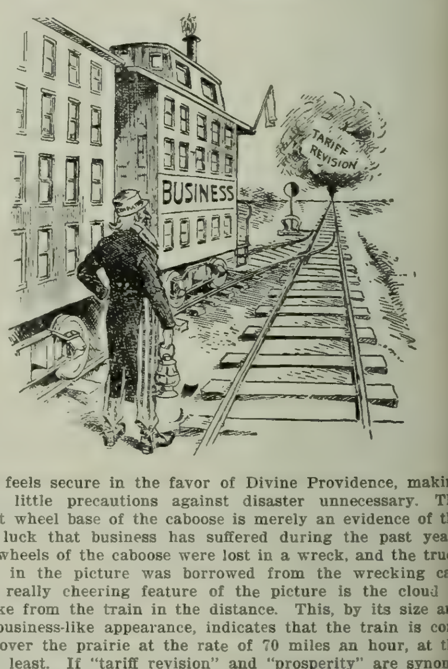
The facts that the lands on which this recovery is made had been mortaged to the Morton Trust Company, of New York, to secure a bond issue of $2,000,000; that most of these bonds were in the hands of innocent purchasers, and that any decree for the recovery of lands would have been subject to the lien of this mortgage played a part in inducing the government to compromise the case. It is further stated that the individuals indicted with the Utah Fuel Company did not appear to have been guilty of any intentional fraud or to have profited individually by the acts which led to the procurement of title to these lands by the predecessor of the Utah company.

John Fritz Medal.

The John Fritz medal for 1909 has been awarded to Charles T. Porter, Hon. Mem. Am. Soc. M. E., for his work in advancing the knowledge of steam engineering, and in improvements in engine construction. The public ceremony of the presentation of the medal to Mr. Porter will take place in the Engineering Societies' building, New York, at 8.30 p. m., on April 13. There will be addresses by representatives of the four groups of the profession most concerned, as follows: "The Debt of Modern Industrial Civilization to the Steam Engine as a Source of Power," by Dean W. F. M. Goss, University of Illinois, Mem. Am. Soc. M. E. and Am. Inst. E. E. "The Debt of the Modern Steam Engine to Charles T. Porter," by Prof. F. R. Hutton, Columbia University, Hon. Sec. Am. Soc. M. E. "The Debt of the Era of Steel to the High-Speed Steam Engine," by Robert W. Hunt, Chicago, Mem. Am. Soc. C. E. and Past-Pres. Am. Soc M. E. and Am. Inst. M. E. "The Debt of the Era of Electricity to the High-Speed Steam Engine," by Frank J. Sprague, of New York, Mem. Am. Inst. M. E. and Am. Soc. C. E.

Business Waiting.

The cut shown below comes from the *Philadelphia Record*, whose artist seems to appreciate the tediousness of waiting on a side track at a lonely way station. No adequate key is published with the picture and the reader will be obliged therefore to interpret the details for himself. The four-story effect which is seen in the view of the freight car does not mean that this is a circus train, with such a large pack of performing dogs that four-deck stock cars have to be used, but rather that every freight car detained by Congressional time-wasting means loss to a four-story woolen mill or shoe shop. The provision of multiple floors in the caboose is a feature to be criticised, for if the business train is to have a dozen conductors, as this would seem to imply, the business world will be in a poor situation to condemn Congress when it allows too many cooks to spoil the broth. The absence of guard rails opposite the frog means, presumably, that the G. O. P.



still feels secure in the favor of Divine Providence, making such little precautions against disaster unnecessary. The short wheel base of the caboose is merely an evidence of the bad luck that business has suffered during the past year; the wheels of the caboose were lost in a wreck, and the truck seen in the picture was borrowed from the wrecking car. The really cheering feature of the picture is the cloud of smoke from the train in the distance. This, by its size and its business-like appearance, indicates that the train is coming over the prairie at the rate of 70 miles an hour, at the very least. If "tariff revision" and "prosperity" are synonymous this little romance should soon have a happy ending The conductor has got his badge on one-sided, and we are a little bit afraid that the caboose does not clear; the switch is old-fashioned, and such a thing as an up-to-date system of fixed signals appears to be entirely foreign to the thoughts of the management of this railway; but in such little details as these we may safely trust to the Railway Business Association to guard us from all evil!

Afternoon Tea on P. R. R. Pullman Cars.

The Pennsylvania Railroad now furnishes tea and coffee free to all passengers in Pullman parlor or sleeping cars at any hour of the day. The passengers will feel as English as though they were on an ocean steamer. This is the way the innovation strikes the Pittsburgh *Gazette-Times:*

"The most stupendous revolutions are those that come quietly. Thus unheralded came a little order issued to Pullman conductors of the Pennsylvania Railroad yesterday, decreeing that henceforth 'tea and coffee will be served in Pullman cars free of charge,' which service is to be performed by the porters, who 'shall not accept from passengers any

gratuities therefor.' This means that the great corporation, the world's model railway, has joined the ranks of those who go about doing good. We should not be surprised to hear the announcement next that bridge tables will be installed, that the company will furnish cards and prizes, and that the porters are to keep the score. A box of caramels for every section is a logical sequence, and bunches of violets are next in order." * * *

Southern Association of Car Service Officers.

The semi-annual meeting will be held on April 15 at the Piedmont hotel, Atlanta, Ga. Reports are expected from the Committee on Discussion and Arrangements and the Committee on Interchange, Per Diem and Car Service.

Canadian Society of Civil Engineers.

A meeting of the Mining Section was held on April 1. An authorized announcement was made by Dr. J. B. Porter in regard to the manufacture and qualities of Monel metal, followed by brief papers on the metallurgical and physical qualities of the metal, by Dr. A. Stansfield and Prof. E. Brown. Specimens of the material were exhibited.

New York Traffic Club.

At the meeting of the Traffic Club of New York on Tuesday evening last a paper was presented by O. P. Austin, Chief of the Bureau of Statistics of the Department of Commerce and Labor, on transportation throughout the world. Mr. Austin has lately made a tour of the world, and gave particular attention to canals and other waterways, and to the means of transportation in China and other countries not well supplied with railways.

Traffic Club of Chicago.

At the annual election on March 30, three tickets, the following officers were elected: President, Oscar F. Bell, Crane Co., Chicago; First Vice-President, Fred Zimmerman, Michigan Central; Second Vice-President, J. C. Madison, Montgomery Ward & Co., Chicago; Third Vice-President, W. H. Johnson, Pennsylvania Railroad; Treasurer, John H. Grace, Great Northern; Secretary, John T. Stockton, Joseph Stockton Transfer Co., Chicago; Directors for two years: F. T. Bentley, Illinois Steel Co., Chicago; D. W. Cooke, Erie; G. H. Ingalls, New York Central; F. B. Montgomery, International Harvester Co., Chicago.

It was announced that 5,000 sq. ft. on the 18th floor of the New LaSalle hotel has been rented for club rooms, to be ready September 1. The present membership is 545.

Western Canada Railway Club.

The Western Canada Railway Club was organized in February. Meetings are to be held in Winnipeg, Man., on the second Monday of each month except June, July and August. The officers are as follows: Honorary President—Wm. Whyte, Second Vice-President, C. P. Honorary Vice-Presidents—M. H. McLeod, General Manager, C. N.; G. J. Bury, General Manager, C. P.; G. W. Caye, Asst. to Vice-Pres. & Genl. Manager, G. T. P.; W. Phillips, General Manager, Winnipeg Elect. Ry. President—Grant Hall, Supt. Motive Power, C. P. Vice-President—A. E. Cox, General Storekeeper, C. N. Second Vice-President—L. B. Mirriam, Div. Chief Engr., G. T. P. Secretary—W. H. Rosevear, 199 Shestnut street, Winnipeg. Treasurer—E. Humphrys, Chief Clerk to S. M. P., C. P. Executive Committee—E. W. DuVal, Secretary to Genl. Mgr., C. P.; S. J. Hungerford, Supt. of Shops, C. P.; W. R. Smith, Supt. of Shops, C. N.; R. R. Neild, Genl. Foreman of Shops, C. P.; C. W. Cooper, Asst. Genl. Passr. Agent, C. N; J. McKenzie, Purch. Agent, Winnipeg Elect. Ry.; L. O. Moody, Mgr. Northwestern Brass Co. Audit Committee—L. O. Genest, Genl. Storekeeper, C. P.; A. H. Mulcahey, Purch. Dept., G. T. P.; A. Shields, Master Mechanic, C. N.

Chicago Railway Club.

The following officers and directors of the new Chicago Railway Club have been elected: President, W. B. Barr, Vice-President, W. J. Leahy; Secretary, C. Nyquist; Treasurer, H. E. R. Wood; Board of Directors, W. B. Barr, E. J. Engle, Charles G. Hall, Herbert Hasse, H. E. Pierpont, W. J. Leahy, F. H. Tristram, E. P. Skene and E. L. Bevington. Th first meeting will be held at the Auditorium Hotel on Friday evening, April 2.

The object of the club is stated in the constitution and by-laws to be to secure for the members and for the transportation companies they represent the benefits that flow from personal acquaintance among the members and the constant interchange of ideas and experiences. Those eligible to membership are executive and other officers, chief clerks and men holding co-ordinate or superior positions with railway and steamship companies and traffic associations. The admission fee will be $5 and the annual dues $20. It is expected to get club rooms soon.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York; May 19, 1909; New York.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.
International Railway General Foremen's Association. E. C. Cook, Royal Insurance Bldg., Chicago; June 1 5; Chicago.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D Vought, 95 Liberty St., New York; 3d Friday, in month, except June, July and August; New York.
North West Railway Club T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug; St. Paul and Minn.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association. J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
St. Louis Railway Club. B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.
Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H R. R.R., East Buffalo, N. Y.; September, 1909; Denver
Western Railway Club. J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month except June, July and August; Chicago
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Chicago, Milwaukee & St. Paul on March 28 began running its Pioneer Limited, its "crack" train between Chicago and St. Paul, in two sections. The first section will reach St. Paul at 7:15 a.m.

The Burlington has announced that on May 23 it will put on a new passenger train between Chicago and Denver. It will leave Chicago daily at noon.

The Pacific Northwest Demurrage Bureau had 71,687 cars reported in February, 1909, with 3,553 cars held overtime and 0.95 per cent. of cars released in free time.

The Buffalo, Rochester & Pittsburgh announces that the free time allowed for unloading coal and coke after April 15 will be 48 hours. At present the allowance is 72 hours.

An officer of the National Railways of Mexico denies the report that the government is to make a general revision of rates. An extensive revision, resulting mostly in increases, was made about two years ago.

The Wisconsin Demurrage Bureau reported 86,308 cars in February, 1909, as compared with 83,539 in the same month for 1908. The average day's detention by the railway was 0.17 this year and 0.16 in 1908. The average day's detention by consignee was 1.35 this year and 1.56 last year, making the total day's detention 1.52 days in February, 1909, and 1.72 days in February, 1908.

The National Railways of Mexico, now controlled by the government and operated as a single system, have given notice that ticket agents will sell tickets over practically any route between two points which a passenger may desire to take. For example, a passenger from the city of Mexico to Porfirio Diaz may go by way of Torreon or by Monterey, or over parts of both lines.

Frank Barry has been appointed Manager of the Syracuse (N. Y.) Traffic Bureau. Mr. Barry was formerly connected with the traffic departments of the Missouri Pacific, the Wabash and the Chicago, Milwaukee & St. Paul, later a traffic man for commercial interests, and for the last year or two chief of the traffic division of the New York State Public Service Commission, Second district.

The committee on Common Carriers of the Texas House has reported against the passage of a 2-cent fare law. It opposes the bill on four grounds: First, that such legislation would tend to reduce the wages of railway employees; second, if it did not have this tendency it would tend to increase freight rates; third, it would hinder the development of railways in Texas; fourth, the Railroad Commission has investigated the subject and decided that at present the roads could not stand a 2-cent fare.

The notice recently given by the trunk lines that they would reduce rates on grain from Buffalo to New York on the opening of navigation, was followed the next day by announcements from Montreal that the Canadian Transportation Co. would make a rate of 5½ cents a bushel from Fort William to Montreal. The Grand Trunk Railway will, no doubt, make a rate from Georgian Bay to meet that of the water lines. All of these reductions apply to export shipments only. As there will be no terminal charges at Montreal, shippers there calculate that their rate will be nine mills a bushel better than the rates through New York.

Business men representing more than 20 towns in Oklahoma met in Oklahoma City on March 23 and discussed the boycott declared by the merchants of Kansas City against the Missouri, Kansas & Texas because that road granted Oklahoma City a reduced rate on freight from New York via Galveston. Resolutions were adopted endorsing the action of the Katy and warning the merchants of Kansas City that unless they within five days withdraw their boycott against that road the business men of Oklahoma would declare a boycott against Kansas City. An executive committee was appointed to act in case the Kansas City boycott was not withdrawn within five days. Attorney-General West, of Oklahoma, has addressed a letter to Governor Haskell, suggesting that a communication be sent to Oklahoma bankers carrying deposits in Kansas City banks, asking that they protest against Kansas City's boycott of the Katy and indicate that unless the boycott is withdrawn the reserves of Oklahoma banks in Kansas City banks will be withdrawn.

Since the first of the year the Atlanta, Birmingham & Atlantic has established a through package car service from Atlanta, Ga., to points in Alabama, Middle and Southern Georgia and Florida. Fifteen cars are run from Atlanta daily, regardless of tonnage, to an equal number of points, in addition to through car service in connection with other roads, which enables the Atlanta, Birmingham & Atlantic to make fourth day delivery, to points on its line, of merchandise from Chicago and other central western points. Its service from Chicago is operated in connection with the Chicago & Eastern Illinois, the Louisville & Nashville and the Nashville, Chattanooga & St. Louis.

It is announced that the special Trunk Lines committee appointed to consider the subject has decided to take no action in connection with the rates on import freight from Boston to the West. The recent reduction of 1 cent per 100 lbs., by the Boston & Maine, was objected to by the differential lines from New York, Baltimore, etc.; but the conclusion is that rates had better be maintained from the other ports and allow Boston to have its way; for the amount of import traffic moving by way of Boston is not large. The Boston & Albany made a reduction from Boston to meet that of the Boston & Maine, and the present conclusion is that the Boston & Albany and the Boston & Maine may adjust the matter as they please.

The Hudson & Manhattan, operating the tunnel railway between New York and Hoboken, announces that in the morning rush hours to New York and the evening rush hours to Hoboken—two hours in the morning and 2½ hours in the evening—one car of each train will be reserved for ladies; and if the experiment proves satisfactory the practice will be made permanent. This announcement follows considerable discussion in the newspapers concerning the practicability of trying an experiment of this kind on the subway express trains of the Interborough Rapid Transit Co. This question (as to the Interborough lines) is now under discussion, and the Public Service Commission, having received complaints on the subject, will hold a hearing.

The railway committees of the two houses of the Iowa legislature and G. S. Fernald, General Counsel of the Pullman Company, have entered into an agreement under which the Iowa legislature will not pass any law reducing the Pullman Company's rates in that state and the Pullman Company will make in return some substantial reductions. A bill has been pending in the legislature fixing a maximum berth rate in Iowa of $1.50 for a 10-hour trip; the present maximum rate is $2. Mr. Fernald has promised that his company within seven days will file with the Railroad Commission a schedule under which there will be reductions from $2 to $1.50 in all rates from the west bank of the Mississippi river to and including the following towns: Sanborn on the northern Iowa line of the St. Paul; Cherokee on the Illinois Central; Wall Lake on the North Western; Carroll on the North Western and the Great Western; Atlantic on the Rock Island, and Red Oak on the Burlington. The rate will be reduced from $2 to $1.50 from the east bank of the Missouri river up to and including the following towns: New Hampton on the North Iowa line of the St. Paul; Oelwein on the Great Western; Marion on the St. Paul; Cedar Rapids on the North Western; Iowa City on the Rock Island, and Ottumwa on the Burlington.

The newspapers of Illinois on March 28 printed statements to the effect that there had been an enormous increase in the earnings of Illinois railways under the 2-cent fare law. These statements purported to be based on the annual report of the Illinois Railroad Commission for the year ended June 30, 1908. The 2-cent fare law went into effect in Illinois in July, 1907. A careful inspection of the report shows that the supposed large increases were mainly mere paper increases, due to changes in methods of accounting. According to the newspaper reports the total number of passengers carried increased from 57,218,825 in 1907 to 76,842,521 in 1908. On this basis the increase in earnings from passenger traffic

was $1,906,000. It was reported also that there was an increase in mail, express and miscellaneous earnings from passenger service that increased the total earnings from passenger service by $3,079,232. But among the increases in passengers carried in Illinois shown are that of the Chicago & North Western from 2,420,207 in 1907 to 15,326,673 in 1908; that of the Chicago, Burlington & Quincy from 4,147,753 in 1907 to 8,005,341 in 1908, and that of the Chicago, Milwaukee & St. Paul, which did not report in 1907 that it carried any passengers at all in Illinois, but for 1908 reported 2,017,161. It will be noted that these increases alone aggregate almost 19,000,000 passengers. The reason for these abnormal increases is that in previous years the railways reported their passenger traffic on a mileage basis, the average in Illinois being, of course, pulled down by being mixed up with the traffic in such states as South Dakota and North Dakota, while this year the roads reported the actual traffic and earnings in Illinois. Eliminating the railways that have shown such abnormal increases due to changes in accounting the report shows that the other roads of the state in 1908 carried 51,200,000 passengers as compared with 50,335,000 in 1907, an increase of about 865,000. The total revenue from freight service in 1907 was $120,621,000 as compared with $112,782,000 in 1908, a decrease of $7,139,000.

INTERSTATE COMMERCE COMMISSION.

Yarding-in-Transit.

National Lumber Co. v. San Pedro, Los Angeles & Salt Lake. Opinion (825) by Commissioner Lane. Case No. 1897.

Prior to August 28, 1906, defendant allowed shippers a yarding-in-transit privilege on lumber shipped from San Pedro to Los Angeles and subsequently reshipped to other destinations. This privilege was not covered by published tariff. Shippers were denied the benefit of this privilege between August 28, 1906, and June 1, 1907, when it was made effective in defendant's regularly established tariff. Reparation cannot be awarded because a carrier has ceased to grant an unpublished privilege, which amounted to nothing less than a departure from the legal tariff, and that transit privileges cannot be given a retroactive effect.

Discrimination Against Denver.

George J. Kindel v. New York, New Haven & Hartford et al. Opinion by Commissioner Clark.

Complaint alleges that, generally, rates from the Missouri river and east thereof to Denver, Colo., and from Denver to Utah common points are discriminatory, unreasonable and excessive. The present adjustment of rates is discriminatory against Denver, in favor of Kansas City and other Missouri river crossings, and the class rates from Chicago and from St. Louis to Denver are excessive and unreasonable, and they should be reduced. Further, the class rates from the Missouri river to Denver and from Denver to Utah common points are unreasonable and excessive, but no order will be entered herein reducing those rates, as it seems obvious that they must be readjusted in harmony with the principles announced in the *Spokane case*, either through voluntary action of the carriers or in some other proceeding before this commission.

Discrimination Against Indianapolis.

Indianapolis Freight Bureau v. Pennsylvania et al. Indianapolis Freight Bureau v. Illinois Central et al. Opinion by Commissioner Clark.

Complaint alleges unjust discrimination against Indianapolis, Ind., in that the long-established relationship of rates between Indianapolis on the one hand and St. Louis and the Ohio river crossings on the other hand has been departed from in adjusting rates on sugar and on coffee from New Orleans, La., and from Atlantic seaboard points to Indianapolis and to St. Louis and the Ohio river crossings.

Departure from the former relationship of rates on sugar from New Orleans to Indianapolis and to St. Louis and the Ohio river crossings is not unjustly discriminatory against Indianapolis, because the rates on sugar from New Orleans to St. Louis and to the Ohio river crossings are controlled by potential water competition; but it is unjustly discriminatory against Indianapolis to depart from the former relationship of rates on coffee as between Indianapolis and St. Louis and the Ohio river crossings, because such rates on coffee are not controlled by the water competition.

Rates on sugar from Atlantic seaboard points to St. Louis and the Ohio river crossings are controlled by the water-controlled rates from New Orleans and therefore it is not unjustly discriminatory against Indianapolis to depart from the former relationship of rates on sugar from Atlantic seaboard points to Indianapolis and to St. Louis and the Ohio river crossings; but it is unjustly discriminatory against Indianapolis to depart from the former relationship of rates on coffee as between Indianapolis and St. Louis and Ohio river crossings, which are not so controlled by water competition.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has issued an order that whenever a carload shipment of lumber moves over two or more track scales, whether the shipment be over one road or more, the car shall be weighed by the carrier on the first scales over which it passes, and upon the weight then found the freight charges shall be assessed, provided that in case of dispute by the consignee as to the correctness of the weight, the carrier shall, when there are track scales at the point of destination, re-weigh the car on them, and if there is a difference in the two weights the freight bill shall be corrected to conform with the last weighing. For the re-weighing of the car the consignee shall pay the carrier performing the service $1.50 when his contention is not substantiated to the extent of 1 per cent., and the only additional free time allowed on such a shipment shall be from the time the consignee orders the car re-weighed until he shall receive written notice of the re-weigh. Re-weighing must be done in the presence of the consignee if he so requests.

Pennsylvania: Affording Terminal Facilities to a Competitor.

Manufacturers' Association of York v. Northern Central and the Western Maryland. Opinion by Chairman Ewing.

The Northern Central, one of the Pennsylvania lines, built its line into the city of York, Pa., in 1876. In 1893, two roads, one of which has since been taken over by the Northern Central and the other by the Western Maryland, made an agreement by which they bound themselves to exchange cars at the nearest convenient point for delivery to consignees on lines of their respective roads, the agreement to apply only to certain territory in the city of York and not to any other territory. The company receiving the cars was to deliver them at cost, but since this service was to be performed at cost, in practice the delivering company uses its own locomotives to haul cars over the tracks of its competitor to delivering points within the specified limits of the city.

Shippers situated in York but not within these specified limits complain that the refusal of the companies to allow the free interchange of cars at York is an unjust discrimination. While the Interstate Commerce Commission law recognizes the common law principle that competing roads do not necessarily have to afford terminal facilities to each other, yet it is the opinion of the commission [of Pennsylvania] that if these facilities are afforded to certain shippers located at York, they should be afforded to all shippers at York. The commission while not deciding conclusively that the granting of trackage rights for delivery and receipt of freight at York is affording terminal facilities as between competitors, nevertheless says that these privileges must be afforded to all shippers at York, and finds that the present agreement, which may have been logically enough the outcome of a compromise, is, as a matter of fact, a discrimination against certain shippers, that is, those who are not located within the limits specified by the original agreement of 1893. They therefore recommend that some arrangement be made so that all shippers at York are put on an equality as to the receipt and delivery of cars of the Western Maryland and of the Northern Central.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.
(See also issues of March 5, 12, and 26.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atlanta & West Point	93	$46,927	$32,527	$85,662	$12,140	$14,821	$4,479	$28,142	$4,441	$64,023	$21,639	$167	$2,461	$19,345	$8,159
Atlantic & St. Lawrence	167	86,752	14,080	115,614	6,360	18,568	2,605	36,378	3,819	67,730	47,884	.....	6,846	41,038	35,078
Atlantic City	167	43,575	29,071	77,371	22,056	11,356	936	55,148	289	89,785	12,414*	3,781*	7,000	23,195†	‡23,120
Bessemer & Lake Erie	201	219,468	17,608	242,802	35,715	93,703	6,081	94,478	9,101	239,078	3,724	.....	6,000	2,276†	‡19,329
Cincinnati & Muskingum Valley	148	38,215	14,182	57,005	10,375	8,456	1,925	25,424	7,204	53,384	3,621	.....	3,360	261	‡6,705
Cleveland, Lorain & Wheeling	194	141,713	15,462	162,489	24,401	46,096	5,984	82,148	7,291	165,920	3,431*	.....	9,406	12,837†	54,471
Cleveland Terminal & Valley	93	58,335	11,176	75,658	11,982	7,443	1,358	36,267	1,712	58,762	16,896	.....	3,359	13,537	‡236
Coal & Coke	191	35,990	8,517	46,336	7,220	13,027	650	13,887	2,257	37,041	9,295	6,814	3,500	12,609	7,775
Cincinnati Northern	248	61,131	12,438	77,139	10,676	17,877	2,596	32,309	2,615	66,073	11,066	.....	4,100	6,966	12,145
Duluth & Iron Range	168	54,406	16,611	78,916	32,230	34,685	607	51,801	9,179	128,502	49,586*	2,466*	3,391	55,443†	‡17,329
Eastern Ry. of New Mexico	227	36,093	32,922	73,176	11,377	4,644	1,106	20,940	2,207	40,274	32,902	.....	3,481	29,421	15,367
Fort Smith & Western	221	36,733	16,365	56,136	18,622	13,880	1,185	17,991	2,657	54,338	1,798	.....	7,000	5,202†	‡19,307
Chicago Terminal Transfer	90	6,827	1,324	77,545	9,547	23,783	715	40,677	4,782	79,504	1,959*	617	14,482	15,824†	‡214
Gila Valley, Globe & Northern	125	64,808	10,651	79,447	34,876	10,297	562	17,965	1,684	65,384	14,063	.....	1,900	12,163	‡3,620
Green Bay & Western	225	32,121	10,264	45,993	6,972	9,542	534	14,987	2,457	34,492	11,501	.....	1,736	9,765	72
Houston, East & West Texas	191	69,312	21,824	96,837	22,627	9,482	1,330	41,963	3,209	78,611	18,226	.....	4,808	13,418	14,825
Indianapolis Southern	179	42,877	15,515	62,046	8,958	13,620	1,015	33,788	1,625	59,006	3,040	.....	2,392	648	7,506
International Ry. of Maine	233	88,288	17,695	112,916	12,738	27,071	4,003	65,858	3,006	112,676	240	.....	5,000	4,760†	‡23,682
Lehigh & New England	170	37,124	1,014	39,116	6,331	7,153	676	14,928	3,617	32,705	6,411	.....	850	5,561	2,242
Louisiana & Arkansas	226	99,025	12,073	114,519	14,650	22,160	1,618	27,530	4,489	70,447	44,072	.....	1,760	42,312	21,736
Louisville, Henderson & St. Louis	200	53,871	28,021	87,344	15,728	7,881	3,126	29,385	3,192	59,312	28,032	86*	2,500	25,446	20,116
Mineral Range	130	57,839	3,299	62,666	11,513	10,531	354	35,253	1,134	58,785	3,881	.....	3,200	681	‡3,404
Minnesota & International	177	36,301	10,909	49,361	4,235	5,145	222	16,136	1,802	27,540	21,821	.....	1,894	19,927	‡10,330
Pecos & Northern Texas	152	54,483	25,511	84,090	14,870	6,214	1,128	28,171	3,032	53,415	30,675	.....	876	29,799	40,933
Pittsburg, Shawmut & Northern	238	48,570	6,802	57,168	8,499	14,715	1,166	25,067	6,894	56,341	827	.....	1,525	698†	27,086
Richmond, Fredericksburg & Potomac	83	74,816	69,603	167,226	24,787	21,069	1,938	57,598	4,703	110,095	57,131	.....	200	56,931	35,695
Rio Grande Southern	180	30,861	6,119	39,531	8,485	3,725	30	17,208	1,352	30,800	8,731	.....	2,200	6,531	‡8,026
Southern Indiana	237	69,467	10,958	82,350	9,438	12,662	1,473	28,699	6,215	58,487	23,863	.....	6,928	16,935	‡16,338
Southern Kansas Ry. of Texas	125	44,736	24,934	72,598	16,396	7,435	1,011	27,102	2,621	54,565	18,033	.....	1,083	16,950	85,400
Spokane & Inland Empire	168	16,370	23,994	45,647	10,683	6,101	2,076	24,417	5,951	49,228	3,581*	7,259	2,250	1,428	‡1,512
Terminal R. R. Ass'n of St. Louis	26	......	237	190,640	22,159	10,091	477	66,048	4,690	103,165	87,175	10,751	21,000	76,926	34,861
Ulster & Delaware	129	31,499	11,113	46,480	6,249	9,155	767	25,517	2,392	44,080	2,400	189	3,000	411†	12,447
Union R.R. (Pittsburgh)	31	......	......	141,741	28,149	42,766	100	89,331	3,099	163,445	21,704*	3,948	1,500	19,256†	8,826
Union R.R. (Baltimore)	9	64,227	16,355	82,349	7,697	......	318	5,054	1,604	14,673	67,676	.....	2,881	64,795	‡8,320
Washington Southern	34	25,626	33,871	79,121	5,933	10,306	839	29,402	2,130	48,610	30,511	.....	2,345	28,166	42,748
Western Ry. of Alabama	133	50,092	32,971	89,742	16,505	16,636	4,354	26,572	3,980	68,047	21,695	233*	4,835	16,627	‡166
SEVEN MONTHS OF FISCAL YEAR.															
Atlanta & West Point	93	$291,188	$242,203	$584,414	$77,219	$124,889	$28,918	$192,262	$32,277	$455,565	$128,849	$1,482	$25,106	$105,225	‡$24,156
Atlantic & St. Lawrence	167	499,186	180,743	749,821	131,465	98,564	21,891	307,982	20,024	579,926	169,895	.....	47,919	121,976	‡4,630
Atlantic City	167	369,164	599,977	1,014,731	166,792	79,476	11,231	488,845	4,324	750,668	264,063	32,229*	49,000	182,834	56,076
Bessemer & Lake Erie	201	3,639,289	193,458	3,870,659	356,326	686,066	41,273	1,012,640	66,523	2,162,828	1,707,831	.....	61,000	1,646,831	‡58,724
Cincinnati & Muskingum Valley	148	352,199	117,753	501,160	90,592	64,334	11,921	178,548	14,470	359,865	141,295	.....	28,996	112,299	‡29,932
Cleveland, Lorain & Wheeling	194	2,061,611	137,817	2,344,615	222,941	424,002	42,061	781,191	42,074	1,512,269	832,346	.....	65,845	766,501	‡111,503
Cleveland Terminal & Valley	93	480,138	101,869	623,295	79,062	60,539	9,838	259,820	11,012	420,271	203,024	.....	23,511	179,513	6,054
Coal & Coke	191	286,285	76,018	374,426	64,974	92,218	5,284	102,623	15,360	280,459	93,967	38,778	24,500	108,245	61,992
Cincinnati Northern	248	497,552	129,810	659,888	131,064	176,190	18,443	232,218	16,462	574,377	85,511	.....	26,917	58,594	17,106
Duluth & Iron Range	168	4,566,482	135,988	4,752,742	524,685	337,479	2,870	766,024	71,946	1,703,004	3,049,738	7,106	191,419	2,865,425	‡251,703
Eastern Ry. of New Mexico	227	297,124	231,215	559,331	94,082	48,738	5,723	146,916	16,128	311,587	247,744	.....	21,155	226,589	55,617
Fort Smith & Western	221	274,518	134,410	430,241	114,824	97,532	7,636	129,231	19,637	368,860	61,381	.....	45,500	15,881	‡108,855
Chicago Terminal Transfer	90	54,127	14,383	650,047	97,394	164,267	5,412	300,764	33,263	601,100	48,947	5,653	101,376	46,776†	24,233
Gila Valley, Globe & Northern	125	451,497	72,873	550,157	119,678	47,509	2,485	123,009	10,284	302,965	247,192	.....	12,793	234,399	‡100,072
Green Bay & Western	225	229,408	100,451	357,069	73,524	56,747	2,713	99,207	13,049	245,240	111,829	.....	12,835	98,994	9,286
Houston, East & West Texas	191	509,590	167,183	716,127	124,875	57,773	8,745	227,037	21,779	440,209	275,918	.....	20,867	255,051	69,887
Indianapolis Southern	179	394,770	144,821	568,395	124,797	68,469	7,824	230,521	10,390	442,001	126,394	.....	16,742	109,652	98,258
International Ry. of Maine	233	345,672	133,925	526,724	112,080	101,174	27,046	242,288	21,105	503,693	23,031	.....	35,000	11,969†	‡3,634
Lehigh & New England	170	420,080	11,583	441,562	90,925	55,569	5,944	123,746	19,094	295,278	146,283	.....	5,950	140,333	‡4,239
Louisiana & Arkansas	226	558,581	94,266	684,582	132,153	133,043	11,127	190,778	30,575	497,676	186,906	.....	10,060	176,846	‡23,670
Louisville, Henderson & St. Louis	200	339,587	235,614	608,011	116,938	53,026	24,380	192,383	20,307	407,034	200,977	2,172	17,500	185,649	49,474
Mineral Range	130	446,724	31,926	490,512	81,727	71,199	4,804	230,956	10,006	398,692	91,820	.....	24,214	67,606	‡3,455
Minnesota & International	177	220,821	94,961	337,172	64,316	36,712	1,698	103,641	12,902	219,269	117,903	.....	13,407	104,496	‡28,924
Pecos & Northern Texas	152	441,292	161,084	630,606	98,381	60,404	5,982	195,487	20,292	380,546	250,060	.....	3,879	246,181	234,145
Pittsburg, Shawmut & Northern	238	421,260	60,653	495,770	91,883	194,975	7,414	175,865	25,325	495,462	308	.....	10,863	10,555†	52,376
Richmond, Fredericksburg & Potomac	83	553,429	375,129	1,052,314	137,233	159,743	14,324	383,024	31,343	725,667	326,647	.....	1,400	325,247	131,817
Rio Grande Southern	180	268,910	69,173	361,538	71,536	20,996	823	111,864	12,469	217,688	143,850	.....	17,200	126,650	3,248
Southern Indiana	237	585,045	98,262	699,832	97,831	127,529	11,577	201,686	45,626	484,249	215,583	.....	48,499	167,084	‡198,394
Southern Kansas Ry. of Texas	125	397,408	151,732	572,205	112,595	88,177	6,157	204,510	19,097	430,536	141,669	.....	7,790	133,879	476,941
Spokane & Inland Empire	168	176,048	295,777	501,864	61,432	40,647	14,465	173,188	42,709	332,441	169,423	67,359	12,550	224,232	9,627
Terminal R. R. Ass'n of St. Louis	26	......	1,723	1,380,988	121,253	90,317	2,993	420,513	39,376	674,452	706,536	83,658	150,739	639,455	65,759
Ulster & Delaware	129	340,659	239,047	610,469	78,595	69,320	7,265	242,366	16,429	413,975	196,494	1,322	21,000	176,816	68,996
Union R.R. (Pittsburgh)	31	......	......	1,725,006	200,141	281,408	700	610,185	23,625	1,116,059	608,947	2,139	19,000	592,086	49,515
Union R.R. (Baltimore)	9	510,558	122,256	645,178	39,569	......	1,765	34,356	10,084	85,774	559,404	.....	20,171	539,233	‡142,671
Washington Southern	34	205,243	190,804	513,070	61,054	43,834	6,176	199,334	15,805	326,203	186,867	.....	16,414	170,453	109,746
Western Ry. of Alabama	133	327,860	258,556	638,287	116,161	104,736	28,305	184,350	29,477	463,029	175,258	1,328*	31,664	142,266	5,104

*Deficit. †Loss. ‡Decrease.

SUMMARY OF MONTHLY REPORTS OF REVENUES AND EXPENSES OF RAILWAYS. FOR SEVEN MONTHS ENDED JANUARY 31, 1909.

		Companies reporting.		Revenues,			Maintenance		Expenses			Net	Outside	Total	One-twelfth	
		No.	Mileage.	Freight.	Passenger.	Total operating.	Of way & structures.	Of equipment.	Traffic.	Trans-portation.	Total operating.	operating revenue.	operations net.	net revenue.	annual taxes.	Operating income.
JULY,																
1907.	Amount	770	223,877	$154,335,610	$56,465,908	$227,966,607	$32,532,992	$35,750,400	$4,304,186	$75,292,508	$152,783,745	$75,182,962	$716,921	$75,899,883	$6,781,495	$69,118,389
1908.	Amount	792	229,220	127,221,139	52,148,138	194,634,612	26,893,423	27,447,708	3,995,854	64,351,868	127,777,867	66,856,745	854,215	67,710,960	7,140,687	60,570,273
1907.	Per mile of line	...	....	689	252	1,018	145	160	19	336	682	336	3	339	30	309
1908.	Per mile of line	...	....	555	227	849	117	120	17	281	557	292	4	295	31	264
1907.	Ratio per cent.	...	....	67.70	24.77	100.00	14.27	15.68	1.89	33.03	67.02	32.98	.....	.....	.....	.....
1908.	Ratio per cent.	...	....	65.36	26.79	100.00	13.82	14.10	2.05	33.06	65.65	34.35	.....	.....	.....	.....
AUG.,																
1907.	Amount	776	224,416	$161,759,324	$61,691,128	$240,601,077	$34,029,133	$36,489,054	$4,167,425	$76,847,314	$156,543,908	$84,057,169	$977,217	$85,034,387	$6,883,371	$78,151,015
1908.	Amount	794	229,309	134,210,198	56,755,743	206,254,003	27,732,968	29,203,417	3,887,822	65,704,012	131,386,157	74,867,846	898,077	75,765,923	7,260,511	68,505,412
1907.	Per mile of line	...	....	720	274	1,072	151	162	18	342	697	374	4	378	30	348
1908.	Per mile of line	...	....	585	247	899	120	127	16	286	572	326	3	330	31	298
1907.	Ratio per cent..	...	....	67.23	25.64	100.00	14.14	15.17	1.73	31.94	65.06	34.94	.....	.....	.....	.....
1908.	Ratio per cent..	...	....	65.07	27.52	100.00	13.45	14.16	1.88	31.85	63.70	36.30	.....	.....	.....	.....
SEPT.,																
1907.	Amount	775	224,654	$159,664,897	$57,368,722	$233,735,975	$33,333,986	$36,176,765	$4,231,697	$77,475,285	$156,379,839	$77,356,135	$711,150	$78,067,286	$6,835,131	$71,232,154
1908.	Amount	792	229,406	149,099,645	53,569,234	218,399,159	28,630,240	31,640,001	3,951,368	67,687,711	136,942,269	81,456,890	635,792	82,092,683	7,376,808	74,715,874
1907.	Per mile of line	...	....	710	255	1,040	148	161	18	344	696	344	3	347	30	317
1908.	Per mile of line	...	....	649	233	952	124	137	17	295	596	355	2	357	32	325
1907.	Ratio per cent..	...	....	68.31	24.54	100.00	14.26	15.48	1.81	33.14	66.90	33.10	.....	.....	.....	.....
1908.	Ratio per cent..	...	....	68.27	24.53	100.00	13.11	14.49	1.81	30.99	62.70	37.30	.....	.....	.....	.....
OCT.,																
1907.	Amount	776	225,217	$180,467,548	$52,957,046	$250,976,436	$35,488,005	$38,958,319	$4,408,922	$83,708,710	$167,945,936	$83,030,499	....	....	$7,088,825	$75,941,674
1908.	Amount	740	227,680	165,555,298	49,008,919	231,184,082	28,045,186	33,458,045	4,065,535	72,226,189	142,952,898	88,231,184	$574,360	88,805,544	7,633,944	81,171,599
1907.	Per mile of line	...	....	801	235	1,114	157	172	19	371	745	368	.....	.....	31	337
1908.	Per mile of line	...	....	727	215	1,015	123	146	17	317	627	387	2	390	33	356
1907.	Ratio per cent..	...	....	71.91	21.10	100.00	14.14	15.52	1.76	33.35	66.92	33.08	.....	.....	.....	.....
1908.	Ratio per cent..	...	....	71.61	21.20	100.00	12.13	14.47	1.76	31.24	61.83	38.17	.....	.....	.....	.....
NOV.,																
1907.	Amount	673	222,100	$155,439,291	$45,001,783	$217,465,144	$28,184,975	$34,959,696	$3,964,948	$79,379,711	$151,607,818	$65,857,325	$368,465	$66,225,791	$6,833,504	$59,392,287
1908.	Amount	659	226,551	150,256,617	43,372,432	209,852,055	24,869,115	31,598,840	3,895,989	70,585,109	136,012,760	73,839,295	193,423	74,032,719	7,467,864	66,564,854
1907.	Per mile of line	...	....	699	202	979	126	157	17	357	682	296	1	293	30	267
1908.	Per mile of line	...	....	663	191	926	109	139	17	311	600	325	1	326	32	293
1907.	Ratio per cent..	...	....	71.48	20.69	100.00	12.96	16.08	1.82	36.50	69.72	30.28	.....	.....	.....	.....
1908.	Ratio per cent..	...	....	71.60	20.67	100.00	11.85	15.05	1.86	33.64	64.81	35.19	.....	.....	.....	.....
DEC.,																
1907.	Amount	579	208,687	$126,212,593	$43,866,696	$185,837,241	$21,529,207	$31,651,789	$3,790,278	$73,616,491	$136,018,801	$49,818,439	$450,670	$50,269,110	$6,540,141	$43,728,969
1908.	Amount	601	213,700	136,713,517	44,234,311	196,908,534	21,345,453	30,572,787	3,912,740	69,478,231	130,667,891	66,240,643	287,797	66,528,440	7,144,446	59,383,994
1907.	Per mile of line	...	....	604	210	890	103	151	18	352	651	238	2	240	31	209
1908.	Per mile of line	...	....	639	206	921	99	143	18	325	611	309	1	311	33	277
1907.	Ratio per cent..	...	....	67.91	23.61	100.00	11.59	17.03	2.14	39.61	73.19	26.81	.....	.....	.....	.....
1908.	Ratio per cent..	...	....	69.43	22.46	100.00	10.84	15.53	1.99	35.28	66.36	33.64	.....	.....	.....	.....
JAN.,																
1908.	Amount	195	164,341	$94,452,128	$31,945,992	$138,276,186	$15,703,781	$24,151,385	$3,118,990	$58,331,185	$105,288,919	$32,987,267	$154,234	$33,141,501	$5,440,677	$27,700,824
1909.	Amount	198	167,493	$101,430,863	32,717,480	146,197,828	16,372,676	25,178,650	3,189,718	56,851,321	105,705,597	40,492,231	109,999*	40,382,231	5,776,224	34,606,006
1908.	Per mile of line	...	....	574	194	841	95	146	18	354	640	200	1	201	33	168
1909.	Per mile of line	...	....	605	195	872	97	150	19	339	631	241	1	241	34	206
1908.	Ratio per cent..	...	....	68.31	23.10	100.00	11.36	17.47	2.25	42.18	76.14	23.86	.....	.....	.....	.....
1909.	Ratio per cent..	...	....	69.38	22.38	100.00	11.20	17.22	2.18	38.89	72.30	27.70	.....	.....	.....	.....

*Deficit.

COURT NEWS.

In the United States Circuit Court at New York City, March 29, the New York Central & Hudson River pleaded guilty and paid fines of $10,000 on 10 counts in an indictment found by the federal grand jury in 1906 for giving rebates on cooperage material carried from Poplar Bluffs, Mo., to New York, Boston and other places. The road's demurrer had been sustained by the lower court, but the United States Supreme Court has now overruled that decision.

The Missouri Pacific has attacked in the Supreme Court of Kansas the constitutionality of the state maximum oil rate law. A shipper in Osborne county got a judgment for $500 against the road for alleged violation of the act. In his brief, B. P. Waggener, General Attorney of the Missouri Pacific, calls attention to the fact that provision is made in the law only for single line and double line rates. If oil is shipped over one line 200 miles the maximum rate is 9 cents per 100 lbs.; if the same oil be shipped the same distance over two roads the maximum rate is 10 cents; but if the same oil be shipped the same distance over three roads, then there is no maximum rate to apply, and the three roads may charge any amount in the aggregate without violating the act. He alleges that for these reasons the law is discriminatory and invalid.

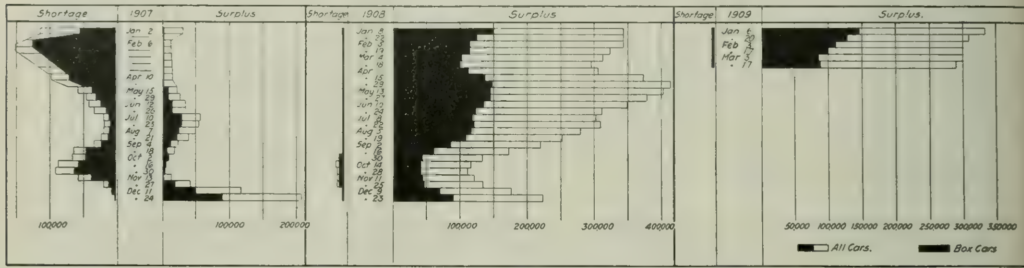
The Union Pacific, the Oregon Short Line, the Union Pacific Coal Co. and J. M. Moore, Manager of the Union Pacific Coal Co., were fined $2,000 each, and Everett Buckingham, a traffic officer of the Oregon Short Line, was fined $1,000 by Judge Marshall in the federal court at Salt Lake City on March 29. The fines were imposed under the anti-trust law on charges of conspiracy to destroy the business of the T. J. Sharp Coal Co. The charge was that the railways and their officers refused to haul the coal of the Sharp coal company and that in so doing they acted in collusion with the Union Pacific Coal Co.

The United States Circuit Court of Appeals at St. Paul, Minn., has affirmed the sentence imposed by the lower court, fining the Wisconsin Central $17,000, Burton Hanson, former General Freight Agent, $2,000, and George T. Huey $1,000 for granting rebates to the Spencer Grain Company, of Minneapolis. These parties were indicted on 17 counts, it being alleged that the Wisconsin Central charged the Spencer Grain Company 7½ cents per 100 lbs. for transporting barley between Minneapolis and Milwaukee and rebated ½ cent a bushel. The defense of the railway was that the refund was an elevator allowance. The shipment was made July 28, 1905.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 43-A, giving a summary of car surpluses and shortages by groups from February 19, 1908, to March 17, 1909, says: "The total surplus for this report is 291,418, a decrease of 8,507 in the two weeks since the date of our last bulletin. Coal cars, which have been on the increase, show a decrease of 9,989, while box cars increased 4,680. Group 2 (Eastern) shows a decrease of 16,360 in coal and gondolas and 954 in box. Group 3 (Middle), while showing a reduction of 2,479 box cars, increased its coal surplus by 2,002. In group 6 (Northwestern) there are 1,608 more coal cars than on our last report, and the box car surplus increased 6,008. There is little change in the situation in the other groups."

The accompanying table shows the surpluses and shortages for the period covered by the report and the accompanying chart shows the surpluses and shortages in 1907, 1908 and 1909.



Car Surpluses and Shortages in 1907, 1908 and 1909.

CAR SURPLUSES AND SHORTAGES, FEBRUARY 19, 1908, TO MARCH 17, 1909, INCLUSIVE.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
March 17, 1909	161	88,459	20,328	139,997	42,634	291,418	310	74	27	139	550
March 3, 1909	158	83,779	21,438	149,986	44,722	299,925	271	122	11	281	685
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	50[illegible]
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249

Passenger Fares in Missouri.

Conferences were held at Jefferson City, Mo., last week between Governor Hadley and Attorney-General Major and representatives of the railways in Missouri, with a view to effecting a compromise of the rate litigation in that state. A

statement was issued for the Missouri lines on March 26, in which it was said that the 3-cent local ticket rate and a 2,000-mile interchangeable book at 2 cents a mile would be put in effect on April 10. It was also announced that action to test the validity of 2-cent fare laws in adjoining states would be made at once. The statement issued on behalf of the roads reads in part as follows: "The state favors a 500-mile book good upon an individual railway and for bearer at 2¼ cents a mile. The railways offer in lieu of this a 500-mile book good over all of the railways in the state and for bearer at 2½ cents a mile, and upon an individual railway a 500-mile book good for owner only for 2¼ cents a mile. The objection by the railways to the 2¼-cent individual railway bearer mileage book is the fact that where more than ½ cent difference is made between the ordinary local ticket rate and the bearer mileage rate the mileage ticket will be used by scalpers and also to reduce interstate rates. The mileage book which the railways offer would be flat 2½ cents. The difference would not represent a profit to both scalper, and purchaser, therefore this ticket would not be scalped. The opinion of every passenger traffic official is that the practical effect of the 2½-cent statewide mileage book would be to extend the benefit of that rate to every traveler. They would be perfectly negotiable and it would be the simplest matter for individuals to secure the use of a portion of a book held by another."

Denver Rate Decision Pleases Nobody.

The decision of the Interstate Commerce Commission in the case of George J. Kindel v. the New York, New Haven & Hartford et al., an abstract of which is given under Interstate Commerce Commission, by which class freight rates from eastern points to Denver were ordered reduced, does not seem to have pleased anybody. Mr. Kindel has given to the Denver papers an interview in which he says that he did not ask or care for a reduction from Chicago to Denver; a 12 per cent. reduction from Chicago to Denver was ordered. Mr. Kindel asked for a reduced rate from Missouri river points to Denver and said that he did not see why the commission gave any reduction at all if it could not do better by Denver than it did. He says he will appeal from the decision to the United States Supreme Court and even talks of instituting impeachment proceedings against members of the Interstate Commerce Commission. The decision shows, he asserts, that Denver need no longer hope for justice from the commission. The Denver Chamber of Commerce and Board of Trade has adopted a resolution in which it says:

"The principle as laid down in the Missouri river rate case and Kindel case is destructive to now recognized centers. This principle should be affirmed by the courts before being recognized as a basis for readjustment of rates. Denver interests desire that application for restraining order be made until courts can act."

This resolution was telegraphed to U. S. Senator C. J. Hughes, of Colorado, in Washington. The Denver commercial organizations have asked the railways to fight the decision in the Denver case as they are now fighting the decision in the Missouri river case.

Meantime the shippers at Missouri river points, who are siding with the commission in its effort to get the courts to uphold its decision in the Missouri river case, are denouncing the commission for its decision in the Denver case, saying that if the Denver decision is upheld it will enable jobbers at Chicago and St. Louis to drive the jobbers at Missouri river cities out of a large trade territory in western Nebraska, western Kansas, Colorado and Wyoming. A meeting of Missouri river jobbers has been called to be held in Kansas City, where a plan for resisting the decision in the Denver case will probably be decided on. The effect of the decision in the Kindel case has been discussed by traffic officers of the western lines and others, and there is little question that the roads will appeal to the courts to protect them against an enforcement of the order. The Interstate Commerce Commission has asked for a dissolution of the injunction which was issued by the Federal Circuit Court of Appeals at Chicago restraining it from enforcing its order in the Missouri river case.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. B. Chamberlain, Vice-President of the Erie, has resigned and his former office has been abolished.

Harry Brengle has been appointed a Traveling Auditor of the Atchison, Topeka & Santa Fe, with office at Wellington, Kan.

Horace E. Andrews, formerly President of the Cleveland Electric Railway, has been elected President of the New York State Railways.

Silas H. Strawn has been appointed the General Solicitor of the Chicago & Alton, with office at Chicago, succeeding F. S. Winston, deceased.

J. J. Jermyn has been elected the President of the Gulf, Texas & Western, succeeding R. C. Megargel, resigned. Mr. Megargel was elected Vice-President.

D. B. Sweeney has been appointed the Claim Agent of the Yazoo & Mississippi Valley, with office at Memphis, Tenn., succeeding Parks C. Archer, resigned.

B. F. Bush, President and Receiver of the Western Maryland, has been elected also the President of the Pittsburgh Terminal Railroad & Coal Co., succeeding F. A. Delano, resigned.

Edward M. Hyzer, Counsel of the Chicago & North Western for the state of Wisconsin, has been appointed the General Counsel, with office at Chicago, succeeding Hon. Lloyd W. Bowers, resigned to become Solicitor General of the United States. Mr. Hyzer was born in Janesville, Wis., on December 10, 1854, and received his education at the public schools. He was admitted to the bar in 1879. He has been Counsel of the Chicago & North Western for the past 11 years.

The board of directors of the Pennsylvania in view of the coming retirement of Captain John P. Green, First Vice-President, have recorded a minute giving an account of the interesting life of Captain Green, the main facts of which were published in these columns last week. The directors sum up Captain Green's work as follows: "His complete mastery of the science of sound financiering, his thorough knowledge of the finances and history of this company, his pleasing address and clear and forceful style, have made him for many years the spokesman of the management, while his general knowledge of the railway affairs and business conditions of the country have made him a prominent figure and potent factor in the debates on legislation seeking to regulate rates and other railway matters, as well as in the discussion and solution of intricate problems in accounting. Captain Green has been an executive adviser of five of the eight presidents of the company, and, when he retires from active service on July 31 next, will have served it for over 40 years, a faithful and efficient officer, and an indefatigable worker with singleness of purpose for the welfare of the company and the interests of the stockholders. The company is fortunate in the long enjoyment of his service and counsel, and the board, while regretting that the time has arrived for the severance of the

John P. Green.

official ties which have existed for over quarter of a century, congratulate him on the completion of a service as valuable to the company as it is honorable and creditable to him, and express the hope that the evening of his active and useful life may bring him a long continuance of good health, and every opportunity for the fullest enjoyment of his well-earned freedom from exacting cares and responsibilities.

Operating Officers.

Samuel C. Stickney, General Manager of the Chicago Great Western, has resigned to engage in other business.

E. P. Eppes has been appointed the General Manager of the Gainesville Midland, with office at Gainesville, Ga., succeeding E. L. Douglass, resigned.

Richard S. Thompson has been appointed the Superintendent of the Mountain division of the Kansas City, Mexico & Orient, with office at Creel, Chihuahua, Mex., succeeding Edward Harrison, resigned.

W. C. Ashcraft, Trainmaster of the Middle division of the Atchison, Topeka & Santa Fe, has been appointed a Trainmaster on the Belen cut-off, with office at Vaughn, N. Mex. His successor has not been appointed.

L. R. Taylor, Superintendent of the Third division of the Virginian Railway, with office at Roanoke, Va., has been appointed the Superintendent of the Third and Deepwater divisions, with office at Princeton, W. Va., succeeding as Superintendent of the Deepwater division O. B. Johnson, resigned.

Major Charles Hine, the well-known railway official, since July, 1908, the organization expert of the Harriman Lines, with the title of "special representative" on the staff of the Director of Maintenance and Operation, Chicago, is a native and citizen of Vienna, Va., a suburb of Washington, D. C. He was born March 15, 1867; graduated, 1885, from Washington (D. C.) High School, and entered the employ of a contractor. In a competitive examination at Alexandria, Va., he won a cadetship and graduated from the U. S. Military Academy at West Point in 1891. Graduated from Cincinnati Law School and was admitted to the bar in 1893, while serving as lieutenant in the U. S. Army. He resigned his commission in 1895 and began railway work as freight brakeman on the Cleveland, Cincinnati, Chicago & St. Louis. He has worked as brakeman, switchman, yardmaster, conductor, chief clerk, Trainmaster, Assistant Superintendent, Right of Way Agent and as General Superintendent, besides holding various unique staff positions, while doing special work for numerous railways and other corporations. He has made reports on divers features of several small railways and of the following larger ones: Chicago & Alton; Chicago, Rock Island & Pacific; St. Louis & San Francisco; Chicago & Eastern Illinois; Chicago, Burlington & Quincy; Erie; Delaware & Hudson; Intercolonial; Prince Edward Island; Union Pacific System-Southern Pacific Co.

Charles Hine.

He served in the siege of Santiago de Cuba, Spanish-American war, 1898, as major, U. S. Volunteers. In 1900 he was inspector of safety appliances for the Interstate Commerce Commission. While with Gunn, Richards & Co., 1907, he assisted in the revision of business methods of the Department of the Interior at Washington. In 1907 and 1908 he acted as receiver of the Washington, Arlington & Falls Church (Electric) Railway. He is an editorial and magazine writer, and, in Virginia, a farmer and real estate dealer. Author of "Letters from an Old Railway Official to His Son," *The Railway Age*, Chicago, 1904, and is the originator of "The Hine System of Organization," which, among other special duties, he is engaged in installing on the Harriman Lines as described in the *Railroad Age Gazette* of January 22, 1909.

That part of the Lincoln division of the Chicago, Burlington & Quincy east of and not including Lincoln, Neb., will be operated, after April 15, as the Omaha division. E. Flynn, Assistant Superintendent, with office at Lincoln, Neb., has been appointed the Superintendent of the Omaha division; J. P. Austin, Trainmaster at Omaha, Neb., has been appointed the Trainmaster, and J. T. McShane has been appointed the Chief Despatcher, all with office at Omaha.

Elisha Lee, Principal Assistant Engineer of the Philadelphia, Baltimore & Washington, has been appointed the Superintendent of the New York, Philadelphia & Norfolk, succeeding J. G. Rodgers, who becomes the Assistant to the General Manager of the Pennsylvania. Mr. Lee was born September 24, 1870. He graduated from the Massachusetts Institute of Technology in 1892, and began railway work on the Pennsylvania in November, 1892, in the office of the Assistant Engineer of the Tyrone division. He has served through the various grades of Assistant Supervisor, Supervisor, Assistant Engineer and Principal Assistant Engineer. Before becoming Principal Assistant Engineer of the Philadelphia, Baltimore & Washington he had been Assistant Engineer of the Philadelphia Terminal division.

Traffic Officers.

J. N. Tittmore, General Traffic Manager of the Pere Marquette, has resigned.

A. Hillman has been appointed a Division Agent of the Chicago, Rock Island & Pacific, with office at Cedar Rapids, Iowa.

George F. Miller has been appointed a General Agent of the Yosemite Valley and the Yosemite Stage & Turnpike Co., with office at Los Angeles, Cal.

H. W. Prickett has been appointed a Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, with office at Salt Lake City, Utah.

P. H. Kennedy has been appointed a General Agent of the Pittsburgh & Lake Erie, with office at Pittsburgh, succeeding Captain W. L. Hager, deceased.

C. T. Chapman, Assistant General Freight and Passenger Agent of the Toledo & Western, has been appointed the Traffic Manager, with office at Toledo, Ohio.

David L. Gray, Assistant General Freight Agent of the Erie, has been appointed the Assistant General Traffic Manager, with office at Chicago. This office is a new one.

E. J. Tuttle has been appointed the General Freight and Passenger Agent of the Argentine Central, with office at Denver, Colo., succeeding C. A. Johnson, resigned.

Ransom M. Calkins, General Freight and Passenger Agent of the Chicago, Milwaukee & Puget Sound, has been appointed the Traffic Manager, with office at Seattle, Wash.

C. B. Fisk has been appointed a Division Freight Agent of the Chicago Great Western with office at Fort Dodge, Iowa, succeeding M. E. Newell, resigned to engage in other business.

T. A. Helm, Traveling Freight Agent of the St. Louis, Iron Mountain & Southern, has been appointed a Commercial Agent, with office at Dallas, Tex., succeeding H. J. Owens, resigned.

J. N. Chandler, General Agent of the Louisville & Nashville at St. Louis, Mo., has been appointed a Traveling Freight Agent, with office at Evansville, Ind. George S. Burnam, Contracting Freight Agent at St. Louis, succeeds Mr. Chandler.

W. W. Johnson, Chief Claims Clerk of the Canadian Northern Quebec and the Quebec & Lake St. John, has been appointed the Contracting Agent, with office at Quebec. H. McDonald succeeds Mr. Johnson, with office at Quebec. G. E. Beekman has been appointed the New England Passenger Agent, and E. T. Tarbox a Traveling Passenger Agent, both with office at Boston, Mass.

W. L. Kingman, Industrial Agent of the New York Central & Hudson River, has resigned, and correspondence in regard to industrial matters should hereafter be addressed to R. C.

Caples, General Agent, Traffic department, Grand Central Station, New York.

Delos W. Cook, General Traffic Manager of the Erie, heretofore with office in Chicago, now has his headquarters at 50 Church street, New York, succeeding to the duties of H. B. Chamberlain, Vice-President, hitherto at the head office of the traffic department, who has resigned.

L. H. McCormick, Traveling Passenger Agent of the St. Louis & San Francisco, has been appointed a District Passenger Agent, with office at Pittsburgh, Pa., succeeding George S. Pentecost, resigned to go with another road. Joseph M. Gittings succeeds Mr. McCormick, with office at Pittsburgh.

W. H. Abel, Assistant General Passenger Agent of the Toledo, St. Louis & Western and the Chicago & Alton, has been appointed an Assistant General Passenger Agent, with office at St. Louis, Mo., succeeding David Bowes, Chief Assistant General Passenger Agent, who resigned to become General Manager of the Judson Excursion & Freight Forwarding Co. C. R. Murray, Division Passenger Agent at Springfield, Mo., succeeds Mr. Abel, with office at Kansas City, Mo.

Edward A. Donnelly has been appointed a Traveling Freight Agent of the Chicago, St. Paul, Minneapolis & Omaha, with office at Grand Forks, N. Dak., succeeding Frederick C. Lang, promoted. He will have charge of freight traffic in the states of Minnesota and North Dakota west of Brainerd and Cass Lake, Minn.; on the north of the Northern Pacific from Brainerd, Minn., to Apple Creek, N. Dak; east of and including Minot, N. Dak., on the Great Northern, and Portal, N. Dak., on the Minneapolis, St. Paul & Sault Ste. Marie, including the Minnesota & International and the Big Fork & International Falls; also Rainy River, Ont.

The offices of the Seaboard Air Line, the Seaboard Despatch and the Seaboard-Savannah Line at Philadelphia have been abolished, and William V. Massey, Commercial Agent of the Seaboard-Savannah Line, has been appointed a General Agent of the Seaboard Air Line, with office at Philadelphia. He will have charge of freight traffic to and from Philadelphia territory via all fast freight lines operating over the Seaboard Air Line. William J. Kirkpatrick, Commercial Agent of the Seaboard Despatch, has been appointed a Traveling Freight Agent of the S. A. L.; James A. Henderson has been appointed a Soliciting Freight Agent, and Earle B. Gunkle a Soliciting Freight Agent, all with office at Philadelphia and all reporting to Mr. Massey.

Clyde W. Colby, recently appointed General Pacific Coast Agent of the Erie, with office at San Francisco, was born in 1862 at Marshall, Mich. After a high school education at Chicago he began railway work in 1886 in El Paso, Tex. In April, 1888, he became Chief Clerk to the Traffic Agent of the International of Mexico, and in 1889 he was made Contracting Agent of the Union Pacific at Los Angeles, and a year later became General Agent of the Chicago, Milwaukee & St. Paul at Los Angeles. During 1891 and part of 1892 he was out of railway work, but in June was appointed Commercial Agent of the Rio Grande Western at San Francisco. In May of the next year he was made representative in Mexico of the Fruit Growers' Express, and in March, 1896, became Pacific Coast Agent of the Erie Despatch, and the following year was made General Agent of the Erie at San Francisco, Cal. In August, 1907, he was appointed Commercial Agent of the Erie Despatch at Chicago, which position he held until his recent appointment.

Engineering and Rolling Stock Officers.

W. P. Chrysler, Superintendent of Motive Power of the Chicago Great Western, has been appointed the Assistant Superintendent of Motive Power and Machinery, with office at Oelwein, Iowa.

G. A. McCarthy, Chief Engineer of the Temiskaming & Northern Ontario, has resigned and is to become connected with the firm of Smith, Kerry & Chase, Consulting Engineers, Toronto, Ont.

That part of the Lincoln division of the Chicago, Burlington & Quincy, east and not including Lincoln, Neb., will be operated, after April 15, as the Omaha division. E. D. Andrews, Master Mechanic at Sterling, Col., has been appointed the Master Mechanic of the Omaha division; F. A. Hedengren, Master Carpenter at Lincoln, Neb., has been appointed the Master Carpenter, both with office at Omaha.

S. E. Kildoyle, Master Mechanic of the Vera Cruz & Isthmus, has resigned, and his position has been abolished. J. A. Baker, General Foreman, has been appointed the Foreman of shops and locomotive repairs, with office at Tierra Blanca, V. C., Mex., and reports to the Acting Superintendent.

William H. Fenley, whose appointment as Signal Engineer of the Chicago Great Western has been announced in these columns, was born at Greenwood, Ind., on May 7, 1876. He received his education in the public and high school and later took a special course in a correspondence school. He began railway work in March, 1894, as agent's helper on the Cleveland, Cincinnati, Chicago & St. Louis. In 1896, he was appointed Yard Clerk at Greensburg, Ind., and later was made night yardmaster. On May 15, 1898, he became connected with the National Switch & Signal Co., helping in the construction of its new plant at Greensburg, Ind., and after completion of the plant he remained in charge of the tower. From June, 1899, to June, 1900, he was engaged in newspaper and advertising work part of the time and maintaining interlocking apparatus on the Cleveland, Cincinnati, Chicago & St. Louis the rest of the time. In June, 1900, he began work with the Chicago Great Western as a fitter in a construction gang; later he was engaged in the installation and maintenance of electrical and mechanical apparatus. In October, 1906, he was appointed Signal Supervisor, which position he held until his appointment as Signal Engineer on February 24.

Wilson E. Symons has been appointed the Superintendent of Motive Power and Machinery of the Chicago Great Western. Mr. Symons was born at Farmland, Ind., on December 18, 1858. He received his education at Dublin Academy in Eastern Indiana. He began railway work in 1880 as a machinist on the Chicago, Rock Island & Pacific at Chicago. In 1881 he was made Chief Engineer of the Merchant Marine service on the Great Lakes. From 1885 to 1887 he was a locomotive fireman and engineer and did some special expert work on the Wisconsin Central. From 1887 to 1889 he was a locomotive engineer on the Atlantic & Pacific, now a part of the Atchison, Topeka & Santa Fe, and also did some special engineering work in California and Arizona. During 1889 he was engaged in special and Electrical Engineering work in Chicago. In 1890 he was appointed General Foreman of the Atchison, Topeka & Santa Fe at Chanute, Kan., and in 1892 Master Mechanic at Raton, N. Mex. In 1896 he was made Master Mechanic of the Mexican Central at San Luis Potosi, Mex., and in the same year was appointed Mechanical Expert and Salesman of the Galena-Oil Co., Scranton, Pa., in the United States, England and France. In July, 1898, he was appointed Superintendent of Motive Power and Equipment of the Plant System Railways at Savannah, Ga. In May, 1902, he was made Mechanical Superintendent of the Gulf, Colorado & Santa Fe, and in August, 1904, Superintendent of Machinery of the Kansas City Southern. From 1905 to 1909 he has been engaged in special expert and consulting railway work in Chicago. Mr. Symons is a member of and a contributor to the Western Society of Engineers, the American Society of Mechanical Engineers, American Railway Master Mechanics' Association, Master Car Builders' Association and Franklin Institute. His headquarters will be at St. Paul, Minn.

W. E. Symons.

Purchasing Officers.

C. R. Craig has been appointed the Purchasing Agent of the Mobile & Ohio, with office at Mobile, Ala., succeeding R. H. Duesberry, resigned.

OBITUARY.

John C. Kennedy, Purchasing Agent of the Nashville, Chattanooga & St. Louis, died of heart failure on March 17. He was 58 years old.

J. T. Young, formerly Superintendent of Bridge Construction of the Detroit, Toledo & Ironton, died March 21 at Greenfield, Ohio. He was 62 years old and had retired from railway work about a year previous to his death.

William C. Barnes, Passenger and Ticket Agent of the St. Louis, Iron Mountain & Southern at Little Rock, Ark., died suddenly on March 23 at St. Louis, Mo. He had been connected with the Missouri Pacific-Iron Mountain System for 22 years.

Thomas Fitzgerald, General Manager and Receiver of the Norfolk & Southern, died at Baltimore, Md., on March 28, after a long illness from stomach trouble. He was born January 1, 1853, at Fairmount, W. Va., and began railway work in 1866 on the Baltimore & Ohio as water boy. A year later he became telegraph messenger boy at Fairmount, and in 1868 worked as telegraph operator at various places. By March, 1873, he had become Night Despatcher at the Camden station and a year later was made Train Despatcher on the Washington and Alexandria branches. By 1879 he had become Superintendent of trains on the Harper's Ferry, Valley and Washington county branches, and two years later was appointed Train Master of the Ohio divisions. In 1883 he was promoted to Master of Transportation of the Trans-Ohio division. After three years of work on this division he was promoted to Superintendent of the Central Ohio, Lake Erie and Straitsville divisions, and later in the same year, 1886, was made Superintendent of the Eastern division. In 1893 he was appointed Superintendent of Transportation and the next year also General Superintendent of main stem and branches of the Philadelphia division, with office at Baltimore, Md. In 1899 he was appointed General Superintendent of the Baltimore & Ohio, and in February, 1905, was made General Manager. Later he left the Baltimore & Ohio to become General Manager of the Norfolk & Southern.

Thomas Fitzgerald.

Cyril C. Harvey, until August, 1907, President of the New Orleans & Northeastern, the Alabama & Vicksburg and the Vicksburg, Shreveport & Pacific, died at his home in East Molesey, Surrey, England, on March 25. He was born near St. Johns, Newfoundland, in 1846. He began railway work in 1864 in the Accountant's office of the London, Brighton & South Coast, in England. From 1865 to 1882 he held various positions in the offices of the General Manager, Superintendent, Accountant and Auditor. In 1882 he was made Assistant General Manager. In 1883 he was appointed Assistant General Manager of the Cincinnati, New Orleans & Texas Pacific and associated lines. In 1885 he was made Comptroller, and in 1887 Vice-President. In 1894 he was elected President of the three companies first above named, which position he held until his retirement from active service in August, 1907.

Railroad Construction.

New Incorporations, Surveys, Etc.

CANADIAN PACIFIC.—Contract let to John Dutton, contractor, Winnipeg, Man., for a 20-mile branch west from Weyburn, Sask.

Contract let to Foley, Welch & Stuart, contractors, Winnipeg, Man., for a 20-mile section from Lethbridge, Alb., eastward.

Contract let to Foley, Welch & Stuart, Winnipeg, Man., for a branch in Alberta from Lacombe east to Stettler, 51 miles. (March 12, p. 523.)

CHAMBERSBURG, GREENCASTLE & WAYNESBORO (ELECTRIC).—According to press reports, this company will build an extension from Chambersburg, Pa., northeast towards Shippensburg.

CHEMICAL & HELVETIA.—Organized in West Virginia, with $25,000 capital, and headquarters at Helvetia, to build a line in Upshur and Randolph counties from a point near Chemical station, on the Baltimore & Ohio, to Helvetia, W. Va. The incorporators include H. G. Young, Charleston, W. Va.; J. M. N. Downes and E. Brown, Buckhannon, W. Va.; Wm. McDode, Shelbyville, W. Va.; P. H. Schaffner, Falls Creek, Pa., and C. Mudge, Olean, N. Y.

DAYTON, LEBANON & CINCINNATI.—Building from Dayton, Ohio, south to Lebanon, to a connection with the Cincinnati, Lebanon & Northern, which is in operation from Lebanon north, 27 miles. Contracts are to be let shortly to complete the line to Dayton. (March 19, p. 653.)

DENVER, LARAMIE & NORTHWESTERN.—Grading for the first 42 miles out of Denver, Colo., including a 700-ft. trestle at Sand Creek (Denver), has been practically completed. Track laying out of Denver, which was started early last winter, was discontinued after the completion of 12 miles on account of severe weather, but this work will be resumed about April 1 and be pushed as rapidly as possible to the coal fields of Wyoming, 216 miles from Denver, the first objective point.

DULUTH, WINNIPEG & PACIFIC.—Incorporated in Minnesota with $100,000 capital stock to build from Virginia, Minn., south to Duluth, thus connecting the Duluth, Rainy Lake & Winnipeg, which is controlled by the Canadian Northern, with Duluth. The directors include W. H. Cook, Pres., Duluth; J. L. Washburn, W. B. Bailey, L. I. Feetham and J. F. Walsh.

ENID, OCHILTREE & WESTERN.—Organized to build from Enid, Okla., west via Ochiltree, Tex., and Hanford to Dalhart, about 265 miles. Surveys made and rights of way secured. A. E. Wiest, Jr., Vice-Pres. and Gen. Mgr., Dalhart, Tex., is quoted as saying that construction work from Dalhart, east, is to be begun early in April. (March 19, p. 653.)

FINDLAY & MARION (ELECTRIC).—According to press reports, contracts are to be let soon to build from Findlay, Ohio, southeast via Mt. Blanchard, Forest and Marseilles, to Marion, 45 miles. It is expected that work will be begun this month. G. E. Meeker, Columbus, Ohio, and H. P. Hankey, Detroit, Mich., are interested.

GOOSE LAKE & SOUTHERN.—See Southern Pacific.

IOWA & OMAHA SHORT LINE.—Construction will begin on the line between Council Bluffs, Iowa, and Treynor, 15 miles, early this spring. Contract given to George W. Adams & Co., Walnut, Iowa, on March 23.

KANSAS CITY, MEXICO & ORIENT.—According to press reports, the concession granted by the Mexican government has been extended three years. The additional time was granted to complete the unfinished sections through Mexico from Falomir north to the Rio Grande, and from Sanchez southwest to Las Hornillos. (March 19, p. 655.)

KINGFISHER, COLORADO & GULF.—Organized to build from Oklahoma City northwest to a point in New Mexico. According to press reports, surveys have been made and grading work is to be begun within 60 days. J. M. McDonald, Pres., New York; W. W. Bonser, Treas., and J. M. Cunningham, Sec.

Marietta & Lake.—Incorporated in Ohio with $1,000,000 capital to build from Lore City, Ohio, east, thence north to Freeport, about 30 miles. According to press reports a contract has been signed with the Moorehead Construction Co., and work is to be begun shortly. E. P. Strandburg, Pres., Cambridge, Ohio. (Feb. 26, p. 435.)

New Orleans Great Northern.—According to press reports, this company has extended its service north, 56 miles, to Hopewell, Miss. It is expected that the line will be in operation north to Jackson, about 20 miles additional, early in May. (March 19, p. 656.)

New York Connecting.—According to a press despatch from New Haven, the New York, New Haven & Hartford has acquired all the land needed in connection with the proposed bridge across the East river and Ward's and Randall's islands, New York, to be built by the New York Connecting Railroad, and conferences are being held between officers of the New Haven company and the Pennsylvania. (March 19, p. 657.)

New York, New Haven & Hartford.—See New York Connecting.

Oklahoma, Vernon & Texas.—An officer writes that the present plans call for a line from Vernon, Tex., westerly through the counties of Wilbarger, Foard, Cottle, King and Dickens to a point in Crosby county, about 125 miles. Preliminary surveys being made. L. G. Hawkins, Pres., and A. J. Robinson, Ch. Engr., Vernon. (March 26, p. 727.)

Pennsylvania.—See New York Connecting.

Philadelphia & Reading.—Bids are wanted April 6 by W. Hunter, Ch. Engr., Philadelphia, Pa., for work in connection with the elimination of grade crossings on the Philadelphia, Germantown & Norristown, as follows:

Contract No. 20 includes material for permanent tracks from Berks street to Broad street.

Contract No. 36, for fences, gates, etc., at York street and Narrow street yards; raising Huntingdon street foot bridge, etc.

Philadelphia. Germantown & Norristown.—See Philadelphia & Reading.

Sonora Central.—According to press reports from Mexico City, the American interests which own the Cieneguita copper mines in the Sahuaripa district, state of Sonora, Mex., are organizing a company and making surveys to build from Toniche, in the Yaqui river valley, to Sahuaripa. The new line is to furnish an outlet for the mines and will connect, at Toniche, with the branch of the Cananea, Yaqui River & Pacific, now building up the valley.

South Bethlehem & Saucon.—According to press reports, work is to be started at once on an extension from Colesville, Pa., south to Center Valley, about five miles. At Center Valley connection is to be made with the Lehigh Valley Traction Co., furnishing a direct route to Philadelphia from South Bethlehem, 15 miles shorter than the old route via Allentown.

Southern Pacific.—An officer writes that preliminary surveys have been made for the Goose Lake & Southern, from the California-Oregon state line on the east side of Goose Lake, south via Alturas and Eagle Lake, thence from near Prattville southwest towards Vina. The G. L. & S. was organized to build about 406 miles from Goose Lake, Cal., south. (March 19, p. 658.)

Valdosta, Moultrie & Northwestern.—Projected from Valdosta, Ga., northwest to Moultrie, 38 miles. Press reports indicate that contract has been given to J. W. Wright, Jr., contractor, for work to be completed within five months. (March 15, 1907, p. 393.)

Wheeling & Uniontown.—Incorporated in West Virginia with $10,000 capital to carry out the project under consideration for a long time to build from Wheeling, W. Va., east to Uniontown, Pa., about 60 miles. The incorporators include S. N. Noyes, A. B. Woodruff, J. M. Ritz, R. Hix and L. C. Ebeling, all of Wheeling.

Railroad Financial News.

Chicago, Rock Island & Pacific.—The $6,000,000 6 per cent. notes dated 1906 and extended for one year in 1908 were paid at maturity April 1 at the office of Speyer & Co., New York.

Cincinnati, Hamilton & Dayton.—Judge Lurton, of the United States Circuit Court, ruled at Cincinnati that the receivership of the Cincinnati, Hamilton & Dayton must end as soon as possible and that the road must be sold. Governor Judson Harmon was asked to continue as receiver until May 1. Judge Lurton refused the petition of the Brooklyn Trust Co. and others to intervene in legal proceedings against the road.

Duluth, Rainy Lake & Winnipeg.—See Duluth, Winnipeg & Pacific under Railroad Construction.

Erie.—The coupons due April 1 on various issues of Erie bonds were paid at the offices of the company by the Erie and were not sold to J. P. Morgan & Co. as had been done with other maturing coupons three months ago and for some time before that. (June 19, 1908, p. 210.)

Geneva, Corning & Southern.—The stockholders of the Syracuse, Geneva & Corning, the Fall Brook Railway and the Pine Creek Railway voted on March 16 to consolidate these companies under the name of the Geneva, Corning & Southern with an authorized capital stock, all of which is outstanding, as follows: Common, $2,325,000; preferred 4 per cent. cumulative, $5,000,000, and with no bonds. The new company will own about 230 miles of railway, which is leased to the New York Central & Hudson River. See New York Central & Hudson River.

Grand Trunk Pacific.—President Hays is quoted as saying that the cost of the 916 miles of the prairie section will be $32,198,351, or about $35,151 per mile. Up to September 3, 1908, $24,087,743 had been spent.

Great Northern.—The premiums offered for exchange of the bonds of the St. Paul, Minneapolis & Manitoba for consolidated mortgage 4 per cent. bonds of the Great Northern will be reduced on April 1 from $5 to $4 on each $1,000 second mortgage bond, and from $15 to $14 on each $1,000 Dakota extension bond.

Manistee & North-Eastern.—Devitt, Tremble & Co. and A. B. Leach & Co., Chicago, are offering $1,015,000 5 per cent. bonds dated January 1, 1909, due $40,000 annually beginning January 1, 1912, at a price to yield 5¼. The company owns railway running from Manistee, Mich., to Traverse City, with branches, making a total mileage of 184 miles. The total authorized issue of bonds is $1,500,000, of which $485,000 are reserved for the purchase of future equipment and improvements.

Missouri Pacific.—The *Commercial and Financial Chronicle*, New York, says: "It is understood that a new mortgage is in contemplation under which bonds will be issued to provide for the company's requirements, both present and future. Details as to the nature of the bonds, the interest rate, and so on, have not yet been determined. The flotation of the first issue, it is said, will be through Kuhn, Loeb & Co., New York."

New York Central & Hudson River.—Stockholders are to vote on April 21 on approving a lease of the Spuyten Duyvil & Port Morris for the term of the corporate existence of the company and on the lease of the Geneva, Corning & Southern, and to substitute these new leases for the existing lease under the New York Central & Hudson River's $100,000,000 mortgage. See Geneva, Corning & Southern.

New York, New Haven & Hartford.—Kidder, Peabody & Co., Boston, Mass., are offering at 100¼ $5,000,000 one-year 4 per cent. notes of the New York, New Haven & Hartford dated March, 1909.

Spuyten Duyvil & Port Morris.—See New York Central & Hudson River.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Buffalo & Susquehanna is making inquiries for 11 consolidation locomotives.

The Buffalo, Rochester & Pittsburgh is making inquiries for 1 Atlantic, 2 decapod and 12 consolidation locomotives.

The Lufkin Land & Lumber Co., Kansas City, Mo., has ordered one locomotive from the Baldwin Locomotive Works.

The Saginaw & Flint has ordered two locomotives from the Baldwin Locomotive Works in addition to the four ordered some time ago.

The Canadian Pacific is building one articulated compound locomotive at its Angus shops, Montreal.

General Dimensions.

Total weight	250,000 lbs.
Cylinders	22 in. and 33 in. x 26 in.
Diameter of drivers	57 in.
Boiler, type	Straight top
Boiler, working steam pressure	180 lbs.
Heating surface, total	4,000 sq. ft.
Tubes, length	328, 9 ft. 3 in.; 401, 18 ft. 6 in.
Firebox, length	10 ft.
Firebox, width	4 ft. $11\frac{3}{4}$ in.
Grate area	58.3 sq. ft.
Water capacity	5,000 Imp. gals.
Coal capacity	10 tons

Special Equipment.

Air-brakes	Westinghouse
Axles	Mild steel
Bell ringer	Little Giant
Boiler lagging	1st ring plastic asbestos, remainder sectional magnesia
Brakebeams	Simplex truss
Brakeshoes	Can. Pac. standard
Couplers	Tower
Headlight	Pyle-National, electric
Injector	Hancock
Journal bearings	Canadian Bronze Co.
Piston and valve rod packings	Lewis & Kunzer
Safety valve	World
Sanding devices	Leach
Sight feed lubricator	Detroit, 7-feed
Springs	Can. Pac. standard crucible steel
Steam gages	Star, vertical reading hand
Wheel centers	Cast steel

The Minneapolis & St. Louis, as reported in the *Railroad Age Gazette* of March 26, has ordered 14 locomotives from the Baldwin Locomotive Works. Of these 7 are simple consolidation freight locomotives, 4 simple 10-wheel passenger locomotives and 3 simple Mogul switching locomotives. The consolidation and 10-wheel locomotives will be equipped with Walschaerts valve gear and the switching locomotives with the Stevenson link.

General Dimensions.

	Consolidation.	10-wheel.	Switching.
Number	7	4	3
Weight on drivers	150,000 lbs.	145,000 lbs.	138,000 lbs.
Total weight	172,000 "	182,000 "	157,000 "
Cylinders	21 in. x 30 in.	21 in. x 26 in.	20 in. x 28 in.
Diameter of drivers	60 in.	68 in.	51 in.
Boiler, type	Straight top.	Ext. wgn top.	Straight top.
" wkg. stm. press.	200 lbs.	200 lbs.	190 lbs.
" diam. smlst ring	$66\frac{7}{16}$ in.	$66\frac{3}{8}$ in.	72 in.
Heating surf., tubes	2,717 sq. ft.	2,490 sq. ft.	1,778 sq. ft.
" " firebox	144 "	164 "	177 "
" " total	2,861 "	2,654 "	1,955 "
Grate area	46.0 "	47.7 "	31.2 "
Tubes, number	326	318	311
" diameter	2 in.	2 in.	2 in.
" length	16 ft.	15 ft. $\frac{1}{2}$ in.	11 ft.
Tender, style	Water bottom.	Water bottom.	Sloping back.
Tender, truck	Bar frames.	Bar sides.	Andrew C.S.
Water capacity	6,000 gals.	6,000 gals.	5,000 gals.
Coal capacity	12 tons.	10 tons.	8 tons.

Special Equipment.

Bell ringers	Simplicity
Blow-off valves	Bordo
Boiler covering	Sectional magnesia lagging
Boiler steel	Homogeneous
Brakes	New York
Brake shoes	Undecided
Couplers	Simplex
Driving wheel centers	Cast steel
Firebox steel	Otis
Headlights	Wabash all steel
Injectors	Ohio and Monitor
Journal bearings	Damascus bronze
Lubricators	Nathan
Metallic packing	Jerome
Safety valves	Coale
Sanding device	"She"
Tires	American O. H. steel
Valves	American balanced

The Chicago, Burlington & Quincy, as reported in the *Railroad Age Gazette* of March 12, has ordered 25 simple Pacific locomotives from the Baldwin Locomotive Works for May and June delivery.

General Dimensions.

Cylinders	88 in. x 28 in.
Diameter of drivers	74 in.
Boiler, working steam pressure	200 lbs.
Firebox, length	$108\frac{1}{2}$ in.
Firebox, width	$72\frac{1}{4}$ in.
Tubes, number	293
" diameter	$2\frac{1}{4}$ in.
" length	21 ft.
Tender, style	Special low design
" truck	Equalized pedestal type
" water capacity	8,000 gals.
" coal capacity	13 tons

The Canadian Pacific is building 10 ten-wheel locomotives at its Angus shops, Montreal.

General Dimensions.

Weight on drivers	141,000 lbs.
Weight, total	190,000 lbs.
Cylinders	22½ in. x 28 in.
Drivers, diameter	63 in.
Boiler, type	Wagon top.
Boiler, working steam pressure	180 lbs.
Heating surface	2,418 sq. ft.
Tubes, number and diameter	(240) 2 in.; (24) 5-in.
Tubes, length	14 ft. 3 in.
Firebox, length	8 ft. $6\frac{1}{8}$ "
Firebox, width	5 " $9\frac{7}{8}$ "
Grate area	49 sq. ft.
Water capacity	5,000 Imp. gals.
Coal capacity	10 tons.

Special Equipment

Air-brakes	Westinghouse
Axles	Mild steel
Bell ringer	Little Giant
Boiler lagging	1st ring, plastic asbestos, remainder Kerr's air cell.
Brake beams	Simplex
Brake shoes	Canadian Pacific standard
Couplers	Tower
Headlight	Pyle-National electric
Injector	Hancock
Journal bearings	Canadian Bronze Co.
Piston and valve rod packings	Lewis & Kunzer
Safety valve	World
Sanding device	Leach
Sight-feed lubricator	Detroit, 5-feed
Springs	Can. Pac. standard, crucible steel
Steam gage	Star, vertical reading hand
Tender wheels	Solid, rolled steel
Wheel centers	Cast steel
Superheater	Vaughan-Horsey

The New York, Chicago & St. Louis, reported in the *Railroad Age Gazette* of February 26 as being in the market for 10 simple 10-wheel and 5 simple six-wheel switching locomotives, has placed this order with the American Locomotive Co. This equipment will be built at the Brooks works for delivery in August. The 10-wheel locomotives will be equipped with Walschaerts and the switching engines with Stephenson gear.

General Dimensions.

	10-wheel.	6-wheel switch.
Weight on drivers	106,300 lbs.	105,000 lbs.
Total weight	140,500 "	105,000 "
Cylinders	19 in. x 24 in.	18 in. x 24 in.
Diameter of drivers	62 in.	50 in.
Boiler, type	Ext. wagon top.	Straight top.
" wkg. steam press.	180 lbs.	170 lbs.
" diam. smlst ring.	$58\frac{1}{8}$ in.	56 in.
Heating surface, tubes	1,655 sq. ft.	990 sq. ft.
" " firebox.	128 "	131 "
" " total	1,783 "	1,121 "
Tubes, number	239	172
" diameter	2 in.	2 in.
" length	13 ft. $\frac{1}{8}$ in.	11 ft. $1\frac{1}{16}$ in.
Firebox, length	$102\frac{1}{8}$ in.	96 in.
" width	$40\frac{1}{4}$ in.	33 in.
" depth	F.71 in., B.58 in.	F.64 in., B.62 in.
Grate area	28.54 sq. ft.	21.34 sq. ft.
Tender, style	Water bottom.	U-shaped.
" truck	Arch bar	Arch bar.
" water capacity	5,500 gals.	3,000 gals.
" coal capacity	14 tons.	4.4 tons.

Special Equipment.

Bell ringers	Gollmar
Blow-off valves	Johnstone
Boiler covering	Keasby & Mattison
Boiler steel	Lukens
Brakes	Westinghouse
Brake-shoes	American Brake Shoe & Foundry
Couplers	Climax
Driving wheel centers	10-whl. cast-steel; 6-whl. cast-iron
Exhaust apparatus	Co. standard
Firebox, steel	Otis
Headlights	Co. standard 18 in. R. C.
Injectors	Monitor
Journal bearings	Magnus
Lubricators	Nathan
Metallic packing	United States
Safety valves	Coale
Sanding device	Leach
Springs	Railway Steel-Spring Co.
Steam gages	Crosby
Tender brake-beams	Wycott No. 2
Tires	Latrobe
Valves	Richardson
Whistles	Co. standard chime

The Temiskaming & Northern Ontario, reported in the *Railroad Age Gazette* of March 12, has ordered two switching locomotives from the Canadian Locomotive Co., for July delivery.

General Dimensions

Total weight	128,000 lbs.
Cylinders	19 in. x 26 in.
Diameter of drivers	51 in.
Boiler, type	Radial stayed
Boiler, working steam pressure	200 lbs.
Tubes, number	223
" length	10 ft. 6 in.
" outside diameter	2 in.
Water capacity	45,000 Imp. gals.
Coal capacity	6 tons

Special Equipment.

Brakes	Westinghouse
Piston and valve rod packing	Metallic
Truck bolsters	Simplex

CAR BUILDING.

The St. Joseph & Grand Island is in the market for three observation parlor cars.

The Central Railroad of New Jersey has ordered 15 coaches from Harlan & Hollingsworth.

The Baltimore & Ohio is said to be asking prices on 10,000 freight cars. This item is not confirmed.

The Sugar Land Railway, N. V. Truly, General Manager, Sugar Land, Tex., is in the market for a rebuilt first-class private car.

The Long Island, reported in the *Railroad Age Gazette* of March 5 as asking prices on 114 fifty-ton box and 20 fifty-ton gondola cars, has given this order to the Pressed Steel Car Co.

The Wabash-Pittsburgh Terminal Railway, reported in the *Railroad Age Gazette* of February 19 as asking prices on 200 hopper cars, has ordered 500 fifty-ton hopper cars from the Standard Steel Co.

The Chicago, Milwaukee & St. Paul, reported in the *Railroad Age Gazette* of February 12 as asking prices on passenger equipment, has ordered 25 coaches, 10 sleepers and 4 dining cars from the Pullman Car Co.

The Spokane, Portland & Seattle has ordered 5 coaches, 3 combination passenger-smoking, 2 combination baggage-express, 1 combination mail-express and 2 observation buffet cars from the Pullman Car Co.

The Erie & Michigan Railway & Navigation Co., reported in the *Railroad Age Gazette* of December 18 as being in the market for 200 box cars, has not placed the order for that equipment and the matter is now being held in abeyance.

The Vandalia has ordered 205 freight cars for replacement account as follows: 52 hopper and 50 gondola cars from the Cambria Steel Co.; 72 box cars from the American Car & Foundry Co., and 31 stock cars from the Standard Steel Car Co.

The Salt Lake & Ogden (Electric), Salt Lake City, Utah, reported in the *Railroad Age Gazette* of December 25 as soon to be in the market for cars, expects to purchase twelve 56-ft. cars, six of which will be coaches and six combination passenger and baggage cars.

The Third Avenue Railroad, New York, was reported in the *Railroad Age Gazette* of December 18 as being in the market for 200 cars. These cars were ordered from the J. G. Brill Co., as were 75 additional cars just placed. The electrical equipments for these 75 cars were divided between the Westinghouse Manufacturing Co., which received 50, and the General Electric Co., which received 25 complete equipments.

The New York Central Lines, reported in the *Railroad Age Gazette* of March 12 as being in the market for passenger and freight equipment, has placed orders as follows:

New York Central & Hudson River:	
20 steel baggage-express	American Car & Foundry Co.
16 steel baggage-express	Standard Steel Car Co.
Michigan Central:	
10 steel baggage-express	Pullman Car Co.
Cleveland, Cincinnati, Chicago & St. Louis:	
5 steel baggage-express	Barney & Smith Car Co.

The Minneapolis & St. Louis, as reported in the *Railroad Age Gazette* of March 5, has ordered 500 wooden 30-ton box and 100 wooden 40-ton coal cars from the Mt. Vernon Car Manufacturing Co. The box cars are for delivery in April and May and the coal cars in April. The box cars will be 34 ft. 1½ in. long, 8 ft. 3 in. wide and 7 ft. 1 in. high, inside measurements, and 35 ft. ½ in. long, 8 ft. 9¾ in. wide and 12 ft. 4 in. high, outside dimensions. The coal cars will be 38 ft. 8 in. long, 8 ft. 8⅞ in. wide and 4 ft. 1 in. high, inside dimensions, and 40 ft. long and 9 ft. 1⅞ in. wide, outside dimensions. The box cars will weigh 32,100 lbs. and the coal cars 37,700 lbs. The special equipment will include:

Axles	O. H. steel
Bolsters, body and truck	Simplex
Brakebeams	Simplex
Brakeshoes	Streeter steel back
Brakes	New York
Center bearings	Co. standard
Couplers	R. E. Janney steel
Door fastenings, box cars	Positive
Doors, box cars	Security
Draft rigging	Farlow
Journal bearings	Eureka
Journal boxes	McCord
Paint	Co. standard
Roofs, box cars	Hutchins inside
Side bearings, box cars	Barber roller
Springs	Railway Steel-Spring
Trucks	Andrews side frames
Wheels	Mt. Vernon Car Mfg. Co.

IRON AND STEEL.

The Northern Pacific is in the market for 5,000 tons of rails.

The Philadelphia & Reading is reported to be in the market for 10,000 tons of steel.

The New York Central Lines are making inquiries for about 40,000 tons of fabricated steel.

The Minneapolis, St. Paul & Sault Ste. Marie is in the market for 6,000 tons of rails.

The Chicago, Milwaukee & St. Paul, reported in the *Railroad Age Gazette* of February 12 as soon to be in the market for 40,000 tons of rails, is reported to have placed an order for 1,600 tons with the Illinois Steel Co.

The Grand Trunk Pacific has ordered 13,000 tons of 80-lb. rails and 2,000 tons of 60-lb. rails from the Dominion Iron & Steel Co., for delivery at Prince Rupert during the coming summer. These rails will be A. S. C. E. section.

The Chicago & North Western, reported in the *Railroad Age Gazette* of March 19 as being in the market for 11,000 tons of structural steel for track elevation work, has placed an order for 9,000 tons with the American Bridge Co. and for 2,000 tons with the Modern Structural Steel Co. of Waukesha, Wis.

General Conditions in Steel.—During the month of March, according to information gathered by the *Journal of Commerce*, New York, contracts were given for 144,420 tons of fabricated steel, of which 46,420 tons are for use in railway bridge and building construction. The all important factor in the steel business seems to be the final action on the tariff. Indications are that orders for a considerable tonnage are still being held back on this account. An officer of the Chicago & Alton is quoted as having said that close investigation of the steel rail situation disclosed no tendency to grant concessions in price even on a fair-sized order; on the contrary, manufacturers were positive that standard sections would not be cut. In this connection, it is to be remembered that a cut at this time would affect prices of rails now being rolled.

RAILROAD STRUCTURES.

Brewster, Ohio.—The Receiver of the Wheeling & Lake Erie has made application to the courts for permission to issue receivers' certificates to the amount of $1,429,976 for building new stations, interlocking plants, equipment supplies and making necessary renewals. It is planned to build new shops at Brewster costing $750,000. (Dec. 4, p. 1503.)

Columbus, Ohio.—According to press reports, the Ohio Electric Railway Co. will put up a new passenger station on

ground which it owns on South Third street, between Town and Rich streets.

Dayton, Wash.—The Oregon Railroad & Navigation Co. may build a steel bridge over the Touchet river.

New York.—See New York Connecting under Railroad Construction.

Vancouver, B. C.—The head office of the Canadian Pacific at Montreal refuses to confirm the report that this company will put up new car and locomotive shops at Vancouver, B. C. (March 26, p. 729.)

SIGNALING.

The Chicago, Rock Island & Pacific has changed the night color indications in its fixed signals and switch targets throughout the Illinois division from Blue Island to Davenport, 167 miles. The indications now are green for clear, red for stop and yellow for caution in block and interlocking signals, and for the adverse indication of siding switches.

Supply Trade News.

Press reports from Dunkirk, N. Y., indicate that the American Locomotive Company will build a new boiler shop at its Brooks plant.

Jasper R. Rand, of New York, vice-president of the Ingersoll-Rand Co., New York, died at St. Mark's Hospital, New York, on March 30.

The Isthmian Canal Commission is asking bids up to April 26 on hose, packing, rubber, valves, gaskets, rubber belting, etc. (Circular No. 501.)

Ezra D. Beckwith, Vice-President of the W. F. Bossert Manufacturing Co., Utica, N. Y., died suddenly of heart trouble last week. He was 70 years old.

According to a consular report a private motor car service is shortly to be started between Bukit Mertajam and Kulim, in Kedah, Straits Settlements. The car will make four round trips a day.

G. Fred Collins has resigned his position with the Gold Car Heating & Lighting Co., New York, to take charge of the railway business of John A. Crowley & Co., 120 Liberty street, New York, U. S. representatives for "Arrow" high-speed tool steel.

The Westinghouse Electric & Manufacturing Co., Pittsburgh Pa., will furnish the electrical equipment for 50 cars, and the General Electric Co., Schenectady, N. Y., the equipment for 25, of the 75 cars recently ordered from the J. G. Brill Co., Philadelphia, Pa., by the Third Avenue Railroad, New York.

As noted in the *Railroad Age Gazette* of March 26, part of the works of the Wright Wire Co. at Worcester, Mass., were burned on March 20. The next day there was a fire at the Palmer plant. Nearly all the machinery, however, is in such shape that it can be operated, and the company is in a position to fill orders.

The American Car & Equipment Co., Chicago, announces the following changes in the officials of its company: President, H. H. Sessions; Vice-President, C. R. Powell; Secretary and Treasurer, W. H. Horine; General Sales Manager, B. B. Barry. I. J. Kusel having disposed of his holdings in the company to H. L. Winslow, formerly of Julian L. Yale & Co., Chicago, has resigned as Vice-President.

The Jones & Laughlin Steel Co., Pittsburgh, Pa., has sold to Blair & Co., New York, and the First Trust & Savings Co., Chicago, $15,000,000 30-year 5 per cent. bonds, being part of an authorized issue of $30,000,000. The proceeds are to be used to retire about $2,000,000 in previous obligations, and the remainder will be used for future improvements and to reimburse the treasury for money already spent on new construction.

The Hanlon Locomotive Sander Co., Winchester, Mass., has had its locomotive sanders specified upon the 10 consolidation, 5 Pacific and 5 switching locomotives being built by the American Locomotive Co. for the Chicago & Alton; the 16 ten-wheel locomotives being built by the same company for the Missouri, Kansas & Texas, and the 12 consolidation locomotives being built by the same company for the Wabash-Pittsburgh Terminal.

Gulick-Henderson & Co., Pittsburgh, Pa., have been awarded the contract for the inspection of a bridge to be built across the Monongahela river at Monongahela City, Pa. This work is under the charge of County Engineer J. C. Chalfant, and the construction work has been let to the Fort Pitt Bridge Works, Pittsburgh, Pa. The firm will also inspect some 30,000 all-steel wheels to be furnished the Chicago city railways and the Chicago railways to be made at the Schoen steel wheel plant of the Carnegie Steel Co., Pittsburgh, Pa.

Willis C. Squire, Consulting Engineer, has been appointed District Manager of the Central Inspection Bureau, New York, with office in the Western Union building, Chicago. The Bureau is equipped to furnish engineers for all kinds of railway, bridge and builders' equipment; it also makes a specialty of designing cars and inspecting locomotives, passenger cars and freight cars. It recently completed the inspection of 44 locomotives for the Argentine government, and is now superintending the construction of a number of freight and passenger cars for the Yueh-Han Railway, China.

Horace L. Winslow, for a number of years connected with Julian L. Yale & Co., Chicago, in general railway supply business, pipe engineering, etc., has opened an office at 730 Old Colony building, Chicago, and will handle specialties along the same lines as heretofore. A corporation with $25,000 capital is being organized and Mr. Winslow will have some of the men formerly connected with Julian L. Yale & Co. associated with him. In addition to the old lines handled, Mr. Winslow will handle the Clark blow-off system for removing sludge from locomotive boilers and keeping them free from scale.

Julius W. Schaub, Consulting Engineer, Chicago, died on March 30, on a train en route from New York to Chicago. Mr. Schaub was born in 1859 and graduated from Washington University, St. Louis, Mo., in 1881 with C.E. degree. For the next five years he worked with C. Shaler Smith, C.E., in St. Louis. Then, until 1892, he was Chief Engineer of the Detroit Bridge & Iron Works. He then went to the Pottsville Iron & Steel Co. as Chief Engineer and Manager, and two years later became Chief Engineer and Manager of the Hamilton Bridge Works, Canada. Since 1898 he had been a consulting engineer. He was a member of the American Society of Civil Engineers.

Thomas Dales Henderson, Western Representative of James B. Sipe & Co., Pittsburgh, Pa., died on March 23 at his home in Chicago. His death came very unexpectedly and suddenly. He was at his desk on Monday in apparently his usual health and early Tuesday morning was stricken with heart failure and died before medical aid could be got. He was born in Allegheny county, Pa., in 1861. Going to Chicago in 1889 he became connected with various oil and paint manufacturing companies, having been engaged in the oil and paint business five years previously. During this period he was engaged in the manufacture of Japan oil, and at the time of his death had charge of the Chicago office of one of the largest distributors of that product.

R. H. Weatherly, Third Vice-President in charge of sales of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has resigned, effective April 15. Mr. Weatherly intends to remain in the railway supply business and has received several inviting propositions. He has spent nearly all his life in this field and his acquaintance is large and influential. He got his early education in the Manual Training School of Washington University, St. Louis, and after graduating in 1892 he went into the car seat business, where he remained for about six years. After this he became connected with the Safety Car Heating & Lighting Co., New York, and later resigned to go with the Shickle-Harrison-Howard Iron Co.

On the organization of the American Steel Foundries, Chicago, in 1902, he became Assistant to the Second Vice-President, with office in New York. In 1905 he was made Third Vice-President of the Scullin-Gallagher Iron & Steel Co., in charge of the Eastern district, and in February, 1907, was given charge of the entire sales of the company, with office in St. Louis.

The Bureau of Manufacturers, Washington, D. C., has an inquiry from a saw mill owner in Latin America asking for an estimate on a small electric trolley to be used in hauling cars loaded with logs and sawed timber. The estimate should cover cost of trolley, transmission wire, connections for rails, etc., f. o. b. New York City. The motor is required for a 200-volt continuous current, carrying a load of 5,000 to 7,000 lbs. dead weight, and should be reversible if possible, so as to avoid use of a switch in returning train to loading point. Track gage is 1.06 meters, laid with rails running 10 kilos (22.04 lbs.) to the meter. Correspondence should be in Spanish if possible. (Inquiry No. 3232.) Another saw mill owner in Latin America asks for an estimate of cost of a simple wire rope haulage system to handle logs and sawed timber. He has 15 h.p. available to operate the system. There is now a single track about 1,000 ft. long, with rails weighing 10 kilos to the meter, and the load to be carried will average about 6,000 lbs. Correspondence should be in Spanish if possible, and details regarding the initial cost for installation, together with facts relative to the ease and economy of operation, should be given. The inquirer has the necessary cars and requires only cable, connections, drums, etc. (Inquiry No. 3237.)

TRADE PUBLICATIONS.

Pneumatic Pumps, Rock Drills and Channelers.—The Ingersoll-Rand Co., New York, in catalogue 74-B, describes pneumatic pumping systems, and in 21-A illustrates and describes electric-air rock drills and channelers.

Suction Conveyor.—The Darley Engineering Co., Pittsburgh, Pa., has just issued Bulletin No. 2 on suction conveyors, which contains a large number of illustrations and an amount of instructive information on this subject.

Mill Motors.—The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has just issued Circular No. 1164, which illustrates and describes type MS mill motors for polyphase alternating currents circuits, with constant speed squirrel cage rotors.

Train Lighting.—The General Electric Co., Schenectady, N. Y., has just issued Booklet No. 3,757, which deals with the advantages to be derived from the use of tantalum incandescent lamps for illuminating railway coaches, also with reference to the generating outfit designed for use with train illuminating systems.

Thermit.—The Goldschmidt Thermit Co., New York, in a catalogue just issued, describes with a number of illustrations thermit welding of castings and forgings. The illustrations show work done on both steam railway and electric apparatus. One illustration shows a weld on a railway truck, made without dissembling the parts.

Track Wrenches.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued, from its forge and foundries department, Bulletin No. 101, which contains a description, with a number of illustrations, of the Jeffrey lock-jaw track wrench. This wrench was illustrated and described in the *Railroad Age Gazette* of March 26.

Furnaces.—The Hawley Down Draft Furnace Co., Chicago, has issued an 80-page catalogue which describes in detail the Schwartz metal melting and refining furnaces. These furnaces use crude oil, fuel oil or gas for fuel. The publication is well illustrated with half-tones and line drawings and contains several fac-simile letters from prominent industrial companies testifying to the merits of the furnaces under different conditions.

Vestibule Diaphragms.—A circular just issued by Victor Labadie, 181 Live Oak street, Dallas, Tex., contains a complete description of the Labadie vestibule diaphragm recessed face plate, which is a patented device designed to eliminate personal injuries caused to passengers in placing their fingers between the face plates of vestibuled railway cars. This device was illustrated and described in the *Railroad Age Gazette* of March 26.

Malleable and Cast Iron Pipe Fittings, Castings and Railway Supplies.—The general steam goods catalogue for 1909 of the Illinois Malleable Iron Co., Chicago, containing 466 pages of descriptive and illustrative matter, has just been issued. The publication gives in detail the malleable and cast iron pipe fittings, steam and hot water boilers and castings of every description in gray and malleable iron manufactured by the company; also the pipe, steam fitters', engineers', gas, water works and railway supplies which it handles. It is bound in cloth and is a convenient general reference book, very complete and useful.

Heavy Milling Machines and Hammers.—The Niles-Bement-Pond Co., New York, has just issued two of its standard 9-in. x 12-in. catalogues printed on heavy paper. One of these describes heavy milling machines, including 24, 30, 36, 42, 48 and 60-in. horizontal milling machines; 43 and 48-in. heavy rod milling machines; the 42-in. planer type milling machine; a five-spindle type milling machine and rotary planers. The other catalogue describes double and single-frame steam hammers, double-frame steel tilting hammers, and steam and board drop hammers. Both of these catalogues contain a large number of excellent full-page half-tone illustrations and some line cuts.

Signal Apparatus.—The General Railway Signal Co., Rochester, N. Y., has issued a number of catalogues and bulletins calling attention to its new devices as well as its standard signal apparatus. Especial attention is called to its Model 2-A signal mechanism, which is the first universal power-operated signal designed, being operated as an interlocking signal with either dynamic or battery indication; as an automatic block signal, a.c. or d.c.; as a high or a dwarf signal; in upper or lower quadrant; on high or low voltage and at base or top of post. Bulletin No. 102 illustrates and describes its Model 5 signal. Bulletin No. 104 is devoted to relays. Model 9, Form C, is arranged so that its front contacts can be removed for cleaning without breaking the seal on the relay or in any way interfering with the adjustment of the contacts. Bulletin No. 105 describes Model 1, Form A, outlying switch lock. This device is also designed for a telephone attachment. Bulletin No. 106 describes lightning arresters, Model 1, Form A, which contains a new arrangement of parts. Bulletin No. 107 describes Model 4, Form A, universal screw release for mechanical interlocking machines designed for application to either the Saxby & Farmer or Style A machine. The only difference in application of this device is in the style of dog. Bulletin No. 108 describes the universal electric lock for mechanical interlocking, Model 5, Form A. Bulletin No. 109 describes electric lever lock, Model 4, Form A, designed for application to any of its Model 2 interlocking machines. Bulletin No. 110 describes a switch indicator, Model 9, Form A. This is a new device designed with standard parts wherever applicable. Bulletin No. 111 describes Model 9, Form A, tower indicator. This is also a new device equipped with standard parts and is a unit construction, which can be grouped on shelves or screwed to the wall. Bulletin No. 112 is devoted to the controlled manual block system.

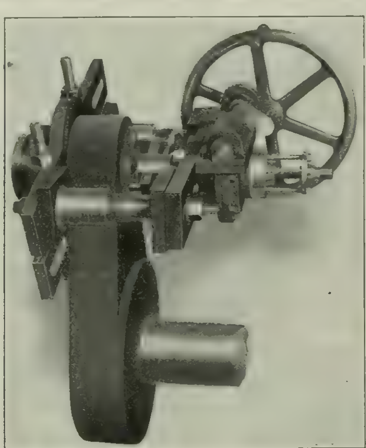
Underwood Universal Boring, Turning and Facing Machine.

The tool shown in the accompanying half-tone is designed principally for facing off the rivet head on crank pins, although it is also adaptable to a wide range of other work. When crank pins are riveted in countersunk holes, it is an expensive operation for a mechanic to cut away the riveted metal with a hammer and chisel in order to force out the pin.

The machine is easily set up and will, it is said, cut the metal in

about one-quarter of the time required by the other method. It is readily clamped to almost any piece of work and is then in position to bore, turn or face. The machine consists of a slotted crosshead, which forms its base, and a casing which contains a worm wheel having large integral hubs. The cutting spindle slides through the worm wheel through a range of 4 in. The feed is adjusted by hand. A steel slide is cut in the end of the spindle and the cutting tool is adjustable in this slide for different diameters by a feed screw, up to about 12 in. The two slotted V-blocks clamp the work and are pulled together by 1-in. through bolts. There are two adjustable spacing blocks threaded to receive each other, to straddle different diameters of cranks, locomotive wheels or other work. The bolts pass through the blocks and clamp the machine proper to the V-blocks.

The entire arrangement is firm and solid, and each piece being light, is easily handled by one man. The machine is quickly centered and has three changes of speeds, designed for heavy, medium or light work.



Underwood Universal Boring, Turning and Facing Machine.

These speeds are obtained by interchanging the gears on the driving shaft, or by driving direct without them. The spindle at right angles to the base or crosshead and through an extra heavy facing attachment, can be used for facing off pump or engine valve seats, it being immaterial whether or not the steam chest be solid or the seat be several inches below the face of the chest. The machine may be driven by hand or any other power.

In turning off a rivet on a crank pin, it is claimed that the machine will save at least 70 per cent. of the time required for the same operation using a hammer and chisel. These machines are made by H. B. Underwood & Co., Philadelphia, Pa

"Economy" Tie Plates at the Maintenance of Way Convention.

At the exhibit of railway appliances during the Engineering and Maintenance of Way convention in Chicago, the Spencer Otis Co., Chicago, exhibited several new patterns of "Economy" tie plates. These plates are rolled from open hearth steel and are designed to meet all of the conditions of tie preservation and track fastening betterments necessitated by the increased speed and weight of rolling loads.

Special attention was directed to "Economy" types 9 and 10. No. 9, shown in Figs. 1 and 2, was designed to meet the demands of screw spike users to obviate failure from distortion and bending of the spike under the head from the lateral thrust of the rail, imperfect application and non-support back of the head. These plates are made for both three and four-hole punching. The bosses or reinforcements are given the same angle as the rail base and the holes form a jig or guide for boring the holes before applying the screw spike. The user is thus assured of a good bearing of the flange or head of the spike against both rail and tie plate whether applied by hand or machine. This type of plate can always be used with driven spikes, affording reinforcement back of the head. Both of these features were demonstrated during the convention.

Fig. 3 shows the "Economy" No. 10 type, which is unique in design. It has an overhanging hook on the outside of the plate and a vertical shoulder on the inside. The hook affords vertical and transverse resistance to prevent the rail from rolling or turning on sharp curves and turnouts; it also prevents the plate from buckling. The inside shoulder, in combination with the hook, eliminates any necking or cutting

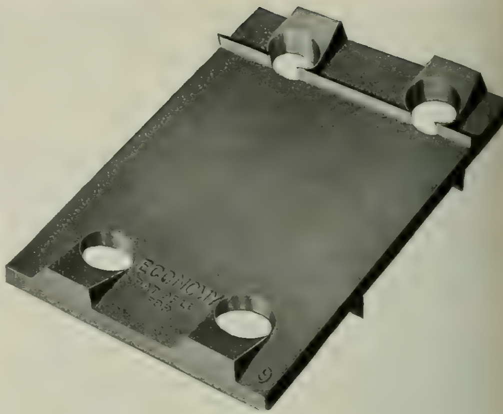


Fig. 1.

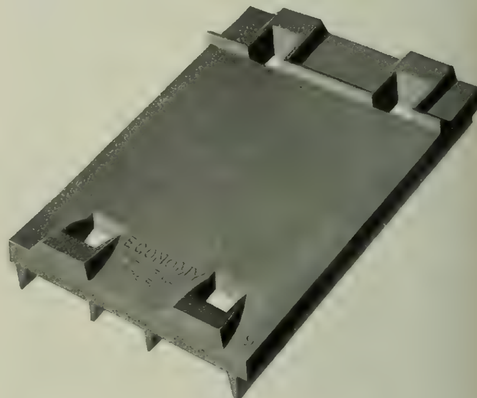


Fig. 2.

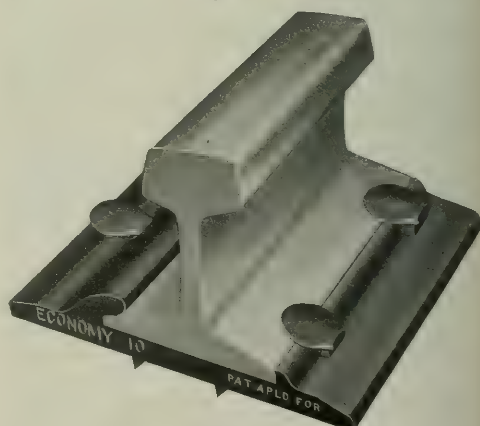
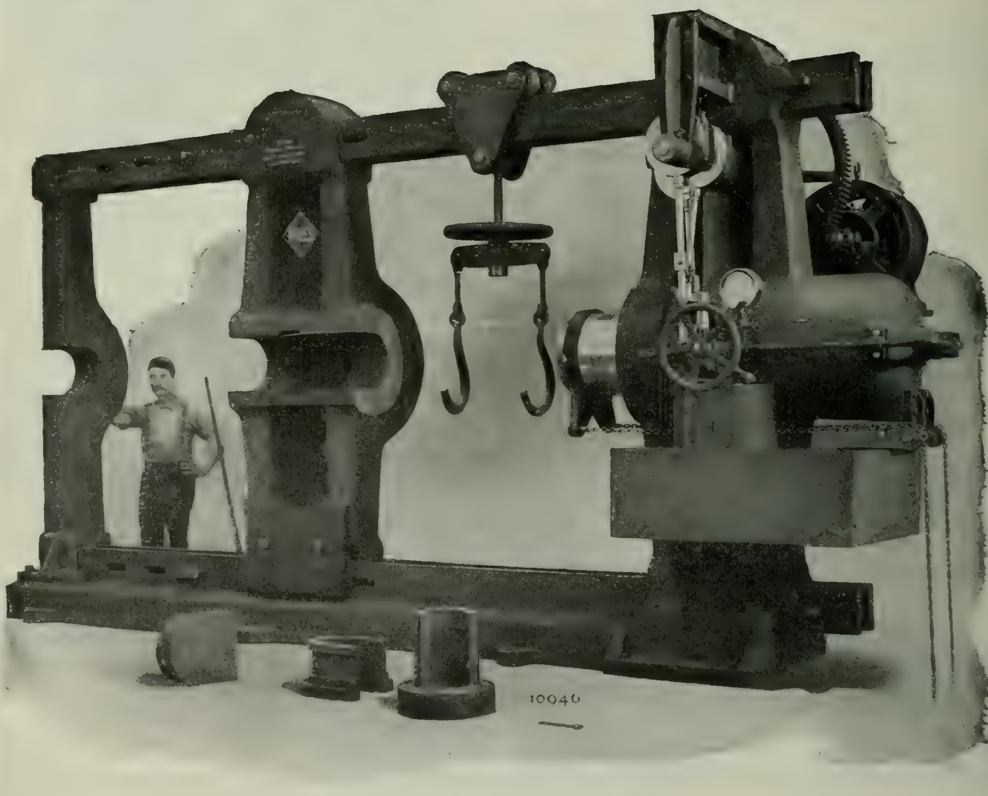


Fig. 3.

of the spike by abrasion from the running or "back slap" of the rail.

The general offices of the Spencer Otis Co. are in the Railway Exchange, Chicago. Branch offices are located in New York, St. Louis, Mo., St. Paul, Minn., Omaha, Neb., and Norfolk, Va., and the mills are at Portsmouth, Ohio.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ALPHABETICAL INDEX TO ADVERTISERS—CLASSIFIED DIRECTORY ON THE NEXT PAGE.

†Once a Month. *Every Other Week.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Accountant.
Whitehead, H. C.

Acetylene Lighting.
Commercial Acetylene Co.
Rushmore Dynamo Works.

Air Brake Fittings.
Fairbanks, Morse & Co.
National Tube Co.
Simmons Co., John.
Western Railway Equipment Co.
Westinghouse Air Brake Co.

Air Brake Hose—(See Hose).

Air Brakes.
Westinghouse Air Brake Co.

Air Compressors.
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Franklin Railway Supply Co.
Gardner Governor Co.
Independent Pneumatic Tool Co.
Murphy & Co., Christopher.

Air Hoists—(See Hoists).

Anti-Friction Metal—(See Babbitt Metal).

Anti-Rail Creepers.
Railway Specialty & Supply Co.

Anvils.
Eagle Anvil Works.

Architects.
Dodge & Day.

Asbestos.
Asbestos Protected Metal Co.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Asphalt.
Standard Asphalt & Rubber Co.

Augers Pneumatic—(See Pneumatic Tools).

Axles.
Block-Pollak Iron Co.
Cleveland City Forge & Iron Co.
Gould Coupler Co.
Johnson & Co., J. R.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Manganese Steel Rail Co.
Pittsburgh Forge & Iron Co.
Standard Steel Works Co.

Babbitt Metal.
Brady Brass Co.
Damascus Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Baggage Checks.
American Railway Supply Co.

Baggage Racks.
Rostand Mfg. Co.

Balanced Main Valves.
American Balance Valve Co.
Hammett, H. G.

Ballast Cars—(See Cars, Ballast).

Ballast Unloaders.
Bucyrus Co.
Fairbanks, Morse & Co.
Marion Steam Shovel Co.

Batteries, Electric.
Edison Mfg. Co.
Electric Storage Battery Co.
Railroad Supply Co.
Westinghouse Machine Co.
Willard Storage Battery Co.

Battery Chutes and Vaults.
Buda Foundry & Mfg. Co.

Bearing Metal—(See Journal Bearings).

Bell Ringers.
Ward-Packer Supply Co.
Western Railway Equipment Co.

Bells, Locomotive.
Lawrenceville Bronze Co.
National Tube Co.

Bending Rolls.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Blocks and Tackle.
American Hoist & Derrick Co.
Boston & Lockport Block Co.

Blowers.
American Blower Co.
Monarch Engineering & Mfg. Co.
Sirocco Engineering Co.

Blow Torches, Large Portable Oil.
Macleod & Co., Walter.

Blue Printing Machines.
Kolesch & Co.

Blue Print Papers.
Kolesch & Co.

Boiler Compounds.
Dearborn Drug & Chemical Works.
Jewell Engineering Co.
Johns-Manville Co., H. W.
Ward-Packer Supply Co.

Boiler Covering—(See Covering, Pipe and Boiler).

Boilers.
American Locomotive Co.
Baldwin Locomotive Works.
Carlin's Sons Co., Thomas.
Fairbanks, Morse & Co.
Hannoversche Masch.-Actien-Ges'aft
Hicks Locomotive & Car Works.
Vulcan Iron Works.
Yale & Co., Julian L.

Boilers, Steam and Water Heating.
Lord & Burnham Co.

Boiler Tubes.
Krupp (Prosser & Son).
National Tube Co.
Parkesburg Iron Co.
Simmons Co., John.
Tyler Tube & Pipe Co.
Worth Bros. Co.
Yale & Co., Julian L.

Boiler Washout Systems.
National Boiler Washing Co.
Yale & Co., Julian L.

Bolsters, Steel.
American Steel Foundries.
Atha Steel Casting Co.
Barney & Smith Car Co.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Commonwealth Steel Co.
Gould Coupler Co.
Pressed Steel Car Co.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Car Co.

Bolt and Nut Machinery.
Acme Machinery Co.
Ajax Mfg. Co.
Niles-Bement-Pond Co.

Bolts and Nuts.
Q. & C. Co.
Railway Specialty & Supply Co.

Boring Bars—(See Portable Tools).
Underwood & Co., H. B.

Boring Machines, Horizontal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring Machines, Metal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring and Turning Mills.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Brakebeams.
American Steel Foundries.
Chicago Railway Equipment Co.
Cleveland Car Specialty Co.
Barney & Smith Car Co.
Davis Solid Truss Brake Beam Co.
Pressed Steel Car Co.
Standard Steel Car Co.

Brakejaws.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.
U. S. Metal & Manufacturing Co.
Western Railway Equipment Co.

Brake Levers.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.

Brakeshoes.
American Brake Shoe & Fdry. Co.
Buckeye Steel Castings Co.
Franklin Railway Supply Co.
Georgia Car Co.
Railway Materials Co.
Transue & Williams Co.
Wheel Truing Brake Shoe Co.
Yale & Co., Julian L.

Brakeshoes, Wheel Truing.
Wheel Truing Brake Shoe Co.

Brass Castings—(See Castings, Brass).

Brasses, Car and Engine—(See Journal Bearings).

Bridges, Buildings & Roofs.
Atlantic Equipment Co.
American Bridge Co.
Baltimore Bridge Co.
Interstate Engineering Co.
King Bridge Co., The.
Louisville Bridge & Iron Co.
Males Co., The.
McClintic-Marshall Constrn. Co.
Missouri Val. Bridge & Iron Wks.
Phoenix Bridge Co.
Riter-Conley Mfg. Co.
Scherzer Rolling Lift Bridge Co.
Shoemaker & Co., Lewis F.
Snare & Triest Co.
Virginia Bridge & Iron Co.
White & Co., J. G.

Bridges, Second Hand.
Johann, F. A.

Bridge Timber—(See Timber).

Bronze.
Brady Brass Co.
Damascus Bronze Co.
Lawrenceville Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Buckets, Automatic Grab.
Browning Engineering Co.
Link-Belt Co.

Bulldozers.
Ajax Mfg. Co.
Niles-Bement-Pond Co.
Williams, White & Co.

Bumping Posts.
Fairbanks, Morse & Co.
McCord & Co.
Mechanical Mfg. Co.

Cables, Electric.
Brixey, W. R.
General Electric Co.

Cableways.
Brown Hoisting Machinery Co.
Flory Mfg. Co., S.

Caboose, Jacks, Cast-Iron.
Dickinson, Inc., Paul.

Calculating Machines.
Kolesch & Co.

Car Axles—(See Axles).

Carborundum.
Carborundum Co.

Car Cleaner.
Ward-Packer Supply Co.

Car Closets.
Duner Co.

Car Couplers—(See Couplers).

Car Curtains.
Curtain Supply Co.
General Railway Supply Co.
National Lock Washer Co.
Pantasote Co.

Car Doors.
Ostermann Mfg. Co.
U. S. Metal & Mfg. Co.
Western Railway Equipment Co.

Car Flooring.
American Mason Safety Tread Co.
General Railway Supply Co.
Wood, Guilford S.

Car Heating.
Chicago Car Heating Co.
Consolidated Car-Heating Co.
Franklin Railway Supply Co.
Gold Car Heating & Lighting Co.
Johns-Manville Co., H. W.
Safety Car Heating & Lighting Co.

Car Lighting.
Bliss Electric Car Lighting Co.
Commercial Acetylene Co.
Electric Storage Battery Co.
General Electric Co.
Gold Car Heating & Lighting Co.
Safety Car Heating & Lighting Co.

Carlines, Pressed Steel.
Cleveland Car Specialty Co.

Car Movers.
Appleton Car Mover Co.
Fairbanks, Morse & Co.
Hubbard & Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Platforms, Steel.
Commonwealth Steel Co.
Standard Coupler Co.

Car Repair Material, Second-Hand.
Jennings, Geo. W.

Car Replacers.
Buda Foundry & Mfg. Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Roofing.
Asbestos Protected Metal Co.
Bird & Son, F. W.
Bunker, Ed. A.
Chicago-Cleveland Car Roofing Co.
Drake & Weirs Co., The.
Excelsior Car Roof Co.
General Railway Supply Co.
Johns-Manville Co., H. W.
Standard Paint Co.
Standard Ry. Equipment Co.

Car Sills.
Carter Lumber Co.
Frost-Trigg Lumber Co.
Stone, F. B.

Car Trimmings.
Wood, G. S.

Car Trucks—(See Trucks).

Car Upholstery.
Aikman & Co., C. M.
Chase & Co., L. C.
Pantasote Co.
Collins & Aikman.

Car Wheels.
Barney & Smith Car Co.
Fairbanks, Morse & Co.
Griffin Wheel Co.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Lobdell Car Wheel Co.
Mt. Vernon Car Mfg. Co.
Railway Steel-Spring Co.
Standard Steel Works Co.
Wiener Co., Ernst.

Car Window Fixtures.
Curtain Supply Co.
Edwards Co., O. M.
General Railway Supply Co.
National Lock Washer Co.

Cars.
American Car & Equipment Co.
Atlantic Equipment Co.
Barney & Smith Car Co.
Bradley & Sons, O.
Buda Foundry & Mfg. Co.
Cincinnati Equipment Co.
Climax Mfg. Co.
Continental Car and Equipment Co.
Fairbanks, Morse & Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
German-American Car Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Hotchkiss, Blue & Co.
Illinois Car Co.
Lima Locomotive & Machine Co.
McGuire-Cummings Mfg. Co.
Middletown Car Works.
Milwaukee Car Mfg. Co.
Mt. Vernon Car Mfg. Co.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Ralston Steel Car Co.
Rodger Ballast Car Co.
Russell Car & Snow-Plow Co.
Standard Steel Car Co.
White Enamel Refrigerator Co.

Cars, Ballast.
Continental Car & Equipment Co.
Fairbanks, Morse & Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Males Co.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Rodger Ballast Car Co.
Standard Steel Car Co.

Cars, Dump.
Cincinnati Equipment Co.
Continental Car & Equipment Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Hunt Co., C. W.
Jeffrey Mfg. Co.
Lima Locomotive & Machine Co.
Milwaukee Car Mfg. Co.
Oliver Mfg. Co., Wm. J.
Ostermann Mfg. Co.
Pressed Steel Car Co
Ralston Steel Car Co.
Rodger Ballast Car Co.
Russell Car & Snow-Plow Co.
Standard Steel Car Co.
Wiener Co., Ernst.
Wonham & Magor.

Cars, Inspection.
Buda Foundry & Mfg. Co
Fairbanks, Morse & Co.
General Electric Co.
Kalamazoo Railway Supply Co.
Kenly Co., W. K.
Light Inspection Car Co.
Stover Motor Car Co.
Wiener Co., Ernst

Cars, Logging.
Buda Foundry & Mfg. Co.
Continental Car & Equipment Co.
Wiener Co., Ernst.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Cars, Rebuilt.
American Car & Equipment Co.
Atlantic Equipment Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
Hicks Locomotive & Car Works.
Illinois Car Co.
Males Co.
Milwaukee Car Mfg. Co.
Ostermann Mfg. Co.

Cars, Second-Hand.
American Car & Equipment Co.
Atlantic Equipment Co.
Beatty, W. R.
Cincinnati Equipment Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
Johann, F. A.
Males Co.
Milwaukee Car Mfg. Co.
Ostermann Mfg. Co.
Ralston, C. A.
Southern Iron & Equipment Co.
Wilson & Co., E. H.
Zelnicker Supply Co., Walter A.

Cars, Tip.
Continental Car & Equipment Co.
Hunt Co., C. W.
Jeffrey Mfg. Co.
Link-Belt Co.
Whiting Foundry Equipment Co.
Wiener Co., Ernst.

Castings, Brass.
Brady Brass Co.
Continental Car & Equipment Co.
Damascus Bronze Co.
Lawrenceville Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corporation.

Castings, Iron and Steel.
American Brake Shoe & Fdy. Co.
American Steel Foundries.
Atha Steel Casting Co.
Barney & Smith Car Co.
Buckeye Steel Castings Co.
Bucyrus Steel Castings Co.
Commonwealth Steel Co.
Gould Coupler Co.
Hunt-Spiller Mfg. Corporation.
National Malleable Castings Co.
Ramapo Iron Works.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Works Co.
Vulcan Steam Shovel Co.

Castings, Malleable Iron.
Beaver Dam Malleable Iron Co.
Buckeye Steel Castings Co.
Dayton Malleable Iron Co.
Gould Coupler Co.
Illinois Malleable Iron Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Northwestern Malleable Iron Co.
Pratt & Letchworth Co.
Q. & C. Co.
Simmons Co., John.
Union Malleable Iron Co.

Cattle Guards.
American Bridge Co.
Buda Foundry & Mfg. Co.
Cook's Standard Tool Co.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.
Railroad Supply Co.

Cement.
Franklin Mfg. Co.
Johns-Manville Co., H. W.
Q. & C. Co.

Cement Machinery.
Link-Belt Co.
Vulcan Iron Works.

Cement, Metallic.
Smooth-On Mfg. Co.

Cement, Testing.
Hunt & Co., Robt. W.
Lehigh Valley Testing Laboratory.
Pittsburgh Testing Laboratory.

Center Bearings.
General Railway Supply Co.

Centering Machines.
Niles-Bement-Pond Co.

Central Power Plants.
Arnold Co., The.

Chains.
Carter Iron Co.
Link-Belt Co.
Murphy & Co., Christopher.

Charcoal Iron.
Parkesburg Iron Co.

Chemists.
Am. Bureau of Inspec. & Tests.
Dearborn Drug & Chemical Works.
Gulick-Henderson & Co.
Hunt Co., Robert W., The.
Jewell Engineering Co.
Pittsburgh Testing Laboratory.

Chimneys and Ventilators, Cast Iron.
Dickinson, Inc., Paul.

Chimneys for Headlights.
Star Headlight Co.
Storrs Mica Co.

Chisel Holders, Blacksmiths'.
Macleod & Co., Walter.

Chucks.
American Specialty Co.
Niles-Bement-Pond Co.
Standard Tool Co.

Clay Pipe.
Evens & Howard Fire Brick Co.

Claw Bars.
Jeffrey Mfg. Co.

Coal, Ash and Ore Handling Machinery.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Darley Engineering Co.
Fairbanks, Morse & Co.
Flory Mfg. Co., S.
Hunt Co., C. W.
Industrial Works.
Interstate Engineering Co.
Jeffrey Mfg. Co.
King Bridge Co.
Link-Belt Co.
Marion Steam Shovel Co.
McMyler Mfg. Co.
Mundy, J. S.
Northern Engineering Works.
Roberts & Schaefer Co.
Robins Conveying Belt Co.
Vulcan Iron Works.
Vulcan Steam Shovel Co.
Williams, White & Co.

Cocks, Iron and Brass.
National Tube Co.

Cold Storage.
Interstate Engineering Co.
Standard Asphalt & Rubber Co.

Concrete Mixers.
Fairbanks, Morse & Co.
Interstate Engineering Co.
Jeffrey Mfg. Co.

Concrete Reinforcement—(See Reinforced Concrete).

Conduits.
Evens & Howard Fire Brick Co.
Johns-Manville Co., H. W.
Wyckoff Pipe & Creosoting Co.

Conduits, Metal Flexible.
Franklin Railway Supply Co.

Consulting Engineers—(See Engineers).

Contractors.
Arnold Company.
Snare & Triest Co.
White & Co., James G.

Contractors' Machinery.
American Hoist & Derrick Co.
Atlantic Equipment Co.
Block-Pollak Iron Co.
Browning Engineering Co.
Bucyrus Co.
Carlin's Sons Co., Thomas.
Davenport Locomotive Works.
Fairbanks, Morse & Co.
Flory Mfg. Co., The S.
Hicks Locomotive & Car Works.
Industrial Works.
Jeffrey Mfg. Co.
Males Co.
Marion Steam Shovel Co.
Mundy, J. S.
Porter Co., H. K.
Robins Conveying Belt Co.
Rodger Ballast Car Co.
Standard Asphalt & Rubber Co.
Vulcan Steam Shovel Co.
Wiener Co., Ernst.

Copper.
Murphy & Co., Christopher.

Cordage.
Johns-Manville Co., H. W.
Samson Cordage Works.

Corrugated Bars.
Corrugated Bar Co.
Jones & Laughlin Co.

Correspondence Schools.
International Corresp. Schools.

Cotters.
Standard Tool Co.
Niles-Bement-Pond Co.

Counters, Automatic.
Veeder Mfg. Co.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Dayton Malleable Iron Co.
Franklin Railway Supply Co.
Gould Coupler Co.
Latrobe Steel & Coupler Co.
McConway & Torley Co.
National Malleable Castings Co.
Railroad Supply Co.
Standard Coupler Co.
Western Railway Equipment Co.

Covering, Pipe and Boiler.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Cranes.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Bucyrus Co.
Case Mfg. Co.
Chicago Pneumatic Tool Co.
Industrial Works.
Interstate Engineering Co.
King Bridge Co.
Link-Belt Co.
Manning, Maxwell & Moore (Inc.).
McMyler Mfg. Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Sellers & Co., Wm.
Whiting Foundry Equipment Co.
Wood & Co., R. D.

Cranes, Locomotive.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Industrial Works.
Interstate Engineering Co.
Link-Belt Co.
Manning, Maxwell & Moore (Inc.).
McMyler Mfg. Co.
Morgan Engineering Co.
Northern Engineering Works.
Whiting Foundry Equipment Co.

Crank Pins.
Krupp (Prosser & Son).

Creosoting.
American Creosote Works.
Barber Asphalt Paving Co.
International Creos. & Constn. Co.
National Lumber & Creosoting Co.
Percival Wood Preserving Co.
West Pascagoula Creosoting Works.
Wyckoff Pipe & Creosoting Co.

Creosoting Cylinders.
Petroleum Iron Works Co.

Crossarms.
American Creosote Works.
Barber Asphalt Paving Co.
Baxter & Co., G. S.
National Lumber & Creosoting Co.
Wyckoff Pipe & Creosoting Co.

Crossing Gates.
Buda Fdy. & Mfg. Co.
Railroad Supply Co.

Crossings—(See Frogs and Crossings).

Crossing Signals.
Federal Signal Co.
General Railway Signal Co.
Hall Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.

Crucibles.
McCullough-Dalzell Crucible Co.

Crushers and Pulverizers.
Jeffrey Mfg. Co.

Culvert Pipe, Clay.
Evens & Howard Fire Brick Co.

Cupola Blocks.
Evens & Howard Fire Brick Co.

Cupolas, Foundry.
Northern Engineering Works.
Whiting Foundry Equipment Co.

Curtains and Fixtures—(See Car Curtains).

Derails.
Buda Foundry & Mfg. Co.
Fairbanks, Morse & Co.
Kilby Frog & Switch Co.

Derricks and Derrick Outfits.
American Hoist & Derrick Co.
Industrial Works.

Despatching Systems, Telephone.
Western Electric Co.

Ditching and Excavating Machinery.
American Hoist & Derrick Co.
Browning Engineering Co.
Bucyrus Co.
Carlin's Sons Co., Thos.
Fairbanks, Morse & Co.
Flory Mfg. Co., The S.
Hicks Locomotive & Car Works.
Industrial Works.
Jeffrey Mfg. Co.
Males Co.
Marion Steam Shovel Co.
Mundy, J. S.
Robins Conveying Belt Co.
Standard Asphalt & Rubber Co.
Vulcan Steam Shovel Co.
Wiener Co., Ernst.

Doors, Extension Platform Trap.
Edwards Co., O. M.
General Railway Supply Co.

Doors, Folding.
Ritter Folding Door Co.
Wilson Mfg. Co., J. G.

Doors, Steel Rolling.
Kinnear Mfg. Co.
Wilson Mfg. Co., J. G.

Door Stops and Holders.
Edwards Co., O. M.

Draft Rigging and Attachments.
Butler Drawbar Attachment Co.
Cardwell Mfg. Co.
Commonwealth Steel Co.
Dayton Malleable Iron Co.
Farlow Draft Gear Co.
Franklin Railway Supply Co.
Gould Coupler Co.
McCord & Co.
Miner Co., W. H.
Standard Coupler Co.
U. S. Metal & Mfg. Co.
Ward-Packer Supply Co.
Western Railway Equipment Co.
Westinghouse Air Brake Co.

Drawbridge Machinery.
Fairbanks, Morse & Co.
Nichols & Bro., Geo. P.

Drawing Materials.
Higgins & Co., Chas. M.
Kolesch & Co.

Dredges.
Atlantic Equipment Co.
Bucyrus Co.
Industrial Works.
Jeffrey Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Vulcan Steam Shovel Co.

Drill Chucks—(See Chucks).

Drilling Machines.
Ajax Mfg. Co.
American Tool Works Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Drills.
American Specialty Co.
Niles-Bement-Pond Co.
Standard Tool Co.

Drills, Pneumatic—(See Pneumatic Tools).

Drills, Rock—(See Rock Drills).

Drill Sockets.
American Specialty Co.

Driving Wheel Centers.
American Steel Foundries.
Commonwealth Steel Co.
Hunt-Spiller Mfg. Corporation.
Krupp (Prosser & Son).
Pratt & Letchworth Co.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Works Co.

Driving Wheel Lathes.
Niles-Bement-Pond Co.
Sellers & Co., Incorp., Wm.

Drop Hammers—(See Hammers, Drop).

Drying Apparatus.
American Blower Co.
Indiana Foundry Co., Ltd.

Dry Kilns.
American Blower Co.

Dump Cars—(See Cars, Dump).

Dust Collectors.
American Blower Co.
Macleod & Co., Walter.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Dust Guards.
Franklin Mfg. Co.
Franklin Railway Supply Co.
Gould Coupler Co.
Harrison Dust Guard Co.
Symington Co., T. H.

Dynamos.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
General Electric Co.
Northern Electrical Mfg. Co.
Ridgway Dynamo & Eng. Co.
Rushmore Dynamo Works.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.

Electric Batteries—(See Batteries, Electric).

Electric Grinders.
Independent Pneumatic Tool Co.
Niles-Bement-Pond Co.
Northern Electrical Mfg. Co.

Electric Headlights.
Pyle National Elec. Headlight Co.
Rushmore Dynamo Works.

Electric Heating—(See Car Heating).

Electric Hoists—(See Hoists, Electric).

Electric Lighting & Power.
Arnold Co.
Crocker-Wheeler Co.
Electric Controller & Mfg. Co.
General Electric Co.
Gould Storage Battery Co.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.

Elevators — (See Hoisting and Conveying Machinery).

Engineering Instruments.
Kolesch & Co.

Engineers, Civil, Consulting and Contracting.
Am. Bureau of Inspn. & Tests.
Arnold Co.
Bogue, V. G.
Dodge & Day.
Edwards & Zook.
Fowler, Geo. L.
Interstate Engineering Co.
Jewell Engineering Co.
Keith, Herbert C.
Link-Belt Co.
Lovell, Alfred.
Lucius, Albert.
Moreno, C. A.
Murphy, J. F.
Northern Electrical Mfg. Co.
Pittsburgh Testing Laboratory.
Stone & Webster Engrng. Corp.
Virginia Bridge & Iron Co.
Webster, William R.
Westinghouse, Church, Kerr & Co.
White & Co., J. G.
Whiting Foundry Equipment Co.

Engines.
American Blower Co.
Brown Hoisting Machinery Co.
Carlin's Sons Co., Thomas.
Erie Pump & Engine Co.
Flory Mfg. Co., The S.
Hannoversche Masch.-Actien-Ges'aft
Independent Pneumatic Tool Co.
Mundy, J. S.
Ridgway Dynamo & Engine Co.
Vulcan Steam Shovel Co.

Engravers.
Ringler Co., F. A.

Excavators.
Industrial Works.
Marion Steam Shovel Co.
Thew Automatic Shovel Co.
Vulcan Steam Shovel Co.

Exhaust Fans.
American Blower Co.
Crocker-Wheeler Co.
General Electric Co.
Sirocco Engineering Co.

Expanded Metal.
Corrugated Bar Co.
Jones & Laughlin Co.

Extension Platform Trap Doors—(See Doors, Extension Platform Trap).

Eye Benders.
Williams, White & Co.

Fans, Exhaust and Ventilating — (See Exhaust Fans).

Fence Posts—(See Poles and Posts).

Files.
Nicholson File Co.

Filters—(See Water Filters).

Fire Box Steel.
Worth Bros Co.

Fire Brick.
Evens & Howard Fire Brick Co.

Fire Clay.
Carborundum Co.
Evens & Howard Fire Brick Co.

Fire Door Opener, Pneumatic.
Franklin Railway Supply Co.

Fireproof Construction Material.
Asbestos Protected Metal Co.
Corrugated Bar Co.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Fittings, Cast and Malleable Iron.
National Tube Co.

Flat Keys.
Standard Tool Co.

Flexible Joints, Steam, Air, Liquid.
Franklin Railway Supply Co.
Moran Flexible Joint Co.

Flooring Composition.
General Railway Supply Co.

Flue Cutters.
Faessler Mfg. Co.
Independent Pneumatic Tool Co.
Murphy & Co., Christopher.

Flue Expanders.
Faessler Mfg. Co., J.
Independent Pneumatic Tool Co.
Niles-Bement-Pond Co.

Flue Welders, Pneumatic.
Draper Mfg. Co.

Flue Welding Furnaces.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Railway Materials Co.
Rockwell Furnace Co.

Flue Welding Machines.
Macleod & Co., Walter.

Flue Welding Tools.
Davis-Bournonville Co.

Forges.
Monarch Engineering & Mfg. Co.
Independent Pneumatic Tool Co.

Forging Machines.
Acme Machinery Co.
Ajax Mfg. Co.
Monarch Engineering & Mfg. Co.
Niles-Bement-Pond Co.
Williams, White & Co.

Forgings.
Barney & Smith Car Co.
Braeburn Steel Co.
Cleveland City Forge & Iron Co.
Georgia Car Co.
Goldschmidt Thermit Co.
Gould Coupler Co.
Krupp (Prosser & Son).
Manganese Steel Rail Co.
McGuire-Cummings Mfg. Co.
McInnes Steel Co., Ltd.
Middletown Car Works.
Mt. Vernon Car Mfg. Co.
Pittsburgh Forge & Iron Co.
Standard Steel Works Co.
Steel Car Forge Co.
Stoever Foundry & Mfg. Co.
Transue & Williams Co.
Vulcan Steam Shovel Co.

Foundry Equipment.
Hunt Co., C. W.
Monarch Engineering & Mfg. Co.
McCullough-Dalzell Crucible Co.
Whiting Foundry Equipment Co.
Wiener Co., Ernst.

Freight House Doors—(See Doors, Steel Rolling, and Doors, Folding).

Friction Buffers.
Gould Coupler Co.
Westinghouse Air Brake Co.

Frogs and Crossings.
Ajax Forge Co.
American Frog & Switch Co.
Buda Foundry & Mfg. Co.
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Continuous Rail & Safety Switch Co.
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Kilby Frog & Switch Co.
Krupp (Prosser & Son).
Morden Frog & Crossing Works.
New York Switch & Crossing Co.
Pettibone, Mulliken & Co.
Railway Specialty & Supply Co.
Ramapo Iron Works.
Union Switch & Signal Co.
Wiener Co., Ernst.

Furnaces, Annealing.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Billet Heading.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Bolt Heading.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Brazing.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Case Hardening.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Forging.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Hardening.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Lead Melting, Oil Fuel.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Liquid Fuel.
Monarch Engineering & Mfg. Co.
Railway Materials Co.
Rockwell Furnace Co.
Tate, Jones & Co.
Whiting Foundry Equipment. Co.

Furnaces, Metal Melting, Oil Fuel.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Plate Heating.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Scrap Melting.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Tempering.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Welding.
Macleod & Co., Walter.
Monarch Enginering & Mfg. Co.
Rockwell Furnace Co.

Gages.
Ashton Valve Co.
Crosby Steam Gage & Valve Co.
Niles-Bement-Pond Co.
Star Brass Mfg. Co.

Gas and Gasoline Engines.
Fairbanks,, Morse & Co.
Kalamazoo Railway Supply Co.
Otto Gas Engine Works.
Stover Motor Car Co.

Gas Holders.
Petroleum Iron Works Co.

Gaskets.
Johns-Manville Co., H. W.
McCord & Co.
Power Specialty Co.

Gasoline Motor Cars—(See Inspection Cars).

Gates, Railroad Crossing—(See Crossing Gates).

Gear Cutters.
Niles-Bement-Pond Co.

Gears and Pinions.
Atha Steel Casting Co.
Link-Belt Co.

Glue.
Baeder, Adamson & Co.

Gongs, Seamless Steel.
National Tube Co.

Governors.
Gardner Governor Co.

Grain Doors.
McGuire-Cummings Mfg. Co.

Grease, Lubricant.
Dixon Crucible Co., Joseph.

Graphite & Graphite Paint.
Detroit Graphite Co.
Dixon Crucible Co., Jos.
Detroit White Lead Works.
National Paint Works.
Sherwin-Williams Co., The.

Graphite Lubricant.
Dixon Crucible Co., Joseph.
Galena-Signal Oil Co.

Greenhouses.
Lord & Burnham Co.

Grinders, Portable Tool.
Buda Foundry & Mfg. Co.
Cook's Standard Tool Co.
Independent Pneumatic Tool Co.

Grinding Machines.
Buda Foundry & Mfg. Co.
Cook's Standard Tool Co.
Independent Pneumatic Tool Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Grinding Wheels.
Carborundum Co.

Grip Nuts.
Grip Nut Co.

Grip Sockets.
Standard Tool Co.

Hair Felt, Etc.
Baeder, Adamson & Co.

Hammers, Drop.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.
Williams, White & Co.

Hammers, Electric.
Buda Foundry & Mfg. Co.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.
Northern Electrical Mfg. Co.

Hammers, Power.
Independent Pneumatic Tool Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
The Pittsburg Pneumatic Co.
Williams, White & Co.

Hand Cars.
Fairbanks, Morse & Co.
Georgia Car Co.
Kalamazoo Railway Supply Co.
Kenly Co., W. K.
Lima Locomotive & Machine Co.
Wiener Co., Ernst.

Hat Racks, Extension.
Rostand Mfg. Co.

Headlight Chimneys.
Storrs Mica Co.

Headlights.
Anderson-Lacy Elect. Headlight Co.
Macleod & Co., Walter.
Pyle Nat'l Electric Headlight Co.
Rushmore Dynamo Works.
Star Headlight Co.

Headlights, Acetylene.
Macleod & Co., Walter.

Heaters, Portable.
Macleod & Co., Walter.

Heating and Ventilating.
American Blower Co.
Sirocco Engineering Co.
Westinghouse, Church, Kerr & Co.
Yale & Co., Julian L.

Hoisting and Conveying Machinery.
American Hoist & Derrick Co.
Boston & Lockport Block Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Carlin's Sons Co., Thos.
Case Mfg. Co.
Darley Engineering Co.
Fairbanks, Morse & Co.
Flory Mfg. Co., The S.
Hunt Co., C. W.
Industrial Works.
Interstate Engineering Co.
Jeffrey Mfg. Co.
Link-Belt Co.
McMyler Mfg. Co.
Mundy, J. S.
Niles-Bement-Pond Co.
Northern Engineering Works.
Roberts & Schaefer Co.
Robins Conveying Belt Co.
Vulcan Iron Works.

Hoisting and Pumping Engines.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Bucyrus Co.
Fairbanks, Morse & Co.
Flory Mfg. Co., S.
Hunt Co., C. W.
Industrial Works.
Mundy, J. S.
Otto Gas Engine Works.
Vulcan Iron Works.
Vulcan Steam Shovel Co.

Hoists, Electric.
American Hoist & Derrick Co.
Case Mfg. Co.
Crocker-Wheeler Co.
Flory Mfg. Co., S.
General Electric Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Vulcan Iron Works.
Whiting Foundry Equipment Co.
Yale & Towne Mfg. Co.

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CONTENTS

SPECIAL CONDITIONS VERSUS ECONOMIC LAW.

After holding up prices for more than a year against lower prices of the independent companies, the United States Steel Corporation has been forced to lower its trade colors, drop prices and meet actual conditions. This, in itself, is a significant symptom of the slow outworking in a normal way of the law of emergence from hard times. But it has been accompanied by a symptom still more noteworthy. Wages have been lowered by a number of the smaller steel concerns, the reduction of wages has also extended to some iron producing interests, and there are prophecies and omens of other wage reductions to come. The situation raises an important question bearing upon the momentous subject of the time and process of full recovery from industrial depression and renewal of national prosperity. Is that recovery to come as it has come from every great industrial depression of civilized nations in the past, by the lowering of wages and the cost of living that is to say, of the prices of commodities—and is the break of prices and wages in the steel industry the first sign? Or on the other hand, are special conditions in the country to tide us over the gulf of hard times and relieve us from what has been hitherto the inexorable fiat of political economy? And is the break in steel but a temporary incident, not a harbinger?

The question is one of great import to the railways of the country, which, indeed, have been in some ways both an index and a reflection of the national problem. When, in December of 1907, the railways were hit suddenly and hard by reduction of earnings—"chopped off as by an axe" as a prominent railway president expressed it—the railways under normal conditions would have had several expedients of breasting the storm. First and foremost was the reduction of wages. This, with stoppage of extensions and improvements, and sharp economies in train service, would have gone far toward ameliorating the stress. But conditions were not normal. There was not, for one thing, the usual and expected fall in the cost of railway supplies. There was not then, and there has not been since, the fall in the cost of living, upon which, as a broad and underlying dictum, wage reduction can be most justly predicated; and there were the hostile attitudes of federal and state authority, the complications of a "presidential" year and the high organization of labor. Such a situation forced the railways to novel measures of economy or, more exactly speaking, certain normal measures adopted in an abnormal degree. A reduced *rate* of wages bore nothing of the brunt. It was instead a matter of reduced force, reduced maintenance, reduced purchase of supplies and, in a good many cases, reduced operation, the latter not seldom attended by public outcry. Stated more succinctly, the railways in an irregular way have had to go through that painful ordeal of contraction that bridges the gulf between one period of prosperity and another.

General interests of the country, industrially and financially speaking, undoubtedly have had to suffer contraction, too, but in far less degree, taking them as a whole, than the railways. Wages have not contracted in rate, and hard times have not yet, apparently, tamed the spirit of the labor organizations, though doubtless affecting somewhat their general attitude and policy. Up to the break in steel, cost of commodities have fallen but little, and of immediate cost of living hardly at all. The luxuries of the rich, and even of the merely well-to-do, seem but little abated; and in a large section of the West and Northwest hard times have been well nigh non-existent. Yet, paradoxically enough, such a situation has been paralleled with no conditions of decided trade recovery such as, for example, would be indexed by the large increase of railway gross earnings and decrease of idle cars.

The great interrogation mark, then, set against the future and deepened by the break in the vast industry represented by steel and iron, is whether great and general interests outside the railways are to confirm the law of political economy and recuperate through that contractive process which the railways already have undergone. Are wages and commodities to fall, demand be quickened by their fall, and business revive on the enlarged and firm basis of production? And will production in its turn be quickened by demand? Or, on the other hand, are there special forces and elements that will resist successfully the economic precedents of the past? Some special and exceptional forces of the kind can be descried. These are the high organization of flexible capital in great volume, fundamental resources of the country, cheap money and high production of gold as a world influence against contraction of prices and, therefore, of wages. Will these, and more transitory influences, such as a readjustment of the tariff, countervail as against what has hitherto been almost an economic axiom?

No man can answer that final question or determine whether the break in steel is a forecast or a limited episode. But in the

case at bar of special conditions *versus* economic law, the railways have at least one ground of self-congratulation. They have passed through the throes of contraction, or through most of them. Lower prices, lower wages and consequential increase of demand, should they come, connote increased business, saying nothing of the effect on such commodities of first necessity as structural steel and rails. The railway contraction, especially upon Eastern lines, has been searching and painful, but now happily it is mainly in the past tense. There have been sad railway experiences, but not a few of them have been disciplinary.

Amid the multitude of confusing experiences and indications, however, we may once more indulge the reflection that from the bed-rock of contraction there can be rebound only in one direction, and that upwards. There are exceptions, of course. Some railways have not contracted enough; in others, contraction has exposed radical infirmities and left them staggering. But the great majority of them have contracted to the hard-pan, whence they can look hopefully to the future whether its problem is solved by time-honored economic law or by forces which are so new that we do not dare to class them as of either law or logic.

RAILWAY MAIL PAY.

In the past ten years the United States postal revenues have increased from 89 millions to 191 millions, being 115 per cent. During the same period the railway mail ton mileage has increased 78 per cent., while the gross payment for it has been increased only 40 per cent., and this in spite of the fact that other post office expenses have been increased 152 per cent. This situation and the heavy burden of loss which is laid by the government on the railways has been carefully analyzed by Julius Kruttschnitt, Director of Maintenance and Operation of the Union Pacific System and the Southern Pacific Company. His statistics and argument, which are being published nearly in full in other pages of this paper, constitute a remarkable document, bold, scholarly and unanswerable.

In 1898 and 1899, after exhaustive investigation, a joint commission of the Senate and House of Representatives reported that the railway mail pay was not excessive, and that the pay for railway post office cars should not be reduced. Nevertheless, by acts of Congress passed in 1906 and 1907, the railway mail pay was reduced 3½ per cent., and the railway postal car rental was reduced 16 per cent. By successive orders of the postmaster general the postal car rental and the railway mail pay were further reduced. Perhaps the most indefensible reduction was made by order in this way: The law prescribes that the weighing of mails for the purpose of fixing rates shall be done "not less frequently than once in every four years." The department takes the limit and weighs only once in four years. The tonnage increases something like 6 per cent. a year, so that by this trick the railways receive pay for something like 12 per cent. less than they carry.

From 1898 to 1907 the price of labor increased 28 per cent., the price of commodities increased 38 per cent., train-mile costs increased 54 per cent., average freight-train tonnage increased 58 per cent., freight-train earnings per mile increased 58 per cent.—and all this while the freight ton-mile rate remained nearly stationary, increasing only 1 per cent. in nine years. Nevertheless, during the same period the railway mail pay per ton-mile was arbitrarily decreased 15 per cent. It is easy to see that the increase in train-mile operating expenses was not wholly due to heavier loading; it was largely due to the heavy increases in the cost of labor and materials.

The standard railway postal car of a few years ago was 60 ft. long, weighed 80,000 lbs. and cost about $5,500; the present standard 60-ft. car weighs over 100,000 lbs. and costs 40 per cent. more. The new standard steel postal cars weigh 108,000 lbs. and cost over $9,000. Specifications are made by the government. There are also 40-ft. R. P. O. cars, and the average weight of mail in the United States per equivalent full R. P. O. car is a trifle over two tons. The ratio of paying to dead load is 1 to 21.7. Assuming that a passenger weighs 150 lbs., the average rate of dead to paying load in all classes of passenger cars is the same as the ratio for R. P. O. cars. For freight cars the ratio is 1 to 1.1. But the earnings per gross ton-mile are: from mails .438 cents, from passengers .805 cents, from freight .369 cents.

The study of the relative cost of mail, passenger and freight service is a thorough one. It is interesting and even ingenious in its method of division of expenses. The Interstate Commerce Commission reports are largely relied on, but where they are deficient for the purpose, the more complete statistics of the Union and Southern Pacific are made available, and are invaluable. Indeed, it seems proper and no more than fair to say here that this system was established by the veteran statistician and accounting officer, William Mahl, who served through Mr. Huntington's administration, and is still Comptroller of the Harriman lines.

It is shown that the railway mail service is done at a cost, not including taxes and interest, of 96 millions, with an income of 48 millions and an operating expense of 200 per cent.; that the other passenger-train business is done at a cost of 677 millions, with an income of 622 millions and an operating ratio of 109 per cent. The freight business of the country is done at a cost of 974 millions, with an income of 1,823 millions and an operating ratio of 53 per cent.

The computations show that each passenger train hauls an average of .43 of a mail car, giving an income of 9.4 cents per mile; while each freight car run, loaded or empty, earns 10½ cents a mile. The proportion of dead weight of the mail car is 20 times that of the freight car, but its ton-mile earnings are only 13 times as much. There is still another way of expressing this fact: The average number of cars in each passenger train handled in the United States is 3.95, of which mail cars constitute 11 per cent.; but 11 per cent. of the average earnings of a passenger-train mile is 13.8 cents, while the mail pay is only 9.4 cents. The methods of conducting passenger traffic are largely, and mail traffic are entirely, beyond the control of the companies as to cost, and this cost has been steadily increasing. The deficit, as shown, is made up by economies in larger capacity cars and larger engines, which are entirely within the control of the companies. Mail-train speeds are continually increasing. Mr. Kruttschnitt finds an average yearly increase during the past 25 years of more than a half of 1 per cent. He shows from statistics in his own company the enormous percentage of accidents and losses due to high speed and enumerates the other elements of increased cost. He finds that high-speed passenger trains constitute the most unprofitable business in which railroads are engaged.

The transportation of railway mail clerks is considered. Figured at two cents a mile, the transportation of clerks in R. P. O. cars amounts to $8,600,000 a year, nearly double the rental which the railways receive for these cars. On a similar basis the value of transportation furnished clerks in apartment cars is an additional four million dollars. A scandalous situation is boldly stated in the following paragraph:

"The post office department issues annually about 600 traveling commissions to post office inspectors and other postal officials, and requires railway companies to honor such commissions for free transportation on all trains on all lines on which mails are carried. In some cases these commissions are issued to government officers whose official duties are in no way connected with the transportation of mails on railways. The railways have no control whatever over the issuance of these commissions and cannot even secure from the post office department a list of them, the department holding that the list is confidential. These commissions are frequently

used for personal travel, in violation of the rulings of the Interstate Commerce Commission. In brief, the post office department in effect arbitrarily issues about 600 annual passes over each mail carrying railway in the United States, which is equivalent to about 200,000 annual passes."

The appearance of Mr. Kruttschnitt's argument is well timed for the reason that the department is calling upon heavy mail carrying roads for data on this subject. Such investigations are costly; moreover, it is almost impossible to obtain results that are thorough and complete except in corporations with such a system of statistics and accounting as Mr. Kruttschnitt enjoys.

THE COMMISSION AND JOBBING CENTERS.

The Interstate Commerce Commission is having as ill success in satisfying rival commercial centers with its adjustments of rates as the railways always have had. In its decision in the Missouri river Jobbers' case (Burnham-Hanna-Munger Dry Goods Co., et al., v. C. R. I. & P., et al.) the Commission laid down the principle that a rate for a through haul should ordinarily be less than the combination of two or more local rates over the same lines, and in accordance with this principle ordered the proportional class rates from the Mississippi to the Missouri river on goods moving from the eastern seaboard to be made lower than the local rates from river to river. The jobbers at the seaboard and at Missouri river cities rejoiced over the decision while those at Chicago, St. Louis and other immediate points groaned under it; for it tended to give the jobbers at the seaboard and at the Missouri river a substantial relative advantage over their competitors at intermediate cities in competing for business in Trans-Missouri territory.

It was pointed out at the time (*Railroad Age Gazette*, Sept. 18, 1908, page 938) that if the principle laid down in this case should be applied in later decisions to the rates on goods moving from eastern and central jobbing centers to towns *beyond* the Missouri river, the jobbers at Kansas City, Omaha and St. Joseph would lose a great deal more by these later decisions than they could ever gain by the proceeding that they won. The Commission now has applied this principle. It is in the case of George J. Kindel v. New York, New Haven & Hartford, et al. Heretofore the through rates to Denver from eastern points have been the sums of the rates to the Missouri river and the local rates beyond; the first class rate from Chicago to the Missouri river being 80 cents, and the rate from the river to Denver being $1.25, the Chicago-Denver rate has been $2.05. In the Kindel case the Commission orders the roads to make through rates from Chicago and St. Louis to Denver that shall be lower than the sums of the locals; fixing, for example, a through Chicago-Denver first class rate of $1.80, as compared with the combination on Kansas City of $2.05. The jobbers at Kansas City, Omaha and St. Joseph have extinguished the bonfires that they started when they got the news of the decision in the Burnham-Hanna-Munger case, and are now holding meetings and putting on their war paint preparatory to attacking the decision in the Kindel case. For this last decision gives to Chicago, St. Louis and Denver the same relative advantage over the Missouri river cities that the earlier decision gave to the Atlantic seaboard and Missouri river cities over Chicago, St. Louis and other intermediate points. Heretofore a Chicago jobber who wanted to sell goods in Denver has had to pay exactly the same rate for the through haul to Denver that the Kansas City jobber paid when he shipped goods from the factory at Chicago, broke bulk at Kansas City, and then reshipped. On the basis fixed by the Commission the Kansas City jobber—taking a first class shipment as an example—will have to continue to pay the present rate, $2.05, while the Chicago jobber will have to pay only $1.80. The jobber at Denver who buys goods in Chicago and St. Louis also will be enabled by the reduction in his rates to compete more successfully and in a larger territory, both east and west of Denver, against the jobbers at Missouri river points.

Yet the jobbers at Denver are as much dissatisfied with the decision as are those on the Missouri. For they see that their present advantage will be but transitory. The shippers at Denver wanted their city made a basing point; they wanted the rates from the East to points west of Denver made the sums of the local rates from the Missouri river to Denver and from Denver to the points farther west. This would have enabled them to ship goods from the East to Denver and reship them from Denver to points West—to Utah common points, for example—as cheaply as they could be shipped direct from eastern commercial centers to those points. But the Commission refused to make Denver a basing point, and the Denver jobbers sorrowfully admit that a logical application of the principle on which the case turned will make through rates from the East to Utah lower than the combinations on Denver. The Denver Chamber of Commerce has adopted resolutions denouncing the decision, and Mr. Kindel, who, in winning this battle, has lost a campaign, is throwing verbal brick-bats at the Commission and threatening to have its members impeached.

The Commission is in the same predicament in which railway traffic managers repeatedly have found themselves after they have tried to adjust rates fairly and satisfactorily as between rival jobbing points. The jobber does not care much about the absolute amount of his rate; he cares a great deal about its relation to the rates of his competitors. In the adjustment of freight rates railway traffic managers usually have been merely expert arbitrators between competing shippers and communities. No matter what adjustments have been made there always have arisen loud outcries from most or all of the communities affected, each declaring that it had got the worst of it. No commercial center in the United States ever was satisfied with its rate adjustment. If there ever should be one, there would be good reason for suspecting that it was being unfairly favored. The constant complaints of shippers convinced Congress that the railways were discriminating, and the rate-making power was therefore given to the Interstate Commerce Commission. Now that the Commission has thrown itself into the breach it is receiving the same objurgations that the traffic managers always have received. Chicago and St. Louis complain that in the Missouri river decision the Commission discriminated unfairly in favor of New York and Kansas City. Kansas City, Omaha and St. Joseph complain that in the Kindel case it discriminated unfairly in favor of Denver, St. Louis and Chicago. And now Denver is weeping over the future.

If the Commission's theory of rate-making is not disturbed by the courts every application of it will cause reductions of the earnings of the railways; and who will be the gainers? Chicago and St. Louis gain by the Kindel decision, but they and every other jobbing center between there and the Atlantic seaboard lose by the Missouri river decision. New York, Kansas City, St. Joseph and Omaha gain by the Missouri river decision, but the Missouri river cities lose by the Denver decision; Denver gains by the Kindel decision, but will ultimately lose to Chicago, St. Louis, Kansas City, Omaha and St. Joseph if similar decisions are later rendered. In the long run the chain of decisions which the Commission has begun must work to the detriment of the more westerly and to the advantage of the more easterly jobbing points.

Railway traffic men take the view that if the Commission's orders for reductions in through rates are upheld and enforced corresponding reductions in local rates inevitably will follow. In that event, of course, the relations between rates will not be permanently changed; there will be simply a general reduction at the cost of the railways. The Commission argues, on the other hand, that there need be no corresponding reductions in local rates. If there are not, the communities that think

themselves hurt by the Commission's policy are very apt to appeal against it to higher authority. Already the business men of Denver have telegraphed a protest against the principle on which the Kindel case decision turns, addressing it to one of the United States Senators from Colorado. It was from the first as certain as that night would follow day that rival commercial centers would be no better satisfied with adjustments of rates made by the Commission than they had been with adjustments made by the railways. It seems that when the results of appeals from the railways to the Commission do not satisfy shippers, we are to have appeals from the Commission direct to Congress. Is it not enough to have our tariff legislation a national scandal of selfish and corrupt trading and log-rolling between the business interests and members of Congress of different sections at the expense of consumers, without subjecting railway rate-making to the same evil influences and treatment?

HEAT TRANSMISSION IN BOILER TUBES.

In the introduction to his recent book on "The Locomotive," Vaughan Pendred says: "Unfortunately, the locomotive lends itself in many ways to mathematical treatment, but in practice this plays but a secondary part, principally because it does not always fit in with existing conditions." In his chapter on "The Boiler," he says: "Into a boiler we put water and take out steam, but of the inwardness of the process practically nothing is known. Things are taken for granted, and when phenomena present themselves which are out of the common we are told either that they have no real existence, that they are quite usual, or that it is not worth while to pursue the inquiry. A great deal has been written about the conductivity of boiler plates, but no one cares to inquire how or why the heat passes into the water or what it does when it gets there."

While all this may be true in respect to engineers in a general way, fortunately there are exceptions, the most prominent being some of his own countrymen, who have been earnest and enthusiastic searchers after the truth regarding the transmission of heat through boiler plates. We are indebted to British scientists and engineers for much of our theoretical and practical knowledge of the subject, and it has recently occupied a prominent place in the London engineering journals. Rankin's formula makes the rate of heat transmission directly proportional to the square of the difference in temperature between the two sides of the plate. The expression, $Q = \frac{(T - t)^2}{160}$ which he proposed does not take account of the rate of circulation of the water or of the hot gases, but it was for a long time accepted, as it gave results agreeing closely with actual boiler performance as found in measured tests.

In 1874 Professor Osborne Reynolds presented his paper on the "Action of the Heating Surface of Steam Boilers," before the Philosophical Society of Manchester, in which he endeavored to deduce from experiments and theoretical considerations the law governing the transmission of heat in boiler tubes, and announced that it is nearly proportional to the rate of flow of the gases. In 1899 Professor John Perry further developed Reynolds' suggestion, and in his book on the steam engine he advanced his theory that the rate of heat transmission in a boiler tube is proportional (1) to the temperature difference of the gases and the metallic surface; (2) to the density of the gas; (3) to the velocity of the gas parallel to the metallic surface; and (4) to the specific heat of the gases at constant pressure. The relation between the heat transmitted per second per unit of heating surface, and the above four factors is expressed by the equation:

$$H = C\,p\,v\,(T_1 - T_2)$$

where H = the amount of heat transmitted.
C = the specific heat times a constant.
p = the density of the gas.
v = the velocity of the gas parallel to the metallic surface.
$T_1 - T_2$ = the difference of temperatures of the gases and the water.

In discussing the efficiency of boilers, in the same book, Professor Perry remarks: "When a good scrubbing action is established on both sides of the tube wall there ought to be at least 10 times, and maybe 100 times, as rapid an evaporation per square foot of heating surface as has yet been obtained in any boiler." While nothing of this kind has since been realized, and boiler design has not been changed materially, yet this theory explains why the tube heating surface of locomotive boilers is so much more efficient than in other boilers of good design, where the gas velocity is not so high. Coming from such an eminent authority, it has stimulated other investigators, and heat transmission in steam boilers has recently been the subject of lively discussions in the leading columns of London *Engineering* and *The Engineer*. In the numbers for Feb. 5 and 12, 1909, *Engineering* contains an extensive paper on the "Laws of Heat Transmission in Boilers as Deduced from Experiment," by Dr. John T. Nicholson, Professor of Mechanical Engineering in the University of Manchester. This paper reviews the principal experiments and theories of previous investigators, and gives the results of tests made with a large boiler where the gases were forced past a restricted passage in the heating surface so as to attain velocities much higher than usual. The author states that the amount of heat transmitted was about eight times the rate per hour per square foot of heating surface as is found in ordinary practice, and it was a specific demonstration of the law that the rate of heat transference from a gas through a plate is directly proportional to the speed of flow of the gas.

The leading editorial in *Engineering*, February 5, 1909, on "Steam Boiler Design," discusses Dr. Nicholson's paper, principally with reference to the effect of a knowledge of this law of gas flow upon boiler design and says:

"Not one designer in a hundred ever bothers himself about any theory of heat transmission. Boilers are now so thoroughly standardized that the proportions of heating surface, grate area, flue area and draft, have become little more than a question of following the teachings of experience. This may not be scientific, but like most of the habits of engineers, it is the expression of opinions arrived at after years of practical experience, and as such is entitled to every respect. The important point is not whether these formulas are right or wrong,—for nobody uses them in designing boilers,—but whether boiler practice might be improved by increasing the speed of the gases. The advantages of rapid circulation have been known for years and engineers have done their best to keep the water in rapid motion and to scour the heating surface well with hot gases. Possibly they have not gone far enough in either case, but they have done practically as much as natural means could effect and perhaps as much as is commercially practicable."

A more definite statement can be made with respect to the tendency of boiler practice in America. The enormous power developed by high speed turbines has made such a demand for large boiler capacity that engineers are no longer satisfied to supply sufficient heating surface to equal 15 sq. ft. per boiler horse-power and use ordinary draft and methods of firing, but are now obtaining a boiler horse-power from less than 5 sq. ft., as the result of high chimneys or forced draft and the use of machine stokers which cause a more rapid flow of gas through the tubes.

Heat transmission is considered at length by Lawford H Fry in an article on "Combustion and Heat Absorption in Locomotive Boilers," in London *Engineering*, February 19, 1909. This is an extension of his study of the boiler performance in the St. Louis locomotive tests and subsequent ones made on the plant at Altoona. Mr. Fry's first paper related to combustion and heat balance in locomotives, and it was read at a meeting of the Institution of Mechanical Engineers, March 27, 1908.

Further reference should also be made to the experimental work and discussion of this subject by American engineers.

In connection with the stationary tests made at St. Louis by the Steam Engineering Division of the United States Geological Survey, it was found desirable, for the sake of better boiler construction and operation, that the factors which influence the rate of heat transmission by convection be more thoroughly known, and an investigation of the subject was made by the use of a special apparatus consisting of a small multitubular boiler, an electric furnace, a surface condenser and a steam ejector for producing draft. These tests demonstrated that there is a critical velocity of gas flow at which for any initial temperature the true boiler efficiency curve becomes horizontal, and beyond the point of critical velocity the rate of heat absorption by convection in boiler tubes is nearly a straight line function of the velocity of the gas. Experiments with the same apparatus with different sizes of tubes showed that increasing the diameter of tubes decreases their efficiency as heat absorbers, and increasing their length beyond a certain size decreases their efficiency.

These experiments were made under the direction of Professor L. P. Breckenridge of the University of Illinois, and in his "Study of Four Hundred Steaming Tests. Bulletin No. 325. United States Geological Survey," he devotes 52 pages to a very interesting treatment of the subject of heat absorption and boiler efficiencies.

Discussing the locomotive boiler more particularly, at a recent meeting of the Western Railway Club, Professor Breckenridge said:

"Much of the good performance of the locomotive boiler is due to the rapid sweeping flow of the hot gases through the tubes. Every ton of coal burned discharges about 20 tons of gas at a high velocity through the tubes, and this sweeping action of the gas is one reason why the locomotive has performed so well under conditions which are not altogether best for economical performance. The influence of gas velocity will have a larger effect on heat transmission than the velocity of the water current on the other side of the tube, and in about the same proportion as the specific heats of the gas and water. It is clearly evident that any boiler which is to give the maximum rate of heat transmission, greatest capacity and perhaps therefore the highest commercial efficiency will be one with a very high gas velocity passing over the inner tube surface and a high water velocity passing over the outer tube surface. A very large part of the heat imparted to the water in a locomotive goes directly by radiation to the plates of the firebox and the above remarks have no bearing upon this part of the heat transmitted."

In a slow gas current through a tube there is a tendency to form a film of cool gas next the soot or rough metal surface of the tube. Now, gas is a very poor conductor of heat, and if we depended on its conduction the process of transferring heat from the moving gas to the adherent film and through it to the tube would be very slow indeed. The only quick way of getting heat through is to dislodge the cold adhering film and replace it by hot gas. Thus it is that high velocity of gases along the heating surfaces is an important factor in heat absorption. It is this dislodgement that makes a boiler respond in amount of steam made to any reasonable demands put on it.

The important conclusions to be drawn from the above are: First, that the tube-heating surface in modern large locomotive boilers is often larger than necessary to properly absorb the heat from the furnace, and some improvement would be made if fewer tubes were used and larger water spaces provided for a more rapid circulation of water. The H7 consolidation locomotive of the Pennsylvania Railroad, with 24-in. x 28-in. cylinders and 76¾-in. boiler, contains 508 tubes, while consolidations built since by this company, with the same size cylinders and boiler and larger driving wheels, have only 465 tubes; second, something further should be done in the direction of accelerating the water current about the tubes, and especially in the water legs of the firebox; third, there is little change in the rate of evaporation with higher rates of combustion so far as heating surface is concerned, as the principal loss is due to sparks and unconsumed fire drawn through the tubes; fourth, higher rates of combustion may be obtained by the use of larger grates and automatic stokers. By obtaining higher gas velocities in this way the boiler capacity can be largely increased without increasing the tube-heating surface, and the large grate, combined with a brick arch, should keep down the spark loss; fifth, scientific investigators should be encouraged to continue their study and experiments connected with boiler phenomena because all new contributions to our knowledge of the subject, which help to explain those phenomena, must eventually result in improved boiler operation and improved design.

NEW YORK CENTRAL & HUDSON RIVER.

With earnings from freight 14 per cent. less in 1908 than in 1907, and passenger earnings 7 per cent. less, the New York Central & Hudson River had net earnings of $19,184,905, as compared with $19,102,707 in 1907. This remarkable result is directly due to increased efficiency and economy in handling business resulting from past expenditures for improvements and betterments.

The New York Central, although slow in waking up to the fact that terminal and yard facilities were the limiting factors in the economical handling of business, nevertheless did eventually realize this, and in the past seven or eight years have consistently developed these facilities. Between Buffalo and Albany the Central is a six-track railway, since the main line, four tracks, and the West Shore, two tracks, are operated under the same division organizations. Detouring connections have been made when necessary, notably at Churchville and at Schenectady, so that freight may take advantage of either the West Shore or the main line, according to which affords the lower grade and best facilities. Some idea of the present capacity of the Central to handle business may be gained from a study of the table showing miles of track. From Buffalo to Rochester the Central has nine tracks; from Rochester to Syracuse, eight tracks; from Syracuse to Rome, seven tracks; from Rome to Hoffmans, six tracks, and from Hoffmans to the Hudson river, seven tracks.

Since June 30, 1901, the management has spent for extraordinary improvements, additions and betterments and charged to income, $23,730,042*, and charged to capital account, $40,587,718 and in addition to this has spent $42,532,976 for improvements, additions and betterments to leased lines, part of which expenditure is borne by the lessor. This makes $106,850,736 in all spent on the Central and its leased lines since 1901. While of course a considerable part of this money has been spent for additional tracks, a very large part of it has been spent directly for yard and terminal improvements. Between New York and Buffalo in the last 10 years the Central has spent $6,265,000 for freight, yard and terminal improvements, including passing sidings, and $3,820,000 for passenger, freight houses and yard improvements incident to the above improvements. Engine houses have been enlarged and the most improved methods of hostlering engines have been adopted. For instance, at various places, hot water wash-outs for locomotives are established. Although expensive in the first instance, they reduce the time required to wash out the boiler of a locomotive from seven hours to a possible one hour, and make a distinct saving in the life of boiler tubes by avoiding sudden cooling and reheating.

The present condition of the property is such that not only could the road economically handle the greatest amount of traffic that has ever been offered it, that is, the amount that was offered in 1906, but could probably handle a very much greater traffic with a minimum of congestion.

The electrical operation of the lines into New York city has had its second complete year of trial, and has apparently, at least as far as the rendering of adequate service is concerned, been justified. On few roads were the complaints about suburban service more bitter, and to some extent more justified,

*This does not include $2,853,718 in 1905, and $2,923,340 in 1906, charged for renewals of equipment.

than on the Central out of New York two or three years ago. The present service is clean, both the Central and the New York, New Haven & Hartford operating their trains by electricity through the tunnel into the Grand Central station, and it is now dependable. Trains are on time and annoying delays are infrequent.

While improvements that are now under way, notably the building of the new station in New York city, are not completed and will require considerable sums, the greatest part of the extraordinary expenditures on property for the purpose of making the facilities for handling traffic commensurate with the traffic offered in a prosperous year have been made. Ninety per cent., it is estimated, of the extraordinary improvements between Buffalo and New York are now completed.

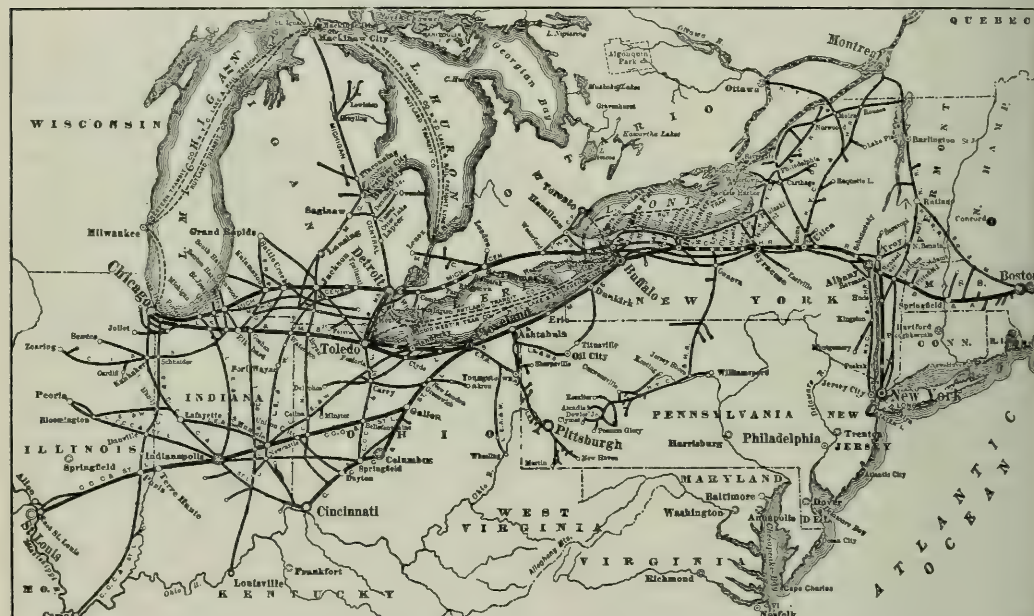
The results were necessarily not directly felt at first in the operation of the road, but last year for the first time the effect of these improvements was shown in net earnings. Gross earnings last year amounted to $88,849,368, being $9,519,692 less than in 1907, and, as has been pointed out, the greater part of this decrease in earnings came from a decrease in freight earnings. Operating expenses were $65,419,085 last year, being $10,384,249, or 14 per cent., less than in 1907. While the cost of maintenance of both way and of equipment decreased the great saving in expenses came from a saving of 16 per cent. in the cost of conducting transportation. This cost was $38,750,355 last year, or $7,236,548 less than in 1907.

As was to be expected, there were savings in such items as wages of enginemen and other trainmen due, at least in part, to a smaller business handled. There were also large reductions in the cost of such items as fuel for locomotives, which saving was due possibly as much to the improved condition of the property as to a smaller tonnage hauled.

The cost of maintenance of way and structures per mile of first, second, third, etc., track (switch tracks and sidings being counted half) is shown in the following table. The table also shows the unit cost of repairs and renewals of equipment:

	1908.	1907.
Maintenance of way per mile........	$1,464	$1,712
Repairs and renewals per locomotive..	1,991	2,291
" " " " pass'gr car.	618	837
" " " " freight car.	81	77

The tons of revenue freight carried totaled 39,105,955 tons, or 18 per cent. less than in 1907, and the number of both interline and local passengers also decreased, the total number of passengers carried being 42,855,069, or 3,684,689 less than in the previous year. The earnings per ton amounted to $1.28 last year and $1.23 in the previous year, both the rate per ton per mile and the average length of haul increasing last year. The earnings per passenger, which amounted to 63 cents last year, were higher by one cent than in 1907, although the average number of miles one passenger was carried remained exactly the same, 36. The slightly higher rate received per ton per mile for freight is due probably to the fact that the loss in tonnage of merchandise and of the higher classes of freight was not proportionately as great as in the commodities of lower grades.



The New York Central Lines.

The map shows in addition to the roads whose reports are reviewed in this issue, the smaller New York Central Lines, like the Lake Erie & Western and the Rutland.

The financial position of the New York Central & Hudson River has been strengthened during the year, so that while current assets amounted to $42,757,677 in 1907, and included but $4,633,022 cash, the current assets in 1908 amounted to $50,722,575, and included $16,018,182 cash. At the same time, current liabilities were reduced from $27,516,371 in 1907 to $20,238,221 on December 31, 1908. Dividends of 5 per cent. were paid in 1908 as compared with 6 per cent. in 1907, and the company had a surplus of $144,277 last year as compared with $365,909 in the previous year. And in comparing income in the two years it should be remembered that the principal subsidiaries of the New York Central paid smaller dividends to the Central as the majority stockholder last year than in 1907.

Not only the report for the calendar year 1908 but the monthly returns to the Interstate Commerce Commission indi-

cate the New York Central & Hudson River's ability to economically handle the increase in business that should come with a return of generally prosperous business conditions.

The following table shows the results of operation for the last two years:

	1908.	1907.
Average mileage operated	3,781	3,782
Freight revenue	$51,200,547	$59,406,447
Passenger revenue	27,824,492	29,837,859
Total operating revenue......	88,849,368	98,269,060
Maint. way and structures.	10,768,284	12,462,047
Maint. of equipment.......	13,420,283	14,823,631
Conducting transportation..	38,759,355	45,995,903
Total operating expenses.....	65,419,085	75,803,334
Taxes	4,245,378	3,463,019
Net revenue	19,184,905	19,102,707
Gross income	29,555,984	30,578,758
Net income	9,075,877	11,083,829
Dividends	8,931,600	10,717,920
Surplus	144,277	365,909

LAKE SHORE & MICHIGAN SOUTHERN.

Like the camel, who can maintain himself on his accumulated surplus, the Lake Shore & Michigan Southern demonstrated last year that in crossing a desert year it could without detriment to the property spend for maintenance a very much smaller sum than in previous years and could get along without charging large sums to income account for betterments. During the eight years beginning with 1900, the Lake Shore charged to income account for additions and betterments, $41,416,611. This is an average of $5,177,076 per year. In 1908 there was charged for additions and betterments, $1,292,276 only. Moreover, maintenance of way and structures, which cost $6,328,638 in 1907, cost but $4,909,069. The curtailment in permanent improvements resulted, the annual report says, in a correspondingly decreased maintenance charge. "The heavy improvement work in 1907, consisting of four-tracking the main line, rebuilding bridges, construction of new stations, etc., made necessary during that year heavy charges to maintenance to provide for changes to existing roadway and structures."

This sentence throws considerable light on the policy of the management of the Lake Shore in regard to what expenses are included in maintenance charges. The maintenance charges in the past eight years have been liberal in the extreme, and as was previously mentioned, an enormous sum has been charged to operating expenses for additions and improvements. This lump sum for the eight years amounts to $27,410 per mile of line operated in 1908, and in addition, each year the Lake Shore was earning large surpluses. Out of these surpluses, $15,556,082 was spent in the eight years, of which $2,000,000 was to discharge floating indebtedness and the remaining $13,556,082 for the acquisition of stocks of other companies, largely the Cleveland, Cincinnati, Chicago & St. Louis and the Pittsburgh & Lake Erie.

The bonds and stocks owned, having a par value December 31, 1908, of $128,952,450, are carried on the balance sheet at $89,718,447. The income from interest and dividends on bonds and stocks in 1908 totaled $3,367,797. This is nearly 4 per cent. on the book value of the bonds and stocks, and since 1908 was a year of general depression, it may be taken as showing that the investment in stocks and bonds is fully able to take care of itself. If we subtract, therefore, this book value of stocks and bonds owned from the total capitalization of the Lake Shore we find that the road is capitalized at $63,059 per mile of line operated in 1908. This figure (which does not take rentals into account) is only a little more than twice the amount spent per mile of line during the eight years 1900-1907 inclusive. The $27,410 per mile spent during the total eight years is, as a matter of fact, 43.5 per cent. of the total capitalization, the cost of the book value of the bonds and stocks being subtracted from the par value of securities of the Lake Shore outstanding, it must be remembered.

The total operating revenue amounted to $39,964,858 last year, a decrease of $4,988,617 from the revenue in 1907. This entire decrease is accounted for by the decrease in freight earnings. Earnings from this source were $25,935,473, or $5,176,009 less than in the previous year, a decrease of 17 per cent. The falling off in earnings from freight was rather less than commensurate with the falling off in tonnage carried. This tonnage totaled 26,224,406 tons last year, a decrease of 8,057,540 tons, or 24 per cent., from the figures for the previous year, while the earnings per ton increased, being 97.1 cents last year as compared with 89.2 cents in the previous year. The increase in earnings was due to a greater average haul, since the earnings per ton per mile averaged but 0.525 cents last year as against 0.533 cents in 1907. The average haul was 10.4 per cent. greater last year than in the previous year, the average in 1908 being 185 miles.

There was little change in the total passenger earnings, although the earnings per passenger per mile fell off from 1.967 cents in 1907 to 1.914 cents last year.

Total operating expenses, exclusive of additions and betterments, amounted to $26,712,012, a decrease of $2,832,336 from the expenses of 1907. Conducting transportation cost $15,554,043, or $796,868 less than in 1907. The cost of maintenance in general has already been mentioned. The cost per mile of maintenance of first, second, third and other tracks (mileage of switch tracks and sidings being counted one-half) and the cost per unit of repairs and renewals of equipment are shown in the following table:

	1908.	1907.
Maintenance of way, per mile.........	$1,686	$2,141
Repairs and renewals, per locomotive..	1,711	1,770
" " " per passenger car	735	874
" " " per freight car ..	67	74

The balance sheet shows current assets of $32,396,543 and current liabilities of $8,840,037. This compares with current assets in 1907 of $18,015,331 and current liabilities of $13,049,548. The $5,500,000 mentioned in the report of the Big Four as being a loan from the Lake Shore is shown on the balance sheet as a current asset in 1908 and not shown, separately at least, in 1907. Not only is the position of the Lake Shore strengthened in general as to current assets and liabilities, but cash charged the treasurer, which amounted to but $961,127 in 1907, was increased in 1908 to $14,418,965. Part of this increase presumably came from the sale of $7,000,000 Chicago, Indiana & Southern bonds. This strong position as regards cash, together with a surplus of $1,740,013 earned after the payment of 12 per cent. dividends in 1908, emphasizes once more the enormous equity of the New York Central stock in the earnings of the Central's most valuable subsidiary.

The following table shows the results of operation for the years 1908 and 1907:

	1908.	1907.
Average mileage operated	1,511	1,520
Freight revenue	$25,935,473	$31,111,482
Passenger revenue	9,583,227	9,769,873
Total operating revenue......	39,964,858	44,953,475
Maint. way and structures.	4,909,069	6,328,638
Maint. of equipment	5,422,114	6,044,155
Conducting transportation .	15,554,043	16,350,911
Total operating expenses	26,712,012	29,544,347
Taxes	1,424,201	1,300,875
Net earnings	11,828,645	14,108,253
Gross income	16,521,310	19,824,673
Net income	8,968,269	12,379,830
Additions and betterments....	1,292,276	4,994,114
Dividends	5,935,980	6,925,310
Surplus	1,740,013	460,406

MICHIGAN CENTRAL.

Drastic reduction in expenses, especially in maintenance charges, was used by the Michigan Central to offset the reduction in earnings due to the bad year 1908. The charges for conducting transportation were reduced to a certain extent. They amounted to $12 406,033 last year, being 8 per cent. less than in 1907, but it was primarily through the reduction of the charges for both maintenance of way and maintenance of equipment that the Michigan Central was able to show a larger net revenue in 1908 than in 1907. Maintenance of way

and structures, as a whole, cost $3,061,375 last year as against $4,991,923 in 1907. Repairs of roadway under the general head of maintenance cost $1,722,708, or 33 per cent., less than in 1907, and repairs and renewals of bridges and culverts cost but $206,119, 70 per cent. less than was spent in the previous year. In the same way the charges for maintenance of equipment were heavily reduced in 1908, but $2,978,744 being spent on this account, a reduction of $1,091,533, or 27 per cent., from the figures in 1907.

In detail, the charge for maintenance of way and structures per mile of first, second, third, fourth, and other track (sidings and switch tracks being counted half) is shown in the following table, together with the unit costs of maintenance of equipment:

	1908.	1907.
Maintenance of way, per mile	$1,041	$1,707
Repairs and renewals, per locomotive	1,975	2,116
" " " per passenger car	340	460
" " " per freight car	67	102

Total operating revenue amounted to $24,918,488, being $3,628,622, or 13 per cent., less than the revenue in 1907. Although passenger earnings suffered to a greater extent than was the case with either the Lake Shore & Michigan Southern or the Cleveland, Cincinnati, Chicago & St. Louis, it was in freight earnings that the Michigan Central, like the other Vanderbilt roads, suffered the most. Earnings from this source amounted to $16,947,002, being $2,979,802, or 15 per cent., less than in 1907.

The reduction in earnings came principally from a reduction in the volume of traffic moved. There were 14,347,464 tons of revenue freight carried in 1908. This is 13 per cent. less than the volume of freight in 1907, and the reduction was evenly distributed through the different classes of commodities, with the exception that the products of agriculture yielded a larger tonnage in 1908 than in 1907. Both the tonnage of grain, which amounted to 1,116,210 tons, and other mill products, which amounted to 256,591 tons, were considerably larger last year than the year before. The increases were 61,166 tons and 38,362 tons respectively.

The earnings per ton per mile on freight averaged 0.627 cents as against 0.641 cents in 1907, while the average haul was about the same in both years, 184 miles. Like all the other roads that have made reports for 1908, the Michigan Central had a considerably larger proportion of empty car mileage and a consequently smaller average train load in 1908 than in 1907. The train load being 379 tons as against 420 tons in 1907.

The total number of passengers carried increased by 169,240, totaling 5,150,871 last year, but since the average distance each passenger was carried decreased from 63 miles in 1907 to 60 miles last year, the number of passengers carried one mile was 3,606,002 less last year than in 1907.

The earnings per passenger per mile averaged 1.95 cents last year and 2.05 cents in 1907. Increased operating efficiency in the passenger department is shown by 55 passengers per train mile in 1908 as against 52 in 1907.

Dividends were reduced from 8 per cent. in 1907 to 6 per cent. last year, leaving a surplus of $502,840 in 1908 as compared with $230,325 in the previous year. There were sold during the year, $3,825,000 4 per cent. first mortgage bonds of the Chicago, Indiana & Southern, and the company's cash capital was increased from $1,318,774 in 1907 to $3,683,940 last year.

Comparatively few roads could meet a falling off in earnings by such deep cuts in their maintenance charges without detriment to their rolling stock and their property, but, as has often been pointed out before, the Vanderbilt lines are in a situation rather different in this respect from that of most of the roads of the country, because their standard of maintenance has been very high in the past, so that one year's retrenchment should not seriously affect the condition of either the rolling stock or the roadbed.

The following table shows the results of operation for the years 1908 and 1907:

	1908.	1907.
Average mileage operated	1,746	1,746
Freight revenue	$16,947,002	$19,926,803
Passenger revenue	6,168,190	6,541,103
Total operating revenue	24,918,488	28,547,110
Maint. way and structures	3,061,375	4,991,923
Maint. of equipment	2,978,744	4,070,277
Conducting transportation	12,406,033	13,503,987
Total operating expenses	19,005,352	23,131,751
Taxes	1,105,694	1,008,776
Net earnings	4,807,442	4,406,583
Gross income	5,462,947	5,109,102
Net income	1,627,120	1,729,365
Dividends	1,124,280	1,499,040
Surplus	502,840	230,325

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.

The assertion of the Middle West that it did not feel the business depression of 1908 as did the rest of the country is to a certain extent borne out by the showing of the Cleveland, Cincinnati, Chicago & St. Louis last year. The Big Four holds somewhat the same position relative to the New York Central lines as the Pan Handle holds to the Pennsylvania system. The P. C. C. & St. L., however, runs as far west as Indianapolis only, and then turns north, while the Big Four extends west to St. Louis and southwest to Cairo.

Although there was a falling off in both freight and passenger business on the Cleveland, Cincinnati, Chicago & St. Louis, the decrease was not very sharp nor very severe. Total operating revenue amounted to $24,621,661 in the calendar year 1908 as compared with $26,447,804 in the previous year, the greatest decrease being in freight earnings, which totaled but $15,711,941 last year. This is $1,526,407, or 9 per cent. less than in 1907, and was caused both by a decrease in the tonnage carried and by smaller earnings per ton per mile. The decrease in actual business as shown by the number of tons of revenue freight carried amounted to but 4 per cent., being 17,361,766 tons carried in 1908 as against 18,130,351 tons in 1907.

Passenger earnings and business show proportionately rather slighter decreases, the total earnings from this source being $6,908,326 in 1908, or $218,723 less than in 1907, and the total number of passengers carried amounted to 6,721,878 as compared with 6,701,012.

Total operating expenses were reduced $924,039, and amounted to $5,390,137 in 1908. They nevertheless consumed a little over 78 per cent. of gross earnings as compared with 76 per cent. in 1908. This is an increase of $332,371 in the cost of conducting transportation, which, by the way, includes most of the items under the heading traffic expenses, prescribed by the Interstate Commerce Commission and not shown separately in this report. These transportation expenses amounted to $12,200,908 last year, the increase being accounted for through an increase in per diem balances due to decreased demand for cars on foreign roads and by increased cost of loss and damage. The latter was due, the report says, chiefly to the settlement of deferred claims, largely the result of congestion in the later months of the year previous, and the increase of fire claims as the result of this year's midsummer drouth. The cost of both maintenance of way and of equipment decreased. The following table shows the cost per mile of first, second, third, and other track (mileage of switch tracks and sidings being counted one-half). It also shows cost, per unit, of repairs and renewals of equipment:

	1908.	1907.
Maintenance of way, per mile	$916	$1,220
Repairs and renewals, per locomotive	1,921	2,379
" " " per passenger car	648	796
" " " per freight car	68	64

With these lower maintenance charges and slightly greater transportation costs, 49.55 per cent. of gross earnings goes to conducting transportation as compared with 44.88 per cent. in the previous year.

Notwithstanding the decrease in freight business, freight

train mileage totaled 6,983,206 miles last year as compared with 6,938,123 miles in 1907. Passenger train mileage, however, slightly decreased. Car mileage increased from 260,319,590 in 1907 to 267,302,854 miles last year, due entirely to an increase of 24,569,260 miles in the empty car mileage. Naturally the average train load decreased, being 383 tons last year as compared with 422 tons in the previous year.

The balance sheet of the Big Four lacks interest, first, because being one of the New York Central lines it is not very full and the items given are not explained in other parts of the report, and secondly, because since it is under the wing of the Central, its balance sheet of itself shows only one side of the general financial position of the so-called Vanderbilt roads. The company on December 31, 1908, had current liabilities of $11,037,448, with current assets of $6,278,819. This compares with December 31, 1907, as follows: Current liabilities, $11,623,139, and current assets of $6,356,314. The supply of cash was slightly larger on December 31, 1908, than in the previous year, and under current liabilities there are but $4,152,398 wages and supplies due as compared with $6,742,683 in 1907. On the other hand, bills payable have increased. The loans and bills payable are carried on the 1907 balance sheet at $3,013,990, while on the 1908 balance sheet the bills payable are divided up, $5,500,000 being due the Lake Shore & Michigan Southern; $112,500 due the Dayton & Union, and other bills payable amounting to the nominal sum of $3,425, making in all $15,615,925 bills payable.

Altogether the Big Four came through the 1908 year remarkably well. It spent considerably less for additions to the property, improvements and new equipment, the sum being $3,210,932 last year as compared with $8,096,403 in 1907, but the expenditures for improvements of the Vanderbilt roads have been heavy in the past, and the amount charged last year to capital account and spent for improvements was probably ample to keep the property up to standard condition.

The following table shows the results of operation for the years 1908 and 1907:

	1908.	1907.
Mileage operated	1,982	1,983
Freight revenue	$15,711,941	$17,238,348
Passenger revenue	6,908.326	7.127,049
Total operating revenue	24,621,661	26,447,804
Maint. way and structures	2.611,392	3,432,738
Maint. of equipment	3,801,196	4.209,998
Conducting transportation	12.200,908	11,868.437
Total operating expenses	19,231,524	20,133.629
Taxes	894,376	842,892
Net earnings	4,495,761	5.471,283
Gross income	4,633,167	5,657,827
Net income	708,779	1,973,217
Dividends	500,000	1,911,689
Surplus	208,779	61,528

Letters to the Editor.

THE USE OF MODERATELY SUPERHEATED STEAM.

Montreal, March 22, 1909.

To the Editor of the Railroad Age Gazette:

The article by Lawford H. Fry in your issue of March 5, page 459, on the use of moderately superheated steam draws conclusions favorable to moderate superheat which are not, I consider, entirely justified.

Mr. Fry's results depend on two deductions, the first with reference to the efficiency of the boilers, the second to that of the engine. Compared with a normal boiler having an efficiency of 60 per cent., Mr. Fry deduces an efficiency of 62.1 per cent. for a boiler having a drop of temperature of 100 deg. in the gases passing through the superheater, and without wishing to question this figure, I would simply call your attention to its being a remarkably efficient case of heat transference and possibly a maximum result. The total heat of steam at 140 lbs. pressure from 60 deg. is 1164 B.t.u., which would represent the heat transferred with an efficiency of 60 per cent. so that with an efficiency of 62.1 per cent. with the increase obtained entirely from the action of the superheater, 1204.7 B.t.u. must be transferred per lb. of steam. I presume that the specific heat of steam has been taken at 0.52 between 400 deg. and 650 deg., so that if the superheat obtained is 40 deg. this would account for 20.8 B.t.u., leaving 20 to be accounted for by evaporation of the entrained water. At 140 lbs. pressure the latent heat evaporation is 860 B.t.u., so that this would correspond to 2.3 per cent. of water, which would be rather high, and I therefore consider that it would be more reasonable to give the superheater credit for 40 deg. superheat, which is, I believe, about the highest that has been claimed for the front end superheater, and say 1 per cent. of moisture, which would reduce the efficiency from 62.1 per cent. to 61.5 per cent. I do not wish to question Mr. Fry's figures, but in view of the variations in temperature which we have found in different parts of the smoke-box of ordinary engines, I do not believe it wise to accept an increase in boiler efficiency in excess of the effects obtained.

I cannot agree at all with the necessity of a smoke-box temperature of 800 deg. for the high superheat boiler. Even admitting for the sake of argument that the gases pass out of the superheater tubes at this temperature, giving a final temperature difference of 150 deg. between the gases and the steam for both types of apparatus, Mr. Fry has neglected the fact that the larger proportions of the gases pass through the evaporation tubes, and would therefore be discharged at 650 deg., following the reasoning in his article. Take the case of an engine having 244 tubes 2 in. diameter or say 1¾ in. inside, and 22 superheater tubes 4½ in. inside, contracted to three inches at the flue sheet. Figuring the area of the large part (less the four 1¼-in. pipes) the area through the superheater tubes is 29 per cent. of the total, while if figured at the flue sheet end it is 21 per cent. of the total. Taking 25 per cent. as an average discharge at 800 deg. and 75 per cent. at 650 deg., the average temperature would be 690 deg., and the B.t.u. discharged 15 per cent. of the coal fired. The boiler efficiency has thus dropped to 59 per cent. in place of 56.7 per cent. as calculated, and the net result is therefore that in place of the low and high superheater boilers having efficiencies of 62.1 per cent. and 56.7 per cent. respectively, they should properly have efficiencies of 61.5 and 59 per cent. respectively; in other words, in place of being as 100 to 91.5 they are as 100 to 96.

Mr. Fry has, however, neglected a further and far more important consideration, namely, that the efficiency of a boiler is a function of the work it is doing. This was shown most distinctly at the St. Louis test, and it is evident that the only proper comparison of two engines can be on the basis of equal rates of work developed.

The above estimates are based entirely on equal weights of coal burned per hour, whereas the thermal consumption of the three engines is given by Mr. Fry as 100, 89 and 79 respectively. For equal rates of work or for equal horse power therefore the high superheat boiler is only requiring 79 per cent. of the B.t.u. required by the saturated steam engine per hour, and the consequence is that all losses are correspondingly reduced and this factor alone will more than overbalance the losses in efficiency shown above.

The general results of the St. Louis tests showed that the relation between the equivalent evaporation per pound of dry coal (which I will call "E") and the equivalent evaporation per sq. ft. of heating surface per hour (which I will call "Q") could be fairly represented by a line having the equation $E = 13 - \frac{Q}{2}$. Now, E is proportional to the efficiency of the boiler and Q to its thermal consumption or the B.t.u. per hour required to do a given amount of work, and while the contestants given may be modified slightly,

they are substantially correct. As the coal used averaged 14,000 B.t.u., an efficiency of 100 per cent. corresponds to an equivalent evaporation of 14.5 lbs. and 60 per cent. efficiency to one of 8.7 lbs. For E = 8.7 lbs., Q = 8.6 lbs., and if on account of the increased efficiency of the engine this is reduced in the ratio of 100 to 89 and 79 respectively, Q for those consumptions becomes 7.75 and 6.9, the corresponding evaporations (E) 9.13 and 9.55, and the corresponding efficiencies 62.9 per cent. and 65.8 per cent. respectively. If these efficiencies are corrected as above by adding 1.5 per cent. to the low superheat boiler and deducting 1 per cent. from the high superheat boiler the final efficiencies for the three boilers are 60 per cent., 64.4 per cent. and 64.8 per cent. respectively, but it must be understood that these results are dependent on the engine efficiencies that have been assumed being obtained.

Mr. Fry has quoted a steam economy on the saturated steam engine of 12.5 per cent. for the low superheat and 30 per cent. for the high superheat engine, these figures based on pounds of steam per i.h.p. hour. Taking B.t.u. the consumption is 27,900, 24,800 and 22,000 per horse power hour respectively, or as 100 is to 89 and 79, or about a 3 per cent. saving for the engines with low superheat as against 21 per cent. for that with high, and these are I believe much more closely the figures that will be obtained in service.

It is obvious that if the engine efficiency of the low superheat locomotive is less than that assumed its steam consumption will not be reduced and its boiler efficiency improved as I have outlined above, while on the other hand, in practice, the application of the smoke tube superheater somewhat reduces the amount of heating surface; and this reduction should be allowed for in the estimate of boiler efficiencies I have made in which I endeavored to follow the method outlined by Mr. Fry. This reduction in heating surface amounts to about 15 per cent. and if Q is corrected for this the equivalent evaporation E becomes 8.95 and the boiler efficiency 61.6. Correcting this for the higher temperature of the gases passing out of the superheater tubes would leave the boiler efficiency of this engine at 60.6 per cent. and the result would be that the thermal efficiency of 21 per cent. should be found to be the saving. It is interesting to note that this figure has been somewhat exceeded on the Canadian Pacific in service, and that this estimate for the high superheat engine is therefore fairly justified, but it is evident that there may be a considerable difference in the results obtained from the low superheat engine, dependent chiefly on the efficiency that is actually obtained from a small amount of superheat in the cylinders.

H. H. VAUGHAN.

THE SPOKANE RATE CASE.

Oklahoma City, Okla., March 27, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

I have just read the editorial on "The Spokane Rate Case" in your issue of March 12, and wish to make one or two comments.

You say "but, as the Commission concedes, water competition is controlling at Coast Terminal points, and it would be pretty sure to force reductions to the coast ports corresponding to any made to intermediate points."

If water competition is controlling, why has it not already forced the rates to Pacific coast ports as low as possible, and if it has not done so does it not follow that there must be some understanding or combination between rail and water carriers?

Again, if the water competition is controlling, and business can profitably be handled to Coast cities for less money than has heretofore been charged, will not the decision simply result in all the consumers of the West securing reductions to which they are entitled; reductions which will supply them with all of their necessaries at a less transportation cost?

Further on you say, "Can rates be properly held to be inherently unreasonable on which the tariff moves easily, which are low as compared with other rates for similar service throughout the world, and for which much better service is rendered than ever before?" The day after the Galveston storm of September 8, 1900, fifty cents or even a dollar a box could readily be obtained in that city for Uneeda biscuit, but no sane man would say that that was a healthy trade condition, or one which it would be well to have indefinitely maintained.

Again you say, "What incentive will the management of a road have to seek to build up a large traffic by skillful adjustment of rates; to attract travel by giving the best and safest service; to reduce opjerating expenses by constantly experimenting with and adopting new and improved appliances, if all profits above a certain maximum, say four or six per cent., are to be appropriated to the public by means of rate reductions?" One may fairly reply with the question, What incentive would there be for a railway to use its best efforts to build up a great commercial metropolis upon the sea coast when it has to continually fight for its share of the business with water carriers? Often it has to take the business at rates inadequate to pay the cost of service, while at the same time maintaining a policy of rate making to otherwise well located points in the interior which discourages their doing any great amount of business and prohibits them from attaining any commercial importance.

If it has been hard for rail carriers to meet competition to Pacific coast points as against water transportation in the past, what will be the condition when the Panama Canal is finished and water transportation becomes a real live factor? It would seem to an ordinary business man that the sensible thing for the railways to do would be to encourage the building up of strong interior jobbing points over which they can retain control, and to which they can always maintain such rates as will be at least compensatory.

J. H. JOHNSTON.
Traffic Manager, Oklahoma Traffic Association.

EFFECT OF FLAT WHEELS ON RAILS.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In the *Railroad Age Gazette* of January 8 the discussion of Messrs. Geo. L. Fowler and E. L. Hancock of my article, on The Effect of Flat Spots, I consider more due to a misunderstanding of the article than a valid criticism of it.

Mr. Fowler calls attention to the fact that a flat spot delivers a substantial blow at speeds above five miles an hour as antagonistic to the results arrived at, and suggests that both writers based the computations on gravity, from which I can only infer that Mr. Fowler did not read carefully either the conditions assumed or the results stated in my article. The conditions assumed are very largely those outlined by Mr. Fowler, but on account of the weight below the springs supported by the wheel being considered as dropping with the wheel the acceleration taken is ten times that of gravity in place of 17.7 times as taken by Mr. Fowler. The speed at which the flat spot strikes its maximum blow would not, however, vary directly as the acceleration, but as its square root, as shown in Section 1 of Mr. Spilsbury's analysis; while if the decreasing action of the spring is taken into account it would be somewhat less. As a matter of fact, for any ordinary flat spot the actual drop of the wheel is so small that without introducing any appreciable error the action of the spring may be taken as constant.

With regard to practical considerations of the irregularities in track, rolling of car, etc., it is true that these enter into the question and cannot easily be allowed for, but as I understand the importance of this question the information desired

is the order of magnitude of the blow delivered by flat spots with the existing limitations; and I consider that the results arrived at in Mr. Spilsbury's analysis have determined this to be of a reasonable and safe amount as opposed to the highly dangerous magnitudes arrived at in Mr. Hancock's original calculation. The blow will be substantially increased or decreased in the same way as the pressure between the rail and a wheel without a flat spot varies from the same causes, but this does not lead us to neglect the weight on the wheel as a measure of the pressure on the rail, and I consider that the kinetic effect of the wheel striking the rail is determined by Mr. Spilsbury with accuracy with proper figures for the various quantities, as the pressure between the wheel and the rail is when the weight on the wheel is known, provided, of course, that no actual error is shown in the calculation, which so far has not been the case.

I do not quite understand Mr. Hancock's position, wherein he states that it is more rational to consider only the mass of the rotating parts as concentrated at the center of the wheel, as to whether he intends to supplement this with the action of the springs. If this be the case he has abandoned his original condition and there is simply a change in the assumptions I have made. As an extreme condition, let us take the weight of the wheel and one-half the axle as the rotating weight, say 1,100 lbs.; take the same total weight per wheel as before, and assume that the springs carry the entire remaining weight. The resulting maximum striking velocity (see result D) is 4.6 ft. per second in place of 3.8. In other words, there is a weight of 1,100 lbs. striking at 4.6 ft. per second against one of 1,600 lbs. at 3.8 ft. per second as originally assumed. The kinetic energy is 363 ft. lbs. against 358 in the latter.

There is no assumption of an upward force in Mr. Spilsbury's analysis; when a body of mass M is rotating around a center at a distance R from its center of gravity the centrifugal force as it is generally termed is $\frac{M V^2}{R}$ and this is the force referred to when the condition is postulated as in section 1 of the wheel turning around the leading edge of the flat spot.

I trust you will pardon these demands on your space, but I consider Mr. Spilsbury has supplied a correct and reasonable analysis of this important question and one that agrees with practical experience, and I feel that the discussions that have taken place would not leave an entirely correct impression.

H. H. VAUGHAN.

Contributed Papers.

RESULT OF FIRST ARBITRATION UNDER BOARD OF TRADE SCHEME.

It will be recalled that in the autumn of 1907 there were threats of an impending strike on British railways, in consequence of which the then president of the Board of Trade—Mr. Lloyd George—had some protracted negotiations with several of the railway chairmen and also with the representatives of some of the men's trades unions. The result was a scheme for conciliation and arbitration which provided for the formation of boards for each railway, consisting of representatives of the company and of the employees, to consider any question relating to rates of wages and hours of duty. The scheme further provided that questions which these boards were unable to settle were to be referred to a single arbitrator.

The London & North Western was the first company to complete the arrangements in connection with the scheme, and demands from most of the grades concerned in the working of traffic, numbering about 39,000 men, were considered by the newly-formed Conciliation Boards. The principal grades concerned were: engine drivers, firemen and cleaners, signalmen, brakemen and shunters, passenger guards and platform porters, carriage cleaners, wagon examiners and greasers, permanent way men, goods staff, cartage staff.

Agreement, however, was found impossible, and reference was made to arbitration, and Sir Edward Fry was selected as arbitrator.

Sir Edward Fry sat at Euston station for eight days in December, 1908, and his award has now been published. The men's demands consisted of a general "All Grades National Program" for advances of pay and reduction of hours, which, if granted in their entirety, would have involved an extra cost of at least £750,000 yearly, equivalent to nearly 2 per cent. dividend on the company's ordinary stock of 42 million pounds. During the course of the arbitration proceedings the employees withdrew a large number of items on account of their being nearly or quite in accordance with the company's existing practice.

Under the award the men obtain benefits estimated at £70,000 yearly—a small proportion of what they claimed. Some of the most important claims put forward in the "National Program" were entirely disallowed by the arbitrator, as for instance: that an immediate advance of 2 shillings a week be given to all grades; that eight hours constitute the standard day for drivers, firemen, signalmen, passenger guards and brakemen; that a full week's wages be guaranteed; that overtime should be calculated for each day separately; that Sunday duty be paid for at a minimum of rate and a half; that the "bonus," "classification" and "trip" systems be abolished; that promotion be according to seniority.

The following is a precis of the principal points in the award:

LOCOMOTIVE DRIVERS, FIREMEN AND CLEANERS.

Minimum of nine hours' rest between two spells of duty, except in case of emergency.

Advance of 1s. 6d. per week to firemen employed on the new large engines.

Slight increased allowance to locomotive men stationed in the London district, without prejudice to the right of the company to advance the rents of their houses.

Slight reduction in scale of pay for cleaners.

SIGNALMEN.

Rate and a quarter for all overtime, and for all time worked between midnight of Saturday and midnight of Sunday; also an allowance when temporarily working in a higher paid cabin.

BRAKEMEN.

A minimum of nine hours' rest, except in case of emergency. An allowance to men stationed at Willesden, without prejudice to the right of the company to advance the rents of their houses.

SHUNTERS.

Reduction in hours of men exclusively engaged in shunting to eight a day.

PASSENGER GUARDS.

Rate and a quarter for all time over standard hours. To be paid time and a quarter for Sunday duty, but the present system of paying the full day's pay for any spell of Sunday duty to be abolished and the duty and pay to be split up into quarter days as proposed by the company.

PLATFORM PORTERS.

To be paid at ordinary rate for Sunday duty in addition to weekly rate of pay, with a minimum of a quarter of a day's pay for each time of booking on duty. This clause not to apply to men finishing their ordinary week's work on Sunday morning or commencing their ordinary week's work on Sunday night.

PERMANENT-WAY STAFF.

Allowance when working in higher grade, for more than a day consecutively, of not less than the minimum rate of the higher grade.

GOODS STAFF.

Maximum working week, 72 hours a week, less three hours daily for meals and rest; of the three hours for meals and rest two to be successive.

Employees under 21 years of age not to be paid adult wages when not employed on adult work.

Rate and a quarter for all time over the standard week of 72 hours and between midnight of Saturday and midnight of Sunday. In regard to Sunday work an exception is made in the case of men finishing their week's work on Sunday, and not recommencing work until after a rest

of 24 hours, and also of men commencing their week's work on Sunday after 12 o'clock at noon, and after a preceding rest of 24 hours.

An advance of 2s. per week to all capstan men.

CARMEN, DRAYMEN AND LURRYMEN.

Maximum hours of work to be 60 per week, inclusive of one hour daily for dinner.

Rate and a quarter for all time worked over the standard week, and between midnight of Saturday and midnight of Sunday, with the same exception in regard to the latter as shown above for the goods staff.

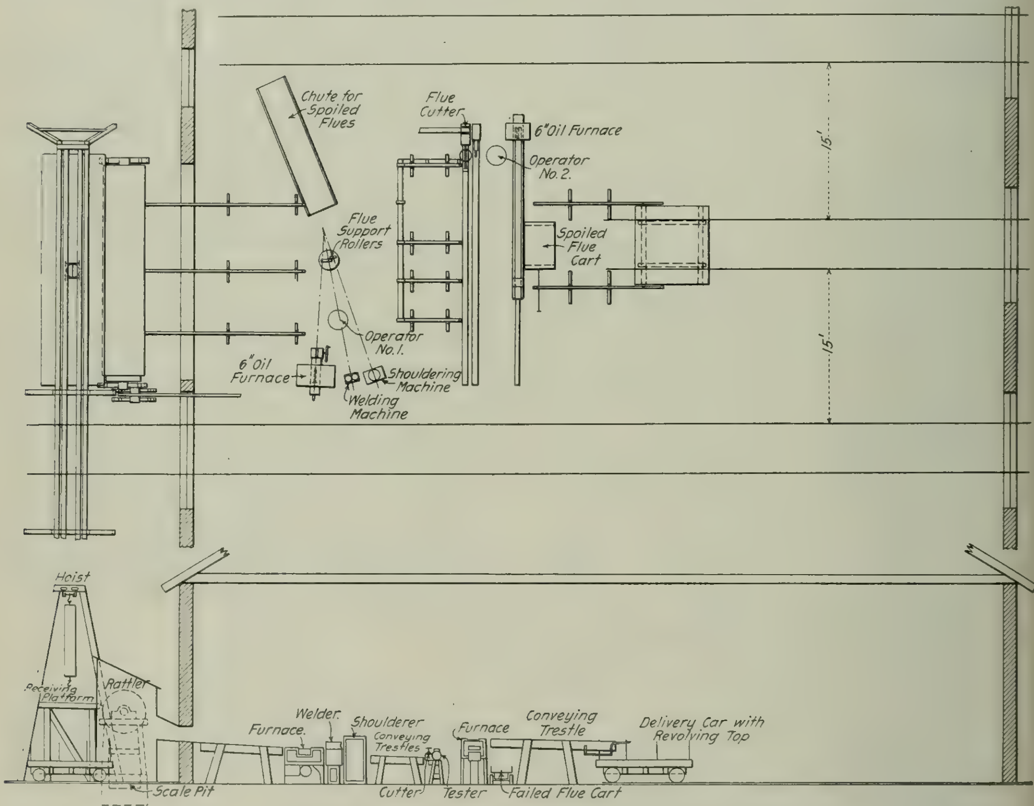
The award was to come into operation on April 1, 1909, and is binding until January 1, 1913.

HANDLING LOCOMOTIVE TUBES.

A flue shop recently has been installed in the Garrett, Ind., locomotive repair plant of the Baltimore & Ohio, which is turning out repaired boiler tubes at the rate of one a minute. A description of the manner in which flues are being handled and worked in this shop, which occupies a floor space only 25 ft. x 35 ft., in one corner of the boiler-shop proper, follows:

The work starts with the flue as it leaves the boiler enroute to the rattler. The track arrangement in the erecting shop is such that it is possible to push flue cars directly in front of each locomotive. When it is desired to renew a set of flues in the roundhouse, the locomotive is backed in, making it possible to bring a flue car close to the boiler, as is done in the erecting shop. The flues are then taken out of the boiler, being careful to see that they are not damaged when the beads are chipped off in the firebox with the air hammer, so that the end of the flue, which is to receive the new safe end, will not need further attention in the way of trimming or cutting off before reaching the furnace at the welding machine.

The operator in the smokebox, who handles the cutting off machine, removes the flue with assistance from the operator in the firebox and pulls it out on to an inclined roller slide which delivers it immediately over and drops it automatically on to a flat car. All handling of the flue, outside of that necessary by the two operators in the flue shop, now ceases until the finished set of flues is returned on the car to the boiler to be reset. A small shop switching locomotive takes the car to the pneumatic hoist at the flue rattler. The flues are rattled wet or dry with the axis of the rattler barrel 6½ ft. above the floor of the shop, which permits the flues, when rattled, to roll into the shop over inclined trestles directly up to the first operator, who stands in front of the furnace and the spreading, welding and shouldering machines. A two-portal furnace burning fuel oil in connection with fan blast air receives the flue in its first portal, where it is heated preparatory to spreading. The operator, in the meantime, has thrown a safe end, already scarfed (the flue is not scarfed) into the portal ahead of the flue.

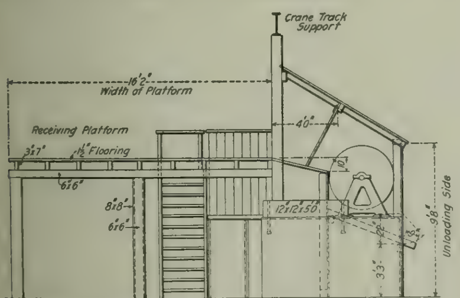


Elevation and Plan, B. & O. Flue Shop at Garrett, Ind.

The flue is now hot enough to spread. A spreading plunger, operated pneumatically, is placed at the proper angle directly under the furnace, and the flue, which is supported near its center throughout the first set of operations on roller supports, is lowered until it is in line with the spreader plunger and then clamped with a quick service vise. After the end of the

flue is spread, it is inserted into the portal which contains the safe end, now red hot, which is then bumped into the spread end, and the flue, with the safe end inserted, is placed in the second portal. While waiting a few seconds for the welding heat, the operator draws the next flue from the inclined rack and places it in the vacant portal, along with a safe end, to heat for the spreading operation. He then takes the other flue, which has reached welding heat, and passes it rapidly through the welding and shouldering machines. He then rolls this flue on another set of inclined trestles to the second operator, who stands at the opposite end of the flue.

On one side of the operator are the belt-driven cutting-off and hydraulic steam-driven testing machines, and on the other side he has a small fuel-oil furnace, directly over the spreading machine, where he heats and spreads the flue to fit the larger hole in the front flue head. The flues, when cut off, are tested by a steam operated water ram and the spreading plunger is worked pneumatically. The flue is then thrown on to the inclined trestles from which it drops to the flue car, finished, and is ready, when the set is complete, to be hauled back to the boiler. All of the machines are adjustable so that flues from 10 ft. to 20 ft. long can be accommodated.

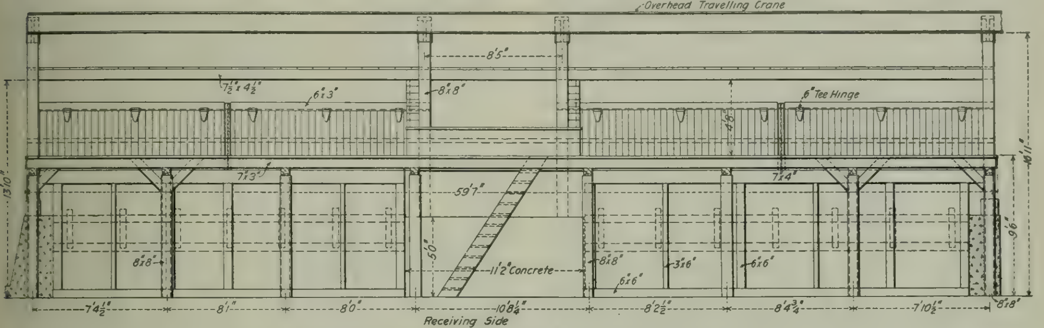


End Elevation of Tube Cleaner Building.

The accompanying drawings will give a general idea of the arrangement of the machines and trestles. The best record is 69 finished flues in 60 minutes, and the average cost for passing a set of flues through this shop from the rattler to the delivering car is from 1¼ to 1½ cents per flue.

We are indebted to D. Gallaudet, division master mechanic Baltimore & Ohio, for this description and the illustration. He designed the special machinery and grouped the various operations so as to make it possible for two men to keep the flues moving from the time they roll out of the rattler until at the rate of one a minute, they drop on to the delivery car ready to go back into the boiler.

At the Burnside shops of the Illinois Central the tube cleaner is driven by an electric motor and arranged in a house, so that the tubes are delivered and removed to the cleaner by gravity, and no hand labor is required in lifting them. The tubes, as removed from locomotives, are loaded on a special car, which is moved to a track under a traveling crane. The entire load of tubes is hoisted by the crane and dropped on the receiving platform at the tube-cleaner house, from which point they are fed into the cleaner. After the tubes are cleaned they are discharged by gravity over an inclined door directly to a car which transfers them to the tube department in the boiler shop. The overhead traveling crane extends along the side of the storehouse and is used principally for handling heavy stores. The tube cleaner is located, so that this crane may be used for hoisting the tubes to the cleaner platform. The drawing shows the house arranged for two tube cleaners, with the motor drive at the center.



Side Elevation of Tube Cleaner Building; Burnside Shops of the I. C.

RAILWAY MAIL PAY.

BY JULIUS KRUTTSCHNITT,
Director of Maintenance and Operation of the Union Pacific System and the Southern Pacific Co.

The question of compensation to the railways of the United States for carrying the mails has been under review before Congress at different times during the past ten years. The subject was exhaustively investigated by a Joint Commission of the Senate and House of Representatives in 1898 and 1899, which reached the following conclusion after full consideration and taking of a mass of testimony on all sides of the question:

> "Upon a careful consideration of all the evidence and the statements and arguments submitted, and in view of all the services rendered by the railways, we are of the opinion that the prices now paid to the railway companies for the transportation of the mails are not excessive, and recommend that no reduction thereof be made at this time."

(See Report 2284, House of Representatives, 56th Congress, 2d Session.)

This Commission also concluded as to the pay for railway postoffice cars:

> "Taking in view all these facts as disclosed by the testimony filed herewith, we are of the opinion that the prices paid as compensation for the postal car service are not excessive, and recommend that no reduction be made therein so long as the methods, conditions and requirements of the postal service continue the same as at present."

Since the above recommendations were made, the operating cost on railways, and, consequently, the cost of handling the mail, have been largely increased, as hereafter shown, through

higher prices for both material and labor, so that if the railways were not overpaid ten years ago, the present rates, being lower than those paid at that time, would be too low and should really be increased to give the railways a reasonable return. Far from doing this, legislation enacted in the past few years has had the effect of cutting down the mail pay of the railways, whilst the special requirements as to service and equipment have been made more severe and exacting.

Recent acts of Congress or orders of the Postoffice Department, which have the force of law, that have caused reduction of railway revenues, are the following:

1. Act of Congress of March 2, 1907, reduced pay on all routes moving in excess of 5,000 pounds per day. This reduced the pay for handling mails $1,740,494.63, or 3½ per cent. of the total earnings. The same act reduced the rental rates for railway postal cars $935,974.09 per annum, or 16 per cent. The total reduction in pay to the railways under this act was $2,676,468.72, or 6 per cent. of the total compensation for both classes of service.

2. Act of Congress of June 26 1906, effective July 1, 1906, withdrew from the mails empty mail bags and certain supplies, to be thereafter shipped as freight or express. It may be conservatively estimated that the annual loss in mail revenue to the railways by withdrawing these shipments from the mails is at least $1,000,000, with practically no reduction in space furnished because of this change.

3. Order of Postmaster-General of June 7, 1907, changing with each mail weighing thereafter the method of computing average weights on which pay is based from that always previously used and theretofore regarded as the proper interpretation of the law. The effect of this on the mail weighings of 1907 and 1908 was to reduce railway mail pay in two sections of the country, $2,222,108,92, or 9½ per cent., or at the rate of $4,500,000 per annum for all roads of the country.

4. Orders of Postmaster-General reducing railway postal car pay by allowing "shorter-car" pay on certain lines than heretofore authorized and changing certain full lines to half lines, that is, reducing pay for return movement; thus causing an annual loss to the railways of $345,287.06. (Second Assistant Postmaster-General's Annual Report 1908, page 13.)

The effects of all of these reductions on the mail revenue of the railways aggregate $8,500,000 per annum, or 17 per cent. of the total pay received by them in the year ending June 30, 1908, for handling the mail and furnishing railway postal cars.

These reductions were made without justification and for the purpose of reducing railway revenues, and, incidentally, the expenses of the Postoffice Department, at a time when the net earnings of the carriers seemed large to the public mind; although under these favorable conditions the returns to the shareholders approximated but 4 per cent., whilst farmers were receiving 10 per cent., manufacturers 15 per cent. and National banks 18 to 20 per cent.

It is true that there has been a large increase in the gross revenue of the railways in the last ten years, but this has accrued from traffic other than carriage of the mails and has been accompanied by great increase in operating expenses. In fact, were it not for the economies of the carriers, effected by the use of more powerful locomotives and larger freight cars, the increase in operating expenses would, without doubt, have fully neutralized the growth in revenue. In the months preceding the panic of October, 1907, the railways were quite generally showing decreases in net earnings in face of the largest gross earnings in their history. It was costing them much more than a dollar to handle every dollar increase in gross earnings.

Since the hasty enactment of ill-considered legislation reducing mail pay, the revenues of the roads have been seriously affected by a change in business conditions which has reduced traffic without reducing prices of materials and labor. At the same time, legislation has increased labor costs by reducing hours of service.

In 1898 rates for transporting the mails were too low to cover the cost of service, they are much too low now, and the losses on the mail service as a whole—there are some routes that pay—are borne by freight traffic entirely.

RECEIPTS FROM MAIL AND OTHER RAILWAY TRAFFIC.

The latest statistics of operations of all railways of the United States are for the year ending June 30, 1907, issued by the Interstate Commerce Commission, July 9, 1908. From them we compile the following exhibit comparing results of 1907 and 1898—when a Commission of Congress, after complete investigation of the subject, recommended that mail rates be not reduced.

Year ending June 30 –	1907.	1898.	Per cent.	
Earnings from passengers	$564,606,343	$266,970,490	Inc.,	111
" " express	57,332,931	25,908,075	"	121
" " mails	50,378,964	34,608,352	"	46
" " freight	1,823,651,998	876,727,719	"	108
Operating expenses	1,748,515,814	817,973,276	"	114
Passenger train mileage	541,439,176*	341,526,769	"	58
Freight train mileage	662,106,857*	503,766,258	"	31

*Including mixed trains.

Earnings per passenger train mile (cents):

	1907.	1898.	Per cent.	
From passengers	105.7	79.4	Inc.,	31
" express	10.7	7.7	"	38
" mails	9.4	10.3	Dec.,	10
Total	125.8	97.4	Inc.,	29
Number of passengers carried per train	51	39	Inc.,	31
Tons of mail carried per train	.86	.80	"	7
Earnings per freight train mile (cents)—				
Earned from freight	274.0	173.1	"	58
Tons of freight carried per train	357.35	226.45	"	58
Operating expenses per total train mile., cents	147.0	95.6	"	54
Net earnings per train mile (cents)—				
Passenger trains	21.2*	1.8		..
Freight	127.0	77.5	"	64
Passenger earnings per pass. mile, cents	2.014	1.973	"	2
Mail earnings per mail ton mile, cents	10.66	12.57	Dec.,	15
Freight earnings per freight ton mile, cents	0.759	0.753	Inc.,	1

*Loss.

NOTE.—Bear in mind these figures do not, of course, show effect of cut of $8,500,000 in mail pay effective July 1, 1907, or losses in net revenue through depression in business conditions commencing in latter part of 1907. As an index of the latter, the *Commercial and Financial Chronicle* of September 5, 1908, showed that 141 roads, aggregating 168,839 miles, or 70 per cent. of all roads in the country, had suffered a loss of $63,484,902, or 24.97 per cent., in net earnings in the first half of the calendar year 1908, as compared with same period of previous year.

The foregoing statement clearly shows the difference between the revenue obtained from passenger trains as compared with freight trains. The control of the former is largely out of the hands of railway operating officers, as to meet competitive and traffic conditions, heavier and more luxurious passenger cars must constantly be furnished, which, of course, means largely increased expense with very little increase in the paying train load. In fact, as to the mails, notwithstanding an increase in tonnage carried on the average train, the mail earnings per passenger train mile were actually less in 1907 than in 1898, due largely to the automatic reduction of railway mail pay per ton mile. Considering the freight train mile, the composition of which is almost entirely within the control of the railways, which institute methods for reducing cost of transportation, it will be observed that by such methods the railways have been enabled to place 58 per cent. more tonnage in a train, bringing them 58 per cent. more earnings, which can be applied as an offset to the increase of 54 per cent. in the cost of running a train one mile.

This increase in operating expenses per train mile last referred to has been brought about largely because of the increased cost of labor and materials, which, as is well known, has been general throughout the country.

Chart marked "Exhibit A" shows, using year 1898 as unity, or 100, the increase in cost of railway operating expenses per train mile as reported to the Interstate Commerce Commission, the rise in prices of labor and commodities from statistics collected by the United States Department of Labor, Bulletin No. 75 of March, 1908, and No. 77 of July, 1908, the average rate per ton of freight handled one mile as reported by the Interstate Commerce Commission and the average rate of railway mail pay, including pay for postal cars, received by

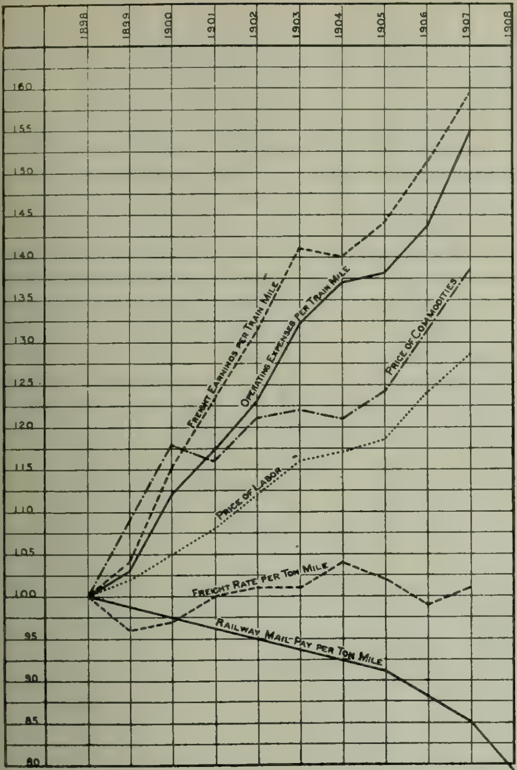


Exhibit A: All Railways in U. S. Relative Results from Mail and Freight Traffic, Prices of Labor and Commodities.

the railways per ton mile, computed from Annual Reports of the Postoffice Department.

Note the close parallelism of the curves of Earnings, Expenses, Prices of Commodities and Labor. Note that freight rates in 1907 were slightly higher than in 1908, and in the whole period were never more than 4 per cent. below or above 1898, and note particularly that the rate of mail pay reduced automatically 15 per cent.

To further illustrate the difference in compensation to the railways from freight and passenger service, see "Exhibit B" showing for each of the years ending June 30, 1898, to 1907, inclusive, the actual earnings per train mile received from freight and passengers and the actual operating expenses per train mile. This chart shows that whilst in 1898 passenger train earnings were slightly more than the cost of running a train, in 1907 it cost considerably in excess of the earnings received from a passenger train to run it, showing that passenger traffic as a whole, including the mails, does not pay its fair share of operating expenses, regardless of taxes, interest on bonds, or dividends, and this it should do—as pointed out by Judge Cooley, the first Chairman of the Interstate Commerce Commission.

Comparing results of the operations of all railways of the United States for the year ending June 30, 1907, with 1898, when this question was last up, it is shown by reports of the Interstate Commerce Commission that gross revenue from operations, as well as income from investments, increased $1,380,000,000. This is a very large sum, but let us see what becomes of it. Increased wages paid to employees consumed $577,000,000, or 42 per cent., purchase of material included in operating expenses, $354,000,000, or 26 per cent. of the increased income, and these material purchases represented largely labor involved in their production. Increases in betterments and miscellaneous deductions consumed $77,000,000, or 6 per cent. of the increased income. Larger payments for interest on funded debt and current liabilities consumed $96,000,000, or 7 per cent., and larger taxes 2.5 per cent., leaving $240,000,000, or 16.5 per cent. of the increased income for the owners of the properties, the stockholders. In 1898 dividends were less than 2 per cent. of the capital stock, and in 1907, even with the large increase noted, they were only 4 per cent. Contrast this with the manufacturers' returns of 15 per cent., the farmers' of 10 per cent., and the National banks' of 18 to 20 per cent. on their capitalization. * * *

Reduction in railway mail pay was not justified in 1898; it was far less justified in 1907. On the contrary, there has been a large fall in mail pay per ton mile, and conditions under which mails are transported are becoming more and more onerous. The cost of building a railway postoffice car to the present plans and specifications of the Postoffice Department is at least 50 per cent. more than it was in 1898, although pay received for handling these cars that weigh from 25 to 30 per cent. more than formerly has been arbitrarily cut over 16 per cent. by the Act of Congress of 1907, and has since been further cut through readjustment of routes. For the year ending June 30 1908, the railways received gross $48,155,379, including railway postoffice pay, for carrying 80 per cent. greater tonnage of mails than in 1898, a sum $12,747,629 less than it would have been but for the reduction of rate from 12.59 cents in 1898 to 9.94 cents in 1908. In face of this, as we have shown, arbitrary cuts of $8,500,000 more have been

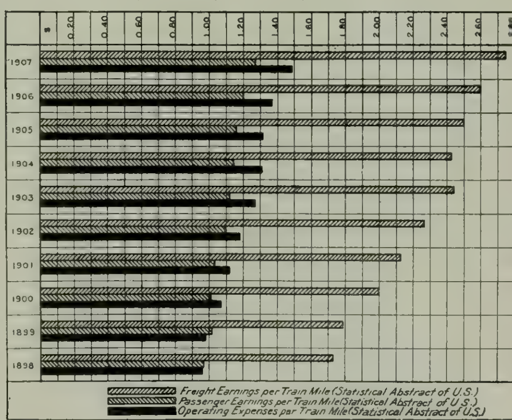


Exhibit B: All Railways in U. S. Earnings and Expenses per Train Mile.

made, a grand total of over $21,000,000 less paid now than ten years ago.

This increase* in weight of a postal car might not be thought

*About 18 months ago, the conclusion was reached that heavier and stronger cars were demanded by changed conditions resulting in heavier trains, greater speed and increased frequency and consequent risk of accident to clerks and mail in collisions and wrecks. After careful investigation and expert testimony, the specifications were revised so that full 60-ft. cars would weigh about 100,000 lbs. instead of 80,000 lbs., and be greatly strengthened by the free use of steel plates and oak timbers. To meet the views of car builders, east and west, two plans and specifications, slightly differing, were adopted as standard, and railways were given the option of conforming to one or the other. The best known anti-telescoping features were adopted in both plans, producing in the judgment of responsible car builders, a car of exceptional resisting and carrying power. When new lines of cars are authorized by the Department, or new cars are ordered to take the place of old cars in service, companies operating the routes are furnished copies of these specifications and the superintendent of division is instructed to see that cars are built in conformity therewith. Inspections are made while the car is in the shop, and when it is completed a full report is made and forwarded to the Department. A decision is then reached as to whether the car is satisfactory and can be accepted.—(Annual Report Postmaster-General for 1905.)

of much moment, but it means to the railways the movement of 1,000,000 additional gross ton miles per car per year, costing them $10,000 per annum in operating expenses, whilst, as shown, they receive 16 per cent. less railway postoffice pay now than formerly.

United States Postal Laws and Regulations, Section 1164, provide that the average weight of the mails used in fixing rates shall be established by the actual weighing of the mails for a period of not less than thirty days and "*not less frequently* than once in every four years." The construction placed upon this by the Department has been the one which reduced to the minimum the pay which the railways receive for services rendered. If mail traffic were stationary, weighing every four years would not matter much, but the increase of mail matter throughout the United States has been very great, and, because of the policy of the Department to weigh the mails not more frequently than every four years, heavy losses have resulted through the railways having to haul tonnage for three successive years following each weighing for which they receive no pay.

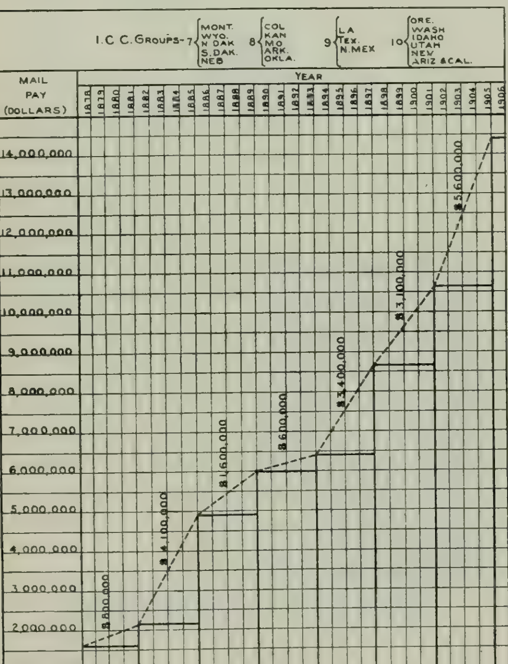


Exhibit E; Loss in Revenue by Weighing Mail Quadrennially Instead of Annually.

"Exhibit E" shows, for roads in Interstate Commerce Groups 7, 8, 9 and 10, by heavy lines the mail pay actually received as determined by the quadrennial weighings, and by dotted lines the natural increase in railway mail pay the roads should have received if the mails were weighed annually. Opposite each triangle is placed the amount of money loss to the railways through the existing policy, this loss aggregating in the periods given for roads in Groups 7, 8, 9 and 10, $19,200,000, or 12 per cent. of the aggregate railway mail pay. In other words, this loss is equivalent to a reduction in the rate received per ton mile in these groups of states of 12 per cent.

The loss to roads in the western part of the United States is most striking, due as it is to the rapid growth of that section. The same reduction, though to a slightly less degree, obtains in other parts of the United States.

COMPARATIVE DECLINE ON MAIL, PASSENGER AND FREIGHT RATES.

"Exhibit G" shows that during the past ten years, from 1897 to 1907, when railway operating costs have been increasing, mail rates have been automatically reduced 16 per cent., with an increase of only 44 per cent. in density of traffic. During the same time, the freight ratio fell only 5 per cent. with an increase of 103 per cent. in density of freight traffic. And, remember, that increase in freight traffic density means opportunity to lessen cost of transporting through larger car and train loads, whilst increase in mail traffic density affords no such opportunity, as under Postoffice Department regulations, which govern with the force of law, considerations of convenience are paramount and no measures of economy are permitted.

When the mail in a car reaches the low maximum of about two and three-quarter tons, greater density means additional cars, and, therefore, added operating cost about in proportion to traffic carried. The same is to a lesser extent true with handling passengers, but Chart "G" shows that passenger rates have been held up quite uniformly whilst density has increased 84 per cent., or nearly double that of the mails.

The actual reduction in rates per traffic unit during the past ten years has been as follows, authorities being Statis-

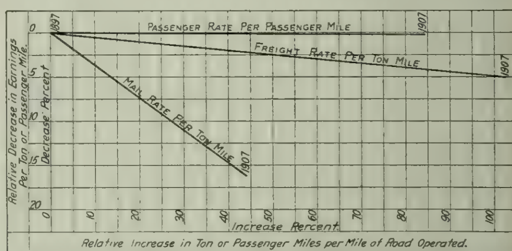


Exhibit G; Changes in Rates per Mile.

Showing for all railways in U. S. that automatic reduction in mail rates with increases in weight has caused a greater fall in actual railway mail pay than in passenger or freight traffic.

tical Reports of the Interstate Commerce Commission and computations based on annual reports of the Postoffice Department:

Year ending June 30—	1908.	1907.	1898.	1897.
*Mail rate per ton-mile, cents..........	9.94	10.66	12.57	12.67
Freight rate per ton-mile, cents........	No data.	.759	.753	.798
Passenger rate per pass'gr mile, cents..	No data.	2.014	1.973	2.022

*Including R. P. O. car pay.

The above is an answer to the argument frequently made that railway mail pay was not changed until the reductions made in 1907. The sliding scale fixing lower mail rates with increasing density is the factor that controls the actual lowering of rates, with the important difference that railways are forbidden to bring about economies in operating cost with mails that they can when freight density increases, and the further important difference that mail rates continue to fall automatically despite changes in industrial conditions which make it much more expensive for the railways to perform the service.

(*To be continued*)

We noted at the time (long ago) the robbery of an express train going from Toulouse to Paris, in which trainmen were severely wounded. The robbers were caught and were recently tried. The leader was condemned to death; one of his comrades to imprisonment for life; another to five years and another to two years in prison. The trainmen shot had recovered.

A UTOPIAN RAILWAY PROJECT.

BY ROBERT W. WILSON.

Each of the six states of the Australian commonwealth owns and operates its own system of railways. These railways have been built entirely with money borrowed in the United Kingdom on the good faith and credit of each individual state for its own separate uses. No bond, or other security, specially ear-marking its railways or, in fact, any of its other assets has ever been given by any Australian state in the issuance of any loan. More than four-fifths of the whole public indebtedness of Australia has been incurred for the construction of railways, and none of the six states has ever had much difficulty in floating loans for these or other public works.

Each state also owns the lands within its confines, save such areas as have passed into private ownership. The land grant system of railway construction has not found favor in Australia, although nearly a generation ago a very bitter political fight was fought on the question. At that time Sir Thomas McIlwraith was Premier of Queensland and put forward a project of constructing a trans-continental railway, which was to be built by an English syndicate in return for large land grants in Western Queensland. The sheep and cattle owners were bitterly opposed to the project and organized to secure its rejection. In this they were successful and the McIlwraith government was turned out of office. Out of the turmoil at that time and the discussion which it created was evolved a proposal so daring in its conception and so brilliant in its possibilities that it holds for many thoughtful Australians possibilities of resurrection at some future day.

Briefly stated, the proposal was to introduce on the Queensland government railways uniform rates, both for passengers and freight, irrespective of the distance for which the traffic should be carried. The postoffice and telegraph services were instanced as analagous cases, in both of which a low uniform rate covered the price of the service, irrespective of distance. Naturally, to work the Queensland railways under such conditions would involve a heavy loss not only on "fixed charges" as represented by the interest on the money spent on their construction, but also on operating expenses. To meet this it was proposed to increase the rentals of all the pastoral lessees in the interior to an amount that in the aggregate would pay the interest on the whole public debt of Queensland and cover any deficit on the operating account of the railways as well. Wool-growing was then the most profitable use to which land could be turned, and it was freely conceded that the lands of the interior were better suited and more valuable for this purpose than the lands nearer the east coast, but without cheap carriage to port they were unavailable for this purpose.

It may be imagined that such a project would be hailed with derision, but it was not so. Some of the leading pastoralists who would be principally affected by the increased rentals took up the proposal seriously and maintained that a good case had been shown for further inquiry. Among them was the late James Tyson, the richest man that Australia has, as yet, produced. Tyson made his home in Queensland, at Felton station, on the Darling Downs, and had property and business interests in all the other Australian colonies. He had a more comprehensive knowledge of the interior of Australia and its capabilities, and especially of Queensland, than any man of his day. Tyson was no visionary, but a hard, conservative man of business. Many people called him a miser, but that was untrue. As a native-born patriotic Australian, Tyson saw the tremendous possibilities inherent to a uniform rate on the state-owned Queensland railways, and his practical experience enabled him to say that sufficient rental could be obtained from the government-owned lands of the interior to leave an ample margin of profit to the lessees, provided they had the cheap transportation proposed. Sir Thomas McIlwraith was a railway engineer by profession and ridiculed the proposal, which he refused even to discuss seriously. No attempt was made then or since to bring the matter before the Queensland Legislature.

Still the idea will not down, and during the generation that has passed since it was first mooted it has cropped up from time to time as a subject of academic discussion. It is said that the Hon. Alfred Deakin, Prime Minister of the Commonwealth, is inclined to believe in the idea theoretically, for the whole of Australia, but the difficulties of carrying it into effect for the whole island continent would be enormously greater than were to be faced in Queensland alone thirty years ago. Under the Australian commonwealth constitution, which came into force on the first day of the present century, the federal government "may" take over the railways of the six separate states. Further, the commonwealth "may" assume the outstanding indebtedness of the six states, and negotiations attended with great difficulty have been in progress with this object, both in London and Australia for several years past. The two propositions are inseparable. If the federal government assumes the state debts, then the state railways, for the construction of which the debts were incurred, must pass to the commonwealth. At the same time the state will continue to own, each within its own boundaries, the unalienated lands of the interior.

The situation is one of great difficulty, which is not lessened by state jealousy of the federal power and considerable interstate friction between state politicians outside the federal arena. Still, Australia has given many notable instances of the lengths she is prepared to go in the way of "advanced" legislation, and a time will probably come when the people, getting tired of the squabbles of politicians, will insist on the federal government going right ahead on the lines originally laid down by "the fathers of the constitution." In that case the commonwealth will assume the state debts, and it will at the same time take over the railways of the six separate states and amalgamate them in one federal system. This would necessarily be a work of time and difficulty, as in "the old cut-throat days" of warring tariffs between the Australian colonies, prior to federation, the different colonies adopted different gages for their railways as an additional artificial means of restricting intercolonial traffic. Still the genius of young Australia will no doubt be quite equal to overcoming all obstacles in due course, and when the commonwealth has its railways federated under one central control, it is fairly certain that the proposal for a uniform rate, both for passengers and freight, will again crop up.

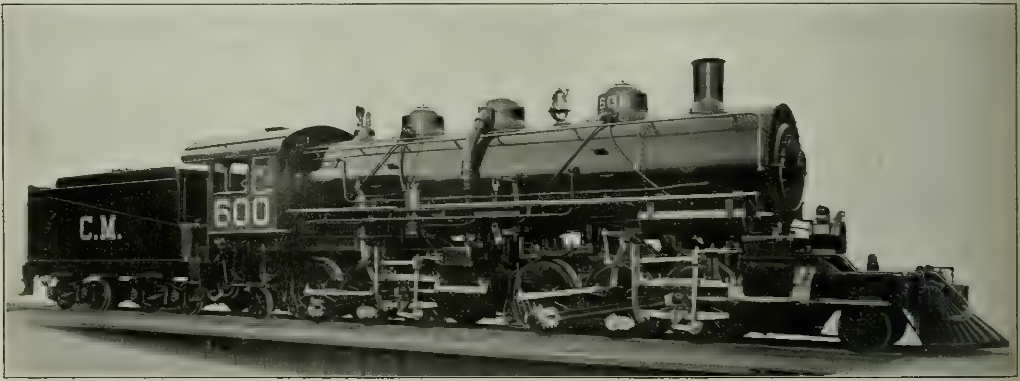
For Australia, were it practicable, the project has many attractions to commend it. One of the misfortunes of the island continent is that the larger cities contain populations enormously in excess of the populations in the back country from which they draw their subsistence. Melbourne and Sydney have enormous populations, utterly out of proportion to the distribution of the people throughout the territories of which they are the seaports, and in a lesser degree this is also true of Brisbane, Adelaide and Perth. People in the large Australian coast cities show little inclination to go inland and settle on the soil. It is not that the soil is unproductive, the occupation unprofitable or the life unpleasant, but that distances are long and the cost of railway transportation heavy. Besides which a man or woman having had some little taste of city life does not care to relinquish it entirely, or get back to it only at the cost of "a king's ransom" in the way of a railway fare. With a cheap uniform rate on the railways through the interior there would be farms, orchards, vineyards and other small holdings at frequent intervals all through long stretches of country now wholly given over to cattle and sheep. The congestion of the cities would be relieved and the natural growth of Australia would be wonderfully promoted by what it at present most needs—a contented class of small settlers on the soil.

Old maps of Australia show its central portion as "the

great stony desert." This is a very mistaken description of what will some day possibly be the most valuable part of the commonwealth. There are areas there of enormous extent, carrying large herds of cattle, that have soil equal to anything that is to be found on the prairies in Western Canada, and the natural grasses and herbage are ideal for the pasturage of stock. With cheap carriage at a uniform rate, wool production would be profitable over a large extent of this part of Central Australia, and away west of it into the northern territory of South Australia for several hundred miles. The wool production of Australia would be trebled with cheaper inland railway freight charges; while agriculture, in all its branches, would blossom out in all directions, with cheaper transportation charges for both the producer and his product. That, at any rate, is what many thoughtful and patriotic Australians think, and when the time is ripe for it they will not shrink from the consideration of a proposal to operate the national railways at a loss, provided the loss can be made up otherwise, and that there is sufficient compensating gain to the commonwealth for the innovation.

MALLET COMPOUND LOCOMOTIVE FOR THE MEXICAN CENTRAL.

The Baldwin Locomotive Works built, for the Mexican Central, the Mallet locomotive shown herewith. It is intended for freight service on the Tamasopo division where there are frequent curves of from 15 to 22 deg. and maximum grades of 3 per cent., compensated, and the track is laid with 85-lb. rails. The weight of this engine is distributed over a wheel base of 44 ft. 2 in., while the rigid wheel base is but 9 ft. 10 in. The 2-6-6-2 wheel arrangement is employed and the locomotive is designated as class H, according to the railway company's classification.



Mallet Compound for the Mexican Central.

In its general features, this locomotive resembles the standard gage Mallet engines hertofore built by the Baltimore Locomotive Works, although improvements, based on previous experience, have been made in some of the details and various changes introduced to suit the practice of the Mexican Central.

The boiler is of straight-top type with a radical stayed fire box and is equipped for burning oil. The shell is 78 in. in diameter in front and is built with three rings. The first and third rings are sextuple riveted with butt seams on the top center line. On the second ring, which carries the dome, the seam is also placed on top, but is welded throughout its length with a heavy liner inside. Liners are also placed inside the shell over the high pressure cylinder saddle and waist supports. The dome is of steel, cast in one piece, with short connecting pipes through which steam is delivered to the high pressure steam pipes. The circumferential seam in front of the dome is triple riveted.

The boiler shell is supported above the high pressure cylinders by a cast steel saddle, which is independent of the cylinders and is made in two pieces placed one above the other. The high pressure cylinders are separate, while the low pressure cylinder castings are bolted together, back to back, on the center line of the engine. The valve gears are equipped with cast steel links, and the link bearings for both the high and low pressure gears are bolted to the guide yokes. Reversing is effected by the McCarroll power-reversing mechanism. The exhaust steam pipe from the low pressure cylinders to the smoke box has been improved by providing greater flexibility. The pipe is fitted with a ball and socket joint at each end, the joint being kept tight by a coiled spring, which holds the pipe firmly against its seat. The slip joint in the middle is made tight by snap rings and leakage grooves. Oil holes are provided for lubricating this joint.

The centering device is placed under the smoke box and is furnished with a double helical spring, which is thrown into compression when the leading group of wheels is displaced toward either side. The spring is placed between stops, which are mounted on a suitable guide rod and which may be forced toward the center line of the engine by brackets bolted to the frame cross-tie. The stops are held between the end walls of a steel casting which is rigid with the boiler. The frames are of cast steel 4½ in. wide and placea 43 in. between centers. The front and back engine trucks are equalized with the corresponding groups of driving wheels, the front truck being center-bearing, while the rear truck is side bearing. The trucks and wheels are steel-tired, with cast iron centers, and these, with the tender wheels, were made by the Standard Steel Works Co., Philadelphia, Pa. Among the larger cast steel details used on this locomotive may be mentioned the driving wheel centers, driving boxes, cylinder heads, steam chests and steam chest caps.

The tender has a water capacity of 8,000 gals. and an oil capacity of 3,500 gals. The tanks are wedge-shaped and placed one above the other. The frame is built of 12-in. channels, and the trucks are of the arch-barred type with cast steel bolsters and rolled steel wheels.

This locomotive was designed in the light of nearly two years' experience with similar engines in heavy service on mountain roads and satisfactory results may therefore be anticipated. The leading dimensions and ratios are as follows:

Cylinders	21½ in. and 33 in. x 32 in.
Boiler, diameter	78 in.
Boiler, thickness of sheets	¾-in. and $\frac{7}{8}$-in.
Steam pressure	200 lbs.

Firebox, length	123 3/16 in.
" width	71 "
" depth, front	73 "
" depth, back	70 "
" thickness, sides, back and crown	3/8 "
" thickness, tube	9/16 "
" water space, front, sides and back	5 "
Tubes, material	Steel
" number	350
" diameter	2 1/4 in.
" length	21 ft.
" gage	No. 12
Heating surface, firebox	201 sq. ft.
" " tubes	4,311 "
" " total	4,512 "
Grate area	61 "
Wheels, diameter, driving	55 in.
" " truck, front	20 1/2 "
" " truck, back	28 1/2 "
" " tender	33 "
Journals, driving, main	10 1/2 in. x 12 in.
" driving, others	10 " x 12 "
" truck	6 " x 12 "
" tender	5 1/2 " x 10 "
Wheel base, driving	28 ft. 2 in.
" " rigid	9 " 10 "
" " total engine	44 " 2 "
" " engine and tender	70 " 11 "
Weight on drivers	300,000 lbs.
" " truck, front	19,000 "
" " truck, back	19,000 "
" total	338,000 "
" engine and tender, about	495,000 "
Water capacity	8,000 gals.
Oil capacity	35,000 "
Tractive effort	67,500 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.44$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 5.00$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 88.75^{*}$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 822.80$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 73.96$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 44.54^{*}$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 66.48$$

$$\frac{\text{Total weight}}{\text{Heating surface}} = 74.91$$

Displacement 2 h. p. cylinders, cu. ft. = 13.4

$$\frac{\text{Heating surface}}{\text{Displacement 2 h.p. cylinders}} = 336.71$$

$$\frac{\text{Grate area}}{\text{Displacement 2 h.p. cylinders}} = 4.55$$

*Per cent.

FOREIGN RAILWAY NOTES.

It is reported that in the course of the excavations for the Amoor Railway rich deposits of gold have been found, so that many workmen have deserted the railway service to dig gold, and the government has ordered soldiers to guard the mines and keep unauthorized persons out of them. Gold has been mined along the Amoor for a very long time, almost exclusively by Chinese, others not finding the results satisfactory.

The regulations for the physical examination of men who desire to enter the Prussian railway service require that they have normal vision and capacity for distinguishing colors, good hearing, be free from bodily infirmities which may restrict their ability to do service, and from any latent disposition to infirmity which would disable them. Especial attention must be paid to ascertaining that they have a sound nervous system.

ELECTRIC TRACTION BY SIMPLE ALTERNATING CURRENT ON EUROPEAN RAILWAYS.*

BY H. MARCHAND-THIRIAR.
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The electrification of railways is indisputably making progress on the Continent, and three countries at least are at the present time actively engaged in the installation of electric traction on their railways: these countries are Sweden, Switzerland and Italy.

The change of method of traction promises great advantages in these countries owing to the abundance of water power, and the consequent possibility of obtaining electrical energy at a low cost. By the abolition of the expenditure on coal, an enormous saving in the working expenses can doubtless be realized.

In Switzerland, some very important schemes have been prepared lately for the Vorarlberg railway, the line from Innsbruck to Zurich and also the St. Gotthard-Milan Railway. Hence it may be anticipated that other transformations will be made, in addition to those already effected in this most favorably situated country.

In Italy, large sums of money have been set aside for the electrification of a dozen lines having a total length of 193 miles, exclusive of the line connecting Milan and Genoa, which is also under consideration.

In Sweden, after exhaustive preliminary investigations, the work of electrification seems likely to enter a period of active development.

Many waterfalls have been taken over by the Government which to-day owns those of Karse, Trolhätta, Motala, Hammerby and Elfkarleby; it is proposed to equip the whole of the railroad system in the south of the country which comprises some 1,243 miles of line.

The method adopted generally in Sweden is that of simple alternating current; this method has also been selected for two of the proposed Italian lines.

The single-phase method, which had only formed the subject of very limited trials in Belgium up to 1904 (when the papers by Messrs. Ernest Gerard, Paul-Dubois, Tremontani and Young were read at the Washington session of the Congress) has proved its practicability and appears likely to be the method of the future.

In a report which he recently made to the Belgian Light Railways Association, Mr. Eric Gérard wrote: "If one may be permitted to draw attention to the tendency which is now apparent, it is noteworthy that the opinion is held by many electrical engineers that the simple alternating current will play the most important part, since it appears to meet the traffic conditions of the majority of light railways successfully. The question is of peculiar interest for small densely populated countries like Belgium, in which the adoption of a service of light and frequent trains, must gradually come into force over almost all the railways."

Quite independently Mr. Wittfeld, electrical engineer, consulting engineer and expert of the Prussian State Railways, on returning from a visit to the United States, confirms the increasing application of the simple alternating current in America. Since the object of Mr. Wittfeld's visit was to study the American methods of electric traction, with a view to the adoption of electric traction on the German railways, it is possible that the simple alternating current may be employed in several cases on the Prussian lines.

For the above reasons, it may be opportune to examine the traction systems which employ the simple alternating current; these systems, moreover, represent the latest practice in electric traction. As shown at the Washington meeting of the Congress, there are several different systems, similar in fundamental principle, which have been developed by and are

*Abstract of an exhaustive article in the Bulletin of the International Railway Congress, September, 1908.

known after Ward-Léonard, Lamme Finzy, Winter and Eichberg, and Latour respectively. Some of these make use of a compensated induction motor; such are Thomson-Houston and the Allgemeine Elektricitäts-Gesellschaft; others use series-wound motors; such are those of the Oerlikon Works, of the Westinghouse Company, of Siemens-Schuckert and of the Gadda Company.

The Electric Construction Works of Charleroi, the International Electric Company of Liége, the Felten und Guilleaume Lahmeyer Werke, the Brown-Boveri Company are also working on the subject of electric traction by simple alternating current and are making exhaustive experiments; the Felten und Guilleaume Lahmeyer Werke in particular have designed and tested a motor, operated by simple alternating current, which shows very great promise.

The preference shown for the simple alternating current is justified by the fact that this method combines the advantages of both the continuous current method and the three-phase method; it shows perfect suitability for urban light railways, for light railways proper and for main railway lines on which heavy trains require to be hauled over long distances; the simple alternating current affords a means by which the high-tension current (which alone can be employed for transmission of energy to a great distance) can be led direct to the vehicles and the transformer, which is carried on the vehicle and reduces the high voltage of the supply to a voltage suitable for the motors, and serves the double duty of regulating the tractive force and the speed.

Apart from the above, and contrary to what is the case where three-phase current is employed, a single conductor alone is necessary for the supply of current to the vehicles, so that the conductors are just as simple in the case of the continuous current. It is worth while recalling the fact that the firm of Ganz & Co. in their trials of the Valtellina, (although this scheme had been most carefully worked out) were unable to overcome all the difficulties due to the closeness of two conductors carrying 3,000 volts (the two conductors carried two of the phases, the third being carried by the rails). The firm of Siemens & Halske and the Allgemeine Elektricitäts-Gesellschaft have, it is true, worked at 12,000 volts on their Berlin-Zossen line with three-phase current, but their experimental line was devoid of either points or crossings. Notwithstanding the increased weight of the vehicles, a better result is obtained from the simple alternating current than from either of the other methods, owing to the elimination or the reduction of the losses in transformation and transmission. And moreover, if certain expenses are greater in the case of the simple alternating current, the conductors are, on the other hand, much less costly and the total efficiency is higher.

Thus on the Murnau-Oberammergau railway, the total efficiency measured between the generating station bus-bars and the tires of the wheels amounted to 62 per cent. with continuous current, 66 per cent. with three-phase current and 71 per cent. with simple alternating current (not converted).

For the same line, the cost of installation, conductors and rolling stock would have been considerably heavier with the three-phase current of the continuous current than with the simple alternating current, the extra costs being 16 per cent. and 25 per cent. respectively.

A great advantage of the simple alternating current is that it permits the use of the overhead conductors, which it had been found necessary to abandon in the case of heavy traction by means of the continuous current. The Americans who have had great experience in the use of the third rail have made use of voltages of 800 and 1,000 volts and it appears probable that even these figures will soon be exceeded; but the third rail is expensive, it adds greatly to the cost of inspection and maintenance of the permanent way; moreover, even were it possible to work up to 2,000 and 3,000 volts with the continuous current, this would only admit of operating comparatively short distances; and again, it is only by reducing the margin of safety in working, that the voltage on the line can be increased; thanks to the adoption of the communicating pole, the running of the motors has been so improved that there is no risk of sparking at the brushes; but the motors have, at the same time, become more delicate and heavier; the necessity for better insulation of the windings has involved an increase of about 20 per cent. in the weight of these, which has considerably reduced the advantage which was possessed, in respect to weight, by the continuous-current motor over the alternating-current motor using brushes.

Apart from the above, the magnitude of the installations using simple alternating current which are proposed is sufficient, in my opinion, to justify a comparative description of the different systems in use up to the present time, more particularly as these have as yet only formed the subject of isolated and generally incomplete papers.

MOTORS.

The systems of traction by simple alternating current can be divided into two classes, according to the type of alternating-current motor employed; the one class, as already mentioned, using the series motor, and the other the repulsion motor.

In general, an ordinary series-wound, continuous-current motor, that is to say, a motor supplied through brushes, will run if supplied with alternating current; actually since the current is reversed simultaneously in the field magnets and in the armature, the field changes its direction simultaneously with the change of direction of the current on which it acts, and therefore the turning effort acts in the same direction; the only difference is that instead of a uniform turning effort, the torque will pulsate.

However, if the motor were so operated, serious difficulties would result; the losses due to hysteresis and Foucault currents would be enormous; the self-induction would be excessive, the efficiency would be very low; moreover, sparking of a very serious nature would occur at the brushes.

In the first place, no one would dream of building such a motor without laminating the pole-pieces in a similar manner to that in which the armature has been made for a long time past; this is necessary to keep down the self-induction.

To reduce the latter to a still lower extent, and at the same time to reduce the loss by hysteresis and Foucault currents, the frequency of the alternation the current used has been reduced, and its further reduction is under consideration.

Although the reduction in frequency diminishes the production of sparks at the brushes, the remedies mentioned above do not entirely protect this delicate and costly detail; much more is required. Sparking is caused by the short-circuiting of the armature coils by the brushes while subject to electromotive forces due to: (1) The flux in the windings surrounding the field magnets which varies and changes its duration with great rapidity, and (2) The fact that these windings also cut at great speed the reaction flux of the armature.

The effect of the electro-motive force resulting from the variations in the magnetic flux, or the static electro-motive forces, can be diminished by inserting resistances in the connections between sections of the rotor with commutator, as is done in the Westinghouse motor for example.

The dynamic electro-motive forces caused by the reaction flux can be neutralized by arranging a coil on the stator of the motor which is short-circuited with or put in series with the rotor and has for object to afford at any instant a number of ampere-turns equal and opposite to those of the rotor. The reaction flux of the armature is thus counteracted. This device is employed in the various motors in use in single-phase traction. When applied to the series motor, in particular, it not only improves the commutation, but also the efficiency, and the latter is its principal object; by means of this device, the only flow in the motors is the flow proper of

the field magnets; the self-induction of the stator above remains and the power factor is increased.

The repulsion motor differs in the first place from the series motor in that its armature is not connected in the outer circuit to the supply circuit; it is instead short-circuited on itself.

The mutual induction between the stator and the rotor generates a current in the rotor; it is easily recognized that this current is approximately in phase with the flux and that a couple is produced thereby.

The repulsion motor, like the series motor, should have the whole of its magnets laminated; its main features should be identical with the latter; it should give a large starting torque and automatic regulation of the energy absorbed. The commutation is excellent at about the speed of synchronisation; there is then no variation in the flux among the sections, the flux being equal and rotating in the motor at the same speed as its windings. The starting torque is a little less than that of a compensated series wound motor, and the apparent absorption of energy is proportionately greater than that of a motor of the latter type; owing to magnetic losses, the mutual induction between the stator and the rotor is unavoidably imperfect.

The compensated repulsion motor is, in a way, derived from the combination of the series motor and the repulsion motor; it comprises the advantages of both types: perfect commutation at normal speed, as in the simple repulsion motor, together with large starting torque, as in the series motor; it requires however, a supplementary set of brushes.

It is actually a series motor, the armature of which is short-circuited by means of two brushes placed so as to form a cross with the main brushes; if these brushes were removed, the motor would be of the ordinary series-wound type; but the auxiliary brushes in question play an important part; the reversal of the flux in the windings which these brushes short-circuit induces a current which tends to neutralize the field which produces it; or in other words: the winding in question acts as the secondary winding of a short-circuited transformer; the result is a great reduction in the self-induction.

This type of motor is that of Mr. Latour, and has been adopted by the Thomson-Houston Company. Since the field windings are in series with the armature, it follows that this type of motor cannot be wound suitably for a high-tension current and that it is necessary to transform down.

As a general rule, the voltage in the armature of alternating current traction motors does not exceed 250 volts for 100 horse-power motors and 150 volts for 40 horse-power motors; the amperage is, it is true, very large, but the reduction in voltage gives much greater safety in working, if possible, than that to be obtained with the best continuous current motors.

The paper then describes at length the various methods of arranging the overhead conductors.

The Oerlikon Works have adopted and are continuing to develop two methods of traction by simple alternating current; the first of these, the Ward-Léonard system, requires the conversion of the alternating current on the locomotive itself into continuous current: the second and more important method is based on the direct utilization of the alternating current to supply the motors. According to the Oerlikon Works, the Ward-Léonard method may show great advantage, in spite of the extra transformation of current, in cases where starting and stopping are of frequent occurrence, and where the track has many changes of gradient. Under these circumstances, it is necessary to avoid excessive demands on the central station while running with a minimum number of large units.

It also enables the energy of braking to be returned, and whereas in the case of the simple alternating system, used in motors with brushes, it is found necessary to reduce the frequency, the Ward-Léonard system is equally applicable to any frequency.

Moreover the line can be worked with a voltage as high as that possible with the simple alternating current; up to 6,000 volts, the current from the conductor wire can be supplied direct to the motors of the converted set; above 6,000 volts a static step-down transformer is used to reduce the voltage to that which the motor can be worked with.

The above mentioned principles have been applied in practice on the Oerlikon locomotive No. 1 which is at present running on the Seebach-Wettingen section of the Swiss federated railroads, constructed for 15,000 volts.

The only respect in which this locomotive differs from the usual arrangement described, is that it is fitted with only two motors, each of which is of 197 horse-power and drives the two axles of a bogie by means of gearing and coupling rods fitted with horn-plates for the driving crank pin brasses; the gear ratio is 1: 3.08; the total weight is 45.27 English tons; the total weight of the electrical gear is 23.82 English tons, the two driving motors by themselves weigh 5.51 English tons; the transformer and converter set weigh 14.37 English tons; the brakes, gearing, etc., 3.94 English tons.

The length of the Seebach-Wettingen line is 12 miles.

Locomotive No. 2 is at the present time at work with locomotive No. 1 on the Seebach-Wettingen line, represents the complete realization of the second method of single-phase traction worked out by the Oerlikon works. Hence the best means for investigating the method will be afforded by a description of the locomotive in question.

Locomotive No. 2 is arranged for the direct supply of current to the simple alternating-current motors; it is fitted with two alternating motors with brushes, each 197 horse-power, and with two transformers each of 200 kilowatts.

The collectors are two in number and of the curved arm type; the current passes from them, after passing through the safety apparatus through the high-tension switch, to the two transformers and thence to the rails.

The secondary windings of the transformers are divided into twenty sections; the terminals of these are connected to a Meyer voltage regulator, by means of which current can be supplied to the motors at any desired voltage, and hence these can be run at any required speed.

The total weight of this locomotive is 40 tons, the electrical portion and brakes weighing 16¼ tons.

The Siemens-Schuckert System.—In this system the high-tension current is taken from the distributing line by means of a bow collector; it passes through a high-tension cut-out and a fuse, and thence is led to the primary of an oil immersion transformer. The alternate-current motors are coupled to the secondary through a controller which performs both speed regulation and direction control, and may be operated either directly or indirectly. Direct operating is only used under exceptional circumstances in the case of vehicles running on a line where it is thought improbable that trains will be run, which comprise several automotor vehicles. Indirect operating is always used where there are several motor vehicles made up in one train, the electric equipment being then the same for all the vehicles.

The alternating-current motors made by the firm of Siemens-Schuckert are series motors working at a medium voltage (200 to 450 volts), fitted with auxiliary compensating windings on the stator to prevent sparking at the brushes. The motors are ironclad and, when of high power, are artificially air cooled. The armature is fitted with a winding which is formed wound and fitted in open channels, so as to render renewal easy. The stator is fitted with equally spaced teeth and has only two windings; the exciting winding and the compensating winding. The latter is used in part to produce the auxiliary field for improving the commutation. It appears that this is effected perfectly. There is no sparking either at any load or on starting. Moreover, the apparatus is not affected by the drop of voltage which inevitably occurs occasionally in traction work. The torque is large and the speed varies automatically according to the changes in the load. The general arrangement is simple; access to the brushes is

easy; there are no auxiliary brushes, and finally, the motor can be used without any modification on continuous current.

Generally the efficiency is high and the power factor is from 0.9 to 0.95, according to the size of the motor. One of the first and not the least important installation made by the Siemens-Schuckert firm was that of the Muenau-Oberammergau line, 14.6 miles long. This line has been worked since 1905.

LOCOMOTIVES SUPPLIED TO THE SWEDISH STATE.

Trials of great importance, since they form the preparatory experiments made with a view to carrying out the scheme which has been worked out for the electrification of the whole system, were commenced by the Swedish State in July, 1905, on the Tomteboda-Värtan section near Stockholm. Single-phase current with series-wound commutated motors was adopted, a frequency of 25 periods per second having been settled on in the first instance. Two locomotives and two vehicles supplied by the Allgemeine Elektricitäts-Gesellschaft and Siemens-Schuckert and by the British Westinghouse Company respectively were tested. One of the special objects of the trials was to determine the limit of voltage which could be used without danger, both in the case of the distributing line and that of the electric installation.

In order to effect this, the generating station supplying the trial section is fitted with arrangements which enable the voltage of the current supplied to the trolley wire to be varied from 5,000 up to 20,000 volts. The Siemens-Schuckert locomotive which was tested, weighed 35.43 tons, and was intended chiefly for the haulage of goods trains at a speed which may amount to 28 miles per hour on the level. The locomotive has six drivers, 51 in. diam., all in one frame. Each pair of wheels is driven by a 108 horse-power motor working with current at 320 volts and a frequency of 25 per second.

The Siemens-Schuckert Company's system has been applied to the Vienna-Baden Railway, where 14 motor cars are used for continuous and alternating current, each fitted with four 40 h.p. motors. On the Prussian State Railway to 6 motor cars, each fitted with two 123 h.p. motors. On the Rotterdam-Hague-Scheveningen line to 20 motor cars, each fitted with two 172 h.p. motors.

On the Parma Provincial Railway to 10 motor cars, each using 60 h.p. motors. On an eight-mile section of the Midland Railway.

They have constructed a motor vehicle with two motors, each 172 h.p. for the Oranienburg experimental line. They also have motors on cars running from Rome to Civita Castellana.

Westinghouse System.—The honor of being the first to overcome in a satisfactory and practical manner the great difficulties which presented themselves, at the outset, in the way of the adoption of simple alternating-current for traction, is indisputably the due of the engineers of the Westinghouse Company, and of Mr. Lamme in particular. Credit is also due to them for having undertaken the investigations which led up to the success now attained. The Westinghouse equipment comprises the following essential details: current collecting gear: one or two step-down transformers; the controller; the motors, usually four in number on each locomotive or automotor vehicle and the usual appliances for protection and safety.

To reduce the voltage from that of the distributing wire to that of the supply to the motors either one or two transformers are fitted on each vehicle; in the case of low power vehicles, the transformers are air-cooled in the case of high powers they are oil-cooled. In the case of the installations fitted in America, the cooling is generally effected by means of a strong air blast produced by an electric fan; this blast is also used to cool the motors. In all cases, the step-down transformers are auto-transformers; that is, they are single wound.

From three to six or even more contacts are taken from the winding; the voltage at these varies progressively from 125 to 250 volts.

To start the motors and to regulate their speed, they are connected to these terminals so that current of a suitable voltage is supplied.

The single-phase Westinghouse motors are series wound with commutators and are compensated; they are generally wound for 250 volts.

The magnetic field of the field-magnets consists of rings of specially treated steel plate arranged inside the casing of the motor. The latter is of cylindrical form; it is of steel casting and cast in one piece; the end plates with the bearings are put on from each side and secured with heavy bolts.

The poles consist of projections on the sheet steel plates of the pole pieces; on the interior, the poles have channels cut in them parallel to the magnetic lines of force passing through them.

There are two field magnet windings; the first is similar to that of the series motors of a continuous current tramway; it consists of windings made on a former and fixed on the poles; the second is arranged parallel to the lines of force of the magnetic circuit; they are of insulated copper wire and go from one pole to the next; they are fixed in the channels in the poles.

The second winding of the field magnets automatically reduces the effects of self-induction in the armature, and this improves, as already described, the power factor of the motors by reducing the result of the reaction of the armature.

The armature is of drum type with channels; the core is formed of stamped sheet; large ventilating passages are arranged for in the design.

The armature coils are of copper bar bent to template and afterwards placed in the channels.

Special resistance of German silver, arranged at the bottom of these channels, are inserted between the armature coils and the segments of the commutator; they are connected to the coils on the opposite side to the commutator; they are carefully designed so as to avoid secondary currents, caused by variations in flux through the coils which are short-circuited which would cause sparking at the brushes and excessive overheating of the commutator.

On the opposite side to the latter, the armature carries equalizing rings which connect the points at equal potential; these rings divide the circuit in the armature coils equally even if the rotor gets out of centre; this uniform division of the current avoids flashing at the brushes.

The carbon holders are carried on a movable ring which can be moved and rigidly secured in any desired position.

The commutator, which consists of copper bars insulated from each other, is keyed to the armature shaft.

The bearings are carefully designed for giving a long life without abnormal wear.

The reduction is performed through a single or double train of gears. In America, in the case of motors on locomotives used for high speed on busy lines, direct driving has been used, the armature being fixed on the axle and the field magnets slung by springs from the bogie; the coupling is then effected by means of spring pins which engage with pockets formed in the centres of the wheels; this mode of driving is for example used on the big locomotives of 1,085 horse-power of the New York, New Haven & Hartford Railroad.

The Westinghouse Company has equipped some important lines in the United States and has constructed some remarkable locomotives. The rolling stock built by this company for single-phase current up to the present date (September, 1908) represents 70,000 h.p. and 310 miles of track. In Europe this company has supplied most of the equipment on the lines from Rome to Civita Castellana, 33½ miles; from Bergamo-Valle to Brembana, 18.6 miles; from Tergnier to Anizy, 19.6 miles; and it has also supplied a 24-ton trial locomotive to the Swedish State Railway. Its Manchester works also has

a vehicle of the automotor type in test on the trial line in Trafford Park.

Finzi System.—The Finzi system, which was worked by the Italian Electro-technical Union of Milan, is to-day amalgamated with the Westinghouse System, in consequence of the alliance between the Officine Elettro Ferroviarie, which is a member of the Union, and the Westinghouse Company.

No complete line has been laid down except that of the Milan exhibition; the cars then working were, moreover, not fitted with the collector designed by Mr. Finzi in collaboration with Mr. Tallero. The Finzi-Tallero collector consists essentially of two contact rollers, connected by jointed arms, fitted with springs; it is very elastic and can be used, without being thrown over, for running in either direction, besides accommodating itself perfectly to variations in the height of the wire.

At Milan, the collector used was the Siemens bow; there were two of these per train. Each train consisted of four vehicles all automotors. One collector was fixed on each of the intermediate vehicles, the one being used for the outward journey and the other for the return; they were not automatic, and this gave rise to an accident owing to the forgetfulness of a driver who omitted to lower both when leaving work.

At Milan, the two end vehicles of each train were fitted with two motors and the intermediate vehicles with one only; hence there were six motors, all of equal power, per train arranged in two groups in parallel, each group consisting of three motors in series. There was a transformer at each end of the train, and each end vehicle was fitted with a controller. The electric connection between the vehicles was made by means of flexible cable. The two transformers were ordinary double-wound transformers; they reduce the voltage from 2,000 volts in the distributing wire to from 150 to 300 volts according to the position of the operating handwheel of the controller; they were used in rotation, that is to say, the one transformer was used when running in one direction and the other for the reverse.

The controllers were of the ordinary type made by the firm of Glöchner of Cologne; they consist of two cylinders, the one for reversing, the other for regulation; the latter enabled the voltage in the motor circuit to be varied by steps of 30 volts.

There were six motors, of the same type as that which had been under trial since 1903 in the works of the Unione Elettrotecenia Italiana and afterwards tested on one of the Edison Company's vehicles in Milan. After the first trials were made at Milan, where a considerable saving in current had been found, the Finzi system was tried on the Valtellina line, and this experiment is still in progress.

The Thomson-Houston System.—The Thomson- Houston Company does not claim other advantages for the single-phase system over those set forth by other manufacturers, but it claims that the repulsion motor, which it adopts, combines the advantages of the compensated series motor with those of the repulsion motor, *e. g.*, perfect commutation when running as in the case of the repulsion motor, as large a torque as with the series compensated motor, together with an excellent power factor. When the vehicles are required to run on both alternating and continuous current lines, a special switch enables all the necessary changes to be made in the connections by a single movement; an arrangement of rheostats is fitted to enable the vehicle to be started on continuous current by gradually diminishing the resistance in the usual manner.

An oil-bath transformer is used; this is specially designed to be fitted in the body of the vehicle; and is completely enclosed in a ribbed cast iron casing.

The coils are very carefully insulated so as to protect them from the vibrations to which the equipment of vehicles is necessarily subjected.

Contacts are provided corresponding to different voltages to permit of graduating the speed of the motors. As previously stated, the Latour repulsion motor is used. The stator is exactly like that of an ordinary monophase induction motor; its winding is placed in the notches of a ring of plates. The rotor is a continuous-current armature; but there are two auxiliary brushes, short-circuited, and arranged at 90 deg. to the first brushes, then these brushes cause the current from the stator to pass through the rotor.

The motor circuit is protected by a cut-out with a fuse and a magnetic blow-out.

The master-controller is of the type used for continuous current where the multiple unit system is worked; it can be greatly simplified where, as in the case of the Malakoff line, the control is direct. In the first case the controller used, while it resembles that used on tramways both in appearance and mode of operation, is much narrower.

It can be fitted with a spring handle which automatically cuts off the current if the driver removes his hand. The function of the master-controller or manipulator, is only that of coupling up circuits of the contact-makers; consequently only the currents operating these electromagnets flow through it. All the apparatus which receives current of large quantity or high voltage is arranged under the floor of the body of the vehicle or in a special insulated compartment.

The British Thomson-Houston Company is building 16 motor cars for the South London Railway, these cars to be fitted with 4 motors each 113 h.p. The only other application of this system is that of the Malakoff line in Paris.

Allgemeine Elektricitäts-Gesellschaft.—This system, together with that of the firm of Siemens-Schuckert, is that which has been adopted for the largest number and the most important installations.

As in the case of the Thomson-Houston system, a compensated repulsion motor is used, designed in this case by Messrs. Winter and Eichberg.

The characteristic feature is the utilization of an autotransformer for regulating and for the supply of current to the field magnets at a relatively high tension; this reduces the weight of the step-down transformers. The equipment comprises the following components; the collectors, the safety appliances, the transformers, the controlling gear, the motors and the accessories.

Usually there are two driver's cabins, one at each end. On the Blankenese-Ohlsdorf line, the vehicles consist of two portions connected in the manner usually employed on the local and inter-urban lines in Berlin; the one half only of each double vehicle is fitted with the collector gear; it comprises a cabin divided into two compartments reserved respectively for high and low tension; the other half is fitted with a compartment for low tension only. Similarly on the "Stubaitalbahn" one only of the two platforms is fitted with high-tension apparatus and this, moreover, is contained in a closed chamber. The reduction of voltage for the whole of the equipment is effected by a large oil-immersion transformer fixed in a corrugated iron box below the top of the underframe. Other transformers, which are air-cooled and receive current from the main transformer reduce the voltage of the current supplied to the armature of the motors and enable the speed to be regulated. Apart from the current for the driving motors, the main transformer furnishes current for lighting, heating, operating the compressed air pump (in cases in which this is electrically driven). The Winter-Eichberg motors have six poles or four poles with toothed armature with core of Martin steel in one piece; they are enclosed hermetically in a protective casing, with side inspection doors and covers near the brushes.

The first motors were intended for high-tension current to be used in the stator; in the new types all the current is transformed; the equipment is thereby increased in weight some 20 per cent., but the constructors think this is only a

slight disadvantage; the usual working voltage is from 500 to 850 volts.

The system of the Allgemeine Elektricitäts-Gesellschaft was first put in operation on the Stubaital line which runs from Fulpmes to Innsbruck, 11.3 miles. It was used also on the experimental work on the Hamburg-Altona line, and on the Borinage Local Railway, a single-phase system designed for a line 80 miles long. This company also has 50 sets of motors operating on the Blankenese Ohlsdorf line, and has supplied two motor cars to the Swedish State Railway for the purpose of testing the single-phase system under preliminary investigation before adopting electric traction. Each car is fitted with two Winter-Eichberg motors of 113 h.p. The stators are supplied direct at 6000 to 7000 volts. The good results obtained with these cars have led the Swedish government to decide for the adoption of the system for the Christiania-Drammen line.

The preceding data will, I think, enable a sufficiently good idea to be formed of the different modes of single phase traction in use at the present time in Europe. I have not thought it necessary to include in this short notice a description of the methods of Mr. Sahulka, or of the methods of Messrs. Auvert and Ferrand, since these systems have not at present been actually and practically worked.

The method of Messrs. Auvert and Ferrand is a current conversion method; it has been described in the *Revue générale des chemins de fer* for October, 1905; it has recently been tried between Cannes and Grasse on the Paris, Lyons & Mediterranean Railway.

ECONOMICAL DISTRIBUTION OF METAL IN THE SPLICE BAR.

BY MC'LEOD THOMSON.

The three types of splice bars illustrated by Figs. 1, 2 and 3 show an interesting distribution of metal. The bars shown by the last two figures have been prepared for the 75-lb. rail of one of the large western railways, and they are presented here as illustrating what can be done by a refinement of design and by bringing into use the latest thought along these lines.

Fig. 1 shows the angle bar which has been standard on the railway in question. Fig. 2 shows a reinforced form and Fig. 3 a girder bar of the latest type. The tabulated statement giving comparative data needs very little explanation in order to bring out the great advantages obtained by a proper distribution of metal. Careful analysis of these figures reveals almost all that can be said.

The moment of inertia of the section of a bar is approximately proportional to its stiffness, providing no part of the bar would buckle under load before the maximum fiber stresses are reached in its top or bottom portion. In Fig. 1 it is apparent that the outwardly extending foot portion of the bar tends to buckle up to the horizontal position long before the metal at the lower outer extremity exerts its full stiffening effect. In other words, in this design, the efficiency under load is determined by the buckling point rather than by the strength of the top and bottom fibers. It, therefore, follows that the foot, which should be very effective for stiffness on account of its being at a distance from the neutral axis, is really the least efficient.

In Fig. 2, it will be noted that nearly all of the metal is removed from the neutral axis and placed at the greatest distance from it in the form of an enlarged head and foot, also that the web joins the foot adjacent to its middle, in order to prevent the buckling which is characteristic of the ordinary angle bar design.

For comparative purposes, and in order to favor the old form shown in Fig. 1, let this buckling feature be eliminated, and let it be assumed that all the metal as distributed in Figs. 1 and 2 acts with equal efficiency in each bar. On this basis the tabulated figures show that the moments of inertia of the two bars are 6.5 and 8.47 respectively, and that the moment of inertia of the rail is 22.4. This means that a bar as shown in Fig. 1 has 29 per cent. of the stiffness of the rail, while Fig. 2 shows a bar of 37 per cent. stiffness. It will also be noted that there is very little difference in the weight of these two bars, and that a pair 24 in. long as per Fig. 2 would be about 5.4 lbs. heavier than a pair of bars as per Fig. 1 and would have an increased stiffness of 28 per cent.

Fig. 3 shows a girder bar having a free depending flange. This flange raises the moment of inertia of a pair of such bars a trifle above that of the rail. The slightly angular form of the bars gives to them more flexibility and resiliency than the rigid T-rail form, and on this account the moment of inertia of them is not exactly proportional to their stiffness, or in other words, to the amount of deflection that would take place under load. The small excess in the moment of inertia of the bars above that of the rail is therefore desirable, in order to obtain a joint having about the same stiffness as the rail. The depending flanges of two bars weigh about nine pounds after their end portions are sheared off for tie clearance, and the upper portions, each having an area of 3.48 sq.

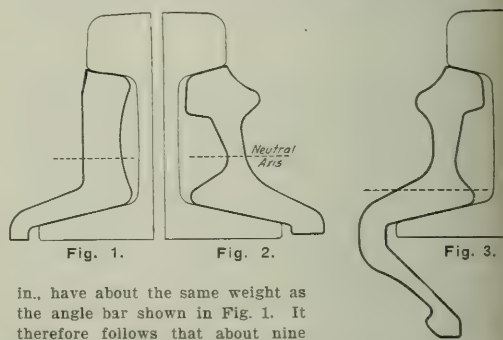


Fig. 1. Fig. 2. Fig. 3.

in., have about the same weight as the angle bar shown in Fig. 1. It therefore follows that about nine pounds of metal in the form of a depending flange increases the stiffness of a pair of bars from 29 per cent. to 103 per cent.

This increase in stiffness obtained by an economical distribution of metal, either in the reinforced angle bar or in the girder angle bar, saves a large amount of money spent in track maintenance. It tends to keep the rail ends up to a normal position, and therefore lessens the necessity for continually raising them by the expensive tamping method.

		Angle bars		
	Rail.	Fig. 1. Pair of ordinary.	Fig. 2. Pair of reinforced.	Fig. 3. Pair of girder bars.
Area	7.6 sq. in.	6.56 sq.in.	7.34 sq. in.	9.5 sq. in.
Moment of inertia	22.4	6.5	8.47	23.12
Stiffness of rail	100.0 per ct.	29.1 per ct.	37.3 per ct.	103.0 per ct.
Weight per ft.	25.0 lbs.	22.5 lbs.	25.2 lbs.	32.8 lbs.

There has been a discussion in the Russian duma concerning the extent of what we would call the "knocking down" of railway fares by conductors and other train and station men. One speaker said that there was a regular organization among these men and the inspecting officers. When one of the latter is approaching, private signals are given from the locomotive, warning all trains moving in the opposite direction. He said that the matter had gone so far that a passenger with a ticket had become a novelty fit for a museum. Another speaker complained that many officials never paid for tickets, but assumed that the trainmen would not dare to enforce the regulations, in view of their rank. Another remarked that in one car there were 33 passengers without tickets; and one railway man was in possession of five different passes for his wife, and he was not a Mohammedan either.

RAILWAY CAPITAL AND VALUES.*

BY W. H. WILLIAMS,
Third Vice-President, Delaware & Hudson Company.

(*Continued from page* 762.)

Railways maintain industrial bureaus, whose energy is concentrated on the location of new and enlargement of existing industries. As between two roads a decision will largely rest on the treatment of the patrons by the respective managements, so that the location of industries in towns served only by one line may be said to depend largely on the good will. At competitive points, and on through traffic passing over the line from one carrier to another, the rates being equal via each of the several roads, the routing of the freight over the intermediate carrier is dependent on service performed, etc., and is another evidence of the good will attached to the railway property.

Neither the property of a railway, nor any other property, is of any value without the right and ability to use it, and to obtain full value there must be the right and ability to use in the manner for which the property is best adapted.

In purchasing any completed railway property at a price greater than the cost thereof of material in place, the additional amount is the capitalization of the good will or business opportunity. Can we deny to one carrier a right that is given another?

In an address delivered at Minneapolis last December, Hon. Robert H. Shields, who was then, and is now, the president of the Michigan Tax Commission, criticised the work of Messrs. Cooley and Adams, in Michigan, and the following expression of opinion is especially worthy of repetition:

"The pendulum of unequal taxation in Michigan, so far as the railways are now concerned, has already pretty nearly swung the return limit, and a strict adherence to this theory in assessing Michigan railways, considering the methods employed in assessing other property, would not only not be a square deal, *but would mean nothing more nor less than confiscat on.*"

In 1900 Professor Adams allowed an annuity of 4½ per cent. on the engineer's estimate of the then present cost of reproduction of the physical property of the Michigan Central, and he capitalized the non-physical property at 6 per cent.

In 1902 Professor Adams used lower rates of valuation for the Michigan Central, viz., 3½ per cent. for physical and 5 per cent. for non-physical, thus by a change in interest rate increasing in two years the value of the Michigan Central to the extent of $20,000,000. On such a basis, as the valuation for taxes increases, the returns to the stockholders would decrease.

The 1900 figures were based on the operations for ten years, while the 1902 figures were based on the operations for five years, the latter in 1902 giving the higher valuation for taxation.

As to the result of the work in Wisconsin, I have the following information regarding one of the electric railways:

Valuation of physical property:	
New	$9,000,000
Present condition	7,000,000
Cost of property to present holders	19,600,000
Securities outstanding (par value)	18,000,000
Valuation for taxation by Wisconsin State Board of Assessment	17,000,000

on which taxes for 1908 will be, approximately, $200,000, or about 6¼ per cent. of the gross earnings.

While they are required to pay taxes on a valuation of $17,000,000, an effort is now being made by the public authorities to have the passenger rates reduced on the basis of the $7,000,000 estimated value of the physical property in its existing condition.

Ordinarily we should expect to see the valuation for taxation much less than the valuation used as the basis for making rates, or for capitalization. Generally speaking, the valuation of property for taxation should be its market value, regardless of the purpose for which it is used. Capitalization should represent the cost of the property to the present holders thereof. The valuation for rates is dependent, among other things, both upon the first cost and the present value as a "going concern."

The following decision by the Circuit Court of the United States for the Southern District of New York in the Consolidated Gas Co. v. the City of New York, is of interest:

"Property invested—Franchises.

"Under the settled rule of decision, however, that if property protected by a franchise is condemned and wholly taken from its owner, the franchise must be paid for, such a state regulation reducing the earning power of property so protected reduces the value of the franchise *pro tanto*, and the complainant is entitled to add the value of its franchises, if ascertainable, to its capital account before declaring the rate of return permitted by the statute.

"Property invested—Valuation of Franchises.

"Complainant having followed the universal custom of American corporations, sanctioned by law, of capitalizing its franchises on its organization by issuing stock in excess of its actual investment in tangible property, and having since then earned fair dividends on all its stock, the amount of such excess stock may fairly be taken as the value of its franchises at the time of issuance, and where its business has largely increased, such value may be assumed to have increased since that time in proportion to the increase in the value of its tangible property.

"Property invested—Title to Franchises.

"Where complainant on its organization purchased the property and franchises of existing gas companies, and has since enjoyed and operated under such franchises, it acquired the legal ownership thereof under the decisions of the Court of Appeals of New York, and, notwithstanding the fact that the original grantees have ceased to exist, it is, for the purposes of an inquiry into the legality of a state statute regulating its rates of charge, entitled to capitalize their value, especially where the state has, during such time, compelled it to pay a franchise tax based thereon."

Based on the company's capitalization of its franchises in 1884, as $7,781,000, the court ruled that under conditions existing in 1905 the franchises were worth over $12,000,000, on which it was entitled to a return of 6 per cent. This is equivalent to about 26 per cent. of the estimated worth of the tangible property, excluding all property not directly operated by the company. The almost vital difference in the method of valuation is best understood by the following quotation from the decision in the Consolidated Gas case:

"As to the realty, the values assigned are those of the time of inquiry; not cost when the land was acquired for the purposes of manufacture, and not the cost to the complainant of so much as it acquired when organized in 1884, as a consolidation of several other gas manufacturing corporations.

"It is objected that such method of appraisement seeks to confer upon complainant the legal right of earning a fair return upon land values which represent no original investment by it, does not indicate land especially appropriate for the manufacture of gas, and increases apparent assets without increasing earning power. Analogous questions arise as to plant, mains, services and meters; the reported values whereof are the reproductive cost less depreciation, and not original cost to the complainant or its predecessors.

"It appears by undisputed evidence that some of these last items of property cost more than new articles of the same kind would have cost at the time of inquiry; that some are of designs not now favored by the scientific and manufacturing world, so that no one now entering upon a similar business would consider it wise to erect such machines or obtain such apparatus. In every instance, however, the value assigned in the report is what it would cost presently to reproduce each item of property, in its present condition, and capable of giving service neither better nor worse than it now does. As to all of the items enumerated, therefore, from real estate to meters, inclusive, the complainant demands a fair return upon the reproductive value thereof, which is the same thing as the present value properly considered. To vary the statement: Complainant's arrangements for manufacturing and distributing gas are reported to be worth the amounts above tabuated if disposed of (in commercial parlance) 'as they are.'

"Upon authority, I consider this method of valuation correct. What the court should ascertain is the 'fair value of the property being used' (Smyth v. Ames, 169 U. S., at p. 546; 18 Sup. Ct., at p 434; 42 L. Ed., 819); the 'present' as compared with 'original' cost; what complainant 'employs for the public convenience' (169 U. S., at p. 547; 18 Sup. Ct., at p. 434; 42 L. Ed., 819): and it is also the 'value of the property at the time it is being used' (San Diego Land Co. v. National City, 174 U. S., at p. 757; 19 Sup. Ct., at p. 811; 43 L. Ed., 1154). And see, also, Stanislaus Co. v. San Joaquin Co., 192 U. S., 201; 24 Sup. Ct., 241; 48 L. Ed., 406. It is impossible to observe this continued use of the present tense in these decisions of the highest court without feeling that the actual reproductive value at the time of inquiry is the first and most important figure to be ascertained, and

*An address before the New York Traffic Club.

these views are amplified by San Diego Land Co. v. Jaspar (C. C.), 110 Fed., at page 714, and Cotting v. Kansas City Stock Yards (C. C.), 82 Fed., at page 854, where the subject is more fully discussed. Upon reason, it seems clear that in solving this equation the plus and minus quantities should be equally considered, and appreciation and depreciation treated alike. Nor can I conceive of a case to which this procedure is more appropriate than the one at bar. The complainant, by itself and some of its constituent companies, has been continuously engaged in the gas business since 1823. A part of the land in question has been employed in that business for more than two generations, during which time the value of land upon Manhattan Island has increased even more rapidly than its population. So, likewise, the construction expense, not only of buildings, but of pipe systems under streets now consisting of continuous sheets of asphalt over granite, has enormously advanced.

"The value of the investment of any manufacturer in plant, factory, or goods, or all three, is what his possessions would sell for upon a fair transfer from a willing vendor to a willing buyer, and it can make no difference that such value is affected by the efforts of himself or others, by whim or fashion, or (what is really the same thing) by the advance of land values in the opinion of the buying public. It is equally immaterial that such value is affected by difficulties of reproduction. If it be true that a pipe line under the City of New York of 1907 is worth more than was a pipe line under the city of 1827, then the owner thereof owns that value, and that such advance arose wholly or partly from difficulties of duplication created by the city itself is a matter of no moment. Indeed, the causes of either appreciation or depreciation are alike unimportant, if the fact of value be conceded or proved; but that ultimate inquiry is oftentimes so difficult that original cost and reasons for changes in value become legitimate subjects of investigation, as checks upon expert estimates or bookkeeping inaccurate and perhaps intentionally misleading. Cf. Ames v. Union Pacific R. R. (C. C.), 64 Fed., at pages 178, 179. If, fifty years ago, by the payment of certain money, one acquired a factory and the land appurtenant thereto, and continues to-day his original business therein, his investment is the factory and the land, not the money originally paid; and unless his business shows a return equivalent to what land and building, or land alone, would give if devoted to other purposes (having due regard to cost of change), that man is engaged in a losing venture, and is not receiving a fair return from his investment, i. e., the land and building. The so-called 'money value' of real or personal property is but a conveniently short method of expressing present potential usefulness, and 'investment' becomes meaningless if construed to mean what the thing invested in cost generations ago. Property, whether real or personal, is only valuable when useful. Its usefulness commonly depends on the business purposes to which it is or may be applied. Such business is a living thing, and may flourish or wither, appreciate or depreciate; but, whatever happens, its present usefulness, expressed in financial terms, must be its value.

"As applied to a private merchant or manufacturer, the foregoing would seem elementary; but some difference is alleged to exist where the manufacturer transacts his business only by governmental license —whether called a franchise or by another name. Such license, however, cannot change an economic law, unless a different rule be prescribed by the terms of the license, which is sometimes done. No such unusual condition exists here, and, in the absence thereof, it is not to be inferred that any American government intended, when granting a franchise, not only to regulate the business transacted thereunder, and reasonably to limit the profits thereof, but to prevent the valuation of purely private property in the ordinary economic manner, and the property now under consideration is as much the private property of this complainant as are the belongings of any private citizen. Nor can it be inferred that such government intended to deny the application of economic laws to valuation of increments earned or unearned, while insisting upon the usual results thereof in the case of equally unearned, and possibly unmerited, depreciation."

The court quoted numerous decisions upholding its decision that in determining the reasonableness of a rate the valuation to be used is that of a "going concern," and not such a valuation as is now suggested by the Interstate Commerce Commission. That Congress has recognized that franchises have value is proven by section 20 of the Act to Regulate Commerce, which provides for showing in the annual reports of the railway companies "the cost and value of the carrier's property, franchises and equipments." Therefore, to have amended the La Follette bill so as to meet the views of the commission, would have provided for a valuation, the use of which as the basis for rates would be unconstitutional.

The injustice of the Commission's plan as a basis for determining the reasonableness of a rate, or fixing the capitalization of a railway, is best understood when considered in connection with the manner in which the present railway systems have come into existence.

Originally the roads were built with varying gages for track; some being less and others more than the present standard, and owing to the sparsely settled territory traversed by the railway, the first cost of the line was kept down to the minimum.

The development of the traffic and the construction of competing lines necessitated improved facilities and more economical operation. This caused the roads to be rebuilt as standard gage lines, and the purchase of rolling stock of greater capacity (thus necessitating the purchase of additional right of way), the widening of cuts and fills, and the purchase of new ties, bridges, rolling stock, etc. For the light capacity rails there have been substituted rails 85 to 100 lbs. per yard. Wooden trestles have either been filled with earth and rocks or have given place to iron bridges, or to stone or concrete arches. The single-track line has been superseded by systems of two, three or four main tracks.

The cost price of a line originally built with a 0.3 grade line would be less than to first build it with a grade of 1 per cent., and subsequently reduce this under traffic to 0.3. The first cost of a line originally built as double-track would be less than to first build one track and subsequently relocate all or a portion of it in the building of a second main track. The ultimate first cost is also greater where the line is originally built with temporary structures and small equipment, which later gave way to permanent structures and modern equipment.

Had the government in the early days undertaken to require the railway companies to build their lines in accordance with the modern standards, the small amount of traffic then moving would not have been sufficient to have paid a reasonable return on the investment, and the building of the railways and the development of the country would have been delayed for many years. Also, there was so much uncertainty regarding the traffic that the financial risk in connection with the construction of the railways was materially greater than that of ordinary commercial pursuits, and to attract investors it was necessary to sell the bonds at a substantial discount. In some cases, stock was offered as a bonus with bonds, and the value thereof may be considered as a discount on securities sold. Whether it be cash or stock, the discount represented the commercial risk. As this risk decreased, the value of the property as a "going concern" increased, until the increased value of the terminals and right of way, and the value of the franchises, good will, etc., more than offset the par value of the securities originally issued on account of the commercial risk.

To now readjust the securities on the basis of "present cost of material in place" is to ignore the risks assumed by those to whom the country is obligated for the great development of the transportation systems (as well as the country), and is to place on an equality with them, companies entering the railway field to-day who do not assume such great risks, and who are not responsible in any way for such development.

In 1848, the chief engineer of the Pennsylvania Railroad estimated the cost of right of way from Harrisburg to Pittsburgh, 245.8 miles, at $154,294. How much has the Wabash paid for right of way into Pittsburgh alone?

The right of way of the Chicago & North-Western for the new passenger depot at Chicago involved the paying of $6,697,-236 for land not half a mile long. Following the construction of the subways in New York city, and the several tubes under and bridges over the rivers, the market value of property in certain sections has increased three and four-fold in from two to five years. These are not isolated cases, nor do they apply only to the large cities. It is probably even more true in the smaller towns, the prosperity of which is almost wholly dependent on the success or failure of one or two industries, and the prices of land fluctuate accordingly. Can it not be said, therefore, without fear of contradiction, that the appreciation of railway property has more than offset any discount on securities sold?

Three purposes to be served by a physical valuation have been advanced. These are:

(1st) The fixing of taxation,

(2d) The enforcement of reasonable rates, and

(3d) The control of financial operations.

TAXATION.

Railway propery is not directly taxed by the federal government and is not subject to such taxation. Any interference with this subject on the part of the federal government is therefore an unconstitutional interference with a matter reserved wholly to the several states. If this were not so, the impossibility of using the valuation of the Interstate Commerce Commission for purposes of state taxation is disclosed by a study of the diverse conditions existing in separate states. The charters of some of the companies make them exempt from taxation. In some states the basis of valuation for taxation is other than the physical property, or its value as a "going concern." In Connecticut it is the value of the capital stock, funded debt and floating indebtedness; in Delaware the number of passengers carried, net earnings, equipment, and the cash value of capital stock; in Maine, the gross receipts; in Massachusetts, the capital stock; in Pennsylvania, the capital stock and franchises; in Maryland, Minnesota and Wisconsin, the gross earnings. The constitutions of the several states provide the manner in which the valuation of property for taxation shall be ascertained, and usually this is determined by a state board of taxation or local assessors, and these powers can neither be delegated to another state commission such as the railroad commission, nor to a federal commission such as the Interstate Commerce Commission. What assurance have we that the laws of the several states will be changed so as to make use for taxation purposes of a valuation of the railways such as is proposed? Certainly so far as its use for this purpose is concerned, the valuation ought not to be undertaken until the state constitutions have in this respect been changed.

RATES.

Although the President did suggest ascertaining whether a valuation of the railways could be made, he has expressly disclaimed having much confidence in its utility. In his speech at Indianapolis, he said:

"At the outset, let it be understood that physical valuation is no panacea; it is no sufficient measurement of a road. . . ."

Similarly, Hon. Charles A. Prouty, a member of the Interstate Commerce Commission, in an address delivered before the National Association of Manufacturers, on May 22 last, said:

"The popular impression that if the value of our railways were known it would be easy so to adjust rates that a fair return upon that value, and only a fair return, would be obtained, is entirely erroneous."

"Fair value" of the carriers' property must be the "basis of all calculations as to the reasonableness of rates," said the Supreme Court of the United States in Smyth v. Ames, and in Franklin County v. Nashville, Chattanooga, etc., Railway, afterward quoted with approval (see Columbus Southern Railway v. Wright, 151 U. S., 470, 479) by the Supreme Court of the United States, the Supreme Court of Tennessee said:

"The value of the roadway at any given time is not the original cost, nor, *a fortiori*, its ultimate cost after years of expenditure in repairs and improvements. On the other hand, its value cannot be determined by ascertaining the value of the land included in the roadway assessed at the market price of adjacent lands, and adding the value of the cross-ties, rails and spikes."

In Cleveland, Cincinnati, Chicago & St. Louis Railway v. Backus, the Supreme Court of the United States said:

"But the value of property results from the use to which it is put, and varies with the profitableness of that use, present and prospective, actual and anticipated. There is no pecuniary value outside of that which results from such use." (154 U. S., 445.)

Turning to Smith v. Ames (169 U. S., 546), the elements of fair value are found fully enumerated in the following significant paragraph:

"We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property used by it for the convenience of the public. And, in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property."

Nothing could be clearer than that this "fair value" is not the aggregate obtained resulting from a physical inventory. For "original cost of construction," "the amount expended in permanent improvements," "amount and market value of bonds and stock," have nothing whatever to do with the idea of fair value; and "probable earning capacity under particular rates prescribed by statute," and "the sum required to meet operating expenses," have but the most remote and indirect bearing upon such idea. Indeed, it is evident that, realizing the potential injustice of rigorously applying either method of valuation, irrespective of the special circumstances surrounding particular cases, the court intended to establish a permanent rule which would protect valuations specially adapted to the requirements of each case which should arise. Therefore, it enumerated the principal classes of facts, both historical and contemporaneous, which might affect the problem of justice in valuation, and, carefully adding that the list was not intended to be exhaustive, declared that each must "be given such weight as may be just and right in each case."

We have already seen that the courts have ruled that in determining the reasonableness of a rate the cost to the present holders, as well as the present value of the property as a "going concern" must be ascertained. In none of the decisions has the court held that the present "value of the material in place" can be used as the valuation for determining the reasonableness of a rate. No valuation, however, can become the sole basis for the making of rates.

Given two roads between New York and Buffalo—one may be fifty miles shorter than the other; one four tracks and the other single track, the first approximately four times as valuable and fifty miles longer; one with 70-ft. grades handling fifteen cars to the train, the other with water grades hauling fifty cars to the train. Physical operation and physical construction are obviously the controlling factors in cost, but so long as the cost of operation does not exceed the gross earnings, even these are disregarded in meeting competition. Physical valuation will not eliminate distance or grades or make the country flat where now are mountains. On the other hand, it will tend to eliminate competition. The terminals of the Pennsylvania Railroad in and about Greater New York are probably worth as much as ther entire line New York to Philadelphia. In the determination of rates following physical valuation, it is hardly conceivable that they would be required to charge double the rate of their competitor without any New York terminals; or even permitted to charge double, for then what shall the competitor charge? If an average between the two or of all lines be taken, it will be too large for one road and not enough for another. To use the cheaper line as the basis might prevent a fair return on the cost of the other.

Under the ruling of the courts, each case must be determined on its own merits, and each rate in itself proven unreasonable for the service performed before a reduction therein can be ordered. This makes it necessary to first determine the proportion of the value of the property as a "going concern" to be assigned to its business as a common carrier, and then assign the proper proportion to passenger

and freight service. The assignment as between passenger and freight service must necessarily increase and decrease as the proportion of either to the total increases or decreases. It cannot, therefore, be considered a permanent factor, but will vary from year to year and from season to season, and with the volume and flow of traffic, so that which would be a reasonable assignment under conditions existing to-day would not necessarily be reasonable under conditions existing to-morrow. Having, for example, determined for the freight traffic such assignment of valuation, it is then necessary to classify the same as between interstate and intrastate business; then into local and through traffic; then into the various classes of commodities handled. The revenues and cost of operation must likewise be classified to determine the net returns from the particular service performed. This is an almost impossible task. Take two roads traversing the same territory and under the same management, over only one of which are fast passenger trains operated—it must set its track up for higher speed, but who can determine the increased cost of maintenance of track that should go to passenger service?

Hancock has said that the tariff is a local issue. It can be claimed with greater force that the question of freight rates is a local issue. The New England States, which depend on other sections of the country for raw materials, such as wool, cotton and leather necessary for their industries manufacturing cotton and woolen goods, and boots and shoes, would welcome the elimination of the tariff on the raw materials, while fighting for the retention and possibly an increase of the tariff on the finished products. For similar reasons western Pennsylvania would favor the elimination of the tariff on all wearing apparel, while insisting on the retention of the tariff on iron and steel products. The South, formerly strongly opposing all tariffs, now wants retained the tariff on cotton (and on wool, which competes with cotton), because of its enormous cotton industry. Oregon and Washington favor the tariff on lumber because of their immense forests, and in like manner each section of the country favors a tariff on the articles produced therein, while insisting on the repeal of the tariff on articles secured from other sections of the country. The same is true regarding the railway freight rates, and the present tendency is to counteract rather than to ascertain the cause.

To-day, England handles the commerce of the world, not because it is cheaper, for example, to carry freight from the United States to England and thence to South America than it would be to carry it direct from the United States to South America, but because of the regular and frequent service established between the ports of England and the other great ports of the world and the absence of such direct regular service to and from ports of the United States. The South can sell little, if anything, to Panama, not because the cost of production is more than in the Central and New England States, but because there is no established steamship service between any southern port and Panama, while such service does exist between New York and Panama, and this necessitates greater cost to the South in placing its products f. o. b. at the seaboard.

In the development of a community there are factors of equal or greater moment than rates:

DEVELOPMENT OF MANUFACTURING CENTER.—The location of a manufacturing center is dependent upon the location of the raw materials, and the market for the finished product; the facilities for assembling the raw materials and distributing the product; the labor market, etc.

This can best be illustrated by a case recently called to my attention. Noting the great development of the rubber trade, and the success of the factories at Akron, Ohio, some gentlemen of another city built what was then considered to be the most up-to-date factory for the manufacture of rubber goods. It cost about $250,000. For a long time, however, it was found impossible to secure skilled operatives; the men claiming that they could get as good wages at Akron, and in event of one plant closing down, work could be secured at one of the others, whereas, were they to enter the employ of the new plant it would be necessary for them to return to Akron in event the new plant closed down for lack of orders. Difficulty was also experienced in marking the goods. Everyone knew of the rubber plants at Akron, and the high quality of the output. In was therefore easy to market rubber manufactured at Akron. No one had heard of the manufacture of rubber at the other place, and were unwilling to buy any considerable quantity of an article regarding the quality of which so little was known. The gentleman told me it was fortunate that the stockholders were wealthy men, as these two facts had necessitated a further expenditure of $500,000 to place the plant on a sustaining basis.

(*To be continued.*)

RAIL BREAKAGES ON "AN INFERIOR SUB-GRADE."

The following letter from A. G. Wells, General Manager of the coast lines of the Atchison, Topeka & Santa Fe, addressed to J. W. Kendrick, Vice-President, is self-explanatory:

"Reading an address made by Charles B. Dudley on 'Some Features of the Present Steel Rail Question,' delivered at the annual meeting of the American Society for Testing Materials, at Atlantic City, in June last, I was struck with a statement that there are indications that rail failures are a question of geography; that the same rail with the same locomotives and cars, and the same density of traffic, will have far less failures if the sub-grade is sandy, porous and well-drained than if the sub-grade is dense, heavy clay, which tenaciously holds water and for quite a portion of the year may be called a more or less modified mudhole.

"With this statement in mind I had some figures made of our rail breakages, the conditions being of the kind referred to by Doctor Dudley. From Seligman to Barstow our track is laid with eighty-five pound rails; the density of the traffic is practically the same over every foot of it. Between Yucca and Barstow, a distance of 227 miles, the sub-grade is sandy, porous and well-drained; between Yucca and Seligman, a distance of ninety-one miles, the sub-grade is largely clay, of a kind that holds water. From November, 1907, to October, 1908, we had eighty-three rail breakages on the territory first named, or a percentage of .001; on the other stretch we had in the same period seventy-two breakages, the percentage being .0025. Or, in other words, where the sub-grade was dense and more or less clay, the breakages per mile were just two and one-half times greater than where the sub-grade was sandy. This in interesting and tends to prove that Doctor Dudley's theory is right."

The paragraph in Dr. Dudley's address, to which Mr. Wells refers, is as follows:

"The sub-grade is the foundation and as such is unquestionably one of the most important elements in the problem. No amount of money spent on rails, ties, splices and ballast, will give successful results on an inferior sub-grade. Our belief is that the importance of the sub-grade has not been sufficiently appreciated by engineers in the past. Indeed there are indications that rail failures are a question of geography. The same rail, with the same locomotives and cars, and the same density of traffic, will have far less failures if the sub-grade is sandy, porous and well drained, than if the sub-grade is dense, heavy clay, which tenaciously holds water, and, for quite a portion of the year, may be called a more or less modified mud hole. The great enemy of the trackman is water, and our firm belief is that if more study had been put on the problem of keeping water out of the sub-grade fewer rail failures would have characterized the past."

RAILWAY RATES AND MERCANTILE PRICES.

The rates of the so-called transcontinental lines to "intermediate points"—that is, to places between the Missouri river and the Pacific coast—have long been the subject of criticism because they are in many instances higher from eastern points than are rates to Pacific coast terminals. A traffic bureau was organized recently at Salt Lake City, Utah, to get "fairer" rates for that city. In reply to complaints against "intermediate" rates in general, and those to Salt Lake City in particular, J. A. Reeves, General Freight Agent of the Oregon Short Line, has written a notable open letter, the reasoning of which is of widespread interest and application. From Mr. Reeves' letter the following extracts are taken:

"The present adjustment of tariffs to, from and within Utah, and the intermountain country generally, is the result of years of negotiation among groups of shippers and groups of railways, beginning when the railways were built here, continuing to the present time and certain to continue as long as the railways run and commerce and manufacturing are carried on. This must be so because in the beginning the make up of the tariff is the result of compromise among varying views and interests, which are affected in diverse ways by the general level of rates maintained or by the adjustment as to particular commodities, and further because no tariff that ever was, or ever can be, built will continue to meet the changing necessities of commerce for any certain length of time. Imperfect in the beginning, because it is a compromise and fully meets the views of no one, its features, one by one, because of changing conditions or alterations in the rate adjustment elsewhere, become absolute and must be continually revised in order to serve the purpose for which the tariff is intended.

"While not wishing to be understood as claiming perfection for the basis here, I am willing to go on record as saying that, all conditions considered, it is as fair and defensible as will be found anywhere, whether we go to competitive or non-competitive territory for comparison, or whether we speak of through rates in and out of this country or of the local tariffs carrying rates within our immediate jurisdiction. * * *

"Not all that we would like to do has been done. Much yet remains. Much is continually under negotiation in a growing country like this, where new conditions spring up daily. Much, probably, which many will think we should do, we will remain unable to accomplish, because we also have our bounds and limitations, and even when our views coincide with theirs we are not always able to convince others or to win over diverse interests to see as we do.

"It is not fair, though, to denounce us and discredit our sincerity in such wholesale fashion as is sometimes done, nor is it encouraging to the conscientious railway representative, who is trying to do the best he can, to appreciate and live up to his responsibilities and his opportunities to act for the general welfare while serving his own. No one has or no one needs a broader understanding of the interdependence of the transportation company and its patrons than the up-to-date railway traffic man of to-day, and I am speaking not of we who live here in Utah any more than of much-maligned superiors who do not live here, but who lend ready consideration of any feasible proposition advanced by us. None of us claim perfection, for we are human, and so liable to misjudge and to err; nor do we claim to be philanthropists or believe it is expected that we will be, but we do think we should be given credit for realizing that no permanent prosperity can come to us unless those we serve and with whom we work are prosperous, and we cannot but feel that much of the criticism with which we are so indiscriminately assailed is thoughtless and unreasonable. Either it is so or our efforts have proved unavailing and our lives are failures.

"Much of that criticism, however, I believe to be based on entire misconception of facts and conditions. Imperfections and unequalities probably exist in our rate basis here, or may hereafter develop, and it will from time to time have to be modified and corrected as to some features, but if the whole structure is to be assailed as wrong and indiscriminately condemned on the one ground that rates to more distant points, the coast, for example, are lower on some commodities, then let me say that that adjustment rests on a principle not only recognized and indorsed by the interstate law itself, but repeatedly confirmed by the Interstate Commerce Commission and the courts—a principle which is the very groundwork and foundation of our entire commercial fabric and enters into every transaction going on every day in every city and every state of this union. I refer to the principle of profit averaging. That is a part and parcel of every business, railway and every other business as understood to-day could not exist without it, be it this or any other business.

"Some illustrations follow in which it must not be understood that I assume to be accurate to the cent. Some of the low profits referred to may not be as low as stated. Some of those referred to as being high may not be as high as given, or they may be higher, but the principle as stated is true and is known to be true by every man of business. We all know that no business is carried on at one dead level of profit. The spread is wide between the least profitable and the most profitable business done. It is the average to which the concern looks for results. The illustrations given below might be multiplied indefinitely until they would embrace every business, large and small, because the same universal principle underlies and governs them all. Those who condemn the railways for these practices, which, as I have stated, are according to law and endorsed by those who enforce the law, are doing the same thing. They are not criticised for it, nor should they be, for it is a business law. They could not do any other way, yet it is the 'terminal' rate, lower than the intermediate rate, which we hear harped upon continually as the great unpardonable sin of the railway, and the very ones whose profits run from 5 per cent. down on some transactions and from 50 per cent. up on others are the same ones prone to demand that a transportation company's lowest profit shall be searched out and set as the maximum and the measure of its entire operations.

"The fourth, or 'long and short haul' section of the interstate law reads as follows:

"'Section 4. That it shall be unlawful for any common carrier subject to the provisions of this act to charge or receive any greater compensation in the aggregate for the transportation of passengers or of like kind of property, under substantially similar circumstances and conditions, for a shorter than for a longer distance over the same line in the same direction, the shorter being included within the longer distance. Provided, however, that upon application to the commission appointed under the provisions of this act, each common carrier may, in special cases, after investigation by the commission, be authorized to charge less for longer than for shorter distances for the transportation of passengers or property, and the commission may from time to time prescribe the extent to which such designated common carrier may be relieved from the operation of this section of the act.'

"Such is the law under which we operate, and which has been interpreted to permit lower charge to points where competition exists, not only water competition, but any competition of a compelling or controlling nature; of market, for example, or of other railways under certain circumstances. Any who doubt this will gladly be given an opportunity to examine records of the decision. The higher intermediate rate is to be challenged, if at all, on the ground of its own unreasonableness, not merely by citing some terminal rate which may be lower. The railway business is not done at one dead level of profit, and in order to show that this is not peculiar to the railway business, a few illustrations will suffice. As stated, the figures given are claimed to be approximate, not accurate

to the cent, but the principle they exemplify is absolute; it is the averaging of profit.

"A furniture dealer's profit probably runs from 10 per cent. on a common kitchen chair to 100 per cent. on more expensive furniture.

"A hardware dealer sells nails by the keg at something like 5 to 10 per cent. profit, and charges 20 per cent. and upward on a kitchen range.

"A grocer sells sugar costing him 95 cents for $1, and he sells the same customer or the next customer fancy pickles costing him 50 cents for $1.

"Any storekeeper sells for the same price goods delivered ten to thirty blocks away that he charges for the same goods purchased over the counter and carried away by the customer. When delivery is necessary he absorbs the cost of it to meet his competition.

"A freight allowance is a reduction made by a manufacturer or jobber in the net price of his goods to meet the price made by a competitor located nearer the point of delivery. The profit on the goods is shrunk to that extent to meet the competition.

"And so do all dealers equalize profits, according to the commodity or the conditions surrounding it or the distance at which the business is done or the proximity or extent of competition.

"The Utah sugar factory sells its product at a small profit at Chicago at a larger profit in Nebraska, and at the largest profit at home in Utah. Sugar factories the world over are operated on the same plan. It is the only plan on which they could be operated on any large scale.

"The Utah fruit and vegetable canner sells for delivery near at home at a higher rate of profit than he will accept, and must accept for the same product, meeting competition in distant markets. At times of surplus production the excess is sold very close, sometimes at an actual loss. The same is true of any other manufacturing business.

"The Utah candy manufacturer makes his highest profit in Utah cities. When he invades competitive fields in other states he shrinks his profits to equalize the competition he finds there. If the narrower margins on which he must do business there were made the maximum he might earn anywhere, he would quit the competitive field.

"And so do all manufacturers average profits. A small business can be done at the higher returns yielded by the home market. The volume will depend upon the extent of the market. This having been supplied, it is possible to reach out and contest competitive fields with rival concerns at a reduced rate of profit, which would not pay were it made the measure of all the business done.

"A railway company hauls a car of low-grade ore cheaper than it will haul a car of high grade of the same weight over the same rails for the same distance. It shrinks its profit to enable the low-grade business to move. It hauls a car of ice or rough stone or scrap iron for a lower rate than it will haul the same weight of some other equally heavy commodity the same distance. The cost of haulage is the same and the profit to the railway is different.

"A railway company hauls business into markets subject to water competition for less than it will haul the same tonnage a less distance to markets not subject to water competition. It makes the rate necessary to meet the competition of the cheaper carrier, or to equalize the producer on its own line with some other producer served by the cheaper carrier. It does this, not because it desires to, but because it must if it and the producer served by it are to hold their share of the business there. In so doing it figures that its line is in existence and must be maintained whether this additional and highly competitive business is accepted or not, and it shrinks its profit to secure this business for itself and the industries served by it to an extent that it could not afford were that to be made a basis and a measure of all its revenues.

"If the law were to select the cheap business of any concern and decree that would set the maximum or serve as the measure of all its transactions, then the cheap business would have to be abandoned. No concern could live under such a rule. Such business is done on a basis which, volume considered, and fixed charges (which remain the same whether volume is large or small) considered, renders it narrowly profitable and justifies accepting it at a level made necessary by conditions surrounding it, but which would prove disastrous and impossible if applied as a measure to the entire business done.

"The law of average is immutable and applies to every business concern in the world, be it large or small. A railway is a quasi-public business concern. It must serve all shippers alike under similar conditions, and the law imposes that. The railway must recognize the law and obey the law, but the law and those who enforce it realize that there are conditions which neither the law nor the railway can change, and these must receive consideration in interpreting the railway's obligations. Beyond that point the railway is a business concern, governed and affected by the same contingencies and the same business principles that govern and affect any other business concern. One of these is the law of average. There is business which it must accept, if it accepts it at all, on the basis of a low rate of profit. It may, in connection with other business, and considering that a certain large portion of fixed expense must be met, whether the cheap business is accepted or not, yield a small return. It is not in itself a loss, else it would not, knowingly, be done, but the net result, were the price at which it is performed made the measure of all business, would be a loss. Were that condition imposed the cheap business would be surrendered. 'Surplus' transportation would go to waste, to the benefit of nobody, but to the distinct harm of the carrier, and also of the industries dependent on the carrier for an outlet to competitive markets.

"Freight rates are but one of many determining factors in cost of living. This may be easily demonstrated by inquiry. For instance, all stations on the lines of the Oregon Short Line, San Pedro and Denver & Rio Grande railways from Ogden to Payson, inclusive, are known as 'Utah common points,' and take the same freight rates from various territories, but, notwithstanding Salt Lake City and Ogden ship much more extensively in carloads and hence obtain goods from other markets at a less total freight cost, it will be found that the cost of living is much less in the smaller cities. Moreover further inquiry also will undoubtedly demonstrate that there are certain points in other states where all freight rates are higher than to Salt Lake City, where the cost of living is less.

"We are glad at all times to confer with our patrons regarding rate matters. It is essentially to our interest that they should be as prosperous and do as large a business as possible. In that lies the measure of our own success. We shall be glad to meet with them and discuss the details of their grievances, lending the best efforts at our command toward reaching a solution. We do not want them to feel that they are at war with us, or we with them."

Baron Goto, who has made a reputation as an administrative officer on Manchurian railways and in the great island of Formosa, is now the Japanese Minister of Transportation, a position of great importance since the private railways have been acquired by the state. The railway system is now divided into four groups, each with a separate operating management, there being about 4,650 miles in all. The manager under the minister is Baron Hirai, who has long been president of the old and much smaller system of state railways. The new organization is said to be in accordance with European practice.

General News Section.

On Thursday, April 1, the office of the New York State Public Service Commission in New York city received no complaints—the first day on which such a record has been made since the establishment of the commission in July, 1907. The office usually receives an average of 16 complaints a day.

The use of street cars with self-contained power supply is again to be tried in New York City. F. W. Whitridge, Receiver of the Third Avenue (surface) Railroad Co., is to try a storage battery car and a gasolene motor car on some one of the short lines in his charge which are now operated by horse cars.

The project to build in New York city a monorail line, which was announced some weeks ago by the owners of the street railway extending from Bartow to City Island, now worked with horses, has now progressed one stage farther, the Board of Estimate and Apportionment having given its assent to the construction of the proposed line.

The report, recently published, that the railways have relaxed their rule forbidding shippers and others to affix advertisements to freight cars is unfounded. The American Railway Association has taken no action recently. Its only rule relating to sizes of placards is that which deals with cards used by the railways themselves to show destinations, classes, etc.

At Washington, April 2, the Car Service Committee of the National Association of Railroad Commissioners held a conference with representatives of the American Railway Association and other interested parties on the question of uniform car service and demurrage rules. The meeting was called by Interstate Commerce Commissioner Lane, who is Chairman of the committee.

The Superintendent of Public Works of New York State has reported to the Senate that the outlets from Cayuga and Seneca Lakes can be improved so as to connect the lakes to the barge canal for less than $6,000,000. The estimate of the State Engineer is $8,000,000. Such improvements would add 20 miles of canal and 80 miles of natural deep water to the canal system and make it possible to shorten the rail haul of coal from the Pennsylvania fields.

Mayor Busse of Chicago has had prepared for introduction in the Illinois Legislature a bill to give the city government of Chicago power to prescribe by ordinance the motive power by which cars or trains may be operated within the city limits. The proposed legislation takes the form of a bill to authorize any city or village to exercise this power. Under similar legislation Chicago and some other cities in Illinois have compelled track elevation within city limits.

The officers of the Interborough Rapid Transit Co., New York, who have made a good deal of objection to having side doors in the cars of the subway, as prescribed by the State Public Service Commission, (*Railroad Age Gazette*, Feb. 26, page 418) are proposing to try a train of cars with doors in the center of the side. This is the arrangement which has long been used in Boston and the officers of the Interborough claim that it will be much more convenient than to have side doors near the end of the car.

The New York Central & Hudson River has sent to the Department of Agriculture a claim for $36,544 for the cost of disinfecting stock cars and stock pens, on the order of the Department, on the occasion of the epidemic of foot and mouth disease last autumn. At the Agricultural Department it is said that if a claim of this nature is allowed, it will make a precedent under which the government can be made liable for millions of dollars, orders of this kind having been issued many times in connection with epidemics of Texas fever and other cattle diseases.

The Chicago & Alton having adopted for its sleeping cars wash bowl arrangements by which passengers who clean their teeth on the cars will be less offensive to other passengers, other roads will, of course, have to do something; the New York Central has them on certain trains, but the enterprising Canadian Pacific has gone the Alton one better; it provides not only the separate dental wash bowl, but also will provide paper tumblers, coated with paraffine, so that each passenger can have a fresh "glass." The "glass" is to be thrown away after being used.

The American Bankers' Association, which hopes to get the Interstate Commerce Commission to forbid express companies to do banking business, declares that the express companies are unfairly and unjustly competing in the banking business. They can carry their own money from place to place practically without cost, and they deposit their money in banks in such a way as to compel the banks to make unnecessary shipments of money for the advantage of the express company; in small towns the express agents keep an insufficient supply of currency and tell the holders of money orders to get them cashed at the banks, thus imposing a loss on the banks; the express companies unfairly compete with the banks by underbidding in the business of exchange, and by keeping their agencies open longer hours than the custom of bankers will permit; and they discount foreign bills, with bills of lading attached, at rates with which the banks cannot compete, because of the favorable shipping arrangements enjoyed by the express companies.

The Adams and American Express companies have disposed of their stock in the United States Express Co., and their representatives have resigned from the board of directors of the U. S. company. Thomas C. Platt and associates are said to be the purchasers of the 20,000 shares of stock, giving them control of a majority. According to the *Wall Street Journal* they seem to have had control heretofore without owning a majority, by virtue of the anomalous character of the organization; it is a joint stock association, organized in 1854, and there is no requirement that an annual meeting shall be held. This being so, the original officers have had no trouble in continuing their control. The changes now going on, like those in other express companies during the past two years, have been brought about in consequence of the requirements in the way of publicity which have been imposed by the Interstate Commerce law, as amended in 1906. Certain stockholders of the United States company, who have been complaining because of insufficient dividends, are continuing their efforts to secure changes in the management of the company. They will try to have a bill passed by the New York legislature to give them the usual privileges of stockholders of corporations, and will try to force a meeting for the election of officers. The annual report of the company for the year ending last June showed gross earnings of $17,000,000 and net earnings of only $37,000. The company has been paying 4 per cent. dividends on $10,000,000 stock. The management is understood to aver that the company's business is being managed in the most profitable way possible. A number of its contracts with railways are unprofitable.

Electric Operation on the New Haven.

The preliminary plans for the further electrification of the New York division of the New York, New Haven & Hartford between Stamford and New Haven are under consideration by the company's board of directors, but the work will probably have to wait until the income of the road revives; and the newspaper reports which say that the work will be finished within two years appear to be founded on the guesses of the reporters. The company's records show that electric operation between Stamford and New York is attended by 3 per cent. fewer delays than under steam operation. The cost of operation on this short line is higher under electricity than under steam, but, with extension, the estimates of the experts of the company indicate that the operation can be brought down to a parity with steam or below. A high officer of the

company can be quoted as saying that the next logical step is the application of electricity to freight business on the New York division. This would require large additional power and a different type of electric engine from that used in the passenger service. One of the first features of electric extension would be the erection of a power plant between New Haven and Bridgeport, but the report that the company has already bought land for this purpose is not confirmed.

Seven Canadian Presidents.

At a dinner given in Montreal on February 12, there were present representatives of seven international associations residing in Montreal, as follows: W. J. Camp, President of the Association of Railway Telegraph Superintendents; William McNab, President of the American Railway Engineering and Maintenance of Way Association; H. H. Vaughan, President of the American Railway Master Mechanics' Association; J. H. Callaghan, President of the Railway Storekeepers' Association; James Powell, President of the Society of Railway Club Secretaries; C. H. Gould, President of the American Library Association, and G. T. Bell, President of the American Association of General Passenger and Ticket Agents. The meeting was presided over by Mr. Bell, whose association is 54 years old.—*Official Guide.*

New York-Chicago Fast Run.

Excluding stops, the special train which was run from New York to Chicago in 16½ hours on March 28, as reported in our last issue, page 763, made an average speed of a trifle over a mile a minute for the whole distance. By a misprint the number of cars in the train was given in our report as five, while in fact it was four. Their estimated weight, as before stated, was 210 tons (one car, 60 tons; three cars, 50 tons each). Slight inaccuracies having occurred in the telegraphic report of the time record, we reprint it with corrections below:

Left New York yards (March 27)	11:40 p.m.	
Arrv. Albany (March 28)	2:15 a.m.	= 137 miles
Left Albany	2:19 "	
Arrv. Syracuse	4:55 "	= 148 "
Left Syracuse	5:03 "	
Arrv. Buffalo yards	7:35 "	= 149 "
Left Buffalo (Central time)	6:41 "	
Arrv. Cleveland	9:25 "	= 183 "
Left Cleveland	9:27 "	
Arrv. Toledo	11:21 "	= 108 "
Left Toledo	11:24 "	
Arrv. Elkhart	1:23 p.m.	= 133 "
Left Elkhart	1:26 "	
Arrv. Chicago	3:10 "	= 101 "
Total distance		959 miles

Actual time consumed 16 hours 30 minutes. Deducting the time lost in making the passenger stops at Scarborough and at Englewood (five minutes each), and the time changing engines, a total of 36 minutes, leaves the running time 15 hours and 54 minutes, equal to 60.31 miles an hour. The rate of speed from Toledo to Elkhart was 67.06 miles an hour, the official distance being 133 miles.

Control of Stock and Bond Issues in Kansas.

The Legislature of Kansas has passed and the governor has signed a radical law to give the State Railroad Commission power to control the issuance of railway securities. The act declares that the power to create liens on property of common carriers situated within the state is a special privilege, and provides that no corporation transacting the business of a common carrier in Kansas, whether organized under the laws of the state or not, shall hereafter issue any stock, stock certificates, bonds or other evidence of indebtedness which shall or may become a lien upon its property in the state payable in more than one year from date unless and until permission shall have been obtained from the Railroad Commission. Any securities issued for property or service shall be void if the value placed upon the property or service by the company be substantially more than that stated in the application. Common carriers are prohibited from declaring any stock, bond or scrip dividends or dividing the proceeds of the sale of stock, bonds or scrip among stockholders.

Chicago Harbor Development, Lake Traffic and the Railways.

The Harbor Commission makes this broad generalization, that two sorts of things are needed in a big city, that is, a "city" or "commercial" harbor for the local demands, local consumption, and all that; and an "industrial" harbor for the demands of the industries, the factories, that consume the coal and iron ore and other raw materials, and at this same industrial harbor would be handled all produce passing through the Chicago "traffic gateway." It would be just as objectionable to attempt to handle that class of traffic in the center of a busy city as it would be to have the railway freight yards occupying valuable ground down town and having that class of business crowding our streets.

On the lakes as a whole, iron ore and minerals, other than coal, represent 58 per cent. of the total tonnage handled. The next most important commodity handled on the lakes is coal, hard coal representing 5 per cent. and soft coal 19 per cent. The next is grain and grain products, 7 per cent. Lumber represents 3 per cent.; it used to be much greater, but the lumber that is tributary to the lakes is rapidly being cut away. That is true even in the Canadian forests. This leaves unclassified 8 per cent.

At Chicago the unclassified freight represents a somewhat larger percentage, and these coarser commodities a smaller percentage. At Chicago it is between 11 and 12 per cent., but that 11 or 12 per cent. while small in volume is very important in value. The class of vessels handling the coarser commodities like iron ore, coal and lumber are vessels which are specially built and designed, with unloading machinery for handling these particular commodities. The only coarse products now handled in Chicago are lumber and grain. These can be handled just as well at or near the Calumet district.

The smaller and faster boat is the boat for quick despatch of merchandise. Boats 350 to 400 ft. long do practically all the work between New York and points along Long Island Sound and New England. They are not building any 600 ft. boats down there to handle that class of business.

I said to you that the percentage of miscellaneous articles handled here was small in comparison to the whole, but very important in value. Government officials estimate the average value of miscellaneous cargoes going through the "Soo" canal at $150 per ton. Using that as a fair valuation for traffic of that class handled here, we get the enormous total of $260,000,000 of that class of business handled annually at Chicago.

I suppose I owed my position on the Harbor Commission to the fact that I was a railway man, and I was therefore looked to for preparing the paragraph on the relations of the water facilities here to the railways. This is what the Commission finally accepted on that subject:

"An important reason for favoring harbor improvements for Chicago and indorsing a general waterway development is the influence which water routes have and probably always will have upon railway service and rates. Without intending disparagement or criticism of railway service or rates, it is generally recognized that water routes give the community they serve a valuable alternative means of transportation. Were water routes lacking it is probable that the geographical advantage of this commmunity would be lost by the railways putting all communities, regardless of size or importance, on a parity. There is a tendency to base rail rates on distance and cost of service. The chief and only well recognized exception is when rail rates are affected by the competition of water transportation." This tendency is noted in various decisions of the Interstate Commerce Commission, and in distance tariffs published by the various states.

Chicago, to maintain its pre-eminence and the advantage which it gains from its geographical location, should never lose sight of the importance of its water gateway, even though the actual tonnage handled by water may not amount to more than 5 per cent. of the total business done.

There is no doubt that water transportation will always affect railway rates in a very important way, and assuming that railways will always be permitted to earn a fair return on the capital invested I think the tendency will usually be that the rates made to points where there is water transportation will be *below* the average; and rates made to points where there is no water transportation will be *above* the

average. In other words, the inland point far away from water and not having the advantage of water transportation will have to pay a little more than its share, because the railway has to compete at the point where there is water transportation. That might not be a very good argument for waterway development at an inland town, but I believe it is the truth.—Extracts from an address by F. A. Delano, President of the Wabash, before the City Club of Chicago, April 3, 1909.

The School of Railway Signaling.

This institution, established in Utica, N. Y., about a year ago, now has 10 instructors and is teaching over 300 students. These students are scattered over the United States and Canada. The school has received numerous inquiries from all over the world.

A complete course in signaling is given, covering every feature of the subject. Hundreds of letters have been received from students all over the country expressing their satisfaction with the instruction they are receiving. The school's General Agent, M. W. Shuler, is representing the school on the road, and reports a promising future for it in all the states he has visited. The course offered by the school is explained in a 20-page catalogue, which is sent on request.

The President of the school, H. C. Williams, was Supervisor of Signals on the Harlem division of the New York Central, where he started a night school for the benefit of the men in his department. The idea was at once successful, and when Mr. Williams was promoted to the Mohawk division he started a night school at Utica; and this was the beginning of the present vigorous institution. The school was incorporated in February of last year and began giving systematic instruction by mail on the first of July following.

Accuracy in Reports.

When the fender of a car on the City Railway of Dayton, Ohio, picked up a young heifer at the corner of Third and Jersey streets the conductor, filling out the report blank and answering the question, "What did the victim say?" wrote: "She was carried along on the fender for a short distance, then rolled off and run away without saying a word." Which recalls the Irish section master's report of his disposition of the carcass of a cow—not a young and wild heifer—that was killed by a train: "Disposition—*mild and gentle.*"

Want a Job?

If you do, listen to the words of an old passenger traffic manager down east. "How did I reach my present position? Well, sir, I aimed for it, right from the start. I knew it was somewhere along the rocky road I had started on, and I was *just bound to have it.* I began when I was 15 years old. I ran errands, I emptied waste baskets, I carried mail, I did whatever 'most anybody told me to do. Hard? Certainly. And I wasn't perfect, by any means. I had all a boy's joy in a day off, and there were times when I hated work. My grandmother died once or twice, and now and then she was frightfully sick. But something happened always to set me straight again. Once, I remember, I was studying the slow, hard system of shorthand they had in those days. I was often tired, for I was growing; I wasn't overly strong, and there was plenty for me to do, so I had a spell of the blues. The General Passenger Agent rang for me, and, fishing around in what looked like a tremendously fat pocket-book, finally selected from a bunch of cards which I knew to be passes, one which he told me to take to the office of another road, and tell the chief clerk to please issue a duplicate, spelling his name right. Something in my wondering eyes at the wealth he held right there made him laugh; and he said, 'Don't stare so, for when *you* have this office, you'll have more passes than these, I tell you *that.*'

"'More?' I stammered. 'Why, yes,' he said, 'for there will be more railways by that time.' My blues vanished for that time, and I never lost hope or expectation from that time on until I got where I am. Yes, I worked deucedly hard, and I do yet. But I would have had to work at anything I did, you see."

That's it—the aim. Bound to hit somewhere near the mark if you aim carefully enough.

You must like the job well enough so that you won't look at the clock more than three times in ten minutes when the shadows begin to get long. The business must seem enough like your own for you to pick scraps off the floor, set a chair straight, answer a chance-met visitor with some appearance of courtesy, speak well of the boss and his enterprise when among strangers. And finally there are three rules that every youngster just beginning would do well to commit to memory. They are appended.

1. Take a personal interest in the business.
2. Take a personal interest in the business.
3. Take a personal interest in the business.

—*North Western Bulletin.*

Museum of Safety and Sanitation.

The following officers have been chosen: Acting President, Philip T. Dodge; Vice-Presidents, Charles Kirchhoff, T. C. Martin, Prof. F. R. Hutton and R. W. Gilder; Director, Wm. H. Tolman. The Museum of Safety and Sanitation is in the Engineering Societies' building, 29 West 39th street, New York. The objects are to promote means and methods of safety and sanitation and the application thereof to any and all public or private occupations, with a view to lessening the number of casualties and avoiding the causes of physical suffering and of premature death.

American Society of Civil Engineers.

At the meeting held on April 7 a paper on "The Sixth Street Viaduct of Kansas City," by E. E. Howard, Assoc. M. Am. Soc. C. E., was presented for discussion.

St. Louis Railway Club.

At the meeting on April 9, H. Wade Hibbard, Professor of Mechanical Engineering at the University of Missouri, will present a paper on "Organization." There will also be a demonstration of autogenous welding by oxy-acetylene.

Mechanical Engineers.

A meeting of mechanical engineers living in and near Boston is called for Friday evening, April 16, at 8 o'clock, in the auditorium of the Edison Electric Illuminating Company, 39 Boylston street, Boston, Mass. A plan for holding in Boston meetings of the American Society of Mechanical Engineers, for the reading and discussion of papers, similar to those held in New York, will be discussed. This meeting has the approval of the American Society of Mechanical Engineers.

Chicago Railway Club.

At a meeting of the Chicago Railway Club on April 2 it was decided to continue the temporary officers, whose names were given in our issue of April 2, page 765, until a meeting on May 3, when election of permanent officers for the ensuing year will be held. About 250 applications for membership have been received. The chief clerks' clubs of the North Western, the Illinois Central and the Rock Island have been merged in the new organization.

The executive officers of the roads entering Chicago are taking much interest in the club and giving it their support. Its main purpose is to bring about closer relations between the officers and chief clerks of the various departments of railway service. The executive officers regard this as a very desirable object and many of them have applied for membership. These include: W. E. Bailey, W. B. Biddle, Geo. H. Crosby, J. N. Faithorn, S. T. Fulton, C. M. Hyzer, J. W. Kendrick, Gardner Lathrop, Frank Nay, Geo. T. Nicholson, W. J. Black, W. B. Kniskern, R. H. Aishton, John Sebastian and others. Those who are active in the formation of the club

desire it to be understood that it is in no way competitive with the Traffic Club of Chicago, the Western Railway Club, or other such organizations. It is designed to occupy a field that has heretofore been unoccupied in Chicago. It will be educational as well as social, and will have addresses by men prominent in the transportation business. The house committee is seeking permanent quarters and has some propositions under consideration. The temporary headquarters for business purposes are at 10 Sherman street, Chicago.

International Railway Fuel Association.

C. T. Malcolmson, Briquette Engineering Expert for the Roberts & Schaefer Co., is to read a paper on "Briquetted Coal As a Railroad Fuel" at the first annual meeting of the International Railway Fuel Association, which will be held at the Auditorium Hotel, Chicago, June 21 to 23, inclusive. Mr. Malcolmson was in charge of the work of briquetting coal at the United States government fuel testing plants at the Louisiana Purchase and the Jamestown expositions, and later has been in charge of the construction of the briquetting plant of the Rock Island Coal Mining Co. at Hartshorne, Okla.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 19, 1909; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C. Collinwood, Ohio; May 17-19; Chicago
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.; April 15; Altanta, Ga.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Spokane & Inland Empire Railroad, on March 31 and April 1, 2 and 3, ran its second annual "fruit special demonstration train" through the Palouse country and Spokane valley, giving lectures to the fruit raisers.

Ten railways in Oklahoma have appealed to the state supreme court against the order of the State Corporation Commission requiring a reduction of 30 per cent. in freight rates on crude oil. The proposed reduction is alleged to be confiscatory.

Complying with the recent order of the government, the Grand Trunk, on April 2, began running third-class passenger cars, one each day each way, between Montreal and Toronto, with tickets at 2 cents a mile. On the first trip from Montreal the car had no passengers; on the return it had three as far as Cobourg.

Bates & Chesebrough announce at San Francisco the establishment of a fleet of four sailing vessels to run regularly between New York and San Francisco, carrying freight at from 30 cents to 35 cents per 100 lbs., or considerably lower than the rates by the Pacific Mail Steamship Co. The time allowed for a trip is 120 days.

The executive officers of the Missouri lines have announced to the state officials of Missouri that they have finally determined to put in effect on April 10 the passenger rates and mileage tickets that they offered at a conference with the state officials on March 25 as a basis of compromise. (*Railroad Age Gazette*, April 2, page 771.)

The transcontinental railways will ask the federal courts to restrain the Interstate Commerce Commission from enforcing its order in the Spokane rate case. W. W. Cotton, General Attorney of the Oregon Railroad & Navigation Co., is quoted in an interview at Portland as definitely announcing that his road will contest the decision. There is no doubt but that the other roads affected will unite with it in this action.

Passenger tariffs showing local fares at 2½ cents a mile were put in effect by the principal railways of Virginia on April 1, in accordance with the recent decision of the State Corporation Commission. Four companies still maintain the 2-cent rate, the order of the Commission not applying to their lines. These are the Richmond, Fredericksburg & Potomac, the Chesapeake & Western, the Louisville & Nashville and the New York, Philadelphia & Norfolk. The Virginian Railway, only recently opened for passenger traffic, had voluntarily put in effect a tariff based on the 2-cent rate.

Judge Kohlsaat, of the United States Circuit Court, sitting at Chicago, has set April 12 as the date for arguments in the suit brought by the Chicago, Milwaukee & St. Paul to restrain the Interstate Commerce Commission from enforcing its order requiring this railway to restore certain joint coal rates. The rates in question formerly were in effect jointly over the Chicago, Indiana & Southern and the St. Paul. The St. Paul canceled them because they were unremunerative to it. The Commission ordered them restored at the instance of the Cardiff Coal Co., which desires to ship coal from its mines in Northern Illinois to points in the Northwest on the St. Paul's lines. The litigation raises important questions regarding the power of the commission. The St. Paul says that it amply serves from mines on its own road all the needs of the various coal consuming communities on its lines and can haul the coal to such communities from these mines without sharing revenue from the traffic with any other line; that to require it to haul coal on joint rates from Illinois mines would materially diminish its revenues and make it an instrument for reducing to a considerable extent the sale of coal produced by mines on its own lines; and that the commission has no power to establish through rates and joint rates except—in the language of the law—"when that may be necessary to give effect to any provision of this act," and then only when no reasonable or satisfactory through route exists, which, the St. Paul asserts, is not the case here. The commission denies the right of a railway to refuse to open its lines to a shipper off its rails, because shippers on its rails

can supply the demand for their product; denies that the fact that the revenues of a carrier may be reduced by the requirement that it make rates for the transportation of the product of certain shippers is a sufficient reason for its refusal to put in such rates, and contends that the refusal of the St. Paul to make joint rates for the coal of the Cardiff Coal Co. constitutes such a discrimination against that company as justifies the commission in ordering the road to restore the rates in question.

INTERSTATE COMMERCE COMMISSION.

Fuel Wood as Emigrants Movables.

J. B. Place v. Toledo, Peoria & Western et al. Opinion by Commissioner Clark.

Fuel wood may lawfully be included in a carload of emigrant movables under a tariff which permits including limited quantities of lumber and fence posts, and also "property included in the outfit of intending settlers." Reparation awarded.

STATE COMMISSIONS.

The Erie Railroad has been ordered by the New York State Public Service Commission, Second district, to run one train each way daily over the Conesus Lake branch from Conesus Lake Junction to Lakeville, Livingston county. During the summer there is satisfactory train service, but in the winter there are no passenger trains run and Lakeville is left without means of transportation except by traveling to the main line of the Erie, a distance of two and a half miles, by highways.

The Railroad Commission of Maryland has issued a new distance tariff on soft coal, applying between all stations in the state. The rate per ton of 2,000 lbs. for 5 to 10 miles is fixed at 30 cents. For every additional five miles up to 150 miles the rate increases 1 cent, the rate for 15 miles being 31 cents, for 20 miles 32 cents, etc. For distances of 155 to 195 miles the rate increases from 5 to 10 cents per ton for each additional five miles, being 60 cents for 155 miles and $1.40 for 195 miles. For distances of 200 to 400 miles the rates increase irregularly as the distance increases, being from $1.50 for 200 miles to $2.15 for 400 miles.

The New York Public Service Commission, Second district, has issued an order requiring the railways operating in the Adirondack forest preserves to use oil-burning locomotives from April 15 to November 1, between the hours from 8 a.m. to 8 p.m. All locomotives in service between 8 p.m. and 8 a.m. during these summer months, other than oil-burning locomotives, must have a certificate from the commission permitting them to operate. The complete installation of oil-burning engines is to be effected by April 15, 1910, and at least two locomotives on the Mohawk & Malone railway and two on the Delaware & Hudson must be fitted with oil-burning apparatus and placed in service not later than July 15, 1909. Further, it is ordered that none but oil-burning locomotives shall be used after June 1, 1909, except those inspected by the commission and given a certificate, revocable at the pleasure of the commission. These orders were issued with a view to preventing fires in the forest preserves.

Wisconsin: Commission's Relation to Common Council.

C. F. Lang et al. v. City of La Crosse and the La Crosse City Railway.

Complaint alleging that an ordinance, allowing the respondent railway to abandon and take up its tracks on a certain street in the city of La Crosse and providing for an extension to take the place of said abandoned track, is unreasonable. Such track was taken up prior to the filing of the petition.

The commission has no authority to authorize the construction or extension of any electric railway within a city or prevent the abandonment or change of location of any part of such a road constructed under a franchise granted by the common council, if the council's consent has been obtained. Petition is therefore dismissed.

COURT NEWS.

The Indiana Supreme Court rendered a decision on April 2 holding that the law conferring the rate-making power on the Indiana Railroad Commission is constitutional. The decision was rendered in a case in which the Southern Indiana and the Baltimore & Ohio Southwestern appealed from an order of the commission fixing joint rates on coal.

The suit of the government to compel a dissolution of the Standard Oil Co., which was begun in November, 1906, has now reached its last hearings, the argument of the government having been heard by the Circuit Court in St. Louis this week. F. B. Kellogg, of St. Paul, Chief Counsel for the government, filed a brief filling 198 printed pages, and going fully into the history of the company and its predecessors.

In the United States Circuit Court of Appeals at New Orleans April 6 the injunction ordered by Judge Jones in the United States District Court at Montgomery restraining the Alabama State Railroad Commission from putting certain rates into effect was dissolved. The opinion was agreed to by Justices Shelby and McCormack. Justice Pardee dissented. The litigation grew out of the law of 1907, which provided for a maximum passenger rate of 2½ cents a mile and a material reduction of freight rates.

The Department of Justice at Washington announces that the decree rendered on April 3 in equity suit No. 870, United States vs. Northern Pacific et al., pending in the district of Montana, is in favor of the government. This suit was instituted on July 19 of last year to cancel patents issued for 1,120 acres of coal land. The Northern Pacific held title to 1,120 acres of land in the Mount Rainier National Park, created by the act of March 2, 1899. Section 3 of the act provided that the Northern Pacific might deed to the government any lands held by it within either this national park or the Pacific forest reserve and select in lieu thereof an equal quantity of non-mineral public lands. The railway company selected the 1,120 acres of land in controversy and received patents therefor. At the time of such selection these lands were classified as non-mineral lands. It developed later that they were valuable coal lands. This suit was instituted to cancel the railway's patent for the lands on the ground that they were valuable coal lands, their value being alleged to be more than $100,000,000.

Supreme Court on Kentucky Rate Law.

The Supreme Court of the United States in a suit appealed by the State Railroad Commission of Kentucky has this week held that, in making a general tariff for all of the railways of the state, the commission had exceeded its powers, and the decision is in favor of the defendant railway, the Louisville & Nashville. The case was an application for an injunction to restrain the enforcement of an order of the commission of June 20, 1906, fixing rates on intrastate business. It came to the Supreme Court on appeal from the United States Circuit Court for the Eastern district of Kentucky, which held unconstitutional the Kentucky statute known as the McChord law. The lower court is affirmed, but the Supreme Court, holding that the statute did not authorize the wholesale creation of tariffs, avoids dealing with the constitutional questions involved. The decision was announced by Justice Peckham. The roads who began the suit asserted that the law was void in that it deprived the companies of property without due process of law, imposed excessive penalties and vested the commission with judicial powers without providing an appeal from its findings. The Supreme Court in the present decision holds that an inquiry into the question of constitutionality is unnecessary, but the action of the commission in making general rates is held to be beyond the powers conferred by the McChord law.

Justice Peckham said that the commission had assumed the power under the McChord law of making what were termed maximum rates for the transportation of all commodities on all railways to and from all points within the state. This was an enormous power. Jurisdiction so extensive and comprehensive as must exist in a commission in the making of

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Trans-portation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,459	$4,006,079	$1,469,415	$5,923,093	$778,590	$817,111	$128,604	$1,700,186	$125,014	$3,549,505	$2,373,588	.....	$231,472	$2,142,116	$199,895
Atlantic Coast Line	4,409	1,652,602	573,663	2,391,265	283,015	316,094	41,260	704,170	66,779	1,411,318	979,947	.....	90,000	889,947	316,552
Boston & Maine	2,242	1,754,599	832,255	2,810,433	237,524	374,808	33,884	1,406,743	76,225	2,129,184	681,249	$2,506	153,721	530,034	301,455
Central of Georgia	1,916	666,251	184,298	929,761	118,700	173,739	26,040	288,607	34,882	641,968	287,793	4,218	38,600	253,411	49,312
Central of New Jersey	668	1,150,385	291,860	1,521,731	137,002	290,433	21,153	466,038	37,692	952,318	569,413	8,040*	83,648	477,725	23,282
Chesapeake & Ohio	1,896	1,495,160	293,586	1,874,035	182,009	409,830	38,145	584,554	44,948	1,259,486	614,549	2,995*	67,100	544,454	190,237
Chicago & North Western	7,635	3,157,189	1,077,381	4,691,857	511,278	643,331	88,474	2,065,109	90,229	3,398,421	1,293,436	8,221*	230,000	1,055,215	196,629
Chicago, Burlington & Quincy	9,023	3,865,759	1,255,078	5,719,427	461,163	1,097,054	121,384	1,929,984	184,907	3,794,492	1,924,935	8,325*	212,600	1,704,010	421,689
Chicago, St. Paul, Minn. & Omaha	1,739	587,241	265,545	923,157	93,458	103,476	20,370	432,083	23,397	672,784	250,373	1,469*	53,008	195,896	†37,082
Colorado & Southern	1,252	532,323	82,441	647,273	74,209	144,461	12,921	200,895	27,768	460,254	187,019	689	21,285	166,422	†11,567
Delaware & Hudson	845	1,096,628	152,567	1,288,508	105,405	183,015	16,701	562,337	33,674	901,132	387,376	407*	35,000	351,969	†97,124
Delaware, Lackawanna & Western	893	1,642,226	427,978	2,219,043	129,394	443,197	52,610	710,828	50,709	1,386,738	832,305	34,090	98,400	767,995	†20,136
Erie	1,902	2,434,189	553,431	3,233,420	212,433	630,479	85,973	1,189,024	78,240	2,196,149	1,037,271	16,884*	105,994	911,393	744,612
Gulf, Colorado & Santa Fe	1,518	687,424	210,028	958,535	161,695	132,636	21,810	337,256	28,218	681,615	276,920	.....	32,649	244,271	139,955
Illinois Central	4,518	2,821,992	824,596	4,202,497	396,533	879,022	101,582	1,562,953	95,130	3,035,220	1,167,276	1,207*	179,541	986,528	172,388
Kansas City Southern	827	513,947	90,978	674,971	67,872	72,739	21,461	214,561	30,568	407,201	267,770	.....	25,342	242,428	65,888
Lehigh Valley	1,446	1,837,773	225,826	2,143,045	262,757	402,141	62,674	777,206	56,015	1,560,793	582,252	28,433*	94,600	459,219	225,777
Louisville & Nashville	4,388	2,531,219	761,488	3,518,846	391,523	663,980	90,520	1,180,183	82,547	2,408,753	1,110,093	519*	112,700	996,874	325,607
Maine Central	931	402,154	145,187	588,447	62,561	96,678	6,779	242,542	17,754	426,314	162,133	1,112	31,962	131,283	52,691
Michigan Central	1,746	1,331,022	391,986	1,891,207	152,224	315,326	55,689	812,567	32,516	1,368,322	522,885	11,379*	94,000	417,506	111,122
Missouri, Kansas & Texas	3,072	1,223,865	506,040	1,859,992	336,173	250,071	46,483	754,833	76,054	1,463,614	396,378	488*	70,034	325,855	11,959
Mobile & Ohio	1,098	591,661	94,682	794,112	73,326	131,877	28,481	276,808	29,825	540,317	253,795	2,671*	24,000	227,124	54,272
New York, New Haven & Hartford	2,000	1,854,814	1,577,792	3,826,500	313,654	486,104	20,861	1,689,215	94,542	2,604,376	1,222,124	79,381	295,000	1,006,505	516,457
Norfolk & Western	1,925	1,848,838	228,071	2,167,477	222,844	396,647	39,834	655,775	52,862	1,367,962	799,515	136	82,300	717,351	196,643
Northern Pacific	5,674	3,053,511	974,258	4,309,819	411,039	609,096	67,273	1,539,564	85,891	2,712,863	1,596,956	6,994	163,773	1,440,177	93,080
Pennsylvania Co.	1,416	1,971,898	428,554	2,671,607	345,181	539,793	62,490	1,125,023	66,528	2,139,015	532,592	6,179*	149,900	376,513	†35,946
Pennsyvania R.R. Co.	4,048	7,286,595	2,029,129	10,018,627	1,345,034	2,339,747	152,610	3,793,180	285,641	7,916,212	2,102,415	126,778*	174,339	1,801,298	342,122
Pere Marquette	2,341	741,061	192,712	1,010,563	122,127	164,161	29,564	487,196	34,794	837,842	172,721	770*	47,462	124,489	113,805
Philadelphia, Balt. & Washington	716	563,199	512,932	1,230,794	193,148	269,993	23,248	537,984	31,958	1,056,331	174,463	.....	31,142	143,321	103,368
Pittsburgh, Cin., Chic. & St. Louis	1,472	1,701,664	456,591	2,433,410	295,334	459,809	66,593	941,028	52,167	1,814,931	618,479	218*	114,000	504,261	4,261
St. Louis & San Francisco	4,727	1,895,727	678,317	2,802,504	262,890	303,522	66,367	1,012,300	92,433	1,737,512	1,064,992	.....	120,781	944,211	198,064
Southern	7,055	2,779,700	919,068	4,062,233	469,183	597,387	105,205	1,458,098	137,416	2,767,289	1,294,944	4,815	160,662	1,139,097	611,720
Texas & Pacific	1,885	770,200	259,733	1,090,438	144,710	214,447	15,139	482,655	33,299	890,250	200,188	1,063	38,000	163,251	6,042
Union Pacific	3,310	1,974,471	636,814	2,918,644	233,728	414,035	81,770	839,747	100,677	1,669,957	1,248,687	4,199*	111,783	1,132,705	132,063
Vandalia	829	417,062	151,066	643,835	58,757	117,993	22,377	278,841	16,405	494,373	149,462	.....	24,365	125,097	†17,948
Yazoo & Mississippi Valley	1,371	589,236	157,326	794,577	148,351	148,865	16,422	339,953	24,965	678,556	116,021	1,786	30,835	86,972	†46,378
EIGHT MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,459	33,745,083	12,251,672	49,914,130	6,356,629	7,942,114	1,038,074	13,570,906	1,059,391	29,967,114	19,947,016	.....	1,627,205	18,319,811	2,757,496
Atlantic Coast Line	4,409	11,815,196	3,839,637	16,883,189	2,336,471	2,416,300	284,537	5,551,361	485,566	11,074,235	5,808,954	.....	720,000	5,088,954	1,405,125
Boston & Maine	2,242	15,014,372	9,184,040	26,202,187	3,029,950	2,954,776	312,716	11,810,385	611,333	18,719,160	7,483,027	78,212	1,171,470	6,389,769	431,503
Central of Georgia	1,916	5,241,687	1,908,277	7,823,123	1,058,403	1,427,580	210,302	2,401,402	290,650	5,388,337	2,434,786	40,303	307,560	2,167,529	267,111
Central of New Jersey	668	10,701,051	2,854,378	14,341,135	1,407,502	2,442,721	202,322	3,935,676	297,092	8,285,313	6,055,822	242,065	701,391	5,596,496	†559,659
Chesapeake & Ohio	1,896	13,667,314	2,998,357	17,386,609	1,944,024	3,337,003	291,957	4,847,226	342,845	10,763,055	6,623,554	12,175*	533,200	6,078,179	452,745
Chicago & North Western	7,635	29,432,252	11,657,132	44,681,725	5,285,212	5,035,183	747,703	16,650,268	734,302	28,452,668	16,229,057	10,780	1,840,000	14,399,837	1,390,630
Chicago, Burlington & Quincy	9,023	35,178,799	13,410,179	53,130,011	7,291,627	8,775,254	1,014,285	16,479,700	1,346,622	34,907,488	18,222,523	93,117*	1,700,800	16,428,606	564,622
Chicago, St. Paul, Minn. & Omaha	1,739	5,743,610	2,792,215	9,149,716	1,072,486	953,707	171,989	3,357,564	233,562	5,789,308	3,360,408	2,418	423,833	2,938,993	308,118
Colorado & Southern	1,252	4,570,282	1,048,982	5,924,190	726,929	1,044,280	110,786	1,808,288	211,269	3,901,552	2,022,638	2,738	168,032	1,857,344	†35,043
Delaware & Hudson	845	10,042,045	1,937,548	12,363,771	880,714	1,338,487	149,051	4,397,682	280,452	7,046,386	5,317,385	422*	276,749	5,040,214	†618,946
Delaware, Lackawanna & Western	893	16,197,245	4,474,092	22,055,223	2,101,166	3,014,578	383,659	6,184,559	438,677	12,122,639	9,932,584	189,980	700,800	9,421,764	277,810
Erie	1,902	21,088,345	5,475,230	28,597,051	2,841,361	5,781,202	630,535	9,872,956	615,056	19,741,110	8,855,941	224,914	800,689	8,280,166	2,600,366
Gulf, Colorado & Santa Fe	1,518	6,582,422	2,018,930	9,030,118	1,334,493	1,420,049	162,188	3,066,167	257,025	6,239,922	2,790,196	.....	214,974	2,575,222	1,398,727
Illinois Central	4,518	24,354,466	7,427,971	36,290,465	4,205,850	8,052,245	780,730	12,473,872	767,711	26,280,408	10,010,057	22,061*	1,498,625	8,489,371	200,531
Kansas City Southern	827	4,354,856	881,535	5,759,558	623,013	672,193	173,949	1,835,063	215,952	3,520,170	2,239,388	.....	220,903	2,018,485	58,797
Lehigh Valley	1,446	18,363,012	2,620,257	21,705,052	2,328,046	4,050,323	518,260	6,681,767	428,131	14,006,527	7,698,525	55,301*	720,800	6,922,424	†831,262
Louisville & Nashville	4,388	21,961,355	6,865,266	30,723,241	3,399,733	5,386,444	666,095	9,831,164	632,378	19,915,814	10,807,427	90,596*	899,125	9,817,406	3,308,328
Maine Central	931	3,217,568	1,929,076	5,516,019	840,443	770,463	58,482	2,002,276	179,618	3,851,282	1,664,737	19,427	249,148	1,435,016	†243,752
Michigan Central	1,746	10,951,266	4,268,566	16,690,098	1,941,654	2,335,251	477,239	6,466,981	278,367	11,499,492	5,190,606	35,153*	753,694	4,401,759	†535,977
Missouri, Kansas & Texas	3,072	11,912,900	4,791,074	17,657,579	2,367,757	2,651,200	380,423	6,392,184	546,156	12,337,720	5,319,859	7,869*	806,758	4,505,232	†685,885
Mobile & Ohio	1,098	4,791,203	828,645	6,529,412	718,622	1,049,748	222,327	2,237,477	233,159	4,461,333	2,068,079	16,398*	140,500	1,911,181	121,230
New York, New Haven & Hartford	2,000	17,047,148	15,276,024	35,533,185	4,267,094	4,223,411	188,319	14,974,836	739,885	24,393,545	11,139,640	819,658	2,307,000	9,652,298	637,448
Norfolk & Western	1,925	16,162,495	2,355,920	19,178,752	2,077,357	3,229,267	313,761	5,555,577	421,933	11,597,895	7,580,857	1,317*	679,600	6,899,940	564,508
Northern Pacific	5,674	32,084,534	11,393,241	46,102,384	4,893,565	5,362,549	550,158	13,440,112	726,225	24,972,609	21,129,775	336,984	1,923,821	19,542,938	†570,431
Pennsylvania Co.	1,416	20,324,289	4,514,311	27,236,326	2,601,307	4,381,940	493,212	9,372,311	569,026	17,417,796	9,818,530	22,331*	1,215,798	8,580,401	34,807
Pennsyvania R.R. Co.	4,048	65,727,345	19,251,643	91,177,798	10,122,571	18,003,441	1,212,858	32,408,141	2,264,382	64,011,393	27,166,405	28,878	1,394,714	25,800,569	†1,665,336
Pere Marquette	2,341	6,275,142	2,322,702	9,333,519	1,111,951	1,380,824	212,903	3,738,782	236,753	6,681,213	2,652,306	8,799	404,422	2,256,683	307,744
Philadelphia, Balt. & Washington	716	5,151,593	4,525,515	10,897,897	1,366,751	1,958,619	169,915	4,526,104	231,874	8,253,263	2,644,634	.....	249,134	2,395,500	†13,018
Pittsburgh, Cin., Chic. & St. Louis	1,472	14,497,856	4,644,316	21,629,623	2,362,937	3,757,649	493,059	7,609,578	445,448	14,668,671	6,960,952	4,578*	963,755	5,992,619	158,759
St. Louis & San Francisco	4,727	15,929,931	6,245,487	24,005,734	3,584,315	3,231,927	511,272	8,308,499	745,592	16,381,605	7,624,129	.....	1,018,267	6,605,862	†40,526
Southern	7,055	23,115,933	9,240,798	35,203,860	4,165,899	5,345,751	807,304	12,312,082	1,149,756	23,780,792	11,423,068	94,134	1,275,883	10,241,319	3,046,032
Texas & Pacific	1,885	7,009,945	2,546,525	10,257,002	1,128,041	1,509,904	121,307	3,851,828	264,641	6,875,721	3,381,281	18,452*	458,740	2,904,089	264,090
Union Pacific	3,310	22,462,868	6,630,686	31,687,007	2,971,924	3,257,762	656,233	7,415,299	809,920	15,111,138	16,575,869	11,851*	874,286	15,689,732	3,998,014
Vandalia	829	3,758,758	1,486,678	5,905,055	842,184	965,655	169,090	2,280,770	133,632	4,391,331	1,513,724	.....	202,922	1,310,802	†77,346
Yazoo & Mississippi Valley	1,371	4,965,940	1,469,982	6,846,066	1,337,248	1,207,233	127,330	2,627,186	189,506	5,488,503	1,357,563	22,622	269,210	1,110,975	†93,194

*Deficit. †Loss.

rates by one general tariff upon all classes of commodities upon all the railways throughout the state was not to be implied.

The proper establishment of reasonable rates upon all commodities carried by railways and relating to each and all of them within the state depended upon so many facts which might be different in regard to each road that it was plain that the work ought not to be attempted without a profound and painstaking investigation, which could not be intelligently or with discrimination accomplished by wholesale. It might be a matter of surprise to find such power granted to any commission, although it would seem that it had in some cases been attempted. At any rate the jurisdiction of such an extraordinary commission should be conferred in plain language, free from any doubt. Such power was not to be taken by implication and the language should admit of no other construction.

Justice Peckham decides that the law gives the commission no power to fix rates in general but only after investigation to amend one found extortionate.

Missouri Rate Case.

On April 3 Frank Hagerman, counsel for all the leading railways in Missouri in the case involving the constitutionality of the passenger and freight rate laws of that state, filed a motion with Judge Smith McPherson in the Federal court at Kansas City asking the court to make certain changes in the decision rendered on March 8 in this case. He asked that the portion of the opinion in which the penalty clauses in the laws in question were held constitutional be stricken out, saying that the fines that could be imposed under the statute would amount to more than 30 times the value of the railway properties in the state. He also asked the court to strike out the portion of the decision recommending a 2½-cent fare on the stronger roads, saying that it was contrary to the finding in the decision that the roads were entitled to earn 6 per cent. Judge McPherson, in his original decision, directed that the cost of the suit be divided between the state and the railways. Mr. Hagerman asked that this also be stricken out, saying that if the roads were required to pay the costs of litigation that they won it would be a direct incentive to the state to protract the litigation against the carriers.

The Railroad Commission of Missouri has ordered a hearing at Kansas City on April 22 on the question of a reduction of rates on all classes and commodities. It is stated that the Commissioners intend to reduce the freight rates to a point just above the maximum fixed by law, which the Federal court held unconstitutional, and that they are acting on the advice of Attorney-General E. W. Major.

The legislature of Missouri is also once more taking a hand in the contest. The House Committe on Railroads has reported favorably a bill to empower the Railroad Commission, or any public service commission which may hereafter be created to take its place, to fix maximum passenger rates. For the purpose of the act the roads would be divided into three classes. Class A would include roads whose gross passenger earnings per mile from intrastate travel exceed $1,500 per annum; Class B those earning more than $750 and less than $1,500, and Class C those reporting less than $750.

Governor Hadley has written a letter to C. R. Gray, Vice-President of the St. Louis & San Francisco, urging the railways in the state to make a 2½-cent rate with 10 per cent. off for round trips instead of a 3-cent rate.

Traffic and Transportation Association of Louisville.

The Traffic and Transportation Association of Louisville has been organized at Louisville, Ky., with a membership of nearly 200. The following officers have been elected: President, J. B. Ford; Vice-Presidents, F. M. Hartwell, M. L. Akers and W. H. Newman; Directors, J. M. Ryan, R. L. McKellar, C. L. Adler, A. Brandeis, Charles P. Fink, L. J. Irwin and J. P. Hanly; Secretary, W. E. Chambers; Treasurer, W. T. Vandenberg. The purpose of the organization is to foster a closer relationship between shippers and railways. Permanent club rooms are to be secured. J. S. Bumbaugh, Traffic Manager of the American Steel & Wire Company, has given $500 as the nucleus of a fund for furnishing the club rooms.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

A. H. Bright, General Counsel of the Minneapolis, St. Paul & Sault Ste. Marie, has been elected also the Vice-President of the Wisconsin Central, succeeding A. C. Starr.

William G. Wheeler, United States District Attorney for Wisconsin, has been appointed the Counsel of the Chicago & North Western in Wisconsin, succeeding Edward M. Hyzer, promoted.

Frank A. Lehman, Superintendent of Transportation of the Atchison, Topeka & Santa Fe, has been appointed the Assistant to the Second Vice-President, succeeding C. W. Kouns, who has been appointed General Manager of the Western Lines, as announced in the *Railroad Age Gazette* of March 19. Mr. Lehman was born on May 31, 1871, at Mast Hope, Pa. He began railway work on August 18, 1888, as a telegraph operator on the Atchison, Topeka & Santa Fe. After that he was consecutively, to February 1, 1902, clerk in the office of the General Roadmaster, clerk in the office of the Trainmaster, clerk in the office of the Superintendent, a despatcher and clerk in the office of the Third Vice-President. On February 1, 1902, he was made chief clerk in the office of the Vice-President, and on November 1, 1907, was appointed Superintendent of Transportation.

F. A. Lehman.

Walter L. Ross, General Traffic Manager of the Toledo, St. Louis & Western and the Chicago & Alton, has been elected Vice-President in charge of traffic. He was born in 1869 at Bloomington, Ill., and educated in the public schools. He began railway work in 1887 as office boy on the Wabash. He later became operator and then was made chief clerk in the local office of the Wabash. Later he was transferred as clerk to the Trainmaster's office and was then promoted to local agent. He became General Agent for the Indiana, Illinois & Iowa, now part of the Chicago, Indiana & Southern. Before 1904 he had served as Freight and Passenger Agent, and on June 1 was made General Passenger Agent of the Toledo, St. Louis & Western. On April 1, 1905, he was appointed also General Freight Agent, and in December, 1907, was made General Traffic Manager of the Toledo, St. Louis & Western and the Chicago & Alton, which position he held until his recent election.

W. L. Ross.

Edmund Pennington, President of the Minneapolis, St. Paul & Sault Ste. Marie, has been elected also President of the Wisconsin Central, succeeding Newman Erb. Mr. Erb will retain his position as chairman of the board of directors.

E. R. Hudson, Vice-President of the Mexican Central, has been elected Vice-President of the National Railways of Mexico. J. M. Frazer, Treasurer of the National Railroad of Mexico, has been elected Treasurer of the National Railways of Mexico.

Edward S. Wortham, Purchasing Agent of the Toledo, St. Louis & Western and the Chicago & Alton, has been appointed also Assistant to the Senior Vice-President, George H. Ross. After receiving an education in the public schools of Lynchburg, Va., Mr. Wortham began railway work in January, 1889, as a messenger in the Yardmaster's office of the Shenandoah Valley, now a part of the Norfolk & Western, at Roanoke, Va. He later worked in the mechanical department of the Norfolk & Western, serving in various capacities. In 1892 he entered the transportation department, serving in various clerical positions. In 1894 he went to the Erie, where he held various clerical positions in the office of the General Freight Agent, at Buffalo, N. Y. On November 7, 1900, he was appointed secretary to the President of the Toledo, St. Louis & Western, at Toledo, Ohio, and on March 4, 1901, was made chief clerk to the President. On June 4, 1904, he was appointed Purchasing Agent, and on December 1, 1907, was made Purchasing Agent also of the Chicago & Alton.

Operating Officers.

R. D. Parker has been appointed the General Superintendent of the Atchison, Topeka & Santa Fe Western Lines, with office at La Junta, Colo.

S. W. Tracy has been appointed the Superintendent of Car Service of the Indiana Harbor Belt, with office at Gibson, Ind., succeeding R. W. Willis, deceased.

William N. Neff has been appointed the Superintendent of the St. Louis Southwestern of Texas, with office at Mount Pleasant, Tex., succeeding C. J. Larimer, resigned.

Payson Ripley, Trainmaster of the Atchison, Topeka & Santa Fe, has been appointed the Trainmaster of the Middle division, with office at Newton, Kan., succeeding W. C. Ashcraft, transferred.

C. W. Kouns, General Manager of the Western Lines of the Atchison, Topeka & Santa Fe, has been appointed the General Manager also of the Eastern Railway of New Mexico, with office at Amarillo, Tex.

Robert King has been appointed the Superintendent of district two, Atlantic division, of the Canadian Pacific, with office at Woodstock, N. B., succeeding D. W. Newcomb, assigned to other duties.

The position of Terminal and Lighterage Agent held by Riley Williams, of the Delaware, Lackawanna & Western, has been abolished and the duties of that position are assumed by E. T. Rine, Superintendent.

Leslie C. Reddish has been appointed the Car Accountant of the Toledo Terminal Railroad, with office at the terminal station, Toledo, Ohio. He will have charge of car records and per diem and reclaim accounts.

C. H. Gaunt, Assistant General Manager and Superintendent of Telegraph of the Atchison, Topeka & Santa Fe, has been appointed the Assistant General Manager of both the Eastern Lines and Western Lines, with office at Topeka, Kan., and will perform such duties as may be assigned to him.

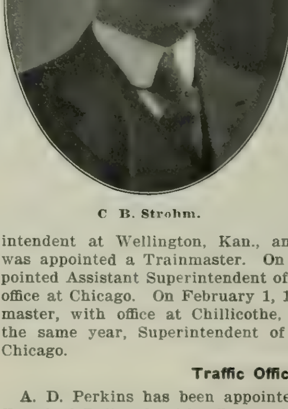
William Walliser, Assistant Superintendent of the Chicago & North Western, has been appointed the Superintendent of the Minnesota division, with office at Winona, Minn., succeeding E. G. Schevenell, resigned. H. M. Eicholtz, Trainmaster, succeeds Mr. Walliser as Assistant Superintendent of the Galena division, with office at Chicago. M. J. Hanson succeeds Mr. Eicholtz, with office at Clinton, Iowa.

Owing to the impaired health of T. S. McDowell, J. W. Walton will assume the duties of General Superintendent of the Missouri, Kansas & Texas of Texas, with the title of Acting General Superintendent, and Mr. McDowell will assume the duties of Superintendent of Transportation of the Missouri, Kansas & Texas and the Missouri, Kansas & Texas of Texas, with the title of Acting Superintendent of Transportation.

F. C. Fox, General Superintendent of the Eastern Grand division of the Atchison, Topeka & Santa Fe, has been appointed the General Superintendent of the newly created Eastern district of the Eastern Lines, with office at Topeka, Kan. H. W. Sharp, General Superintendent of the Western Grand division, has been appointed the General Superintendent of the Western district of the Eastern Lines, with office at Newton, Kan. The Eastern district comprises the lines in Illinois, Missouri, Kansas City and the eastern divisions. The Western district comprises the Middle, Southern Kansas and Oklahoma divisions.

Gilbert P. DeWolf, whose appointment as Superintendent of the National Railways of Mexico has been announced in these columns, was born in 1861 in Chattahoochee county, Ga. He took a college course at Auburn, Ala., and later studied some time at the United States Military Academy at West Point. He began railway work in 1887 as rodman on the Central of Georgia, being promoted later to Assistant Engineer. In 1902 he was appointed Supervisor on the National Railroad of Mexico and became successively roadmaster, yardmaster, Resident Engineer, Assistant Chief Engineer of Construction, Terminal Superintendent, Engineer of Maintenance of Way of the National Lines of Mexico, and was then made Superintendent.

Charles B. Strohm, Superintendent of Terminals of the Atchison, Topeka & Santa Fe at Chicago, has been appointed the Superintendent of Transportation, succeeding F. A. Lehman, promoted. He was born on December 30, 1861, at Iowa City, Iowa. After receiving an education in the University of Iowa, he began railway work in 1878 as an operator on the Atchison, Topeka & Santa Fe. In April, 1880, he opened the first railway telegraph office at Albuquerque, N. Mex. During the same year he was made material clerk at San Marcial, N. Mex., and in 1881 material clerk at Benson, Ariz. In 1882 he became a clerk in the Topeka, Kan., offices, and in 1885 was appointed material agent. In 1888 he was made chief clerk to the Superintendent at Wellington, Kan., and on March 18, 1889, he was appointed a Trainmaster. On June 10, 1894, he was appointed Assistant Superintendent of the Chicago division, with office at Chicago. On February 1, 1896, he was made a Trainmaster, with office at Chillicothe, Ill., and on August 1, of the same year, Superintendent of Terminals, with office at Chicago.



C. B. Strohm.

Traffic Officers.

A. D. Perkins has been appointed an Agent of the Toledo Terminal Railroad, with office at the terminal station, Toledo, Ohio.

Walter S. Curlett has been appointed a Freight Solicitor of the Pennsylvania, with office at New York, succeeding Walter J. Pollock, resigned.

George B. French, General Agent of the Chicago, Milwaukee & St. Paul, has been appointed also the Foreign Freight Agent, with office at Chicago.

J. E. Johanson has been appointed an Assistant General

Freight Agent of the Chicago, Rock Island & Pacific, with office at Little Rock, Ark.

Norton England has been appointed a Commercial Freight Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at Atlanta, Ga.

Thomas W. Parker, Chief Clerk in the Freight Department of the St. Louis & San Francisco, has been appointed the Assistant Freight Traffic Manager, with office at St. Louis, Mo.

R. M. Ritchey, a General Agent of the Union Pacific, has been appointed a General Agent of the St. Joseph & Grand Island, with office at Kansas City, Mo. J. J. Hartnett succeeds Mr. Ritchey, with office at Leavenworth, Kan.

J. N. Tittemore, General Traffic Manager of the Pere Marquette, having resigned, full charge of the Traffic Department will hereafter be in the hands of A. Patriarche, Assistant to the President, with office at Detroit, Mich.

E. P. Erkenbrack, Traveling Agent of the Wisconsin Central, has been appointed a Contracting Freight Agent of the Great Northern, with office at Tacoma, Wash. H. B. Crewson succeeds Mr. Erkenbrack, with office at Seattle, Wash. Effective April 10.

Ralph S. Stubbs has been appointed the General Freight and Passenger Agent of the Phoenix & Eastern, the Arizona & Colorado, the Maricopa & Phoenix and the Gila Valley, Globe & Northern, with office at Tucson, Ariz., succeeding M. O. Bicknell, resigned.

F. W. Brown, Agent of the Chicago, Peoria & St. Louis, has been appointed the General Agent, Freight Department, with office at St. Louis, Mo., succeeding John W. Fox, Commercial Agent, deceased. E. F. Randall succeeds Mr. Brown, with office at East St. Louis, Ill.

Thomas B. Moss, Traveling Freight Agent of the International & Great Northern, has been appointed a Commercial Agent, with office at Kansas City, Mo., succeeding E. M. Gannon, resigned to go into other business. W. G. Trufant succeeds Mr. Moss, with office at St. Louis, Mo.

C. W. Andrews, Contracting Agent of the St. Louis, Iron Mountain & Southern, has been appointed a Traveling Freight Agent, with office at Houston, Tex., succeeding T. A. Helm, promoted. W. Q. Hodgson, Live Stock Agent of the Missouri, Kansas & Texas, succeeds Mr. Andrews, with office at Dallas, Tex.

William P. Fitzsimons has been appointed the Commissioner of Industry of the Grand Trunk, with office at Montreal, and will have, in connection with freight and passenger traffic, express and transportation departments, special supervision of the work of locating new industries, etc., and general development of resources of the territory served by the Grand Trunk.

The Freight Tariff Bureau of the Wheeling & Lake Erie has been transferred from St. Louis, Mo., to the General Freight Department at Cleveland, Ohio, and the office of Chief of Tariff Bureau has been discontinued. All matters relating to coal, coke and ore traffic will be handled by H. J. Booth, General Coal and Ore Agent. Traffic other than coal, coke and ore, and matters pertaining to tariffs, divisions and percentages, will be under the jurisdiction of E. B. Coolidge, General Freight Agent.

R. J. McKay, Assistant General Passenger Agent of the Toledo, St. Louis & Western and the Chicago & Alton, has been appointed the First Assistant General Passenger Agent, with office at Chicago. C. R. Murray, Division Passenger Agent, has been appointed an Assistant General Passenger Agent, with office at St. Louis, Mo., instead of W. H. Abel, as previously reported, succeeding David Bowes, resigned. Frank W. Elder, Traveling Passenger Agent, succeeds Mr. Murray, with office at Springfield, Ill. Frank O'Brien, Traveling Passenger Agent, succeeds Mr. Elder, with office at Cincinnati, Ohio. W. D. Powell succeeds Mr. O'Brien, with office at St. Louis, Mo.

Engineering and Rolling Stock Officers.

James Carmack has been appointed a Supervisor of Signals of the Northern Pacific, with office at Seattle, Wash.

C. B. Keiser has been appointed the Master Mechanic of the Pennsylvania Tunnel & Terminal, with office at New York.

C. I. Leiper has been appointed a Supervisor of Track of the Pennsylvania Tunnel & Terminal, with office at New York.

James MacMartin, Chief Engineer of the Delaware & Hudson, has resigned to go into business for himself. A successor has not as yet been appointed.

George C. Koons, Supervisor of the Pennsylvania, has been appointed the Engineer of the Cumberland Valley, with office at Chambersburg, Pa., succeeding T. J. Brereton, resigned.

W. F. Ackerman has been appointed the Shop Superintendent of the Havelock shops of the Chicago, Burlington & Quincy, with office at Lincoln, Neb., succeeding F. Kroehler, assigned to other duties.

H. E. Billman, Roadmaster of the St. Louis, Iron Mountain & Southern, has been appointed the Assistant Division Engineer of the Southern Kansas division, with office at Coffeyville, Kan. Wade Ray succeeds Mr. Billman, with office at Wichita, Kan.

Augustus Mordecai, recently engaged in making a valuation of the physical property of the New York, New Haven & Hartford, and previous to that Engineer of Maintenance of Way of the Erie, has opened an office at 1328 Citizens building, Cleveland, Ohio, as Consulting and Constructing Engineer.

James M. Reid, whose appointment as Chief Engineer of the National Railways of Mexico has been announced in these columns, was born October 12, near Americus, Ga., in 1861.

James M. Reid.

Before and after entering college he served under his father, O. L. Reid, and uncle, Capt. W. L. Reid, well-known railway men of Georgia, Alabama and Texas, as apprentice in the Maintenance of Way and the Bridge and Building departments of the Western Railway of Alabama. In 1878 he entered the preparatory department of the Alabama Polytechnic Institute, taking a special course in architecture with the regular course in civil engineering. In the class of 1880 he was awarded the prize in drawing. During the summer of 1881 he worked as assistant engineer on location of the extension of the East Alabama & Cincinnati, now part of the Central of Georgia. In 1881 he accompanied his former professor in engineering, Col. R. A. Hardaway, an educator and railway builder, to Mexico, and served as assistant engineer on location and resident engineer on construction in the Tamasopo Cañon-Mexican Central Railway (Tampico division). In 1882 the faculty of the Alabama Polytechnic Institute granted the degree of B. E., considering the year's experience on heavy work in Mexico and with an approved examination equal to the senior year in college. In 1884 he was made engineer in charge of Weatherford and Mineral Wells railway work in Texas, and in 1886 Division Engineer in charge of location and construction on the Royal Trans-African Railway. In 1888 he was appointed Chief of Surveys and Superintendent of Construction. He received the honorary degree of C. E. from the Alabama Polytechnic Institute in 1890. In 1895 he was made a Division Engineer of the Mexican Central. From 1897 to 1900 he worked as levelman, transitman and engineer in charge of the Neuapan extension of the National of Mexico, and in 1900 became Roadmaster and a year later Reconnoissance Engineer of the El Salto extension, which is the only 1 per cent. compensated grade line for over 270 miles south-

bound into the City of Mexico. In 1902 he became Chief Engineer of Construction of the National of Mexico, and in 1906 Chief Engineer. A year later he was appointed Chief Engineer of Construction, National Lines of Mexico, which position he held until his present appointment.

R. G. Kenly, whose resignation as Engineer of Maintenance of Way of the Lehigh Valley has been announced in these columns, has been appointed the Chief Engineer of the Minneapolis & St. Louis and the Iowa Central. Mr. Kenly was born in 1866 at Ritchie Mines, W. Va. After an education in the public schools of Maryland and at Baltimore City College, he began railway work in September, 1885, as rodman on the location of the Annapolis & Baltimore Short Line, now part of the Maryland Electric. Later in the same year he was appointed levelman of the Baltimore & Eastern Shore, now part of the Baltimore, Chesapeake & Atlantic. On October 1, 1886, he was appointed Assistant Supervisor of the Northern Central. On March 15, 1891, he was appointed Supervisor of the Radford division of the Norfolk & Western. Two years later he was made Assistant Engineer of the same division, and in 1887 he became Assistant Trainmaster of this division and of the Pulaski division. The next year he was made assistant to the Chief Engineer of the West Virginia Central & Pittsburgh, now part of the Western Maryland. Later in that same year he was appointed draftsman and Engineer in charge of construction of the Philadelphia & Erie, now part of the Pennsylvania, and of the Northern Central. In 1899 he was made Supervisor of the Lehigh division of the Lehigh Valley, and later in that year Division Engineer of the Lehigh and New Jersey divisions of that road. In 1904 he was made Trainmaster of the same divisions, and was later made Superintendent and Chief Engineer of the Lehigh & New England. In June, 1908, he became Engineer of Maintenance of Way of the Lehigh Valley, which position he has since held.

R. G. Kenly.

Purchasing Officers.

W. K. Kilgore has been appointed the Fuel Agent of the Chicago, Milwaukee & St. Paul, with office at Chicago, succeeding H. R. Lloyd, resigned.

OBITUARY.

O. F. O'Connor, for the past 17 years Assistant Ticket Auditor of the Chicago, Milwaukee & St. Paul, died on March 31 at Chicago.

L. J. Storey, Chairman of the Texas Railroad Commission, who died recently at Austin, Tex., was 75 years old and had been a member of the Railroad Commission since November, 1894.

Charles H. Deans died at his home in Phoenixville, Pa., on March 7, 1909, after a week's illness of pneumonia. He was born in 1863, and graduated from Lehigh University in 1889 with the degree of C.E. By 1895 he had become Vice-President and Chief Executive Officer of Sooysmith & Co., foundation engineers and contractors. He later became President of the Engineering Contract Co. He was one of the first to successfully use pneumatic caissons in the foundation of the office buildings of New York. At the time of his death he was in charge of the construction of piers of the Baltimore & Ohio bridge over the Susquehanna river at Havre de Grace, Md.

Railroad Construction.

New Incorporations, Surveys, Etc.

Arkansas Co-Operative Construction Co.—See Northwest Arkansas Electric Interurban Railway.

Arkansas Roads.—L. S. Powers, of Fayetteville, Ark., and residents of Harrison are planning to build a line from Bergman, Ark., southwest via Harrison and Jasper towards Fort Smith.

Bennettsville & Cheraw.—Work, it is said, will be started about May 1 on an extension from Drake, S. C., southeast to Brownsville, seven miles.

Canadian River Railway.—See Santa Fe, Liberal & Englewood.

Cane River Belt.—Surveys and rights-of-way are said to have been secured by the Valley Trading Co. of Natchitoches, La., for a line from Alexandria, La., northwest via Colfax to Natchitoches, about 60 miles. The line will not be built unless the Sibley, Lake Bisteneau & Southern line of the Shreveport, Alexandria & Southwestern is extended south about 45 miles to a connection with its proposed northern terminus at Natchitoches.

Carolina, Clinchfield & Ohio.—Work has been completed from Dante, Va., to Bostic, N. C.

Chambersburg, Greencastle & Waynesboro (Electric).—An officer writes that it is the intention to eventually extend this line from Chambersburg, Pa., northeast to Shippensburg. The Penn Mar branch is also to be extended to Monterey. These improvements will probably not be carried out in 1909, as the company has had some difficulty in securing the necessary rights-of-way. (April 2, p. 774.)

Charlotte Harbor & Northern.—Work is said to have been started on the extension projected from Arcadia, Fla., north to Plant City, 60 miles. (March 19, p. 652.)

Chicago & Alton.—Oliver Brothers & Callaway, contractors, Knoxville, Tenn., have received a contract for grading and bridge work, excepting the steel, for 46 miles of second track and grade reduction on the Chicago-St. Louis line. The work is between Bloomington, Ill., and Atlanta, 19 miles, and between Springfield and Nilewood, 27 miles. Its completion will give the Alton a double-track line to Chicago from the south side of the coal fields which it traverses, with the exception of about four miles between Atlanta and Lawndale.

Chicago, Milwaukee & Puget Sound.—Track laying has been completed between Missoula, Mont., and Garrison. Press reports indicate that ballasting will be completed about June 1st, and that freight and passenger service will be established soon afterward. (March 19, p. 653.)

Dardanelle, Ola & Southern.—Plans are said to be complete to build an extension from Dardanelle, Ark., west to Paris, about 40 miles.

Dayton, Lebanon & Cincinnati R. R. & Terminal Co.—This company is building three miles of line south from Dayton to a connection with the main line. J. C. Carland & Co., contractors, Toledo, Ohio.

Dyersburg Northern.—Plans are said to be complete to build an extension from Tiptonville, Tenn., northeast to Hickman, Ky., about 40 miles. (March 19, p. 653.)

Hudson & Manhattan.—A sub-committee of the New York Public Service Commission, First district, has reported favorably on the application to extend the subway from its proposed terminus at Thirty-third street and Sixth avenue, Borough of Manhattan, New York City, to the Grand Central Station at Forty-second street. (Feb. 19, p. 380.)

Kingfisher, Colorado & Gulf.—Press reports from Oklahoma City, Okla., indicate that contracts have been let to Frank Adams, Stanley Brown and Frank Brown for building the first section from Oklahoma City northwest to Kingfisher. (April 2, p. 774.)

Mississippi Western.—A permanent survey is being made

for this line, projected from Meriden, Miss., southwest to Natchez, 165 miles. Much of the right-of-way has already been secured. (Oct. 2, p. 1075.)

Mobile & Ohio.—Press reports from Montgomery, Ala., indicate that a line is to be built from Narkeeta, Miss., northeast to Gainsville, Ala.

Norfolk & Western.—According to press reports, a large force of men are now at work double-tracking the line near Columbus, Ohio, cutting down grades, eliminating curves and making improvements all along the line.

Northwest Arkansas Electric Interurban Railway.—The Arkansas Co-Operative Construction Co., Bentonville, Ark., has been incorporated to build a standard gage electric interurban from Joplin, Mo., to northwest Arkansas, about 200 miles. Surveys have been in progress for some time and construction is planned at an early date. The officers are: President, Winlock Morris; Vice-President, H. A. Luekens; Secretary, J. W. Blocher; Treasurer, Dwight Dickson; Chief Engineer, P. H. Sackett.

Pennsylvania.—The work of double-tracking between Salisbury, Md., and Fruitland, four miles, is now under way. (March 19, p. 657.)

Salt Lake & Ogden.—An officer writes that the electrification from Salt Lake City, Utah, north to Ogden, 35½ miles, will probably be finished by June. Work on the transmission lines and overhead construction was started about a month ago and bonding will be commenced soon. All the work is to be under way by April 15. (March 19, p. 657.)

Sanford & Glendon.—Incorporated in North Carolina with a capital stock of $70,000 to build from Sanford, Lee county, N. C., east to Glendon, 14 miles. Incorporators include: J. B. Linnig, W. C. Carrell and J. H. Glover, of Philadelphia, Pa., and J. H. Hull, of Hemp and J. H. Kennedy, of Gulf.

Santa Fe, Liberal & Englewood.—The tentative plans of reorganization which are being considered by the new joint committee in regard to protective measures in respect to the New Mexico and Oklahoma enterprises projected by E. D. Shepard & Co., New York, involve the formation of a new holding company to take over the various properties according to their valuation. The report of T. J. Odell and E. V. Harman, who have made an investigation into the status of the several enterprises, is in part as follows:

There are no immediate prospects of building this line. The conditions are such that a financial plan could not be presented which would show any return on the investment for some time. While the line is necessary for the development of the territory served, it cannot be made to pay on coal traffic alone. (March 19, p. 658.)

There is no necessity for completing the Santa Fe, Raton & Des Moines, into Des Moines, Iowa, for two reasons: first, there is not sufficient coal traffic going into Texas by this route to warrant such construction, and second, should the present tonnage increase to 1,000,000 tons annually, and that tonnage be equally divided between the Colorado & Southern, St. Louis, Rocky Mountain & Pacific and the Santa Fe, Raton & Des Moines, it would then be cheaper to make a trackage or traffic agreement with the Rocky Mountain road than to parallel it for a distance of 30 miles. (March 19, p. 658.)

The Santa Fe, Raton & Eastern should be temporarily abandoned and the property placed in the hands of a caretaker as there is no local traffic on the line and the mail contract can be carried out with a horse and wagon. The road should remain out of commission until the properties of the Yankee Fuel Co. are sufficiently developed to warrant shipments.

The Canadian River Railroad is projected from Woodward, Okla., to Oklahoma City and Guthrie, 220 miles, of which five miles are graded at Woodward. (March 19, p. 652.)

Santa Fe, Raton & Des Moines.—See Santa Fe, Liberal & Englewood.

Santa Fe, Raton & Eastern.—See Santa Fe, Liberal & Englewood.

Shreveport, Alexandria & Southwestern.—See Cane River Belt.

Tennessee Northern.—An officer writes that the proposed route is from Ravenscroft, Tenn., on the N. C. & St. L. branch, to Winchester Siding, on the Queen & Crescent. The work will include one bridge 400 ft. long and 90 ft. high. (March 19, p. 658.)

Veblen & Northwestern.—Incorporated to build from Veblen, S. Dak., northeast to Hankinson, N. Dak., about 30 miles. The charter was recently amended to change the proposed route from Veblen east via White Rock to a connection with the Chicago, Milwaukee & St. Paul at a point near White Rock.

Virginian Railway.—On April 2 the road was formally opened for traffic from Norfolk, Va., west, thence north to Deepwater, W. Va., 436 miles.

West Virginia Roads (Electric).—Albert M. Schenck, of Wheeling, W. Va., associated with Pittsburg, Pa., capitalists, is planning to operate a high-speed electric line from Wheeling northeast to Pittsburgh, Pa. The plans call for a new line from Wheeling to a connection with the Wabash at West Middletown, Pa., about 15 miles, from which place the tracks of the Wabash are to be used into Pittsburgh, 30 miles.

Railroad Financial News.

Denver City Tramway.—Clark, Dodge & Co., New York, the International Trust Co., Denver, Colo., and E. W. Clark & Co., Philadelphia, Pa., have sold at 95 the present issue of $1,848,000 first and refunding mortgage 5 per cent. bonds of 1908-1933. The company owns and operates the street railways of Denver, Colo., about 185 miles of track. The bonds are part of an authorized issue of $25,000,000.

Erie.—The Public Service Commission, Second district, has given an extension of 30 days in which the Erie may accept the provisions of the commission's order regulating the issue of $30,000,000 bonds.

Fonda, Johnstown & Gloversville.—Holders of the $2,500,000 outstanding common stock are given the right to subscribe at par for $500,000 6 per cent. cumulative preferred stock to the extent of 20 per cent. of their holdings. A syndicate has agreed to take at par all the stock not otherwise subscribed for. The Fonda, Johnstown & Gloversville runs from Fonda, N. Y., to Northville, 26 miles.

Houston Belt & Terminal.—A first mortgage securing $2,246,000 5 per cent. 30-year bonds has been approved by the Texas Railroad Commission. The money derived from the sale of the bonds is to be used to reimburse the Atchison, Topeka & Santa Fe, the Trinity & Brazos Valley, the St. Louis, Brownsville & Mexico, and the Beaumont, Sour Lake & Western for money advanced by them for construction work on the property of the Houston Belt & Terminal.

Interborough Metropolitan.—Edwin Hawley has been elected a director, succeeding W. G. Oakman, resigned. During the past year or more the following directors have retired: Paul D. Cravath, J. S. Auerbach, John D. Crimmins, J. B. McDonald, De Lancey Nicholl and George W. Wickersham, and the following new directors have been elected: H. M. Fisher, W. L. Pepperman, W. G. Roelker, R. R. Govin and August Belmont, Jr.

Metropolitan Street Railway (New York).—Over 90 per cent. of the 4 per cent. 100-year refunding bonds has been deposited under the agreement of November 25, 1907, with the bondholders' protective committee, Edwin S. Marston, chairman, and the time for making deposits has been limited to May 1.

Millbrook Company.—See New York, New Haven & Hartford.

New York & Portchester.—See New York, New Haven & Hartford.

New York, New Haven & Hartford.—The Public Service Commission, Second district, has granted permission to the New Haven company to buy all the stock of the New York & Portchester and the New York, Westchester & Boston, thus making it possible to do away with the Millbrook Company. (March 12, page 526.)

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

RUTLAND.—With a total mileage operated of 468 miles in both years, the company had gross earnings of $2,744,240 in 1908 as compared with $3,058,087 in 1907, nearly the entire decrease in earnings being in the falling off in earnings from freight. There was revenue from this source amounting to $1,525,097, a decrease of over 17 per cent. from the earnings in 1907. Expenses as a whole also decreased; they amounted to $1,963,516 in 1908, being $210,462 less than in the previous year, and taking 71.55 per cent. of gross earnings as compared with 71.08 taken for expenses in 1907. A large part of the saving in expenses came from heavily cutting maintenance charges. Maintenance of equipment for instance cost $356,610 last year, being $72,241, or 17 per cent. less than in 1907. Maintenance of way and structures cost $393,358 last year. This is $93,397 less than was charged for this account in the previous year. The expenses of conducting transportation while equaling 38.18 per cent. of the gross revenue in 1907, equaled 40.85 per cent. in 1908.

Repairs and renewals of locomotives averaged $1,715 per locomotive owned in 1908 as compared with $2,119 in 1907, and repairs and renewals of passenger-train cars averaged $660 per car in 1908 as compared with $662 in 1907; while repairs of freight cars averaged $45 per car in 1908 as compared with $52 in 1907.

Under conducting transportation expenses, while there was a decrease in cost of fuel for locomotives and other such expenses due to less business in 1908, the amount charged for loss and damage was $24,116, an increase of $9,303 over the amount charged in 1907.

The balance sheet shows cash on hand of $249,466, and cash loans of $50,000. Current liabilities amount to $589,348, and there are in addition notes payable amounting to $363,819. There is no information in the annual report as to when these notes are due.

The preferred stock of the Rutland is a 7 per cent. cumulative stock of which $9,057,600 has been issued, and in the past minority stockholders have complained that money was put back into the property that might more properly have been paid in dividends to the preferred holders. In 1907 and 1906, 1½ per cent. was paid on this preferred stock, and in 1908 nothing was paid. There has never been more than 4 per cent. paid on the stock and therefore there is a large accumulated dividend due. After crediting the sinking fund for redemption of equipment bonds with $100,000 in both 1908 and 1907, and after the payment in 1907 of $135,864 in dividends, the company had a surplus of $71,499 in 1908 and $7,308 in 1907.

The total number of tons of revenue freight carried amounted to 1,759,502 tons in 1908 and to 135,828 tons in 1907. Earnings per ton per mile were 0.794 cents in 1908 and 0.781 cents in the previous year. There were 1,567,231 passengers carried last year as compared with 1,621,104 in the previous year; and earnings per passenger per mile amounted to 2.241 cents in 1908 and 2.225 cents in 1907.

SANTA FE, RATON & DES MOINES.—See notice about this company under Santa Fe, Liberal & Englewood in the Railroad Construction column.

SOUTHERN RAILWAY.—The $16,000,000 5-year 5 per cent. collateral trust bonds due April 1 were paid at the Guaranty Trust Co., New York.

VIRGINIAN RAILWAY.—See this company under Railroad Construction.

WESTERN MARYLAND.—The interest due April 1 on the $42,518,000 first mortgage bonds was paid by the receiver through the sale of $700,000 4¼ per cent. receiver's certificates, and the United States Circuit Court at Baltimore has authorized the receiver to sell in addition $1,250,000 5 per cent. receiver's certificates to mature April 1, 1911. The proceeds are to be used to pay a promissory note for $1,101,875 held by the Washington Trust Co., New York, and to deposit $41,734 under the sinking fund agreement of the first mortgage of the Georgia's Creek & Cumberland. This issue is a direct obligation of the receiver and a first lien on the entire capital stock of the Georgia's Creek & Cumberland, owned by the Western Maryland.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Canadian Pacific has ordered two Pacific locomotives from the American Locomotive Co.

A. V. Kaiser & Co., Philadelphia, Pa., are in the market for from 4 to 6 saddle tank engines. These engines should have 8-in. or 9-in. cylinders and weigh from 10 to 12 tons. Bidders are requested to give full details by first mail, with prices based on the engines knocked down in export shipping shape, f.o.b. alongside steamer in New York for shipment to Cuba.

The Detroit River Tunnel Co., a subsidiary company of the Michigan Central, has ordered six electric locomotives from the General Electric Co. One of the locomotives has been built and tested. The remaining five are now under construction and will be delivered early next fall, a few months before the completion of the tunnel. Each locomotive will weigh 100 tons, and it is planned to use two of them for the handling of heavy freight trains through the tunnel. The number that will be required to take care of the freight and passenger business crossing the Detroit river is at this time problematical, and until the tunnel is in full operation it will not be known whether additional locomotives of similar design will be ordered.

CAR BUILDING.

The Cuba Railroad is in the market for 100 box and 100 flat cars. The specifications are Cuba Railroad standard.

The Washington Water Power Co., Spokane, Wash., has authorized the purchase of 15 additional cars. These are to be delivered before next fall.

The Marshall & East Texas has ordered one passenger coach and one combination mail, baggage and passenger car from the American Car & Foundry Co.

The La Belle Iron Works, Steubenville, Ohio, reported in the *Railroad Age Gazette* of March 5 as asking prices on 50 seventy-five-ton gondola cars, has decided to defer the purchase of this equipment for the present.

A. V. Kaiser & Co., Philadelphia, Pa., are in the market for about 50, one or two-yard capacity, 30-in. gage, one or two-way dump cars. Bidders are requested to give full details by first mail, with prices based on cars knocked down in export shipping shape, f.o.b. alongside steamer in New York for shipment to Cuba.

The Chicago, Milwaukee & St. Paul has ordered 67 passenger cars. As reported in the *Railroad Age Gazette* of April 2, 15 baggage, 10 sleeping, 10 coaches and 5 dining cars will be built by the Pullman Co. The remaining cars, including 15 coaches, 10 mail and express and 2 buffet cars, will be built by the Barney & Smith Car Co.

The Canadian Pacific, as reported in the *Railroad Age Gazette* of March 5, has ordered 500 fifty-ton steel coal cars from the Dominion Car & Foundry Co. These cars will be 36 ft. 9½ in. long, 9 ft. 6 in. wide and 5 ft. high, inside measurments, and 38 ft. 10 in. long over end sills. The special equipment will include:

Brakes	Westinghouse
Bolsters, truck	Simplex
Brake beams	Simplex
Brake shoes	Am. Brake Shoe & Fdry. Co., steel back
Couplers	Simplex
Draft gear	Miner
Dust guards	Harrison
Journal boxes	McCord, malleable iron
Side bearings	Susemihl, roller
Trucks	Arch bar type with Barber roller device
Wheels	Canadian Pacific standard

IRON AND STEEL.

The Milwaukee Light & Power Co. has ordered 4,500 tons of girder rails from the Pennsylvania Steel Co.

The Lake Shore & Michigan Southern has ordered 3,500 tons of open-hearth rails from the Indiana Steel Co.

The Chicago Railways Co. has ordered 22,000 tons of girder rails from the Lorain Steel Co. and will probably place an additional order of 5,000 tons soon.

The Twin City Rapid Transit Co. has ordered 1,100 tons of open-hearth rails from the Indiana Steel Co. These rails are for the Duluth-Superior Traction Co.

The Trans-Continental Railway Commission, P. E. Ryan, Secretary, Ottawa, Ont., will receive bids until April 13 for 5,154 gross tons of 80-lb. rails, either open hearth or Bessemer, and the necessary fastenings, for delivery at West Fort William, Ont., by June 15.

General Conditions in Steel.—In summing up the steel situation the *Wall Street Journal* brings out the following facts: First, the United States Steel Corporation is operating at about 60 per cent. of its capacity and has been for the last two months; second, according to present estimates, the Steel Corporation will show about $15,000,000 earnings for the current quarter, or about $60,000,000 a year; third, the independent steel companies are suffering, as present prices for steel seem to indicate that many of them will be forced to either reduce or pass their dividends; fourth, the Steel Corporation continues to under-cut its competitors in its aggressive policy for business; fifth, the merchant blast furnaces, which supply iron to the independent mills, are suffering and will be compelled to make a curtailment in production; sixth, the Steel Corporation has not as yet reduced wages, but may yet do so; seventh, no pronounced improvement in steel earnings can be expected for some time to come, perhaps not until the latter part of this year; eighth, improvement in steel is confined to structural steel, tin plates and sheets, and ninth, wire products and steel rails are the only classes of steel not affected by the price changes.

RAILROAD STRUCTURES.

Fort Worth, Texas.—Press reports indicate that the fire on April 3 destroyed the roundhouse, repair shops, coal chutes and a number of box cars belonging to the Texas & Pacific, and that about 20 locomotives were greatly damaged. Officers of the road are reported to have placed the damage at about $160,000.

New York.—Announcement was made on April 5 by the New York Bridge Department that the lower floor members of the river span of the Manhattan bridge across East river would be completed by April 9.

Rice Lake, Wis.—The Chicago, St. Paul, Minneapolis & Omaha is said to be planning to put up a brick passenger station at Rice Lake to cost $25,000.

St. Boniface, Man.—The National Transcontinental Railroad Commission has accepted the bid submitted by Haney, Robertson & Quinlan, of Montreal and Toronto, for building the new terminal shops. The amount of their bid was $869,000. (Dec. 18, p. 1612.)

Tacoma, Wash.—The Northern Pacific will let a contract soon for building a temporary passenger station and office building to be used while its permanent station and terminals are being completed. They will be erected at Dock and Twentieth streets. The passenger station will be one story high with dimensions of 182 ft. x 35 ft. The office building will adjoin the passenger station and be two stories high.

SIGNALING.

The Duluth & Iron Range has given a contract to the Federal Signal Co. for a mechanical interlocking plant at Knife River, Minn.

The Missouri, Kansas & Texas is in the market for three-position automatic block signals to be installed between Machens, Mo., and New Franklin, Mo., 162 miles.

Supply Trade News.

T. N. May, heretofore with the Brady Brass Co., New York, is now dealing in railway equipment and supplies, with office at 2 Rector street, New York.

Frank Miller, formerly the Engineer of Julian L. Yale & Co., Chicago, has been appointed the Sales Manager of the W. L. Miller Heating Co., Chicago.

The H. W. Johns-Manville Co., New York, has given the contract for 1,100 tons of structural steel for its new warehouse at Milwaukee, Wis., to the American Bridge Co.

The Automatic Car Coupler Co., Los Angeles, Cal., has been incorporated with $50,000 capital stock. The incorporators are F. R. Bonney, F. H. Norwood, W. H. Soale, K. Elliott and C. H. Wills.

The New York, Philadelphia & Norfolk has ordered a steel car float with a capacity of 30 cars, and also a sea-going steel hull tug boat. The present floating equipment of the N. Y., P. & N. consists of 11 car floats and 7 tugboats.

The Union Draft Gear Co., Chicago, has been incorporated to manufacture and deal in railway specialties, equipment and appliances; capital stock, $2,000,000. The incorporators are Matthew J. O'Brien, Daniel L. Madden and Francis O'Shaughnessy.

A. Munch, for the past eight years Sales Manager of the Northern Metallic Packing Co., St. Paul, Minn., has resigned. It is understood that Mr. Munch will take a vacation, after which he will become identified with a prominent supply concern.

The New York offices of the Baldwin Locomotive Works, Philadelphia, Pa., and the Standard Steel Works Co., Philadelphia, have been moved to 50 Church street. The New York representatives of both companies are Harry W. Sheldon and Frederick W. Weston.

Gustav Baurmann, President of the Phoenix Car Spring Co., Chicago, died at his home in Chicago on March 31 as a result of a stroke of apoplexy which he suffered nearly a year ago. He was born in 1857, at Louisville, Ky., and located in Chicago about thirty years ago.

A. R. Young, C.E., Western Agent of the Fort Pitt Bridge Works, Pittsburgh, Pa., has resigned to become a member of the firm of W. R. Carter & Co., engineers and contractors, Lawrence, Kan. H. C. Breidert, C.E., of the Pittsburgh office of the Fort Pitt company, succeeds Mr. Young, with office at Chicago.

The Rowe Perfection Sleeping Car Co., Seattle, Wash., has been incorporated with $20,000,000 capital to manufacture and sell a new type of sleeping car. It is intended to build a plant employing several thousand men. President, John Anthen; Vice-President, Eugene E. Harold; Secretary and Manager, John L. Loughran, all of Seattle.

James MacMartin, Chief Engineer of the Delaware & Hudson, has resigned, effective about May 1, to become Vice-President and General Manager of the Elmore & Hamilton Contracting Co., Albany, N. Y. The Contracting company has work under way on the Long Island Railroad, the Western Maryland and the New York city water supply system.

An organization in a city of Latin America engaged in the import and export trade would like to receive propositions and prices from contractors for furnishing the following materials: Locomotives, fuel, bridge material, rails, turn-tables, water tanks, telegraph and telephone supplies, trucks, concrete and cement block machines, wire and building materials of all kinds. (Inquiry No. 3250, Bureau of Manufactures, Washington, D. C.)

The General Railway Equipment Co., Chicago, has just been organized to do a general business in buying, selling and handling new and rebuilt railway and contractors' equipment, locomotives, cars, steam shovels, etc. I. J. Kusel, formerly President of the American Car & Equipment Co., Chicago, is President, and Thomas C. McCalla is Secretary

and Treasurer. The offices of the company are at 1535 Old Colony building.

The Commonwealth Steel Co., St. Louis, Mo., has given the contract for the erection of a finishing building, 75 ft. x 125 ft., and a core and sand storage room, 62 ft. x 112 ft., at its Granite City, Ill., works, to the Missouri Bridge & Iron Co., St. Louis, Mo. The new equipment to be installed will include a 7½-ton traveling crane, which will be built by the Commonwealth company; one 4-ft. and one 10-ft. heavy duty planer, the latter to be furnished by Manning, Maxwell & Moore, Inc., New York.

A report from an American consul in eastern Europe says that it is understood that contracts have been let for the construction of nine sections of roadbed for a railway in that region. The consul reports that this should be a good opportunity for the sale of construction materials. Two large bridges will be built. Plans and specifications will be ready shortly and the construction will be under the supervision of an engineer whose address is given in the report. (Inquiry No. 3255, Bureau of Manufactures, Washington, D. C.)

W. P. Pressinger, who recently resigned as General Manager of the compressor department of the Chicago Pneumatic Tool Co., Chicago, has organized the W. P. Pressinger Co. to handle the vacuum cleaning machines, both portable and stationary, made by the Keller Manufacturing Co., Philadelphia, Pa., and formerly sold by the Chicago Pneumatic Tool Co. The new company has opened offices and sales rooms at 1 West Thirty-fourth street, New York, and will establish local agencies at all distributing points throughout the eastern territory.

The partnership association, existing for the past 20 years under the name George M. Newhall Engineering Co., Ltd., Philadelphia, Pa., has expired and a corporation, the George M. Newhall Engineering Co., has been formed to succeed to the business. The engineering department will be under the personal management of George M. Newhall, President, as heretofore, and the department of supplies for railways, manufacturers and contractors will be under the direction of David Newhall, Vice-President. Robert S. Newhall is Secretary and Treasurer. M. L. Newhall is Manager of the Chicago office.

The Albany Car Wheel Co., Albany, N. Y., has taken over the Thatcher property and will at once begin the manufacture of chilled iron wheels for steam and electric cars. The President of the company is J. A. Kilpatrick, who has been in the wheel business for 30 years and is General Manager of the Canada Iron Corporation, Montreal, Que. J. A. MacIntyre, who has been associated with Mr. Kilpatrick for some years, is Superintendent of the new company. J. A. Granger, for many years with the New York Car Wheel Works, Buffalo, N. Y., and the Griffin Wheel Co., Chicago, is in charge of sales of the new company.

Jasper R. Rand, Vice-President and a Director of the Ingersoll-Rand Company, New York, died of pneumonia in Salt Lake City, Utah, on March 30. Mr. Rand was the son of Jasper Raymond Rand, one of the founders of the Rand Drill Company, and was born in Montclair, N. J., in 1874. He graduated from Cornell University in 1898 with the degree of Mechanical Engineer, and served in Porto Rico in the Spanish-American War as a member of the First New York Volunteer Engineers. During 1899 and 1900 he was President of the Imperial Engine Co., Painted Post, New York, leaving that position to take the Presidency of the Rand Drill Company, which he held until 1905. In that year he was elected Vice-President and a Director of the Ingersoll-Rand Company. Mr. Rand was a member of the American Institute of Mining Engineers and of the American Society of Mechanical Engineers.

Walter S. Seamans, Jr., who on March 1 was made Assistant to the Vice-President, Sales Department, of the American Locomotive Co., New York, is well fitted for the important office he has assumed. He is a graduate of Brown University (1902) with a B. A. degree. In June of that year he entered the employ of the operating department of the New York, New Haven & Hartford and was later transferred to the mechanical department, serving on both the Providence and Worcester divisions. In May of the year following he was made an assistant in the purchasing department of the Providence Works of the American Locomotive Co.; and in April of 1904 was transferred to the Montreal Works as assistant to the Superintendent. Six months later Mr. Seamans was made Chief Clerk to the General Superintendent at the Schenectady Works of the American Locomotive Co. and was later appointed Assistant to the Manager of the same works. On November 1, 1908, he was appointed Assistant Manager, remaining at Schenectady until last month, when he went to New York to assume the duties of Assistant to Vice-President. Mr. Seamans is 29 years old, having been born in Providence, R. I., in 1880.

John M. Goodwin, of New York, who for nine years was President and General Manager of the Goodwin Car Company, New York and Chicago, having received reports of the Inland Empire country, became enthused with its master-spirit, growth and progress, and realizing that here was a field for unlimited energy and expansion, has selected Spokane, Wash., for his business center and has established his office in that city. Mr. Goodwin was for years a designer, mechanical expert, draftsman, superintendent, modeler and decorative renderer in connection with some of the most magnificent and costly residences and public buildings in the country. He was engaged in the office of some of the most prominent architects of this country, doing modeling work, steel construction and designing on the New York *World* building in the office of George B. Post, architect; also in the office of Richard M. Hunt. Mr. Goodwin worked on the drawings for the George W. Vanderbilt mansion at Biltmore, on the John Jacob Astor estate, on the Ogden Gillette gates at Ochre Court, Newport, and on a number of other such buildings. He also represented Richard M. Hunt at the world's fair at Chicago, being located on the grounds during the erection of the Administration building, which was Mr. Hunt's design. Mr. Goodwin organized and promoted the Goodwin Car Company. The first steps were taken in Chicago. He gradually worked out of his engineering and architectural business as the Goodwin car demanded more and more of his attention, until eventually his entire time was devoted to it. Having secured a competent management for this enterprise, he feels that he can confidently turn his attention to new enterprises in the rapidly growing Inland Empire, resting assured that his stock interests in the car company will be well looked after.

John M. Goodwin.

TRADE PUBLICATIONS.

Car Mover.—The Niagara Device Co., Buffalo, N. Y., in a small leaflet describes, with an illustration, the Niagara car mover.

Motor Talks.—The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has issued pamphlet No. 4 on the various uses of the electric motor. The pamphlet also contains a table for finding the current in a three-phase circuit.

Christopher Columbus.—The Carborundum Co., Niagara Falls, N. Y., has just issued a small pamphlet which contains a clever satire on Christopher Columbus, written by F. W. Haskell, President of the company. This pamphlet is Vol. I. of the Revised American Statesmen Series.

Sand Blast.—The Niagara Device Co., Buffalo, N. Y., has issued two leaflets, one of which contains a general description with illustrations of the Niagara sand blast and the other of the Niagara paint spray. These devices were described in the *Railroad Age Gazette* of October 9, 1908.

Identification of Smiths.—The Crocker-Wheeler Co., Ampere,

N. J., is mailing a type-written page containing the identifications of the various electrical engineers at Ampere who are named Smith. It says that statistics show that 1.1 per cent. of electrical engineers are named Smith, and they have been identified at these works by the following: Initials, department, complexion, stature and characteristics.

Safety Valve Capacity.—The Consolidated Safety Valve Co., New York, has just issued, in pamphlet form, the paper which was read before the American Society of Mechanical Engineers, Feb. 23, 1909, by Philip G. Darling, B.S., mechanical engineer of the company. In addition to the full text of the paper, the pamphlet contains valuable data and tables compiled by the author from extensive tests made on safety valves. This book is published for distribution among mechanical and steam engineers, and will be sent to anyone making application. The paper was published in the *Railroad Age Gazette* of March 5, 1909.

Calendar of Railway Conventions.—The Storrs Mica Co., Owego, N. Y., maker of headlight chimneys and lantern globes, has issued a monthly calendar showing the dates of railway club and association meetings and conventions, which should be useful on every railway man's desk. The page for a month is 6½ in. wide and 10 in. high, and a space of ½ in. x 3 in. is allowed for each day. This affords space for all necessary notations on the subject dealt with; and the number of items is by no means small. Under April 9, for example, we find the St. Louis Railway Club, Iowa Railway Club, Central Association of Railroad Officers, American Institute of Electrical Engineers and Western Society of Engineers. There is space also for pencil memoranda.

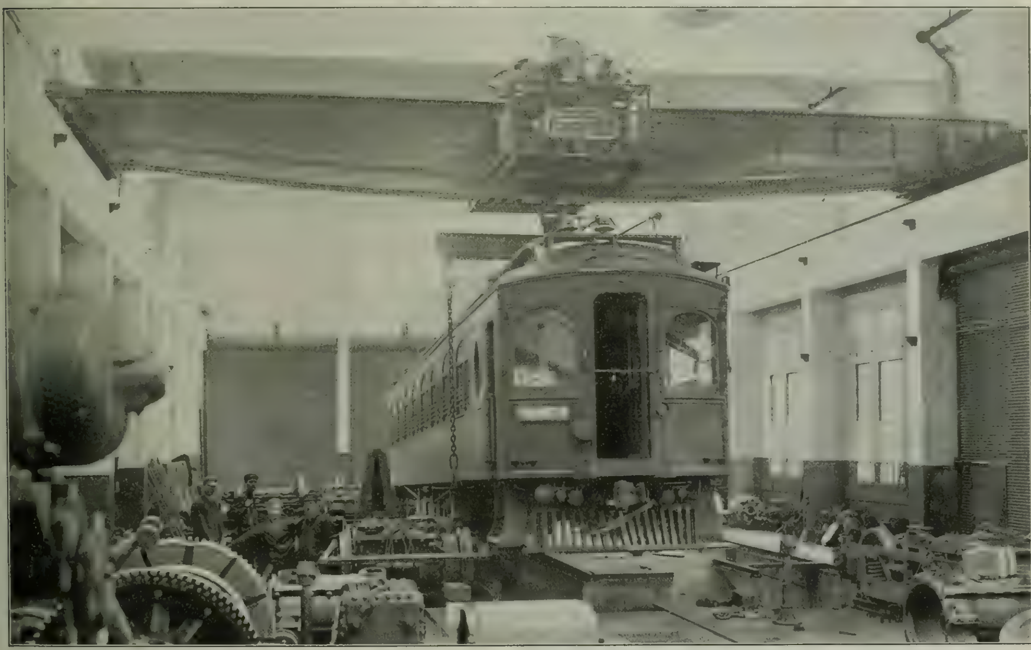
Cosmo Lubricating Oils.

The Cosmo Lubricating Co., Chicago, is making an oil for lubricating purposes that has withstood a fire test of 1,200 deg. F., and is claimed absolutely to prevent hot journals and bearings. The oil also has a viscosity test of between 580 and 625 degrees. In a number of actual tests this oil has been placed on hot shafts, bearings, journals, etc., and has quickly cooled them while running. Another point is its cold test, which is between 10 and 14 deg. F., according to grade. The grades run from a thin to a very heavy oil, and from a soft to a hard grease, being dark brown in color. Heretofore the combination in one oil of both a high fire test and a low cold test has been difficult, if not almost impossible, to obtain. The company makes all kinds of lubricating oils. One of its specialties is a cylinder oil which it is claimed will not leave a deposit on the cylinders.

The directors of the company are J. G. Wiegand, C. H. Wiegand, D. E. Patterson, H. A. Ellithorpe and Charles Hayward. Its plant is at 9 to 15 North Ada street, Chicago.

Traveling Crane for Suburban Car Shop.

When designing the new car repair shops of the Washington, Baltimore & Annapolis Electric Railway, at Academy Junction, Md., shown in the accompanying half-tone, the Roberts & Abbott Co., Cleveland, Ohio, designing engineers, provided in their plant for the installation of an electric traveling crane to be used, first in setting the new shop machinery and later to handle car bodies and heavy running gear parts.



Interior of Washington, Baltimore & Annapolis Electric Railway, Academy Junction, Md.
Showing Whiting Electric Traveling Crane.

The accompanying illustration shows this crane supporting one end of a car body by a yoke, the car having previously been placed with one truck standing on a small transfer table. On raising the bar body, the truck can readily be run out to one side, and, if desired, either into the blacksmith shop or onto the tracks outside the building.

The principal features of the crane are as follows:

Capacity of main hook	15 tons
Capacity of auxiliary hook	6 tons
Span	42 ft.
Hoisting speed, main hook	13 ft. per min.
Hoisting speed, auxiliary hook	50 " " "
Bridge travel	200 " " "
Trolley travel	120 " " "
Motal, main hoist	20 h. p.
Motor, auxiliary hoist	15 "
Bridge travel	15 "
Trolley travel	3.5"

The motors are the Westinghouse type K, working at 550 volts, d.c. The controllers are types G-3 and V of the Electric Controller & Manufacturing Company, Cleveland, Ohio.

On the pilasters on both sides of the shops are brackets or pin bearings for the support of small capacity wall cranes. A small number of wall cranes will render very good service over the entire shop, by

using the electric crane to place a wall crane on any pilaster where needed at a moment's notice.

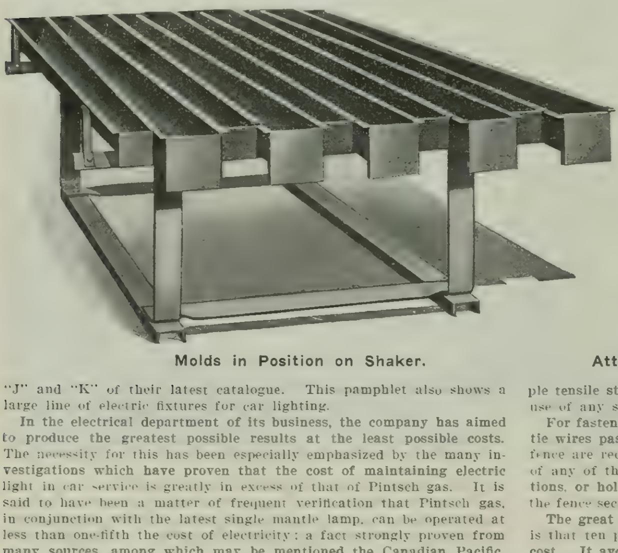
As ordinarily built, the operator's cage is placed below the crane at one side of the girder near the runway. On this crane such an arrangement would interfere with the wall cranes. The cage is placed at the center of the span and at a height sufficient to clear cars when lifted to the maximum height.

The transfer table, the pit of which is to be seen in the illustration, is required to move only the heavy trucks, although it is of strength sufficient to sustain a completely equipped car when rolled across it. The table is operated by hand power, the travel being short.

Both crane and transfer table were designed, manufactured and erected by the Whiting Foundry Equipment Co., Chicago. The building is of reinforced concrete, built with brick curtain walls. The size of the building is 256 ft. 8 in. x 83 ft. 8 in., and the design is such that the lighting is exceptionally good. The heating is by the fan system, with ducts under the floors, and automatic sprinklers provide fire protection.

Recent Developments in Car Lighting.

The Safety Car Heating & Lighting Co., New York, is meeting the demands of the situation in its field. As a result of 16 years' experience the company has in the last few years been installing its axle dynamo electric lighting system, and in successful service tests has demonstrated the value of the equipment. The system has been in service on the Kansas City Southern, St. Louis Southwestern, Pennsylvania, Chicago, Rock Island & Pacific, Grand Trunk and New York, Chicago & St. Louis, and within the past few months the company has received an order from the Rock Island for 70 equipments as well as an order for 10 from the Pullman Co. The dynamo, switchboard and regulator, together with their parts, are all illustrated and described in sections



Molds in Position on Shaker.

"J" and "K" of their latest catalogue. This pamphlet also shows a large line of electric fixtures for car lighting.

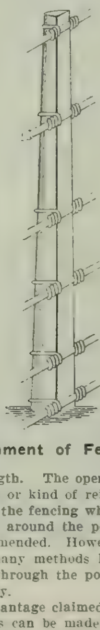
In the electrical department of its business, the company has aimed to produce the greatest possible results at the least possible costs. The necessity for this has been especially emphasized by the many investigations which have proven that the cost of maintaining electric light in car service is greatly in excess of that of Pintsch gas. It is said to have been a matter of frequent verification that Pintsch gas, in conjunction with the latest single mantle lamp, can be operated at less than one-fifth the cost of electricity; a fact strongly proven from many sources, among which may be mentioned the Canadian Pacific, where it has been in successful operation for several years on 1,292 cars. The Safety Car Heating & Lighting Co. has recently remodeled the entire flat flame equipment of the Delaware, Lackawanna & Western, is now remodeling 8,000 lamps for the Philadelphia & Reading, and the lamps on over 600 cars on the Pennsylvania. The alteration of these flat flame lamps, of which there are over 175,000 in service, burning 3 cu. ft. of gas per hour, and giving an efficiency of 33 candles, means that they can be converted into fixtures giving 100 c. p. with a consumption of approximately 2 cu. ft. of gas per hour, or the equivalent of 1 cent per lamp per hour at the prevailing price of Pintsch gas. The cost of maintaining the new lamp is also economical, since the mantle is practically the only part requiring renewal. This new lamp does away with the ring and cup reflectors, mica chimneys, domes, clusters and cluster stems necessary in the flat flame lamps. The breakage of glassware is also minimized, due to the fact that the lamp is lighted through the opening at the bottom of the globe, which eliminates the necessity of opening the lamp from the bezel ring. The records of the Safety Car Heating & Lighting Co. on the 4,414 cars equipped indicate an average life of three months for the mantle. This record has been especially gratifying in view of the original estimates, that the mantle proposition would be economical even if they lasted but one month. The simple method of attaching the mantle and the construction of the fixtures generally, is illustrated in section "H" of the company's latest catalogue, which was published under date of December, 1908.

The company makes a particular point of its work in designing the lamp fixtures, in order to keep pace with the tendency in present day-coach building, where artistic interior decoration is important. The newest design in lamp globes is made by fusing together opal and clear glass. The opal glass forms the top part of the globe, and acts as the reflector. The clear glass forms the lower part of the globe and has a ribbed surface, which increases the diffusion of the lamp and at the same time prevents that intense glare which always meets the eye when a high-power burner is used inside a clear glass globe.

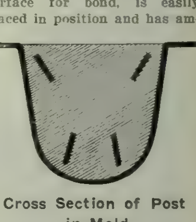
Reinforced Concrete Fence Posts.

The machines made by the D. & A. Post Mold Co., Three Rivers, Mich., consist of individual molds set on a frame, or "shaker," which is supported on four vertical springs. The molds are U-shaped in cross section and when placed on the frame for filling the flanges overlap, forming a complete table on which the concrete is shoveled or dropped from a mixer. The concrete is leveled off, and by means of a "placing" device, which is furnished with the outfits, the reinforcements are pressed into the wet concrete to their respective positions. The concrete in all ten molds is thoroughly compacted at one time by vibrating the molds lengthwise, the operation being done more quickly than a single post could be tamped. The filled molds are set off upon level ground, the square ends holding them upright, and when the concrete is sufficiently set they are turned over on their flat sides and the ends removed, when the mold will release the posts, which are left on the ground to season.

The reinforcement recommended is hoop steel. It is a standard product, has great surface for bond, is easily placed in position and has ample tensile strength. The open face of the mold, however, permits the use of any style or kind of reinforcement.



Attachment of Fencing.



Cross Section of Post in Mold.

For fastening the fencing which lies against the flat side of the post, tie wires passed around the post and twisted to the line wires of the fence are recommended. However, the open-face molds permit the use of any of the many methods having metal fasteners, staples, corrugations, or holes through the post. The method recommended will hold the fence securely.

The great advantage claimed for the shaking system of making posts is that ten posts can be made at one time, greatly lessening the labor cost. It avoids the slow tamping process and permits the use of concrete of just the right consistency; that is, all of the particles being thoroughly wet, yet the concrete not being wet enough to pour or to separate.

The cost of making posts with these outfits varies, of course, with the price of labor and materials. Also, the cost of cement and gravel varies, according to the proportion of each used; the cost of labor accordingly as hand or power mixing is used; the reinforcement according to the number of strips per post, or whether other styles or methods of reinforcement are used. With a mixture of 1 part of cement to 4 parts of gravel, 1 cu. yd. of gravel will make 40 posts 7 ft. long; one barrel (4 sacks) of cement will make 24 posts 7 ft. long; with ⅝-in. 18-gage hoop reinforcement, three strips 7 ft. long weigh 2 lbs., and 4 strips, 2⅔ lbs. Two men can easily make a batch of 10 posts in 30 minutes. If gravel is 50 cents a yard, cement $1.20 a barrel, labor 20 cents an hour, and four strips of reinforcement are used, the posts would cost about 17 cents each. If three strips are used, the cost per post is about 15 cents.

These machines have been on the market for about a year, and are in use by block men and farmers in over 30 states. Also, a leading railway is using one of the machines.

ANNUAL REPORTS

NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO. FORTIETH ANNUAL REPORT:—FOR THE YEAR ENDED DECEMBER 31, 1908.

The Board of Directors herewith submits its report for the year ended December 31, 1908, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

Main line and branches owned	805.47	miles
Proprietary lines	3.06	"
*Lines leased	2,617.92	"
Lines operated under contract	81.70	"
Trackage rights	272.64	"
Total road operated	3,780.79	miles

* The Dunkirk, Allegheny Valley & Pittsburgh Railroad, 90.51 miles, is also leased by this company, but its mileage and operations are not included in this report. Separate accounts are kept and independent reports prepared in its behalf.

The slight decrease in road mileage operated is due to change of alinement and measurement at various points on the system.

The capital stock authorized and outstanding is as follows:

Authorized to December 31, 1908	$250,000,000.00
There was no change during the year in the amount issued and outstanding; the total on December 31, 1908, being	178,632,000.00
Balance authorized but not issued December 31, 1908	$71,368,000.00
The funded debt outstanding on December 31, 1907, was	$230,414,845.00
There have been issued and sold during the year, to provide funds for extensions, additions and improvements to the company's property, Gold debentures of 1904 amounting to	13,000,000.00
making the total funded debt outstanding on December 31, 1908	$243,414,845.00

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1908. 3,780.79 *miles operated.*	1907. 3,781.95 *miles operated.*	Increase or *decrease.* *1.16 miles.*
EARNINGS FROM OPERATION.			
From freight traffic	$51,200,547.11	$59,406,446.56	*$8,205,899.45*
From passenger traffic	27,824,491.56	29,837,859.02	*2,013,367.46*
From express traffic	3,584,721.72	3,577,454.78	7,266.94
From transportation of mail	2,737,731.35	2,775,430.31	*37,698.96*
From rentals	3,206,771.06	2,455,295.65	751,475.41
From miscellaneous sources	295,104.86	316,573.23	*21,468.37*
Totals	$88,849,367.66	$98,369,059.55	*$9,519,691.89*
EXPENSES OF OPERATION.	(73.63%)	(77.06%)	*(3.43%)*
For maintenance of way and structures	$10,768,284.26	$12,462,046.72	*$1,693,762.46*
For maintenance of equipment	13,420,282.68	14,823,630.54	*1,403,347.86*
For conducting transportation	38,759,355.32	45,995,903.11	*7,236,547.79*
For general expenses	2,471,162.52	2,521,753.51	*50,590.99*
Totals	$65,419,084.78	$75,803,333.88	*$10,384,249.10*
NET EARNINGS	$23,430,282.88	$22,565,725.67	$864,557.21
OTHER INCOME.			
Dividend on Lake Shore & Michigan Southern stock	$5,434,704.00	$6,340,488.00	*$905,784.00*
Dividend on Michigan Central stock	1,008,983.00	1,345,144.00	*336,161.00*
Dividends and interest on other securities	2,024,591.40	2,393,121.69	*368,530.29*
Interest on loans, notes and sundry bills	1,352,629.11	1,249,296.24	103,332.87
Sundry miscellaneous profits	550,171.77	148,001.43	402,170.34
Totals	$10,371,079.28	$11,476,051.36	*$1,104,972.08*
GROSS INCOME	$33,801,362.16	$34,041,777.03	*$240,414.87*
FIRST CHARGES.			
Interest on funded debt	$8,501,964.02	$8,214,519.58	$287,444.44
Interest on three year 5 per cent. gold notes of 1907	952,646.21	1,045,048.60	*$92,402.39*
Interest on equipment trust certificates	586,545.01	48,710.44	537,834.57
Interest on loans, notes and bills payable	227,363.92	114,370.79	112,993.13
Use joint facilities: fixed interest basis	295,708.39	285,264.40	10,443.99
St. L. & A. Railway: interest, rentals, etc.	138,600.00	154,750.00	*16,150.00*
N. Y. & Ottawa Railway: interest on bonds	58,240.00	57,660.00	580.00
Rentals of leased lines	9,708,044.63	9,574,606.00	133,438.63
Taxes on real estate	3,153,338.85	2,180,248.55	973,090.30
Taxes on special franchises	329,796.35	330,821.03	*1,024.68*
Taxes on capital stock	599,751.32	764,609.74	*164,858.42*
Taxes on bonded debt	2,547.18	2,978.04	*430.86*
Taxes on gross earnings	159,944.33	160,329.62	*685.29*
Railroad Commissioners' assessments	7,200.00	18,447.65	*11,247.65*
Canadian provincial taxes	3,795.40	5,283.65	*1,488.25*
Totals	$24,725,485.61	$22,957,948.09	$1,767,537.52
NET INCOME	$9,075,876.55	$11,083,828.94	*$2,007,952.39*
*Cash dividends, four each year	8,931,600.00	10,717,920.00	*1,786,320.00*
SURPLUS	$144,276.55	$365,908.94	*$221,632.39*

NOTE.—Decreases in *italics*.

* 5% in 1908; 6% in 1907.

Surplus for the year		$144,276.55
Amount to credit of profit and loss, December 31, 1907		14,698,092.24
Add: amount credited from bills against sundry roads, adjusting use of joint properties prior to 1908		485,408.23
		$15,327,777.02
Deduct: 10 per cent. advance payment and instalments prior to current year, on trust equipment	$1,195,930.60	
Discount account Gold debentures of 1904	1,495,000.00	
Discount, commissions and expenses, account equipment trust certificates	785,419.66	
Injury claims prior to 1908	573,396.58	
Improvements on Boston & Albany Railroad assumed by lessee	229,386.93	
Cancellation of uncollectable charges and sundry adjustments	101,772.29	4,380,906.06
BALANCE, DECEMBER 31, 1908		$10,946,870.96

Gross earnings were $88,849,367.66, a decrease of $9,519,691.89.

Freight earnings were $51,200,547.11, a decrease of $8,205,899.45. The volume of tonnage carried shows a decrease in nearly all of the classified commodities, the greatest reduction being in grain, bituminous coal, ores and lumber. The loss in tonnage of bituminous coal was in part due to the suspension of labor in the Morris Run district during eight months of the year. The average rate per ton per mile received shows a slight improvement, due largely to the fact that the loss in tonnage of merchandise and other freight of the higher classes was not proportionately as great as in the tonnage of commodities of lower grade.

The passenger earnings were $27,824,491.56, a decrease of $2,013,367.46. This decrease was about equally divided between local commutation and interline business. The immigrant business was practically suspended.

The earnings from express traffic were $3,584,721.72, an increase of $7,266.94.

The earnings from transportation of mails were $2,737,731.35, a decrease of $37,698.96. The earnings during the first six months were affected, as compared with the previous year, by an arbitrary reduction in compensation by Congress, which became effective July 1, 1907.

The expenses of operation were $65,419,084.78, a decrease of $10,384,249.10. The percentage of operating expenses to revenue was 73.63% compared with 77.06% in the previous year.

The operating expenses by groups are as follows:

Mainten. of way and structures	$10,768,284 26	decrease	$1,693,762 46
Maintenance of equipment	13,420,282 68	decrease	1,403,347 86
Conducting transportation	38,759,355 32	decrease	7,236,547 79
General expenses	2,471,162 52	decrease	50,590 99

In maintenance of way and structures reduced charges were quite generally distributed through the various accounts. The expense for renewals of rails was but slightly below that of the previous year, and the charges for renewal of ties increased.

In maintenance of equipment, the various repair items show large decreases, due to the volume of idle cars and locomotives. Under the head of renewals, expenses were charged with $1,051,601.73, the value of equipment retired, less the amount received from sales, scrap, etc.

In the cost of transportation the station, train and locomotive expenses, notably fuel for locomtives, show large decreases.

The per diem mileage balance decreased $761,608.52, owing to a reduction early in the year from fifty cents to twenty-five cents in the per diem rate.

The net earnings were $23,430,282.88, a decrease of $864,557.21.

Other income amounted to $10,371,079.28: the decrease of $1,104,972.08 was largely because of a reduction in the income from investment securities.

The first charges were $24,725,485.61, an increase of $1,767,537.52. The principal items of this increase were interest on additional four per cent gold debentures of 1904, interest on equipment trust certificates, and heavier charges for taxes on real estate.

The depression in business which began late in the year 1907 continued throughout the year covered by this report. Through a gradual improvement in revenue during the latter part of 1908, and the continued economy in expenses, especially in the cost of transportation, there resulted a profit from operations for the year sufficient for the declaration of a dividend of five per cent.

The requirements of the Federal and State Commissions entailed considerable additional expenses in the preparation of special statements and the attendance of counsel and employees at the numerous hearings before the Commissions. The first annual reports to the Commissions under the new law have been prepared and filed, and the experience gained in the preparation of these reports, and the subsequent correspondence with the Commissions, prove that in view of the details demanded the added expense is permanent in its nature and **will undoubtedly continue to increase.**

Extraordinary expenses during the year were as follows:

For additions to property, charged to cost of road and equipment	\$5,603,731 54
For construction work on leased lines and for Grand Central terminal improvement, **charged in part against** funds provided by lessor companies	7,644,337 50
Total	\$13,248,069 04

As stated in previous report, this company had acquired \$12,000,000 out of a total issue of \$20,000,000 of the capital stock of The Mohawk Valley Company, which was organized as a holding company for the securities in various electric railway, light and power companies in the State of New York.

During the year a plan for the consolidation and merger of certain **of the electric railways above mentioned, was submitted to the** Public Service Commission of the Second District, and received its approval. This plan provides, among other things, for the reduction of the capital stock of The Mohawk Valley Company from \$20,000,000 to \$7,500,000, and the surrender and retirement of \$12,500,000 of the stock, and the delivery in exchange therefor of stock of the electric railway companies.

Under the provisions of this plan this company retained \$4,500,000 of its total holdings of \$12,000,000 of the capital stock of The Mohawk Valley Company, and surrendered \$7,500,000, for which it received in exchange stock of the electric railway companies of the par value of \$10,239,200.

Out of a total mileage of 389.02 miles of such interurban street railways, a consolidation has been practically effected of the properties in, and in the vicinity of Rochester, New York. The consolidated company—New York State Railways—in exchange for its stock, will **acquire all of the other street railway properties formerly owned by The Mohawk Valley Company.**

A further consolidation of these companies with the New York State Railways will be accomplished as soon as practicable.

The final deliveries of equipment under the New York Central Lines Equipment Trust Agreement and Lease of 1907 have been made.

Large expenditures have been made in constructing additional tracks, in eliminating grade crossings, and in improving terminal facilities at various points, particularly for passenger traffic. The tidewater terminal at East Boston, where the water front property was destroyed by fire during the year, has been rebuilt, and many other improvements on the line of the Boston and Albany Railroad have resulted in a noticeable gain in the operating efficiency of that road. The cost of the principal improvements on that line is provided for by the issue of Boston **and Albany Railroad Company four per cent bonds.**

In the enlargement of the Grand Central terminal in New York city, the company's engineers have been confronted with the problem of complete reconstruction and the handling at the same time of heavy **passenger traffic.**

Notwithstanding these obstacles, the work is progressing steadily without serious inconvenience or delay to the traffic, and the available space for terminal purposes has already been considerably in-creased. The building for the accommodation of the company's offices and the new post office is nearing completion.

A new contract, effective July 24, 1907, has been executed between the New York, New Haven & Hartford Railroad Company and this company, both for itself and as lessee of the New York and Harlem Railroad. Under the new agreement, interest upon the investment in the property, and the expenses incident to the operation of the terminal, are to be prorated on the basis of relative actual use.

W. H. NEWMAN,
President.

DETAIL OF EQUIPMENT.

	1908†	1907*	Increase or *decrease*
Locomotives	2,361	2,304	57
Cars in passenger service	2,414	2,424	*10*
Cars in freight service	66,832	70,989	*4,157*
Cars in company's service	3,505	3,524	*19*
Vessels in mar. frt. service	248	246	2
Ferry boats	8	8	

†1908 figures include 437 locomotives, 88 cars in passenger service and 3,989 freight cars leased under the "New York Central Lines Equipment Trust of 1907."

*1907 figures include 244 locomotives, 70 cars in passenger service **and 3,997 freight cars leased under the "New York Central Lines** Equipment Trust of 1907."

TRAFFIC STATISTICS.

Freight carried and ton mileage.

	1908	1907	Increase or *decrease*
Tons of freight earning revenue	39,105,955	47,422,174	*8,316,219*
Tons of company's freight	6,240,311	7,837,312	*1,597,001*
Total number of tons carried	45,346,266	55,259,486	*9,913,220*
Tons of revenue freight carried one mile	7,787,086,351	9,362,473,992	*1,575,387,641*
Tons of company's freight carried one mile	1,151,277,700	1,393,953,110	*242,675,410*
Total number of tons carried one mile	8,938,364,051	10,756,427,102	*1,818,063,051*

Passengers carried and ticket mileage.

	1908	1907	Increase or *decrease*
Interline passengers	2,796,855	3,085,878	*289,023*
Local passengers	28,016,315	30,475,662	*2,459,347*
Commutation passengers	12,041,899	12,978,218	*936,319*
Total number of passengers carried	42,855,069	46,539,758	*3,684,689*
Passengers carried one mile	1,534,649,681	1,687,152,224	*152,502,543*

FREIGHT RESULTS.

	1908	1907	Increase or *decrease*
Earnings from transportation	\$50,065,454.27	\$58,420,500.56	*\$8,355,046.29*
Earnings from miscellaneous sources	1,135,092.84	985,946.00	149,146.84
Total freight earnings	\$51,200,547.11	\$59,406,446.56	*\$8,205,899.45*
Earnings per ton	\$1.28	\$1.23	\$0.05
Earnings per ton per mile	cts. 0.643	cts. 0.624	cts. .019
Earnings per train mile	\$2.47	\$2.61	*\$0.14*
Earnings per mile of road operated in freight service, trackage included	\$13,596.88	\$15,771.19	*\$2,174.31*
Density of freight traffic (*i. e.* tons of freight carried one mile per mile of road)	2,373,683	2,855,610	*481,927*
Average number of tons of revenue-earning freight carried per train mile	384	419	*35*
Average number of tons of all freight (including pany's) carried per train mile	441	481	*40*
Average number of revenue-earning tons per loaded car mile	16.58	17.51	*.93*
Average number of all tons per loaded car mile	19.03	20.12	*1.09*
Average number of miles one ton of revenue-earning freight carried	199	197	2
Average number of miles one ton carried (all freight)	197	195	2
Average number of freight cars per train mile	36	36	
Average number of loaded cars per train mile	23	24	*1*
Average number of empty cars per train mile	13	12	1
Miles of road, including trackage, operated in freight service	3,765.61	3,766.77	*1.16*

PASSENGER RESULTS.

	1908	1907	Increase or *decrease*
Earnings from passengers	\$27,024,664.44	\$29,045,163.51	*\$2,020,499.07*
Other passenger train earnings	387,144.42	359,313.22	27,831.20
Earnings from miscellaneous sources	412,682.70	433,382.29	*20,699.59*
Total passenger earnings	\$27,824,491.56	\$29,837,859.02	*\$2,013,367.46*
Earnings from mail and express	\$6,322,453.07	\$6,352,885.09	*\$30,432.02*
Earnings per passenger	\$0.63	\$0.62	\$0.01
Earnings per passenger per mile	cts. 1.761	cts. 1.722	cts. 0.039
Earnings per train mile	\$1.20	\$1.22	*\$0.02*
Earnings per train mile (including mail and express)	\$1.39	\$1.41	*\$0.02*
Earnings per mile of road operated in passenger service, trackage included (including mail and express)	\$9,739.41	\$10,318.93	*\$579.52*
Density of passenger traffic (*i. e.* passengers carried one mile per mile of road)	437,713	481,051	*43,338*
Average number of passenger cars per train mile	5.7	5.8	*0.1*
Average number of passengers per train mile	67	70	*3*
Average number of miles one passenger carried	36	36	
Miles of road, including trackage, operated in passenger service	3,506.06	3,507.22	*1.16*

CONDENSED GENERAL BALANCE SH ET, DECEMBER 31, 1908.

Assets.		*Liabilities.*	
Cost of road and equipment	$221,473,672.05	Capital stock	$178,632,000.00
Advances for leased lines construction and equipment.	29,413,842.04	Funded debt	243,414,845.00
Grand Central terminal improvement	12,181,854.91	Bond and mortgage payable	150,000.00
Securities owned	153,874,614.39	Three-year gold notes 1907	25,000,000.00
Other property	2,256,363.36	Current liabilities	20,238,221.25
Advances other than construction	114,939.82	Accounts with lessor companies	2,011,231.02
Fuel and supplies	7,115,875.30	Securities held in trust for lessor companies (per contra)	3,035,752.00
Cash and current assets	50,722,575.24	Profit and loss	10,946,870.96
Items in suspense	3,239,431.12		
Securities acquired from lessor companies (per contra)	3,035,752.00		
	$483,428,920.23		$483,428,920.23

THIRTY-NINTH ANNUAL REPORT LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY COMPANY:—FOR THE YEAR ENDED DECEMBER 31, 1908.

To the Stockholders of

THE LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY:

The Board of Directors herewith submits its report for the year ended December 31st, 1908, with statements showing the results for the year and the financial condition of the company.

The mileage embraced in the operation of the road is as follows:

	Miles
Main line	870.89
Proprietary lines	220.84
Leased lines	416.04
Trackage rights	3.33
Total	1,511.10

There is a decrease of 9.25 miles in the mileage of road operated during the year, due to changes in location of various terminals and elimination of curves.

There was no change in capital stock during the year, the amount authorized and outstanding December 31st, 1908, being ..... $ 50,000,000.00

There has been no change in the funded debt of the company, the amount outstanding December 31st, 1908, being $135,400,000.00

There were sold during the year 114,000 shares of stock of the Lehigh Valley Railroad Company, and $7,000,000.00 of bonds of the Chicago, Indiana & Southern Railroad Company.

There were purchased during the year 4,800 shares of stock of the Toledo Terminal Railroad Company, and one share of stock of the Mahoning State Line Railroad Company.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

EARNINGS FROM OPERATION.	1908 1,511.10 miles operated	1907 1,520.35 miles operated	Increase or *decrease* *9.25 miles operated*
From freight	$25,935,473.24	$31,111,482.12	*$5,176,008.88*
From passengers	9,583,226.94	9,769,872.95	*186,646.01*
From express	1,460,403.74	1,168,090.82	292,312.92
From mails	2,188,215.09	2,224,769.59	*36,554.50*
From rents	729,647.45	604,726.17	124,921.28
From miscellaneous	67,891.98	74,533.37	*6,641.39*
Totals	$39,964,858.44	$44,953,475.02	*$4,988,616.58*
EXPENSES OF OPERATION	(66.84%)	(65.72%)	(1.12%)
Maintenance of way and structures	$4,909,069.09	$6,328,637.72	*$1,419,568.63*
Maintenance of equipment.	5,422,114.41	6,044,154.56	*622,040.15*
Conducting transportation.	15,554,042.88	16,350,910.59	*796,867.71*
General expenses	826,785.19	820,644.40	6,140.79
Totals	$26,712,011.57	$29,544,347.27	*$2,832,335.70*
New construction (addition betterments)	1,292,276.31	4,082,988.44	*2,790,712.13*
New equipment (additions).		911,125.60	*911,125.60*
TOTAL EXPENSES	$28,004,287.88	$34,538,461.31	*$6,534,173.43*
NET EARNINGS	$11,960,570.56	$10,415,013.71	$1,545,556.85
OTHER INCOME			
Interest and dividends on stocks and bonds owned	3,367,797.32	4,530,005.00	*1,162,207.68*
Interest on loans and deposits	1,324,869.16	1,186,414.66	138,454.50
Totals	$4,692,666.48	$5,716,419.66	*$1,023,753.18*
GROSS INCOME	$16,653,237.04	$16,131,433.37	$521,803.67
FIRST CHARGES			
Interest on funded debt	$5,170,000.00	$5,170,000.00	
Interest on gold notes	750,000.00	616,118.08	$133,881.92
Interest on equipment trust certificates	289,225.42		289,225.42
Rentals of leased lines	1,100,381.87	1,420,243.93	*319,862.06*
Interest on loans	179,415.86	163,790.82	15,625.04
Dividends on guaranteed stock	64,020.00	74,690.00	*10,670.00*
Taxes	1,424,200.77	1,300,874.66	123,326.11
Totals	$8,977,243.92	$8,745,717.49	$231,526.43
NET INCOME	$7,675,993.12	$7,385,715.88	$290,277.24
Dividends, (12% 1908, 14% 1907)	5,935,980.00	6,925,310.00	*989,330.00*
SURPLUS	$1,740,013.12	$460,405.88	$1,279,607.24

NOTE: Decrease in *italics*.

To the surplus for the year:—		$1,740,013.12
there should be *added:*		
Profit from sale of Lehigh Valley Railroad Company stock	$3,472,594.77	
Adjustment of sundry accounts	35,730.83	3,508,325.60
		$5,248,338.72
there should be *deducted:*		
Discount, commissions and expenses on account of New York Central Lines Equipment Trust Certificates of 1907.	$442,581.79	
Discount on sale of bonds of Chicago, Indiana & Southern Railroad Company	650,612.24	
Settlement with New York Central & Hudson River Railroad Company for facilities at Buffalo prior to 1908	444,535.53	1,537,729.56
		$3,710,609.16
Amount to the credit of profit and loss, December 31, 1907		17,805,259.03
Balance December 31, 1908		$21,515,868.19

The gross earnings for the year were $39,964,858.44, a decrease of $4,988,616.58 as compared with last year.

The freight earnings were $25,935,473.24, a decrease of $5,176,008.88, due to the falling off in tonnage handled during the depression in business conditions prevailing throughout the year.

Passenger earnings were $9,583,226.94, a decrease of $186,646.01. While there was an increase in the number of passengers carried, the reduction of passenger rates in various states caused a decrease in earnings.

The earnings from express traffic were $1,460,403.74, an increase of $292,312.92.

The earnings from transportation of mails were $2,188,215.09, a decrease of $36,554.50.

The earnings from rentals and miscellaneous sources were $797,-539.43, an increase of $118,279.89.

The operating expenses for the year amounted to $26,712,011.57, a decrease of $2,832,335.70.

Maintenance of way and structures decreased $1,419,568.63. The heavy improvement work in 1907, consisting of four-tracking the main line, rebuilding bridges, construction of new stations, etc., made necessary, during that year, heavy charges to maintenance to provide for changes to existing roadway and structures. In 1908 there was a curtailment of such permanent improvements, resulting in correspondingly decreased maintenance charges.

Maintenance of equipment decreased $622,040.15, due to the large amount of equipment out of service during the year, and therefore, not requiring repairs.

Conducting transportation decreased $796,867.71, due to the falling off in traffic and a resulting reduction in the cost of train service.

General expenses increased $6,140.79.

The income from investments for the year was $4,692,666.48, a decrease of $1,023,753.18, due to reduction in dividends on stocks owned.

The first charges increased $231,526.43, due to interest on equipment trust certificates and increase in taxes.

There was expended during the year for additions and improvements to the property and charged to income, the following amounts:

Yards and sidings	$134,123.06
Shops and engine houses	65,318.63
Stations and other structures	380,014.16
Roadway and bridges	641,266.03
Land at various places	71,554.43
Total	$1,292,276.31

W. H. NEWMAN.
President.

CAPITALIZATION.

Capital Stock.

Number of shares issued—Common	494,665
Number of shares issued Guaranteed 10 per cent	5,335
Total number of shares outstanding	500,000
Number of shares authorized	500,000
Total par value issued and outstanding	$50,000,000.00
Total par value authorized	$50,000,000.00
Par value per share	$100.00

Funded Debt.

Class of bond.	Date of issue.	Date of maturity.	Amount of authorized issue.	Amount issued and now outstanding.	Rate of interest.	Payable on the first days of
Gold mortgage	1897	June 1, 1997	$50,000,000.00	$50,000,000.00	3½%	December and June
Gold bonds	1903	Sept. 1, 1928	50,000,000.00	50,000,000.00	4 %	March and September
Gold bonds	1906	May 1, 1931	50,000,000.00	35,000,000.00	4 %	November and May
Bonds of Other Roads Assumed by This Company.						
Kalamazoo & White Pigeon	1890	Jan. 1, 1940	400,000.00	400,000.00	5 %	January and July

FIRST CHARGES.

Interest on Bonds.

Interest 3½% per annum on Gold mortgage bonds	$1,750,000.00	
Interest 4% per annum on Gold bonds of 1903	2,000,000.00	
Interest 4% per annum on Gold bonds of 1906	1,400,000.00	
Interest 5% per annum on Kalamazoo & White Pigeon mortgage bonds	20,000.00	$5,170,000.00
Interest 5% per annum on gold notes of 1907		750,000.00
Interest on equipment trust certificates		289,225.42
Dividend 12% on 5,335 shares L. S. & M. S. Ry. guaranteed stock		64,020.00
Rental of leased lines		1,100,381.87
Taxes.		
New York	$96,710.16	
Pennsylvania	38,639.10	
Ohio	614,535.58	
Michigan	329,811.60	
Indiana	285,896.38	
Illinois	58,607.95	1,424,200.77
Interest on loans and bills payable		179,415.86
Total first charges		$8,977,243.92

DIVIDENDS.

Payable July 29, 1908, 6% on 494,665 shares of capital stock	$2,967,990.00
Payable Jan. 29, 1909, 6% on 494,665 shares of capital stock	2,967,990.00
Total, 12%	$5,935,980.00

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1908.

Assets.

Cost of road and equipment:			
Cost of road	$66,700,000.00		
Cost of equipment	24,800,000.00		$91,500,000.00
Securities owned:			
Stocks of sundry companies	$88,523,791.65		
Bonds of sundry companies	1,194,655.24		89,718,446.89
Other property:			
Real estate not used in operation of the road			431,498.13
Advances for lessor and other companies:			
Jamestown & Franklin Railroad Co.	$1,024,101.59		
Lake Erie, Alliance & Wheeling Railroad Company	1,015,526.31		
Franklin & Clearfield Railroad Co.	7,090,815.85		
Cleveland Short Line Railway Co.	3,334,932.37		
Lake Erie & Pittsburgh Railway Co.	2,437,157.47		14,902,533.59
Fuel and supplies			3,512,136.69
Current assets:			
Cash charged treasurer	$14,418,964.71		
Remittances in transit	1,179,350.74		
Due from agents and conductors	376,916.68		
Loans and bills receivable:			
Cleveland, Cincinnati, Chicago & St. Louis Ry.	5,500,000.00		
Lake Erie & Western R. R.	952,915.88		
Indiana Harbor Belt R. R.	793,846.61		
Chicago, Indiana & Southern R. R.	505,000.00		
Terminal Railway of Buffalo	500,000.00		
Chicago, Kalamazoo & Saginaw Ry.	147,832.33		
Other bills receivable	823.73		
Traffic balances receivable	565,866.66		
Sundry accounts collectible	7,455,026.02		32,396,543.36
			$232,461,158.66

Liabilities.

Capital stock		
Common	$49,466,500.00	
Guaranteed	533,500.00	$ 50,000,000.00
Funded debt		
Gold mortgage bonds	$50,000,000.00	
Gold bonds of 1903	50,000,000.00	
Gold bonds of 1906	35,000,000.00	135,000,000.00
Bonds of other roads assumed by this company		
Kalamazoo & White Pigeon first mortgage bonds		400,000.00
Three year five per cent. gold notes of 1907		15,000,000.00
Current liabilities		
Audited pay rolls	$ 1,372,586.61	
Audited vouchers	1,737,781.40	
Traffic balances payable	31,673.49	
Interest and rentals accrued	1,499,689.45	
Dividends payable January 29, 1909	2,967,990.00	
Dividends and interest unclaimed	68,264.04	
Sundry accounts payable	1,162,051.99	8,840,036.98
Accounts with lessor companies		
Mahoning Coal Railroad Company		1,705,253.49
Profit and loss		21,515,868.19
		$232,461,158.66

STOCKS AND BONDS OWNED.

Stocks.

	Number of Shares	Total par value
Battle Creek & Sturgis Railway Co.	825	$ 82,500.00
Central Trunk Railway Co.	238	11,900.00
Chicago, Indiana & Southern Railroad Co. pf.	50,000	5,000,000.00
Chicago, Indiana & Southern Railroad Co.	120,000	12,000,000.00
Chicago, Kalamazoo & Saginaw Railway Co. preferred	1,800	180,000.00
Chicago, Kalamazoo & Saginaw Railway Co.	1,800	180,000.00
Cleveland, Cincinnati, Chicago & St. Louis Railway Co.	302,077	30,207,700.00
Cleveland Short Line Railway Co.	2,500	250,000.00
Detroit & Chicago Railroad Co.	10,000	1,000,000.00
Detroit, Monroe & Toledo Railroad Co.	4,141	414,100.00
Detroit, Toledo & Milwaukee Railroad Co.	7,500	750,000.00
Detroit Terminal Railroad Co.	933	93,300.00
Elkhart & Western Railroad Co.	4,598	229,900.00
Fairport & Phalanx Railroad Co.	10	1,000.00
Franklin Clearfield Railroad Co.	5,550	555,000.00
Hocking Valley Railway Co.	11,540	1,154,000.00
Indiana Harbor Belt Railroad Co.	12,250	1,225,000.00
Jackson Coal Railroad Co.	680	34,000.00
Jamestown & Franklin Railroad Co.	11,733	586,650.00
Jefferson Coal Co.	5,100	510,000.00
Kalamazoo & White Pigeon Railroad Co.	2,309	230,900.00
Lake Erie, Alliance & Wheeling Railroad Co. } Lake Erie, Alliance & Wheeling Coal Co. }	50,000	5,000,000.00
Lake Erie & Pittsburg Railway Co.	50	5,000.00
Lake Erie & Western Railroad Co. preferred	59,300	5,930,000.00
Lake Erie & Western Railroad Co.	59,400	5,940,000.00
Lake Shore & Michigan Southern Railway Co.	39	3,900.00
Lansing Transit Railway Co.	10	1,000.00
Mahoning Coal Railroad Co. preferred	7,990	399,500.00
Mahoning Coal Railroad Co.	17,318	865,900.00
Mahoning State Line Railroad Co.	12	600.00
Merchants Despatch Transportation Co.	23,335	2,333,500.00
New York, Chicago & St. Louis Railroad Co. 1st preferred	25,030	2,503,000.00
New York, Chicago & St. Louis Railroad Co. 2nd preferred	62,750	6,275,000.00
New York, Chicago & St. Louis Railroad Co.	62,400	6,240,000.00
Northern Central Michigan Railroad Co.	5,985	598,500.00
Pittsburgh & Lake Erie Railroad Co.	100,002	5,000,100.00
Reading Company 1st preferred	121,300	6,065,000.00
Reading Company 2nd preferred	285,300	14,265,000.00
Reading Company	200,050	10,002,500.00
Sturgis, Goshen & St. Louis Railway Co.	3,000	300,000.00
Swan Creek Railway Co.	400	40,000.00
Taylor Street Warehouse Co.	100	10,000.00
Terminal Railway of Buffalo	5,000	500,000.00
Toledo Terminal Railroad Co.	4,800	480,000.00
Total par value stocks		$127,454,450.00

Bonds.

	Total amount held
Elkhart & Western Railroad Co. First mortgage	200,000.00
Jamestown & Franklin Railroad Co. First mortgage	298,000.00
Jamestown & Franklin Railroad Co. Second mortgage	500,000.00
Terminal Railway of Buffalo First mortgage	500,000.00
Total par value bonds	$ 1,498,000.00
Grand total par value stocks and bonds	$128,952,450.00

The above securities are carried on the books of the company at a total value of $89,718,446.89.

TRAFFIC STATISTICS.

FREIGHT CARRIED AND TON MILEAGE.

	1908	1907	Increase or *decrease*
Tons of freight earning revenue	26,224,406	34,281,946	*8,057,540*
Tons of company freight	3,053,484	3,289,630	*236,146*
Total number of tons carried	29,277,890	37,571,576	*8,293,686*
Tons of revenue freight carried one mile	4,852,862,871	5,741,263,554	*888,400,683*
Tons of company freight carried one mile	227,072,584	262,790,359	*35,717,775*
Total number of tons carried one mile	5,079,935,455	6,004,053,913	*924,118,458*

Note.—Decreases in *italics*.

PASSENGERS CARRIED AND TICKET MILEAGE.

	1908	1907	Increase or *decrease*
Interline passengers	1,072,719	1,100,931	*28,212*
Local passengers	7,485,626	7,330,235	155,391
Total number of passengers carried	8,558,345	8,431,166	127,179
Passengers carried one mile	491,518,018	488,654,632	2,863,386

TRAIN MILEAGE.

	1908.	1907.	Increase or *decrease.*
Freight trains	8,208,002	9,108,434	*900,432*
Passenger trains, exclusive of straight mail and express trains	7,294,685	7,361,612	*66,927*
Mail and express trains exclusive	712,416	994,149	*281,733*
Mixed trains	66,528	175,296	*108,768*
Work trains	535,090	633,550	*98,460*
Total train mileage	16,816,721	18,273,041	*1,456,320*
ENGINE MILEAGE.			
Freight engines	9,366,484	11,353,531	*1,987,047*
Passenger engines	8,386,120	8,805,511	*419,391*
Switching engines	5,964,734	7,500,923	*1,536,189*
Work engines	1,006,731	1,357,801	*351,070*
Total engine mileage	24,724,069	29,017,766	*4,293,697*
CAR MILEAGE.			
Loaded freight cars	246,411,772	274,549,595	*28,137,823*
Empty freight cars (including caboose car mileage)	134,078,958	115,286,749	18,792,209
Total freight car mileage	380,490,730	389,836,344	*9,345,614*
Passenger cars	52,877,061	55,037,716	*2,160,655*
Work cars	2,775,777	6,458,992	*3,683,215*
Total car mileage	436,143,568	451,333,052	*15,189,484*
Miles of road, including trackage, operated in freight service	1,511.10	1,520.35	*9.25*
Miles of road, including trackage, operated in passenger service	1,529.80	1,539.05	*9.25*

NOTE.—Decreases in *italics*.

FREIGHT RESULTS.

	1908.	1907.	Increase or *Decrease.*
Earnings from transportation	$25,454,972.80	$30,596,387.38	*$5,141,414.58*
Earnings from misc. sources	480,500.44	515,094.74	*34,594.30*
Total freight earnings	$25,935,473.24	$31,111,482.12	*$5,176,008.88*
Earnings per ton	cts. 97.1	cts. 89.2	cts. 07.9
Earnings per ton per mile	cts. 0.525	cts. 0.533	cts. *0.008*
Earnings per train mile	$3.08	$3.30	*$0.22*
Earnings per mile of road operated in freight service—trackage included	$17,163.31	$20,463.37	*$3,300.06*
Density of freight traffic (i.e., tons carried one mile per mile of road	3,361,747	3,949,126	*587,379*
Average number of tons of revenue earning freight carried per train mile	586.5	618.4	*31.9*
Average number of tons of all freight (including company's) carried per train mile	613.9	646.7	*32.8*
Average number of revenue tons per loaded car mile	19.7	20.9	*1.2*
Average number of all tons per loaded car mile	20.6	21.9	*1.3*
Average number of miles one ton carried, revenue freight	185.1	167.5	17.6
Average number of miles one ton carried, all freight (including company's)	173.5	159.8	13.7
Average number of loaded cars per train mile	29.8	29.6	0.2
Average number of empty cars per train mile	16.2	12.4	3.8
Average number of freight cars per train mile	46.0	42.0	4.0

PASSENGER RESULTS.

	1908.	1907.	Increase or *decrease.*
Earnings from passengers	$9,407,654.29	$9,613,351.70	*$205,697.41*
Other passenger train earnings	170,016.10	151,199.50	$18,816.60
From miscellaneous sources	5,556.55	5,321.75	234.80
Total passenger earnings	$9,583,226.94	$9,769,872.95	*$186,646.01*
Earnings from mail & express	$3,648,618.83	$3,392,860.41	$255,758.42
Earnings per passenger	$1.10	$1.14	*$0.04*
Earnings per passenger per mile	cts. 1.914	cts. 1.967	cts. *0.053*
Earnings per train mile, excluding mail and express	$1.30	$1.30	.....
Earnings per train mile, including mail and express	$1.64	$1.54	$0.10
Earnings per mile of road operated in passenger service, trackage included; including mail and express	$8,649.40	$8,552.51	$96.89
Density of passenger traffic (i. e., passengers carried one mile of road)	321,296	317,504	3,792
Average number of passenger cars per train mile	6.55	6.45	.10
Average number of passengers per train mile	66.77	64.83	1.94
Average number of miles one passenger carried	57.43	57.96	*.53*

NOTE.—Decreases in *italics*.

SIXTY-THIRD ANNUAL REPORT MICHIGAN CENTRAL RAILROAD COMPANY:—FOR THE YEAR ENDED DECEMBER 31, 1908.

To the stockholders of

THE MICHIGAN CENTRAL RAILROAD COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1908, with statements showing the results for the year and the financial condition of the company.

The report covers the operation of the following mileage:

	Miles.
Main line	270.07
Proprietary lines	345.05
Leased lines	1,117.34
Lines operated under trackage rights	14.00
Total road operated	1,746.46

The capital stock authorized on December 31, 1908, was		$18,738,000.00
The funded debt outstanding on December 31, 1907, was		$26,765,000.00
It has been decreased during the year ended December 31, 1908, as follows:		
Michigan Central-Jackson, Lansing & Saginaw 3½ per cent. gold bonds of 1951 purchased and canceled by the Trustees of the Land Grant Fund of the Jackson, Lansing & Saginaw Railroad Company	$10,000.00	
Michigan Central-Terminal 4 per cent. bonds of 1941 retired in exchange for Indiana Harbor Belt 4 per cent. bonds	725,000.00	735,000.00
Total funded debt December 31, 1908 (detail on another page)		$26,030,000.00

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1908. 1,746.46 *miles operated.*	1907. 1,746.46 *miles operated.*	Increase or *decrease.*
EARNINGS FROM OPERATION.			
From freight traffic	$16,947,001.50	$19,926,803.28	*$2,979,801.78*
From passenger traffic	6,168,190.19	6,541,102.67	*372,912.48*
From express traffic	1,040,663.03	1,241,632.68	*200,969.65*
From transportation of mails	413,540.83	429,173.16	*15,632.33*
From rentals	43,536.34	31,786.18	11,750.16
From miscellaneous sources	305,556.06	376,611.97	*71,055.91*
Totals	$24,918,387.95	$28,547,109.94	*$3,628,621.99*
EXPENSES OF OPERATION.	(76.27%)	(81.03%)	(*4.76%*)
For maintenance of way and structures	$3,061,374.85	$4,991,923.14	*$1,930,548.29*
For maintenance of equipment	2,978,743.87	4,070,277.11	*1,091,533.24*
For conducting transportation	12,406,032.50	13,503,986.92	*1,097,954.42*
For general expenses	559,201.12	565,563.48	*6,362.36*
TOTAL EXPENSES	$19,005,352.34	$23,131,750.65	*$4,126,398.31*
NET EARNINGS	$5,913,135.61	$5,415,359.29	$497,776.32
OTHER INCOME	655,505.40	702,518.99	*47,013.59*
GROSS INCOME	$6,568,641.01	$6,117,878.28	$450,762.73
FIRST CHARGES.			
Interest on funded debt	$2,268,938.33	$2,098,230.00	$170,708.33
Rentals of leased lines	510,310.00	568,200.42	*57,890.42*
Taxes	1,105,694.21	1,008,775.79	96,918.42
Interest on loans, notes and bills payable	842,176.27	702,006.59	140,169.68
Interest on equipment trust certificates	214,402.05	11,300.00	203,102.05
Totals	$4,941,520.86	$4,388,512.80	$553,008.06
BALANCE AVAILABLE FOR DIVIDEND	$1,627,120.15	$1,729,365.48	*$102,245.33*
Cash dividends (in 1908, 6%; in 1907, 8%)	1,124,280.00	1,499,040.00	*374,760.00*
SURPLUS	$502,840.15	$230,325.48	$272,514.67

NOTE.—Decreases in *italics*.

Surplus for the year		$502,840.15
Amount to credit of Profit and Loss, December 31, 1907		9,131,127.34
		$9,633,967.49
Deduct:		
Expenses of extension Canada Southern First Mortgage bonds	$141,291.45	
Loss on sale of Chicago, Indiana & Southern bonds	315,107.44	
Discount, commissions and expenses on account of Equipment Trust certificates	257,721.27	
Use of Indiana Harbor Belt terminal facilities prior to 1908	109,446.60	
Adjustment of sundry accounts	69,386.67	$892,953.43
Balance to credit of Profit and Loss, December 31, 1908		$8,741,014.06

The gross earnings were $24,918,487.95, a decrease of $3,628,621.99 from the previous year.

The freight earnings were $16,947,001.50, a decrease of $2,979,801.78. This was due to a decreased movement in nearly all commodities.

The passenger earnings were $6,168,190.19, a decrease of $372,912.48, due to a general decrease in both local and interline business.

The express earnings were $1,040,663.03, a decrease of $200,969.65.

Earnings from transportation of mails were $413,540.83, a decrease of $15,632.33.

The total expenses of operation were $19,005,352.34, a decrease of $4,126,398.31.

Maintenance of way and structures decreased $1,930,548.29: due to the general economies effected and reduced expenditures for new buildings, separation of grades, new yards, logging branches, etc.

Maintenance of equipment decreased $1,091,533.24: largely due to the reduction in expenditures for repairs on account of idle equipment during the business depression.

Conducting transportation decreased $1,097,954.42; due principally to the falling off in the volume of traffic handled and a general curtailment of expenses. The decrease in car mileage—pier diem account was caused by the preference given to loading of this company's cars and by the change in the rate of per diem on March 1, 1908, from 50 cents to 25 cents. The increase in rents for tracks, yards and terminals is on account of additional expenditures for terminal facilities; and the increase in expenses of stock yards and elevators is on account of extraordinary expenditures incident to the aphthous fever epidemic.

The net earnings were $5,913,135.61, an increase of $497,776.32.

Other income was $655,505.40, a decrease of $47,013.59.

First charges increased $553,008.06, the principal items being interest on additional bonds and equipment trust certificates issued, increased rate on Canada Southern first mortgage bonds, and interest on loans.

The profit from operation for the year, after payment of 6% in dividends upon the capital stock, was $502,840.15, which has been carried to the credit of profit and loss.

Total cost of road and equipment to December 31, 1908	$35,213,257 09
This represents per mile owned (270.07 miles) $130,386	
Joliet and Northern Indiana Railroad Construction account was increased by expenditures for elevation of tracks in the City of Joliet	$71,338 77
Terminal Railroad (Chicago) Construction account was decreased by expenditures for construction assumed by the Indiana Harbor Belt Railroad Company as explained below	$823,443 17
Jackson, Lansing & Saginaw Railroad Construction account was decreased by purchase and retirement of bonds as previously commented upon	$10,000 00

On January 1, 1908, the Indiana Harbor Belt Railroad Company having taken over the ownership and control of the Terminal Railroad property, in accordance with the terms of the agreement of January 29, 1907, there were retired $725,000 of Michigan Central-Terminal Railroad four per cent. bonds, in exchange for which a like amount of Indiana Harbor Belt Railroad general mortgage four per cent. bonds were issued. During the year this company received from the Indiana Harbor Belt Railroad Company $105,000 of the latter issue of bonds in consideration of the transfer and delivery to the Indiana Harbor Belt Railroad Company of 1058 shares of the capital stock of the Calumet Western Railroad Company. The Michigan Central Railroad Company further received from the Indiana Harbor Belt Railroad Company $98,443.17 in cash, in reimbursement of the amount expended for the construction of the Terminal Railroad in excess of the proceeds of the $725,000 Michigan Central Terminal Railroad bonds above mentioned.

Under agreement of December 4, 1907, covering reorganization of the Toledo Terminal Railroad Company (in succession to Toledo Railway and Terminal Company), this company acquired 12 per cent, viz.: 4,800 shares, of the outstanding capital stock of the Toledo Terminal Railroad Company, and guarantees interest on that company's four and one-half per cent. fifty-year bonds of 1957, aggregating $6,000,000.00, in proportion to stock holdings.

There were sold during the year $3,825,000.00 four per cent. First Mortgage bonds of the Chicago, Indiana & Southern Railroad Company, and $115,000.00 general mortgage four per cent. bonds of the Indiana Harbor Belt Railroad Company.

On January 1, 1908, $14,000,000.00 Canada Southern first mortgage five per cent. bonds were extended to January 1, 1913, at six per cent.

Effective January 1, 1908, an agreement, modifying that dated December 29, 1903, was entered into with the Pere Marquette Railroad Company, under the terms of which the annual rental payable by the latter was reduced on account of its relinquishment of the right to use the St. Clair Branch of the Canada Southern Railway between the junction of the Lake Erie and Detroit River Railway, near Courtright, Ontario, and St. Clair Junction, and also that portion of the main line between St. Clair Junction and the crossing of the London & Port Stanley Railway.

The following appointments of officials were made during the year:

January 1, Clyde Brown, General Solicitor.

January 1, Henry Russel, General Counsel.

January 1, Ora E. Butterfield, General Attorney.

July 1, Joseph S. Hall, Assistant General Passenger Agent.

October 7, Frank O. Waldo was appointed Auditor to succeed A. Judson Burt, who died on June 11, 1908.

November 24, the jurisdiction of Charles F. Daly, Vice-President in charge of traffic, was extended to cover freight, mail and express traffic.

W. H. NEWMAN,
President.

Summary of First Charges.

Interest on funded debt	$2,268,938.33
Rentals of leased lines	510,310.00
Taxes	1,105,694.21
Interest on loans, notes and bills payable	842,176.27
Interest on Equipment Trust Certificates	214,402.05
Total first charges	$4,941,520.86

DIVIDENDS.

Payable July 29, 1908, 3% on 187,380 shares of capital stock	$562,140.00
Payable January 29, 1909, 3% on 187,380 shares of capital stock	562,140.00
Total, 6%	$1,124,280.00

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1908.

Assets.

Cost of road and equipment—		
Michigan Central Railroad—Main line		$35,213,257.09
Michigan Air Line Railroad	$3,299,652.23	
Grand River Valley Railroad	2,501,715.87	
Jackson, Lansing & Saginaw Railroad	2,589,921.64	
Kalamazoo & South Haven Railroad	815,610.24	
Detroit & Bay City Railroad	4,168,297.78	
Bay City & Battle Creek Railroad	7,171.75	
Battle Creek & Sturgis Railroad	330.59	
Joliet and Northern Indiana Railroad	862,338.77	
		14,245,038.87
Total cost of raid and equipment		$49,458,295.96
Securities owned—		
Stock in sundry companies	$7,784,626.50	
Bonds of sundry companies	351,976.00	
		8,136,602.50
Other property—		
Real estate, etc., not used in operation of the road		302,597.18
Fuel and supplies		1,569,779.68
Current assets—		
Cash charged Treasurer and Local Treasurer	$3,683,939.86	
Loans and bills receivable:		
Detroit River Tunnel Co	4,297,825.26	
Indiana Harbor Belt R. R	793,846.61	
Chicago, Kalamazoo & Saginaw Ry	221,748.50	
Chicago, Indiana & Southern R. R	195,000.00	
Toledo Terminal Railroad	34,302.00	
Other companies	64,393.86	
Traffic balances receivable	2,833,706.38	
Sundry collectible accounts	1,535,255.57	
		13,660,018.04
Items in suspense		146,220.13
		$73,273,513.49

Liabilities.

Capital stock		$18,738,000.00
Funded debt:		
Michigan Central 3½% bonds of 1952	$14,000,000.00	
Grand River Valley 6% bonds of 1909	1,500,000.00	
Detroit & Bay City 5% bonds of 1931	4,000,000.00	
Kalamazoo & South Haven 5% bonds of 1939	700,000.00	
Michigan Air Line 4% bonds of 1940	2,600,000.00	
Jackson, Lansing & Saginaw 3½% bonds of 1951	1,730,000.00	
Joliet & Northern Indiana 4% bonds of 1957	1,500,000.00	
		26,030,000.00
Total capitalization		$44,768,000.00
Three year 5% gold notes of 1910		10,000,000.00
Current liabilities:		
Wages	$738,891.20	
Loans and bills payable	4,450,000.00	
Traffic balances payable	748,891.93	
Interest and rentals accrued	594,031.84	
Interest unclaimed	28,607.50	
Dividend payable January 29, 1909	562,140.00	
Dividends unclaimed	5,333.00	
Sundry accounts payable	2,506,145.94	
		9,634,041.41
Accounts with lessor companies:		
Canada Southern Railway Company		4,910.67
Other accounts:		
Insurance Fund—buildings		125,547.35
Profit and loss		8,741,014.06
		$73,273,513.49

CAPITALIZATION.

Capital stock

Number of shares issued and outstanding	187,380	Total par value issued and outstanding	$18,738,000.00
Number of shares authorized	187,380	Total par value authorized	$18,738,000.00
value per share	$100.00		

Amount of capital stock per mile of road owned (270.07 miles) $69,382.00

Funded debt.

Class of bond.	Date of issue.	Date of maturity.	Amount of authorized issue.	Amount issued and now outstanding.	Rate of interest.	Payable on the first days of
Michigan Central first mortgage	1902	May 1, 1952	$18,000,000	$14,000,000	3½%	May and November.
Grand River Valley first mortgage	1879	September 1, 1909	500,000	500,000	6 %	March and September.
Grand River Valley first mortgage	1886	September 1, 1909	1,000,000	1,000,000	6 %	March and September.
Detroit & Bay City first mortgage	1881	March 1, 1931	4,000,000	4,000,000	5 %	March, June, September and December.
Kalamazoo & South Haven first mortgage	1889	November 1, 1939	700,000	700,000	5 %	May and November.
Michigan Air Line first mortgage	1890	January 1, 1940	2,600,000	2,600,000	4 %	January and July.
Jackson, Lansing & Saginaw first mortgage	1901	September 1, 1951	*2,000,000	1,730,000	3½%	March and September.
Joliet & Northern Indiana first mortgage	1907	July 10, 1957	3,000,000	1,500,000	4 %	January and July 10.
Total amount of funded debt				$26,030,000		

*$270,000 purchased and retired by the Land Grant Trustees

TWENTIETH ANNUAL REPORT CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RAILWAY CO.:—FOR YEAR ENDED DECEMBER 31, 1908.

To the stockholders of
THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RAILWAY COMPANY:

The Board of Directors submits herewith the following report for the year ended December 31st, 1908:

The mileage embraced in the operation of the road is as follows.

Main line	1,680.97
Branches	166.64
Trackage rights	134.62
Total length of road operated	1,982.23
Second track	338.63
Side tracks	1,061.04
Total mileage of track	3,381.90

The total mileage of track operated has been increased during the year as follows:

Side tracks: increased	38.05	
Side tracks: increased	1.21	39.26
Main line: decreased		.67
Total additional tracks		38.59

The following is a statement of the capital stock authorized and outstanding on December 31, 1908.

Preferred stock authorized		$10,000,000.00
Common stock authorized		50,000,000.00
Total preferred and common stock authorized		$60,000,000.00
Preferred stock issued and outstanding	$10,000,000.00	
Common stock issued and outstanding	47,056,300.00	57,056,300.00
Balance common stock authorized but not issued, December 31, 1908		$2,943,700.00
The funded debt outstanding December 31, 1907, was		$64,612,727.45
This has been increased during the year by the issue of C., C., C. & St. L. Ry. general mortgage bonds	$1,000,000.00	
For retirement of prior lien bonds	78,000.00	$1,078,000.00
		$65,690,727.45
The prior lien bonds retired during the year are as follows:		
C., I., St. L. & C. Ry. Co. first mortgage six per cent bonds	$6,000.00	
C., I. St. L. & C. Ry. Co. general first mortgage four per cent bonds	72,000.00	$78,000.00
Total funded debt outstanding December 31, 1908		$65,612,727.45

There was expended during the year for additions to the property, improvements, double tracking, equipment, etc., and charged to cost of road and equipment, the sum of $3,210,932.47, as follows:

Cleveland Division	$404,213.45
Cincinnati Division	420,236.09
St. Louis Division	653,559.87
Chicago Division	212,623.75
Cairo Division	97,059.04
Michigan Division	20,451.66
Interest during construction Cincinnati, St. Louis and Chicago divisions	151,852.98
For new equipment	1,250,935.63
Total	$3,210,932.47

There has been advanced on account of the St. Louis Short Line Division during the year, for construction, $100,370.73.

There has been advanced to the Central Indiana Railway Company during the year, for improvements and operation, $76,193.72.

There has been advanced on account of the Chicago and Harrisburg Coal Company property during the year, $25,497.42.

There has been advanced on account of the Saline and Williamson Counties property during the year, $18,129.11.

The Evansville, Mt. Carmel and Northern Railway Company was organized under the laws of the State of Indiana, August 1, 1906, and under the laws of the State of Illinois, November 7, 1906 to construct a railroad from Mt. Carmel, on the Cairo Division, to Evansville, Indiana. There has been advanced on account of this property, during the year, $11,692.82.

The Saline Valley Railway Company was organized under the laws of the State of Illinois, April 6, 1907, for the purpose of constructing a railroad from Harrisburg, Saline County, Illinois, to Marion, Williamson County, Illinois. There has been advanced on account of this property, during the year, $610.34.

There was sold during the year to the Missouri & Illinois Bridge and Belt Railroad Company, 40 shares of its capital stock, par value $4,000.00; similarly each of the other proprietary companies surrendered a like amount, making a total of 440 shares, par value $44,000.00, which that company holds in its treasury uncancelled as "Treasury Assets."

There has been purchased during the year by the Central Trust Company, Trustee for the C. C. C. & St. L. Ry. Company's St. Louis Division first collateral trust mortgage bonds, 21 bonds, par value $21,000.00, making a total of 520 bonds at par value of $520,000, now held by the Central Trust Company, Trustee.

SUMMARY OF FINANCIAL OPERATIONS AFFECTING INCOME.

	1908 Miles operated 1,982.23	1907 Miles operated 1,982.90	Increase or *decrease* *.67 Miles*
EARNINGS FROM OPERATION.			
From freight traffic	$15,711,940.70	$17,238,347.59	*$1,526,406.89*
From passenger traffic	6,908,325.96	7,127,049.44	*218,723.48*
From express traffic	757,853.86	849,998.84	*92,144.98*
From transportation of mails	716,673.35	741,728.05	*25,054.70*
From rentals	503,318.75	464,533.10	$38,785.65
From miscellaneous sources	23,548.23	26,147.25	*2,599.02*
Totals	$24,621,660.85	$26,447,804.27	*$1,826,143.42*
EXPENSES OF OPERATION.	(78.11%)	(76.13%)	(1.98%)
For maintenance of way and structures	$2,611,391.72	$3,432,738.28	*$821,346.56*
For maintenance of equipment	3,801,196.10	4,209,998.30	*408,802.20*
For conducting transportation	12,200,907.91	11,868,537.02	$332,370.89
For general expenses	618,028.61	622,355.61	*4,327.00*
TOTAL EXPENSES	$19,231,524.34	$20,133,629.21	*$902,104.87*
NET EARNINGS	$5,390,136.51	$6,314,175.06	*$924,038.55*
OTHER INCOME.			
Dividends on stocks owned	$57,324.90	$78,452.24	*$21,127.34*
Interest on railroad bonds owned	43,420.00	43,012.11	407.89
Interest on loans, notes and sundry accounts	36,660.73	65,079.38	*28,418.65*
Totals	$137,405.63	$186,543.73	*$49,138.10*
GROSS INCOME	$5,527,542.14	$6,500,718.79	*$973,176.65*
FIRST CHARGES.			
Interest on funded debt	$3,030,935.67	$2,989,581.11	$41,354.56
Taxes on real estate	812,766.67	758,155.98	54,610.69
Taxes on gross earnings	81,609.85	84,736.96	*3,127.11*
Railroad commissioners' assessments	966.87	988.07	*21.20*
Use joint facilities; fixed interest basis	224,094.31	204,505.08	19,589.23
Rentals of other property	80,784.45	74,948.31	5,836.14
Interest on loans, notes and bills payable	587,605.62	414,585.84	173,019.78
Totals	$4,818,763.44	$4,527,501.35	$291,262.09
NET INCOME	$708,778.70	$1,973,217.44	*$1,264,438.74*
Cash dividends preferred, four, aggregating 5%	$500,000.00	$500,000.00	

	1908.	1907.	Increase or *decrease*
Cash dividends, common, two, aggregating 3%		1,411,689.00	*$1,411,689.00*
Totals	$500,000.00	$1,911,689.00	*$1,411,689.00*
SURPLUS	$208,778.70	$61,528.44	$147,250.26

NOTE—Decreases in *italics*.

To the surplus for the year—		$208,778.70
There should be added:		
Adjustment of sundry accounts to conform to requirements of classifications prescribed by Interstate Commerce Commission, etc.	$404,303.55	
Less discount, commissions and expenses in connection with New York Central Lines Equipment Trust of 1907, discount on C., C., C. & St. L. Ry. General Mortgage Bonds and adjustment of sundry other accounts	382,189.28	$22,114.27
		$230,892.97
Amount to credit of profit and loss, December 31, 1907		1,847,567.88
BALANCE, DECEMBER 31, 1908		$2,078,460.85

The gross earnings were $24,621,660.85, a decrease of $1,826,143.42.

The freight earnings were $15,711,940.70, a decrease of $1,526,406.89. The local earnings show a decrease of 9%, and the interline a decrease of 11%.

The passenger earnings were $6,908,325.96, a decrease of $218,723.48. The local earnings show a decrease of 4% and the interline a decrease of 1%.

The express earnings were $757,853.86, a decrease of $92,144.98, due to the general business conditions.

The mail earnings were $716,673.35, a decrease of $25,054.70, due to reduced Government allowance.

The rent earnings were $503,318.75, an increase of $38,785.65, due chiefly to increased rentals received from foreign roads.

The expenses of operation were $19,231,524.34, a decrease of $902,104.87.

Maintenance of way and structures showed a decrease of $821,346.56, which is general and made possible by the high standard previously maintained; the only important item of increase being in tie renewals.

Maintenance of equipment showed a decrease of $408,802.20, which is general and was also made possible by the high standard previously maintained; the only important item of increase being in renewals of freight cars.

Conducting transportation showed an increase of $332,370.89. The principal fluctuations were as follows:

Fuel for locomotives decreased $134,253.11.

Engine and roundhouse men, train service and supplies decreased $239,439.43.

Station, yard, telegraph service and supplies decreased $219,837.46.

Car mileage and per diem balance increased $639,602.60, due to decreased demand for system cars on foreign roads and the adjustment of reclaims accrued in prior years.

Loss and damage increased $251,833.83, due chiefly to the settlement of deferred claims, largely the result of congestion in the latter months of the year previous, and the increase in fire claims as the result of this year's midsummer drouth.

The net earnings were $5,390,136.51, a decrease of $924,038.55.

Other income was $137,405.63, a decrease of $49,138.10, due principally to decreased interest earned from notes and deposits.

First charges were $4,818,763.44, a net increase of $291,262.09. The principal fluctuations consisted of an increase in interest on funded debt, due to the issue of additional bonds, increased taxes and increased interest on loans.

The net income for the year, after paying first charges, was $708,778.70 out of which was paid a dividend of 5% on preferred stock, leaving a surplus for the year of $208,778.70.

On the pages following will be found the general balance sheets and tabulated statements showing results of operation for the year.

There will also be found following this report, statements showing the financial condition and results from operation of the Peoria & Eastern Railway and the Cincinnati Northern Railroad for the year.

The operation of the Kankakee and Seneca Railroad for the year (for which separate accounts are kept) shows earnings $87,596.91, operating expenses and taxes $103,478.46, deficit $16,281.55.

The Mt. Gilead Short Line (for which separate accounts are kept) shows earnings for the year $5,496.12, operating expenses and taxes $7,527.02, deficit $2,030.90.

The following changes in organization occurred during the year:

On January 1, 1908, Messrs. Glennon, Cary, Walker & Howe were appointed General Attorneys in charge of legal matters at Chicago and its vicinity.

On January 1, 1908, Mr. Leonard J. Hackney was appointed General Counsel.

On January 1, 1908, Mr. Clyde Brown was appointed General Solicitor.

On January 10, 1908, Mr. Frank Littleton was appointed General Attorney.

On November 24, 1908, the jurisdiction of Mr. Charles F. Daly, Vice-President, in charge of passenger traffic was extended to cover freight, mail and express traffic.

W. H. NEWMAN, President.

FIRST CHARGES.

Interest on bonds	$3,030,935.67
Taxes on real estate	812,766.67
Taxes on gross earnings	81,609.85
Railroad commissioners' assessments	966.87
Use joint facilities: fixed interest basis	224,094.31
Rentals of other property	80,784.45
Interest on loans, notes and bills payable	587,605.62
TOTAL FIRST CHARGES	$4,818,763.44

CONDENSED GENERAL BALANCE SHEET, DECEMBER 31, 1908

Assets

Cost of road and equipment		$125,701,334.03
Securities owned		
Stocks of other companies	$2,127,970.59	
Bonds of other companies	1,498,991.44	3,626,962.03
Advances		
Kankakee & Seneca R. R. Co.	$117,000.00	
Central Indiana Ry. Co.	780,128.88	
Short Line Division	1,328,830.57	
Saline and Williamson Counties prop'ty	968,302.07	
Chicago & Harrisburg Coal Co. prop'ty	58,931.07	
Springfield Union Depot Co.	1,840.00	
Cincinnati Union Depot	60,000.00	
Real estate	41,151.20	
Evansville, Mt. Carmel & Northern Ry. Co.	203,551.00	
Saline Valley Ry. Co.	12,058.64	3,571,793.43
Fuel and supplies		1,494,150.16
Current assets		
Cash charged Treasurer	$519,184.62	
Cash in transit	1,728,319.65	
Cash in banks to pay coupons, dividends, etc.	467,103.37	
Loans and bills receivable	131,934.79	
Traffic balances receivable	858,793.83	
Sundry collectible accounts	2,573,483.19	6,278,819.45
Items in suspense		
New car contracts (per contra)	$509,274.52	
Other items	21,370.64	530,645.16
Accounts with lessor and other companies		
Peoria and Eastern Railway Co.	$55,265.96	
Kankakee and Seneca R. R. Co.	42,999.60	98,265.56
		$141,301,969.82

Liabilities.

Capital stock:		
Common	$47,056,300.00	
Preferred	10,000,000.00	
		$57,056,300.00
Funded debt:		
C., I., St. L. & C. Ry. first mortgage 6 per cent. bonds	$635,000.00	
C., I., St. L. & C. Ry. general first mortgage 4 per cent. bonds	7,323,000.00	
C., C., C. & I. Ry. first consolidated mortgage bonds	4,138,000.00	
C., C., C. & I. Ry. general consolidated mortgage bonds	3,205,000.00	
I. & St. L. R.R. first mortgage bonds	2,000,000.00	
I. & St. L. Ry. first mortgage bonds	500,000.00	
C., C., C. & St. L. Ry. (C., V. & C. Ry.) first mortgage bonds	5,000,000.00	
C., S. & C. R.R. first consolidated mortgage bonds	2,571,000.00	
C., C., C. & St. L. Ry. (Springfield & Columbus Div.) first mortgage bonds	1,103,730.00	
C., C., C. & St. L. Ry. (W. W. Valley Div.) mortgage bonds	650,000.00	
C., C., C. & St. L. Ry. (St. L. Div.) 1st collateral trust mortgage bonds	10,000,000.00	
C., C., C. & St. L. Ry. (C., W. & M. Div.) mortgage bonds	4,000,000.00	
C., C., C. & St. L. Ry. general mortgage bonds	24,058,000.00	
C., S. & C. preferred stock and scrip	428,997.45	
		65,612,727.45
Total capitalization		$122,669,027.45
5 per cent. 4-year gold notes		5,000,000.00
Current liabilities:		
Wages and supplies	$4,152,398.25	
Bills payable—L. S. & M. S. Ry. Co.	5,500,000.00	
Bills payable—Dayton & Un. R.R. Co	112,500.00	
Bills payable—other	3,425.00	
Traffic balances payable	178,980.32	
Interest accrued	494,601.47	
Bond interest due Jan. 1, 1909	383,020.00	
Bond interest unclaimed	70,329.50	
Dividends unpaid—preferred stock payable Jan. 20, 1909	125,000.00	
Dividends unclaimed	17,193.87	
		11,037,448.41
New car contracts (per contra)		509,274.52
Accounts with lessor and other companies:		
Mt. Gilead Short Line Ry.		2,444.39
Items in suspense:		
Trust equipment replacement fund		5,314.00
Profit and loss		2,078,460.85
		$141,301,969.82

CLASSIFIED ADVERTISEMENTS AND PROPOSALS

Undisplayed advertisements are inserted at two cents a word for first insertion and one cent a word for each consecutive insertion of same advertisement. Minimum charge, 50 cents. Proposals are inserted at twenty cents a nonpareil line per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

POSITIONS WANTED.

AN auditor of a 175-mile railroad, having 15 years' experience, would like to hear from management of steam or electric line needing an auditor. Good reason for desiring change. Address Box 242, care *Railroad Age Gazette.*

WANTED—By A1 B. & B. road clerk, 28 years old, married, sober, honest and industrious, position with western road; now employed in Texas. Box 249, care *Railroad Age Gazette,* 81 Fulton St., New York City.

TECHNICAL GRADUATE, four years' experience railway location and construction, wants position as transitman, resident engineer or better. References. Address "T. G.," care *Railroad Age Gazette,* 81 Fulton St., New York.

POSITION with short line as superintendent or assistant; have had 11 years' experience with trunk line, six years superintendent of short line; age 35, married; references no better. Address Box 254, *Railroad Age Gazette,* 81 Fulton St., New York.

WILL be open for engagement for position for auditor of railroad May 1, or sooner. Have held such position for last five years of railroad of 150 miles in central west; am familiar with all detail work and Interstate Commerce Commission requirements. Very best of credentials from present and former employers. Address Box 261, care *Railroad Age Gazette,* 83 Fulton St., New York City.

POSITIONS WANTED.

SALESMAN, well acquainted with the railroad supply trade and particularly with the manufacture and sale of car wheels, wants to change his position. Address Box 259, care *Railroad Age Gazette,* 81 Fulton St., N. Y.

YOUNG man, 26; married; eight years' varied experience in operating department as chief clerk and expert stenographer, desires similar position or as confidential man with railroad, manufacturing concern or public service corporation; best references. Address Box 262, care *Railroad Age Gazette,* 83 Fulton St., New York City.

FIRST CLASS maintenance engineer open to engagement; graduate C.E., M Am. Soc. C. E.; 20 years' experience on best roads; practical trackman; experienced in construction, maintenance, operation, organization and economy; best references. Address Box 255, care *Railroad Age Gazette,* 81 Fulton St., New York.

POSITIONS OPEN.

ASIATIC AGENCY wanted for American machinery by Japanese technical graduate, age 35. "T. I.," 312 South Carolina Ave., S. E., Washington, D. C.

WE have calls daily for skilled mechanics; if ambitious and seeking to better your condition, write us; many new industries in the west offering good positions in the skilled and mechanical line. Address National Reference & Investment Co., 574 Brandeis Building, Omaha, Nebr.

POSITIONS OPEN.

YOUNG engineer of experience, willing to undertake difficult work in both location, engineering, and the actual overseeing of the construction of several short branch lines; most of the grading has been done on the entire proposition, and the bulk of the work will consist of locating connections and the track building thereon. Could use a good superintendent for track work; references: Pennsylvania. Address Box 263, care *Railroad Age Gazette,* 83 Fulton St., New York.

MISCELLANEOUS WANTS.

I WANT to communicate with a live steel mill or railroad business man who has capital or can get it, to market an improved tie plate. A strictly first class commercial article with broad patent protection; will stand fullest investigation. For full details and information address Box 258, care *Railroad Age Gazette,* 81 Fulton St., New York.

PROPOSALS.

ALL railroad contractors read *Railroad Age Gazette* to keep posted on railroad development. That is why all proposals for railroad and similar work should be published here. Rates are low—only 20 cents per line each insertion. Send orders to *Railroad Age Gazette,* 83 Fulton St., New York City.

THE MAN you want for that particular job can be secured by advertising here. Try it! See top of this page for rates and send your order direct to *Railroad Age Gazette,* 83 Fulton St., New York City.

BOOKS AND PUBLICATIONS.

SIGNAL DICTIONARY. New edition now ready. This important work of reference was edited by the authority and under the supervision of a committee of the Railway Signal Association. The definition of all terms and name of every detail part used in signaling refer in each case to the drawings. These drawings, many thousand in number, include under Block signals the Manual or Telegraph block, the Controlled Manual, the Train Staff, the Automatic block and signals for electric roads, together with detailed drawings of track circuits and all parts used. All details of Mechanical and Power Interlocking are fully illustrated and treated. Full morocco binding. Sent prepaid upon receipt of price, $6.00. Send for descriptive circular. *Railroad Age Gazette,* 83 Fulton St., New York City.

LOCOMOTIVE DICTIONARY. (New 1906). Published by authority of the American Railway Master Mechanics' Association under the supervision of a committee of its members. It is an illustrated vocabulary of terms which designate American railroad locomotives, their parts, attachments and details of construction, with definitions and illustrations of typical British locomotive practice. 5,148 illustrations showing general views and detail drawings of all types of modern American and British locomotives, including details of their parts and fittings. An absolute necessity to anyone engaged in designing, building, repairing or handling locomotives. Full morocco binding. 627 pages. Sent prepaid in United States upon receipt of price, $6.00. Write for descriptive circular. *Railroad Age Gazette,* 83 Fulton St., New York City.

"WANTED" AND "FOR SALE" ADVERTISEMENTS

Displayed advertisements are inserted under this heading at the uniform rate of $1.50 an inch (1 inch deep by 1⅝ inches wide) per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

ALPHABETICAL INDEX TO ADVERTISERS—CLASSIFIED DIRECTORY ON THE NEXT PAGE.

†Once a Month. *Every Other Week.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Accountant.
Whitehead, H. C.

Acetylene Lighting.
Commercial Acetylene Co.
Rushmore Dynamo Works.

Air Brake Fittings.
Fairbanks, Morse & Co.
National Tube Co.
Simmons Co., John.
Western Railway Equipment Co.
Westinghouse Air Brake Co.

Air Brake Hose—(See Hose).

Air Brakes.
Westinghouse Air Brake Co.

Air Compressors.
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Franklin Railway Supply Co.
Gardner Governor Co.
Independent Pneumatic Tool Co.
Murphy & Co., Christopher.

Air Hoists—(See Hoists).

Anti-Friction Metal—(See Babbitt Metal).

Anti-Rail Creepers.
Railway Specialty & Supply Co.

Anvils.
Eagle Anvil Works.

Architects.
Dodge & Day.

Asbestos.
Asbestos Protected Metal Co.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Asphalt.
Standard Asphalt & Rubber Co.

Augers Pneumatic — (See Pneumatic Tools).

Axles.
Block-Pollak Iron Co.
Cleveland City Forge & Iron Co.
Gould Coupler Co.
Johnson & Co., J. R.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Manganese Steel Rail Co.
Pittsburgh Forge & Iron Co.
Standard Steel Works Co.

Babbitt Metal.
Brady Brass Co.
Damascus Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Baggage Checks.
American Railway Supply Co.

Baggage Racks.
Rostand Mfg. Co.

Balanced Main Valves.
American Balance Valve Co.
Hammett, H. G.

Ballast Cars—(See Cars, Ballast).

Ballast Unloaders.
Bucyrus Co.
Fairbanks, Morse & Co.
Marion Steam Shovel Co.

Batteries, Electric.
Edison Mfg. Co.
Electric Storage Battery Co.
Railroad Supply Co.
Westinghouse Machine Co.
Willard Storage Battery Co.

Battery Chutes and Vaults.
Buda Foundry & Mfg. Co.

Bearing Metal—(See Journal Bearings).

Bell Ringers.
Ward-Packer Supply Co.
Western Railway Equipment Co.

Bells, Locomotive.
Lawrenceville Bronze Co.
National Tube Co.

Bending Rolls.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Blocks and Tackle.
American Hoist & Derrick Co.
Boston & Lockport Block Co.

Blowers.
American Blower Co.
Monarch Engineering & Mfg. Co.
Sirocco Engineering Co.

Blow Torches, Large Portable Oil.
Macleod & Co., Walter.

Blue Printing Machines.
Kolesch & Co.

Blue Print Papers.
Kolesch & Co.

Boiler Compounds.
Dearborn Drug & Chemical Works.
Jewell Engineering Co.
Johns-Manville Co., H. W.
Ward-Packer Supply Co.

Boiler Covering—(See Covering, Pipe and Boiler).

Boilers.
American Locomotive Co.
Baldwin Locomotive Works.
Carlin's Sons Co., Thomas.
Fairbanks, Morse & Co.
Hannoversche Masch.-Actien-Ges'aft
Hicks Locomotive & Car Works.
Vulcan Iron Works.
Yale & Co., Julian L.

Boilers, Steam and Water Heating.
Lord & Burnham Co.

Boiler Tubes.
Krupp (Prosser & Son).
National Tube Co.
Parkesburg Iron Co.
Simmons Co., John.
Tyler Tube & Pipe Co.
Worth Bros. Co.
Yale & Co., Julian L.

Boiler Washout Systems.
National Boiler Washing Co.
Yale & Co., Julian L.

Bolsters, Steel.
American Steel Foundries.
Atha Steel Casting Co.
Barney & Smith Car Co.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Commonwealth Steel Co.
Gould Coupler Co.
Pressed Steel Car Co.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Car Co.

Bolt and Nut Machinery.
Acme Machinery Co.
Ajax Mfg. Co.
Niles-Bement-Pond Co.

Bolts and Nuts.
Q. & C. Co.
Railway Specialty & Supply Co.

Boring Bars—(See Portable Tools).
Underwood & Co., H. B.

Boring Machines, Horizontal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring Machines, Metal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring and Turning Mills.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Brakebeams.
American Steel Foundries.
Chicago Railway Equipment Co.
Cleveland Car Specialty Co.
Barney & Smith Car Co.
Davis Solid Truss Brake Beam Co.
Pressed Steel Car Co.
Standard Steel Car Co.

Brakejaws.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.
U. S. Metal & Manufacturing Co.
Western Railway Equipment Co.

Brake Levers.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.

Brakeshoes.
American Brake Shoe & Fdry. Co.
Buckeye Steel Castings Co.
Franklin Railway Supply Co.
Georgia Car Co.
Railway Materials Co.
Transue & Williams Co.
Wheel Truing Brake Shoe Co.
Yale & Co., Julian L.

Brakeshoes, Wheel Truing.
Wheel Truing Brake Shoe Co.

Brass Castings—(See Castings, Brass).

Brasses, Car and Engine—(See Journal Bearings).

Bridges, Buildings & Roofs.
Atlantic Equipment Co.
American Bridge Co.
Baltimore Bridge Co.
Interstate Engineering Co.
King Bridge Co., The.
Louisville Bridge & Iron Co.
Males Co., The.
McClintic-Marshall Constrn. Co.
Missouri Val. Bridge & Iron Wks.
Phoenix Bridge Co.
Riter-Conley Mfg. Co.
Scherzer Rolling Lift Bridge Co.
Shoemaker & Co., Lewis F.
Snare & Triest Co.
Virginia Bridge & Iron Co.
White & Co., J. G.

Bridges, Second Hand.
Johann, F. A.

Bridge Timber—(See Timber).

Bronze.
Brady Brass Co.
Damascus Bronze Co.
Lawrenceville Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Buckets, Automatic Grab.
Browning Engineering Co.
Link-Belt Co.

Bulldozers.
Ajax Mfg. Co.
Niles-Bement-Pond Co.
Williams, White & Co.

Bumping Posts.
Fairbanks, Morse & Co.
McCord & Co.
Mechanical Mfg. Co.

Cables, Electric.
Brixey, W. R.
General Electric Co.

Cableways.
Brown Hoisting Machinery Co.
Flory Mfg. Co., S.

Caboose, Jacks, Cast-Iron.
Dickinson, Inc., Paul.

Calculating Machines.
Kolesch & Co.

Car Axles—(See Axles).

Carborundum.
Carborundum Co.

Car Cleaner.
Ward-Packer Supply Co.

Car Closets.
Duner Co.

Car Couplers—(See Couplers).

Car Curtains.
Curtain Supply Co.
General Railway Supply Co.
National Lock Washer Co.
Pantasote Co.

Car Doors.
Ostermann Mfg. Co.
U. S. Metal & Mfg. Co.
Western Railway Equipment Co.

Car Flooring.
American Mason Safety Tread Co.
General Railway Supply Co.
Wood, Guilford S.

Car Heating.
Chicago Car Heating Co.
Consolidated Car-Heating Co.
Franklin Railway Supply Co.
Gold Car Heating & Lighting Co.
Johns-Manville Co., H. W.
Safety Car Heating & Lighting Co.

Car Lighting.
Bliss Electric Car Lighting Co.
Commercial Acetylene Co.
Electric Storage Battery Co.
General Electric Co.
Gold Car Heating & Lighting Co.
Safety Car Heating & Lighting Co.

Carlines, Pressed Steel.
Cleveland Car Specialty Co.

Car Movers.
Appleton Car Mover Co.
Fairbanks, Morse & Co.
Hubbard & Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Platforms, Steel.
Commonwealth Steel Co.
Standard Coupler Co.

Car Repair Material, Second-Hand.
Jennings, Geo. W.

Car Replacers.
Buda Foundry & Mfg. Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Roofing.
Asbestos Protected Metal Co.
Bird & Son, F. W.
Bunker, Ed. A.
Chicago-Cleveland Car Roofing Co.
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Wood, G. S.

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Pantasote Co.
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Barney & Smith Car Co.
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Jeffrey Mfg. Co.
Lima Locomotive & Machine Co.
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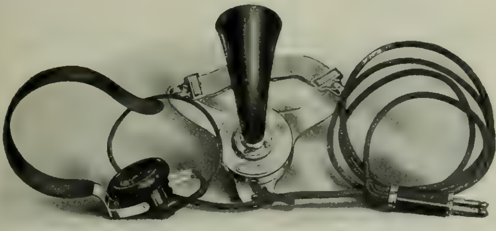

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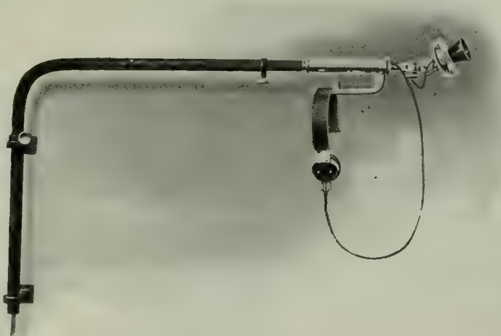

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DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

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Crocker-Wheeler Co.
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Electric Hoists—(See Hoists, Electric).

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Arnold Co.
Crocker-Wheeler Co.
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General Electric Co.
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Keith, Herbert C.
Link-Belt Co.
Lovell, Alfred.
Lucius, Albert.
Moreno, C. A.
Murphy, J. F.
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Pittsburgh Testing Laboratory.
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Virginia Bridge & Iron Co.
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Nicholson File Co.

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Flue Expanders.
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CONTENTS

In a recent talk before the City Club of Chicago F. A. Delano mentioned one phase of the subject of the development of waterways at government expense that has seldom been alluded to. This is, that it will tend to make railway rates to points where there is water transportation *below* the average, and to make railway rates to points where there is no water transportation *above* the average. "In other words, the inland point, far away from water and not having the advantage of water transportation, will have to pay a little more than its share because the railway has to compete with the water at the point where there is water transportation." Those who live and do business at inland points will be taxed as much to pay, for example, for the digging of a deep waterway from Chicago to the Gulf as those who live and do business on the waterways. While the railway rates of those at inland points may not be made *absolutely* higher by waterway development they are pretty sure to be made *relatively* higher as compared with those of their competitors on the waterway, and of course it is not the absolute rates to any point but the relation of its rates to the rates of the commercial centers with which it competes that determine whether it shall grow and prosper. The number of large commercial centers on waterways is much greater than the number of large centers inland; but the number of small manufacturing and jobbing centers inland is far greater than the total number of large manufacturing and jobbing centers. Inland places have always been, and always will be, chiefly dependent for their prosperity upon good means of transportation by rail; and it would seem that they have a right to demand that, if the government shall tax the entire country for the development of waterways, it shall at least do nothing to discourage the development of railways. In his recent speech before the Traffic Club of Chicago, Congressman Ransdell, of Louisiana, warned the railways that if deep waterways were built the roads would arouse more hostile public sentiment against themselves if, in meeting the competition of the boats, they discriminated against points not having water transportation. But if the roads did not meet the water rates the waterways would not have the effect, for which their construction is advocated, of reducing railway freight rates; if the railways did meet the water rates without reducing rates proportionately to inland points the result would be a discrimination against inland points; and if they met water competition, and also reduced their rates proportionately to inland points the roads probably would be bankrupted, and the inland points, depending solely on the railways for transportation, would be crippled by lack of transportation facilities.

IMPROVED SHOP ORGANIZATION.

Railway shop organization of the present day shows a tendency toward giving the tool room foreman more prominence. The general conception has always been that the foreman of machines should have jurisdiction over all the machine tools, at least those within the machine shop. This jurisdiction may even extend over all the tools in the various shop buildings, but it has always included those used in tool making. The tendency now seems to be toward requiring the tool room foreman to report, not to the foreman of machines, but directly to the general foreman. This has undoubtedly come about, as does most improvement in any organization, as a remedy for a recognized weakness. When the tool room is considered as a part of the machine shop, as is generally the case, it comes to be considered the same as any other group in the main shop and gets no more attention from the foreman of machines than does any other. In fact, it even receives less attention, since it has its own foreman, and an organization weakness becomes marked in times of general crowding of all the machines. The machine foreman may have some lathe work which he sends to the tool room because his machines out in the shop are crowded and the result is that the work under way in the tool room must wait. The same movement seldom operates the other way when the tool room is over busy; consequently tool room work gets behind and its foreman is not able to plan and carry out his work, due to interruptions. If he be independent of the foreman of machines and required to report only to the general foreman, work which is sent to him from the outside shop will not be allowed to interrupt the regular tool room schedule. We understand that this plan is now in operation in all the shops of the Erie, and that it is being considered by other roads.

An instance of increased consideration being given the subject of tools is evidenced by the system now in use in one of the shops on the Erie, described in our issue of March 26, in an article by W. J. Eddy, general tool inspector. His jurisdiction extends over the entire system and his recommendations reach the different shops through their master mechanics, who are responsible, not to the tool inspector, but to the general mechanical superintendent. This machine tool system

is undoubtedly elaborate, and some may say too much so, but we believe that it is thoroughly practical for large shops. It may be argued that considerable time is lost in making trips to and from the tool room and in waiting at the window for tools, and anyone who is familiar with the shop knows this to be the case, but with the proper machine tools ground to correct cutting edges, clearance, etc., this loss should be more than made up in the increased efficiency of the machines. If, as is claimed for this system now in use on the Erie, a direct saving of 45 per cent can be effected in a year, an argument against such a system will necessarily have to be a substantial one.

THE NEW ENGLAND RATE DISPUTE.

The dispute over the New England freight rates westward has been slowly but with steady upward movement reaching an acute stage. Beginning several weeks ago with meetings of the executive committee of the trunk line association the general subject was gone over but no agreement reached. Next came the appeal of the committee to the trunk line presidents. These have held a number of meetings and there has been a new series of special "committee" deliberations. At one time there seemed a likelihood of agreement based on the equation of all the New England rail rates westward and of the New England westward rail and water rates also. But this has involved higher rates westward from Boston and northern New England; has met the veto of the Grand Trunk; has provoked a storm of protest from shippers of Boston, of Providence and of central and northern New England points; and finally has encountered the opposition of the Boston & Maine, which holds that by the proposed readjustment it would suffer pains and penalties under the Sherman act. A situation already complex thus falls into new confusion.

The record of the case may be briefly made up to date. Several months ago the New York, New Haven & Hartford Company arranged with the Canadian Pacific for an all-rail rate to the West with a rate equal to the preferential given to the Grand Trunk by water and rail *via* New London. There was thus opened to the New Haven an all-rail preferential route not only to Canadian points but directly or indirectly to Detroit, Chicago, St. Paul and St. Louis. It was met by a request of the Grand Trunk for a similar all-rail arrangement with the New Haven. This was refused unless the Grand Trunk would accede to what was tantamount to a surrender to the New Haven of the Grand Trunk's southern outlet at New London *via* the New London Northern. The two companies disagreeing the Grand Trunk refused to renew its contract for use of the New Haven's boats between New York and New London and proposed to put on boats of its own. This was the starting point of the controversy which, at first, seemed of a localized character affecting only two New England lines and a not very large volume of business—perhaps also overlooked at a time when economy of operation to meet reduced earnings was the overshadowing problem of the trunk lines.

But the situation deepened and broadened. The New Haven-Canadian Pacific combination began to increase its business. It began to take westward traffic from New York over the Canadian Pacific to a considerable amount. The steamship lines connecting with the Southern Central rail systems and enjoying preferential rates began to complain and threaten. Incidentally came the Boston & Maine's import rate reductions. Thus the controversy has spread and thickened until the whole trunk line question of rates is, contingently at least, involved. The New Haven has apparently used successfully its new all-rail preferential as a "club" to force trunk line consideration of readjustment of rates and of redress for what it claims are grievances based on non-preferential rates for its own remoter territory, which, nevertheless, the Grand Trunk is allowed to bisect while at the same time it —the New Haven—suffers from the preferential given its northern points such as Springfield, Worcester, Boston and other Massachusetts cities.

We have stated the situation in some of its bolder outlines and without giving rate figures—it is complicated enough in its mere description. It involves the most varied interests and considerable variations of schedules as well as territorial considerations of diversity and magnitude affecting both the shippers and the transportation companies. There are "in the ring," so to speak, some 15 such companies and the rate complexities are many and profound. There are all-rail rates, lake and rail rates, coastwise and rail rates, river and rail and lake rates, rates based on relative distance and on transhipment. Public sentiment, as moulded by shippers opposed to *any* increase of rates, is another and powerful influence in the controversy. It has been thought that the opening of the lake and rail routes as diminishing the New Haven-Canadian Pacific business will make the question less acute, and this is, no doubt, measurably true. But it means, at most, but a truce for a few months lasting until interior water navigation closes. That there will be a final readjustment and harmony of interests no one can doubt. The interests at stake are too vast, just as business is beginning to recover, to risk a serious war of rates growing out of a few cents a hundred in the schedules. Meanwhile the interesting factor in the situation to watch is the New Haven. We have heretofore pointed out how its control of the Boston & Maine and domination of New England meant problems ahead for the trunk lines. The Canadian Pacific alliance and its results on the trunk lines situation is at once a fact and an omen.

GETTING DOWN TO FUNDAMENTALS.

It is a good thing to get down occasionally to fundamentals. F. A. Delano, in his recent admirable address at Hannibal, Mo., sank a shaft to some of the fundamentals of political economy and of human nature which have a direct and important relation to the policy of government regulation of railways, but which have been pretty generally ignored recently by those who have been working out and applying the details of this policy. He recalled that it has not been many years since the fundamental principle of political economy was *laissez faire*, "let things alone," the theory being that the less the government interfered with business the better it would be for both business and government. As Mr. Delano said, we do not hear much of this theory now. It has been supplanted by the theory that the free operation of commercial and industrial forces gives rise to evils that must be suppressed, or fails to confer benefits that can only be obtained, by constant watchfulness and supervision by government over industry and commerce. It is assumed that men will not or cannot grow the right kind of crops, or make the right goods, unless aided and stimulated by a protective tariff; that railways will not or cannot furnish adequate service at reasonable rates, or treat their patrons fairly, unless some public body shall tell them what they ought to do and warn them against what they ought not to do.

Perhaps there are some people who think that this theory of the need for constant governmental supervision and control of business is new, but, as Mr. Delano recalls, it is a very old theory. It was tried thoroughly by every nation of Europe until early in the Nineteenth century. There then set in a powerful reaction against it. Statesmen, following in the footsteps of students of the sciences of politics and economics, decided that when government tried to tell business what it ought to do and what it ought not to do, it always accomplished very little good and very much harm. There was a wave of legislation that wiped from the statute books, especially in England, many of the laws that restricted the freedom of commerce. The way that the leading statesmen and think-

ers at that time regarded previous attempts of government to direct and control business is illustrated by the following striking remarks of Henry Thomas Buckle in the first volume of his "History of Civilization in England," which was published in 1857 when the reformatory movement was at its height:

"Every great reform which has been effected has consisted, not in doing something new, but in undoing something old. The most valuable additions made to legislation have been enactments destructive of previous legislation; and the best laws which have been passed have been those by which former laws were repealed. . . . The whole scope and tendency of modern legislation is to restore things to that natural channel from which the ignorance of preceding legislators have driven them. . . . But though we may thus be grateful to individual lawgivers we owe no thanks to lawgivers as a class. . . . It is clear that the progress of civilization cannot be due to those who on the most important subjects have done so much harm that their successors are considered benefactors simply because they reverse their policy and thus restore affairs to the state in which they would have remained if politicians had allowed them to run on in the course which the wants of society required."

The time may never come again when the "let things alone" theory will be so generally accepted by all thinkers and statesmen as obviously correct as it was about 60 years ago; but that the time will come when some future writer of authority will say of present legislation for the regulation of business, as Buckle said of such legislation in his day, that the greatest reform that could be effected would be the repeal of most of it, we have no doubt. It is but a matter of years and experience until the public will make the discovery once more that, however much evil may result from the free management of industries by those who understand them, much more evil results from constant interference with those industries by public officers who have no expert knowledge of them. The sound common sense of the American people will sooner or later awaken to the fact that there are natural laws of economics as well as of physiology and pathology; that it is as dangerous to let quacks tinker with ailing business and industry, in defiance of the natural laws, as it is to let them tinker with ailing human bodies, and that while business may sometimes need a physician, it is safer, if a physician of experience and recognized ability cannot be had, to let disease run its course, than to let every political and economic empiric who comes along try some new nostrum on the patient. Sooner or later the people will learn that in about 90 per cent. of the cases of business ailments nature, if given a fair chance, will prove a better healer than even the best of physicians.

The contemporary theory of regulation of railways assumes that the public and public authorities are the right persons to decide how a railway shall be run and how much money it shall make. As Mr. Delano intimated, this runs counter to human nature; and human nature must receive more consideration in the regulation of railways if regulation is not to continue to do more harm than good. Men invest their capital in railways to make money. The legislatures and commissions may legally reduce their rates to any point above confiscation, and courts may perhaps constitutionally hold that rates that yield a return of 6 per cent. or more are not confiscatory. But the owners of railways are apt to disagree with the legislatures, commissions and courts. They are apt to insist that they shall be allowed more than 6 per cent. If they do not get more they are apt to refuse to invest much more money in railways, and while the regulating authorities and the courts can restrict the return from existing investments to a fixed percentage, they cannot compel anybody to invest any more money. They may wax indignant against capitalists for not bowing before the superior wisdom of public authorities. They may denounce them for being so selfish as to want larger profits than public authority may think they ought to have. But such indignation and such denunciations will be wasted. Those who invest money in railways are simply selfish human beings like those who invest money in farms and stores and factories; and if the government, by a protective tariff, for example, makes investments in manufactories unusually attractive, and by government regulation makes investments in railways unusually unattractive, capitalists, regardless of what legislatures, or commissions, or courts may think, will withhold their money from railways and put it into manufactories.

They are withholding it from investments in railways now. We hear a great deal of talk about the return of prosperity being delayed by the tariff agitation. It is notable, however, that the largest industry in the country that is still closely restricting the number of men it employs and the amount of materials it buys is the railway industry. This is due both to the fact that a relatively small amount of traffic as compared with the traffic of recent years is moving, and that the roads and those who might, under different conditions, be disposed to invest in them are constantly harassed by doubts as to what the legislatures, state commissions, congress and the Interstate Commerce Commission are going to do that will further increase their costs of operation and further reduce their earnings. A continuation of this state of affairs will make the railways unable to handle the largely increased traffic that will come to them when good times return. No doubt they will be denounced as they were two years ago for not having sufficiently increased their facilities; but as long as human nature is human nature men will continue to refrain from pouring into any business millions of capital on which they have been warned by the government that they will not be allowed to earn a large return no matter how well managed the properties in which it is invested may be, and on which they are certain to earn no return at all if, owing to conditions that they cannot foresee, the investment shall prove to have been unwise.

THE STRENGTH OF BRICK AND TERRA-COTTA BLOCK COLUMNS.

Compared to our knowledge of structures built of wood, steel or concrete, our knowledge of the properties of structures built of brick, stone and terra-cotta is small. This is true especially of the last, for while a number of tests on brick columns are on record, the use of terra-cotta blocks in compression members is comparatively recent, and therefore there is little on record concerning their properties in such applications. It is well known, of course, that terra-cotta can be made of tremendous strength, being a matter of burning. But it is not necessary that it be burned to withstand stresses higher than 8,000 lbs. per square inch, since its value as a building material is limited by the strength of the Portland cement mortar joint which it is necessary to use with it. A carefully made 1:3 mortar may withstand compressive stresses up to 6,000 lbs. per square inch, and the addition of metal fabric to the joints will give another 2,000 lbs., or 8,000 lbs. total, so there is no advantage in burning the tile harder than this. Makers of this tile with systems for its use in building construction have a good many unpublished tests of column, wall and floor designs which afford valuable experimental data. For example, in some tests of hollow tile wall construction made by R. W. Hunt & Co. a 4-in. wall 12 ft. high sustained a load of of about 61 tons per lineal foot without injurious deflection. This represents the average of six different tests, the maximum allowable deflection in each case being 1 in.

A bulletin just issued by the University of Illinois* describes tests of 16 columns built of terra-cotta blocks and an equal number of short columns or tiers of brick. The length of the columns varied from 10 to 12½ ft. The lateral dimensions were 12½ in. x 12½ in. for the brick, and ranged from 8½ in. x 8½ in. to 17½ in. x 17½ in. for the terra-cotta. Different qualities of mortar and grades of workmanship in laying were used. The terra-cotta columns were built and tested in two

*Bulletin No. 27 of the Engineering Experiment Station, University of Illinois: Tests of Brick Columns and Terra-Cotta Block Columns.

lots, about a year intervening between the tests. The two lots were alike as to quality, but there was a difference in the ends—the bearing faces—the second lot being approximately plane, while the first were appreciably concave, as much in some cases as 3/16 in. Thirteen of the columns were laid with the care usually given to such work, and the remaining three were put up hurriedly to get the effect of poor laying.

The results of these and the brick column tests can be indicated here only in a brief, general way. Portland cement mortar was used in all of the terra-cotta columns and 13 of the brick columns. Lime mortar was used in two brick columns, and natural cement in one. The brick used was of two kinds, 14 columns being of shale building brick, and two of underburned clay brick. Both poor and good laying were represented in the brick columns, as in the terra-cotta. Loads were applied both centrally and eccentrically; also continuously to failure or to the capacity of the machine in some instances, and with full release between increases in others. Regarding the results, the Bulletin says:

"Both brick columns and terra-cotta columns gave high strengths in all cases where strong mortar and care in building were used. For central loading, the strength of the brick columns ranged from 3,220 to 4,110 lbs. per sq. in., and the strength of the terra-cotta block columns from 2,700 to 3,790 lbs. per sq. in., the columns having the highest resistance not failing at the full capacity of the machine. The effect of the strength of the mortar is apparent in the carrying capacity developed in the columns; lower loads were found in columns built with 1 : 5 Portland cement mortar than in those with 1 : 3 Portland cement mortar, still lower loads in those with 1 : 3 natural cement mortar, and still lower in those having 1 : 2 lime mortar. The effect of the quality of the brick is shown in the columns made with inferior brick, which carried only 31 per cent. as much as columns built with the better grade of brick. In the case of the terra-cotta columns, blocks which were culled out as somewhat inferior gave a column strength perhaps 30 per cent. less than the columns built with superior blocks. The effect of the attempt to represent hurried or careless workmanship in two brick columns and in three terra-cotta block columns was a loss in strength of about 15 per cent. and 25 per cent., respectively.

"The ratio of the strength of the columns to the compressive strength of the individual brick and block is of interest. In the well-built brick columns loaded centrally, the ratio of strength of column to compressive strength of individual brick ranged from 0.31 to 0.37, and in the underburned clay brick column the ratio was 0.27. In the terra-cotta block columns with central loading the ratio of strength of column to that of individual block was 0.74 for the incompleted test, and 0.83, 0.85, and 0.89 for the others. If, as seems to be the case, the strength of the brick or block to resist cross-breaking is an element in determining the strength of the built-up column, a deeper or thicker brick would give higher column strength. It is possible that this partially accounts for the fact that the ratio is found to be higher for terra-cotta block columns than for brick columns. The tests suggest that the ability of individual pieces to resist transverse stress is an important element in the strength of the completed column. This suggestion may have an important bearing on the advantageous size of the component blocks which may be used in compression piece where high strength is desired."

Some of the terra-cotta columns by R. W. Hunt & Co. show even higher results than those given above, the difference being attributed to the advantage due to more permanent, and therefore somewhat more efficient, facilities for making special tests of this sort. An interesting test of a cylindrical hard-burned terra-cotta tile column was made by this concern last fall. This column was 21¾ in. in diameter and 21 ft. 9½ in. high. It had seven tiles in the outside course, three in the inside course and was reinforced with six ⅜-in. twisted steel rods. The thickness of the tiles was 2¼ in., there being 106 courses in the column. It was laid with ¼-in. Portland cement mortar joints. The outer courses of tile each had a 1-in. groove ¼ in. deep in which was laid a round ring of 3/16-in. wire 16 in. in diameter. The column, which weighed complete 7,816 lbs., was shipped on a flat car 900 miles to Phoenixville, Pa., for test in the large machine of the Phoenix Iron Works. It withstood a load of 1,500,000 lbs. without reaching the elastic limit, and was then reshipped to the place where it was built.

A practical difficulty, as yet unsolved by terra-cotta construction engineers, occurs in buildings which are tall enough to require wind-bracing. The wind-bracing being steel, all of the outside columns have to be of steel also, as no satisfactory way has been found for connecting the steel bracing to terra-cotta columns. This does not occur in buildings up to five stories, say, where the exterior brick walls aid the columns in carrying the load and lateral bracing is not required. On the higher buildings referred to all interior columns may be terra-cotta, of course. Some difficulty is also encountered when reinforced concrete and terra-cotta are used in the same structure, at points where members of these respective materials must be joined, higher maximum stresses being allowed by most city building departments for the tile construction than for the reinforced concrete. The method followed in this instance is to corbel out from the tile column to support the concrete member.

DELAWARE & HUDSON.

A decision by the Supreme court of the United States holding the commodity clause of the act to regulate commerce constitutional would in all probability necessitate some transfer of the ownership of coal lands from the Delaware & Hudson Company to its stockholders or others. The showing made last year by the company might well be used as an illustration of the evil that may result if the ownership of the coal lands is divorced from the ownership of the railway.

The total railway operating revenue amounted to $18,500,000, and of this revenue, $9,100,000 was derived from coal freight, and, moreover, besides forming nearly half of the total railway revenue, the revenue from coal freight is by far the most dependable source of income. Total railway operating revenue decreased by $1,700,000 from the high figures of 1907, but the revenue from coal freight was about $100,000 greater in the 1908 year than in the generally far more prosperous 1907 year. The coal department, which includes the mining and selling of coal and for which figures are given separately, had gross receipts of $23,800,000 in 1908 and $23,600,000 in 1907, with gross expenses, excluding taxes, of $22,700,000 and $22,400,000 in the two years respectively. This leaves net earnings from the coal department of but $1,100,000 and $1,200,000 in the two years, while the railway net earnings were $7,700,000 in 1908 and $8,500,000 in 1907; in other words, net earnings of the coal department are but 5 per cent. of gross receipts, while net earnings from railway operation are 41 per cent. of gross receipts.

It would appear then that the great value of the coal lands to the Delaware & Hudson Company comes from the freight which these coal lands furnish the railway and not from the net earnings of the coal department itself. Anything, therefore, that might give the control of the routing of coal shipments to others than the management of the railway would expose the D. & H. to very serious loss; to loss which, if this line of argument is correct, would amount to actual confiscation of property, since there is a real value which is not represented either by the coal properties or the railway properties, but is of the nature of good-will, arising from the working of the two in harmonious conjunction.

It has been the policy of the company in the past to acquire coal lands whenever they could be obtained at an attractive price. As has already been pointed out, this policy was justified by the company's earnings from coal freight in the year of business depression.

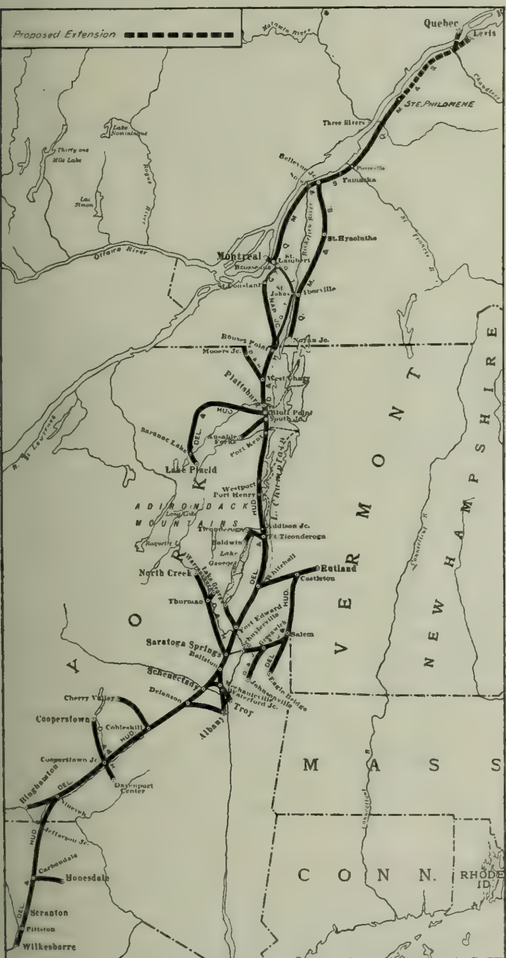
After paying fixed charges and rentals, the company carried to profit and loss $5,300,000 last year as against $6,500,000 in 1907. This is 12.39 per cent. on the $42,400,000 capital stock in 1908 and 15.25 per cent. in 1907.

With a decrease in earnings due to a loss in merchandise freight traffic and passenger traffic amounting to $1,700,000, the company was able to reduce operating expenses by $900,000, the total railway operating expenses being $10,800,000 last year.

The expenses for conducting transportation were reduced about $400,000, and the remainder of the reduction in total expenses is accounted for by reductions in both maintenance of way and maintenance of equipment. The cost of maintenance of way per mile of first, second, third, etc., track (switch tracks and sidings being counted as half) is shown in the following table. The table also shows the unit cost of maintenance of equipment:

	1908.	1907.
Maintenance of way, per mile........	$940	$1,269
Repairs per locomotive	1,909	2,081
" " passenger car	249	344
" " freight car	46	44

Freight statistics show that the number of tons carried one mile totaled 2,135,000,000, a decrease of about 376,000,000. The



Delaware & Hudson.

average miles each ton was carried also decreased, being 121 last year, about half a mile less than in the previous year. The average number of loaded cars in a train was 16.24, or 1.46 less than in 1907, and the average number of empty cars in a train was 9.16, or 1.29 more than in 1907; in other words, the percentage of freight car mileage made by loaded cars was 64 per cent. in 1908 as against 69 per cent. in 1907. This is the lowest per cent. in any year since 1899, and it was particularly hard for the Delaware & Hudson to prevent the increased empty car mileage because so large a proportion of its freight hauled north is coal, while it depends on general merchandise to furnish tonnage for the southbound haul. In 1907 the loaded mileage of home and foreign freight cars northbound was 67,450,000 and the empty mileage, 4,160,000, the southbound mileage was 30,800,000 and the empty, 39,500,000. In 1908 the loaded mileage northbound was reduced to 62,000,000 miles and the empty mileage increased to 6,000,000 miles. At the same time, the loaded mileage southbound was 24,950,000 miles and the empty mileage, 43,100,000 miles. The reason for this is shown by larger proportionate decreases in products of agriculture, products of forests and manufactures, than in the tonnage of anthracite coal.

In the review of the Delaware & Hudson Company's report for 1907 the value of the street railway properties owned by the company was gone into somewhat fully, and it is unnecessary to repeat the descriptions of these properties here. The unprosperous condition of the country made the operation of the electric railways considerably less profitable than should be the case in a normal year. No dividends were declared last year by any of the subsidiary electric street railway properties with the exception of the United Traction Company, which paid 4 per cent. in 1908. The Delaware & Hudson Company owns approximately $12,500,000 of the United Traction Company stock, so that the income from this source was about $500,000, and apparently this is the only income derived from the electric properties during the year.

Closely connected with this question of ownership of the controlling interest in street railway properties is the question of expansion through the acquisition of other steam railway properties. During 1908 the New York & Canada and the Cherry Valley, Sharon & Albany Railways were merged with the Delaware & Hudson Company, and 171 miles of road were thus added to the steam railway property and $9,600,000 transferred from investment assets to cost of road and property.

The balance sheet shows current liabilities of $14,755,925 in 1908 and current assets of $18,834,858, but included in these current assets is $8,039,450 advances for construction and acquisition of new lines, which although generally given under current assets, is in reality more nearly a capital asset. Cash on hand amounted to $830,919 in 1908 and $2,387,851 in 1907. This rather small working capital may be in part due to the trouble the company had in getting permission from the Public Service Commission to issue its bonds.

Application was made to the Public Service Commission to issue $20,000,000 bonds, part of the proceeds of which was to be used to reimburse the railway company for advances for construction and acquisition of new lines. The Commission authorized the issue of $13,539,000 bonds but reserved decision on the question of issuing the remaining $6,461,000. The company applied for the issue of these remaining bonds to discharge its obligations incurred to pay the cost of outstanding securities of the Hudson Valley Railway and of additional coal lands in the state of Pennsylvania. All of these obligations were incurred before the passage of the Public Service Commission law. After reconsideration permission to issue the additional bonds was refused. The decision of the Commission apparently sets up the rule that if the company had incurred liabilities which were perfectly legal at the time, that is, before the passage of the Public Service Commission law, and that now if the Commission does not approve of the purposes for which these liabilities were incurred it can refuse permission to the company to fund the liabilities. This decision of a majority of the commissioners (one commissioner dissenting wholly from the decision and another in part) is a form of retroactive legislation that has been tried before, but by no means always upheld when brought to a test before the higher courts. The Delaware & Hudson Company is now testing the decision before the Supreme Court of the United States.

The following tables show the results of operation for the

last two years, not including the operation of the lines in Canada or the electric lines, and the general balance sheet.

Results of Operation

	1908.	1907.
Average mileage operated	845	845
Coal freight revenue	$9,106.820	$9,081,664
Merchandise freight revenue	6,162,181	7,553,810
Passenger revenue	2,693,672	2,944,743
Total operating revenue......	18,500,731	20,165,440
Maint. way and structures.	1,417,319	1,879,546
Maint. of equipment.......	2,219,543	2,356,514
Traffic	204,849	191,669
Transportation	6,528,112	6,900,431
Total operating expenses	10,811,721	11,694,429
*Net railway earnings.......	7,689,011	8,471,011
*Net earnings coal department	1,145,418	1,173,206
*Gross income	10,339,104	11,208,518
Taxes	705,331	568,589
Net income	5,254,458	6,466,173
Dividends	3,816,000	3,816,000
Surplus	1,438,458	2,650,173

*Before the deduction of taxes.

*Consolidated Balance Sheet.**

Assets.

	1908	1907	Increase or *decrease*
Coal lands	$20,821,971.63	$17,248,002.04	$3,573,969.59
Real estate	4,363,603.35	4,200,299.15	163,304.20
Railway construction...	27,293,160.89	16,518,429.43	10,774,731,46
Railway equipment.....	19,961,069.94	19,353,578.36	607,491.58
Marine equipment.....	9,940.00	9,940.00	....
Coal department equipment, cars, motors, mules, horses, etc....	1,022,411.24	967,977.74	54,433.50
Coal handling and storage plants	273,447.27	298,265.26	*24,817.99*
Stocks and bonds......	23,364,060.57	32,203,146.18	*8,839,085.61*
Supplies on hand.....	2,920,837.73	3,121,967.04	*201,129 31*
Coal on hand.........	1,283,206.09	836,042.81	447,163.28
Fire insurance fund...	249,142.49	220,047.27	29,095.22
Cash	830,919.34	2,387,851.48	*1,556,932.14*
Bills and accounts receivable	4,386,130.06	4,356,471.83	29,658.23
Advances on unmined coal	501,547.87	474,167.42	27,380.45
Advances for construction and acquisition of new lines........	8,039,449.86	1,675,338.43	6,364,111.43
Power plant	623,625.00	521,419.94	102,205.06
Total	$115,944,523.33	$104,392,944.38	$11.551,578.95

Liabilities.

	1908	1907	Increase or *decrease*
Capital stock	$42,400,000.00	$42,400,000.00	....
Bonds	46,961,000.00	34,227,000.00	$12,734,000.00
Loans payable	8,500,000.00	10,754,949.87	*2,254,949.87*
Interests, dividends, etc., accrued	613,784.67	512,058.00	101,726.67
Interest, dividends and bonds due and not yet collected	193,601.10	198,933.85	*5,332.75*
Accrued taxes	112,041.16	111,761.71	279.45
Sinking fund	805,454.55	400,941.96	404,512.59
Audited vouchers and pay rolls	3,611,577.61	4,116,718.03	*505,140.42*
Other accounts payable	919,465.92	906,020.82	13,445.10
Total liabilities...	$104,116,925.01	$93,628,384.24	$10,488,540.77
General profit and loss, being excess of assets over liabilities......	11,827,598.32	10,764,560.14	1,063,038.18
Total	$115,944,523.33	$104,392,944.38	$11,551,578.95

*Includes Hudson Coal Co., and Northern Coal & Iron Co., all the capital stock of which is owned by The Delaware & Hudson Co.
NOTE -Decreases in *italics*.

NEW PUBLICATIONS.

The Railway Locomotive. By Vaughan Pendred, M. Inst. Mech. E. M. I. & S. Inst. Published by Archibald Constable & Co., London; D. Van Nostrand Co., New York; 1908. Cloth; 300 pages; 5½ x 8⅛ in. Price, $2.

In the introduction the author offers an excuse for adding to the large number of books on the locomotive, but the fact is, there are comparatively few satisfactory books in English on this subject. The best technical books on locomotive design and construction are in German or French, and on this particular phase of the subject—design and construction—there are really none of any value in English. The present volume does not fill this need but deals with the locomotive in a general way, always intelligently and so interestingly that it may be read with profit by the engineer as well as the layman. The aim has been to make the study of the locomotive attractive, and, though little effort has been directed to mathematical treatment, the book is well adapted to the need of the student. It is not a history, though it contains much that is historical; nor is it a treatise which seeks to establish theories, though in many cases it deals with facts that are fundamental. The volume is rather a series of logically arranged essays, each one of which reflects the personality of the author. It approaches the subject from the world's viewpoint, but English practice and English standards naturally receive chief attention, and where estimates of value are given these are usually measured by the degree to which the detail concerned has entered into English practice. The subject is treated under three grand divisions: the locomotive as a vehicle; the locomotive as a steam generator, and the locomotive as a steam engine. In the chapter on frames, the origin of the bar frame in the United States is explained in a manner which is new to us and worth repeating. In the early days the United States possessed no rolling mills which could make plates fit for side frames. The average smith had skill enough to build up bars forged under a water-driven tilt hammer, so the bar frame found favor and is still retained.

The construction of the English engine truck and its action on curves is clearly explained, and the vehicle is further considered under the chapters on wheel and rail adhesion, propulsion and counterbalancing. The section on the boiler is particularly interesting and occupies one-third of the book, covering the various features of boiler design, boiler performance, combustion and superheating. The treatment of the locomotive as a steam engine is a remarkable piece of condensation, but each detail is considered with due proportion and in a satisfactory manner. The valve and valve gear are naturally prominent, and while not treated with any completeness, the chapters dealing with them form a good introduction to the subject. The author explains why compound locomotives have not been very successful in England, and says that, while for long runs the Webb compound passenger engine was fairly successful, whether or not it was economical remains to this day a disputed question. In the portion relating to locomotive performance frequent reference is made to the experimental work of Prof. Goss at the locomotive laboratory at Purdue and his published works on this subject, and to the results of the locomotive tests at St. Louis in 1904. The illustrations are rather uneven in their selection and in the character of the drawings, and a slight mistake has been made in the section lines of the cylinder on page 207, so that the cylinder wall is keyed rigidly into the space for the packing ring on the piston head.

At the end of the volume there is a list of standard works on the locomotive with the dates of publication. If the library is to contain but one book of moderate cost on the locomotive, we should be inclined to recommend Mr. Pendred's interesting treatise as the one to be selected.

Letters to the Editor.

PROBABLE EFFECT OF "RECIPROCAL DEMURRAGE."

Scranton, Pa., March 31, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

I have read with interest Mr. Melcher's memorandum, printed in your issue of March 26, which he submitted to the railroad committee of the Iowa Senate, opposing the adoption of a "reciprocal demurrage" bill. I have not read the bill referred to, but, as the name discloses, and as most of the arguments of the advocates of "reciprocal demurrage" reveal, it is undoubtedly of such character that we are safe in saying that, like all other such legislation, it has its origin in a spirit of revenge for demurrage penalties incurred. The law seems to be designed as a means of getting even with the railways for their enforcement of demurrage regulations. Otherwise they would not call it "reciprocal" nor "demurrage." In fact, such laws constitute a peremptory demand for a more rigid enforcement of demurrage rules. Such laws, in effect,

say to the railways: "You must have an available supply of cars. We will fine you if you do not. Demurrage rules are one means of making cars available. Hence you must enforce demurrage rules."

I have often wondered if the advocates of "reciprocal demurrage" recognize that its adoption must tend toward a reduction of the free time allowed for loading or unloading cars, and an increase of the penalty for the detention beyond the free time. This would hardly be a sweet revenge.

Careful examination will disclose the fact that demands for this grossly misnamed legislation come from shippers so insufficiently equipped with modern means for conducting their business as to compel the infliction of demurrage penalties for delay to cars; and it is clear that if they get what they are asking for they will be sadly disappointed in the end.

If such demands come from honest shippers who feel that they have not received a fair distribution of available cars, I have nothing to say, further than that I think they should find a name for their proposed law that is indicative of their purpose, and that does not tend to discredit in the minds of the unthinking the respectable industry in which I am engaged. And if the demand arose from this source the name would never have been "reciprocal demurrage," and I should not have troubled you with this protest.

A. G. THOMASON,
Demurrage Manager.

RUSSIA TEACHING AMERICA.

St. Louis, April 9, 1909.

To the Editor of the Railroad Age Gazette:

Have you noticed that the new minister of the Russian Imperial Railways has set out, disguised, on a six weeks' journey as a third-class passenger over the state railways? He intends to judge at first hand of the discomforts whereof the humble passengers complain, as well as look into other irregularities. Why should not American railway officers follow the example of this Russian minister? Either with or without disguise they could conduct a personal inspection of ordinary passenger train and station service to great advantage.

The officer would find even on the trains de luxe that the smoking compartment of the café car is often so densely filled with smoke that a veteran smoker is willing to exercise some self-denial rather than bathe in such an atmosphere. The kitchen and provision boxes on the dining cars will also bear some inspection, for in such contracted space it is difficult to handle and store large quantities of food in a cleanly manner and to obtain supplies which are always pure and fresh. On the larger lines there is some attempt to inspect the food, and especially milk, but the inspection is apt to be perfunctory and sporadic rather than systematic and continuous. On many lines the heating and ventilation of Pullman sleeping cars has been much improved during the past two years, thanks to good discipline, and they are not now overheated, or too cool, or too close. Why should not this now become the normal condition on all lines?

In the West, competition for passenger traffic has improved the manners and general attitude of the trainmen and agents toward the public, and there is now a noticeable contrast in this particular with conditions on some roads, particularly in the East, where there is no competition, and where railway men have bullied the public so long that it has become a part of their nature. It is in such localities that the officer-inspector incognito might do effective work. He would find that in addition to insolence some old agents are still ignorant of routes and trains, and are unable or unwilling to assist the passenger in determining the best route and proper train. He would find stations in good sized towns or small cities that are in too great contrast with those in larger cities. Many of them are dirty, dull and unsanitary, when with small expenditure they could be made clean and attractive. The average superintendent, who is usually the highest officer that inspects such stations, seems to be hardened to such conditions and does not notice the dingy walls hung with old circulars, time-tables and maps; and apparently few such officers insist that agents shall keep stations clean and neat. F. M.

Contributed Papers.

RAILWAY MAIL PAY.

BY JULIUS KRUTTSCHNITT,
Director of Maintenance and Operation of the Union Pacific System and the Southern Pacific Co.

II.

COMPARATIVE RETURNS TO THE RAILWAYS FROM CONDUCTING MAIL, PASSENGER AND FREIGHT SERVICE IN THE UNITED STATES.

In order to make a fair comparison of operating results from different classes of traffic, it is necessary to consider them under substantially similar conditions. The best measure of railway service is work done, or weight multiplied by distance carried; in other words, the ton mileage. A comparison of services differing so widely as the mail, passenger and freight on the basis of ton mileage of such business is, however, unfair, because in the two former an excessive proportion of dead weight must be transported for each ton of paying load, while with freight traffic the proportion of dead weight is small. The hauling power of a locomotive is measured not by revenue ton-miles, but by ton-miles of gross weight, it making little difference to the locomotive what this gross ton mileage is composed of, the gross tonnage and the speed at which it must be moved being the factors that consume the energy of the locomotive.

A computation has been made of ton mileage on each individual mail route by multiplying weight carried by length of route; to the sum of these we add the dead weight of cars. The report of the Second Assistant Postmaster-General for year ending June 30, 1908, page 32, gives the number of cars engaged in mail service, which we have multiplied by the average mileage made by the average car, based on experience of the Union Pacific and Southern Pacific Systems, to ascertain total car mileage for the United States. Multiplying this by the dead weight of a car, gives the ton mileage of dead weight, which, added to the ton mileage of mails, gives the gross ton mileage, measure of work and cost imposed on the railways in return for the pay they receive for handling the mails. These computations are shown in the following statements, the results being conservative, as for want of accurate data it has been necessary to omit some work which the railways do, which, if ascertainable, would increase the cost. For example, we have made no charge for the dead weight of that portion of baggage cars devoted to the handling of pouch mail, such pouch service, according to the Postmaster-General's report, covering annually on railways and express trains 122,027,597 miles; nor for the dead weight of storage mail cars provided by the railways. Neither has any account been taken of the value of transportation given mail clerks, which, based on the Postmaster-General's report of 1908, amounted to 629,778,443 miles, which at 2 cents a mile would be $12,500,000; nor for the value of transportation or postal commissions of Post Office Department officials; nor does it take into account special service rendered by the railways, such as delivering mail at stations, value of space furnished by the railways and required of them by the Post Office Department at important junction and terminal points for mail distribution and accommodation of government transfer clerks.

The statistics of passenger service in the following state-

ments are based on the 1907 Annual Report of Statistics of Railways published by the Interstate Commerce Commission (1908 figures, which would show higher operating cost, not available), with the exception that the average mileage per car per annum run by passenger cars is based on the experience of the Union Pacific and Southern Pacific Systems.

Statistics of freight service are likewise based on the 1907 Report of Statistics of Railways, freight car mileage being actually reported by the Interstate Commerce Commission, dead weight per car being computed from all freight cars handled on Union Pacific and Southern Pacific Systems.

Mail Service, Year Ending June 30, 1908.

Paid to the railways for railway post office cars.......			$4,567,366
Paid to the railway for mail transportation............			43,588,013
Total			$48,155,379
Ton-mileage of mails handled by railways..............			484,683,135
Pay per revenue ton-mile, including railway postal car pay			9.94c.
Pay per revenue ton-mile, excluding railway postal car pay			8.99c.
	R. P. O.	Apartment.	Total.
No. cars (Post Office Dept. report)	1,342	3,568	4,910
Average length (special mail weighing 1907), ft. mail apartment.	59	27	.....
Equivalent full R. P. O. cars.....	1,342	1,633	2,975
Miles run per car per annum (experience of U. P. System and Southern Pacific Company)..	100,000	60,000	.....
Total equivalent R. P. O. car-miles	134,200,000	97,980,000	232,180,000
Miles traveled by R. P. O. clerks (miles reported as traveled by crews multiplied by average number of men per crews)...	....	....	629,778,443
Gross ton-mileage:			
Equivalent railway postal cars, 232,180,000 miles, at 45 tons per car			10,448,100,000
Ton-miles of clerks at 160 lbs. per man..............			50,382,275
Revenue ton-miles of mail, including pouch mail......			484,683,135
Total gross ton-miles.*			10,983,165,410
Av'ge weight of mail per equivalent full R.P.O. car, tons*			2.09
" " " clerks per equivalent full R.P.O. car, tons			.22
" " " car per equivalent full R.P.O. car, tons.			45.00
Rate of mail and R.P.O. car pay per gross ton-mile......			0.4438c.
Ratio of paying to dead load.*			1 to 21.7

*No portion of mileage or weight of storage cars or cars handling pouch mail has been considered.

Passenger Service, Other Than Mail.

	No. of cars*	Miles per car per annum.†	Total car-miles run per annum.
Baggage and express, excluding 2,975 equivalent postal cars	7,404	60,000	444,240,000
Sleepers, diners and parlor cars.......	2,000	100,000	200,000,000
Coaches, etc.	31,594	40,000	1,263,760,000
Total	40,998	....	1,908,000,000

Passenger train-miles, including mixed trains.........	541,439,176
Cars per train-mile: Mail, 0.43; others, 3.52; total, 3.95	
Gross ton-mileage:	
Baggage and express cars, 444,240,000 x 30 tons......	13,327,000,000
Sleepers, diners and parlor cars, 200,000,000 x 50 tons..	10,000,000,000
Coaches, etc., 1,263,000,000 x 40 tons...............	50,550,400,000
Total ton-miles dead weight......................	73,877,400,000
Ton-miles of passengers, 27,718,554,030* passenger-miles at 150 lbs. per passenger....................	2,078,891,552
Ton-miles of baggage and express, 444,240,000 car-miles estimated at only 3 tons average load in car.	1,332,700,000
Total ton-miles revenue load....................	3,411,591,552
Total gross tons miles..........................	77,288,991,552
Total revenue received from passengers and express......	$621,939,274
" " " per gross ton-mile, ...	0.805c.
" " " per revenue ton-mile	18.23c.
Ratio of paying weight to dead load.................	1 to 21.7

Freight Service.

Total miles run by freight cars*.....................	17,122,259,754
" ton-miles dead weight, each car estimated at 15 tons.†	256,833,896,310
" ton-miles revenue freight*	236,601,390,413
Total gross ton-miles.........................	510,557,546,477
Ratio of paying to dead load..........................	1 to 1.1
Total revenue received for transporting freight........	$1,823,651,998
" " " per gross ton-miles	0.369c.
" " " per revenue ton miles.*.........	0.759c.
Tons per car revenue freight (loaded and empty)........	13.8
Revenue per car-mile.................................	10.5c.

*Statistics of Railways of United States, 1907.
†Experience of Union Pacific and Southern Pacific Systems.

RELATIVE COST OF SERVICE.

To determine the relative costs to the railways of performing mail, passenger and freight service, we must allocate the expenses to freight and passenger service as a whole, afterwards apportioning the latter to mails and other service. Railway operating expenses apply jointly to both passenger and freight trains, so that, with few exceptions, it is impossible to determine exactly from any published statistics the cost of passenger train service as distinguished from freight. There are some items of train-mile expense directly connected with movement which are less for passenger than for freight trains, while, on the other hand, many other expenses are greater for passenger than for freight, such as danger from casualties, necessity of expensive terminals, delays to other traffic through preference given to passenger trains, additional main tracks, and, particularly, higher standards of maintenance of roadbed required for high speed passenger thain movement.

On account of the impossibility of separating the expenses, we assume that the above factors about balance each other and that the average cost of running *all* trains can be taken as either passenger or freight train-mile cost, respectively, without serious error.

We allocate a proportion of the passenger train cost to the mails on the basis of the gross ton-miles handled in each class of passenger traffic.

The relative revenues and expenses are shown below, mail revenues being as shown by the 1908 Report of the Post Office Department, and other statistics as given in the 1907 Statistics of Railways of the United States, published by the Interstate Commerce Commission, or are computed therefrom.

ALL RAILWAYS IN UNITED STATES.

Summary of Mail, Passenger and Freight Service.

	Mails.	Other passenger.	Total passenger.	Freight.
Gross revenue ..	$48,155,379	$621,939,274	$670,094,653	$1,823,651,998
Operat'g expenses	96,322,357	677,614,637	773,936,994	974,577,820
Taxes and interest on bonds ...	23,503,973	165,582,552	189,086,525	235,468,467
Total expenses.	$119,826,330	$843,197,189	$963,023,519	$1,210,046,281
Surplus	....	....	....	613,605,711
Deficit	71,670,951	221,257,915	292,928,866	....
Ton-mileage (thousands)				
Revenue weight..	484,683	3,411,592	3,896,275	236,601,390
Dead weight	10,498,482	73,877,400	84,375,882	256,833,896
Total gross....	10,983,165	77,288,992	88,272,157	493,435,286
Tons dead weight per ton rev..	21.7	21.7	21.7	1.1
Per gross ton-mile, in cents:				
Gross earnings.	0.438	0.805	0.759	0.369
Operating exp..	0.877	0.877	0.877	0.197
Earnings over operat'g exp.	.....	.....	.....	0.172
Operating exp. over earn'gs.	0.439	0.072	0.118	.....
Taxes and interest on bonds.	0.214	0.214	0.214	0.048
Surplus	.....	.....	.....	0.124
Deficit	0.653	0.286	0.332	.....
P. ct. op. exp. to earnings	200	109	115	53
Gross expenses to earnings ...	249	135	144	67

Figures exclude dividends, betterments and additions, etc.

The above shows that while the passenger service as a whole is unremunerative, the mail earnings are hardly half what they should be to pay a fair share of the railway operating expenses only, regardless of taxes and interest.

Or put in another way; our computations have shown that in each passenger train run the railways haul an average of 43/100 of a mail car, and the contents of this car yielded average earnings of 9.4 cents for each mile run. The computation just made shows that each freight car run, loaded or empty, yields a revenue to the carrier of 10.5 cents per mile. Incredible as this may seem, it is understandable when we reflect that the railways transport 1.1 tons of dead weight for each ton of freight for which they are paid; with mail they transport 21.7 tons, or twenty times as much. The freight rate is .759c. per ton-mile, the mail rate 9.94c., or only thirteen times as much.

Arguing in still another way: Average number of cars in each passenger train handled in United States is 3.95, of which mail cars amount to 0.43, or 11 per cent. Eleven per cent. of the average earnings of a passenger train is 13.8 cents, but mail contributed only 9.4 cents. That is, it should pay 47 per cent. more than it does to be made to contribute a fair share to the insufficient earnings of a passenger train. Mails are fairly responsible on basis of space used for 11 per cent. of

the cost of running a passenger train, or 16.17 cents, and as dead weight per foot of space is greater with mails, their proportion of train-mile cost is even larger. They pay little more than one-half this cost.

By building larger capacity cars and larger engines, the cost of handling freight traffic, entirely in the control of the carrier, has been reduced to follow rate reductions and increased expenses.

On the other hand, because methods of conducting passenger traffic are largely—and mail traffic entirely—beyond their control, the cost of handling mail and passengers has been steadily increasing, and, as revenue has not increased, the net revenue or margin of profit has been cut to a point where it is unremunerative.

The argument advanced by advocates of reduced mail pay, that increasing density permitted economies and that lower rates would yield more net, is not applicable when the carriers' hands are tied and measures of economy so successfully applied to handling freight are prohibited. The following will illustrate this:

On routes where pouch service is used mail is handled with express and baggage without much increase of cost over other passenger traffic. A somewhat greater mail traffic obliges the railways to furnish apartment cars, at increased expense and dead weight for the post office feature, but still permitting the railways to carry other traffic in the same car. A still further increase in weight means the establishment of full R. P. O. lines for which the railways receive extra, but inadequate, compensation, these cars being used for no other class of traffic and adding largely to the weight and cost of train service. Even after the route has been made an R. P. O. route, the railways are not permitted to economize by carrying more mail in the car, and as traffic density grows the roads must under the requirements of the Department add more cars, almost in proportion to the business, as the loads carried in R. P. O. cars, as shown by recent special weighing, average only 2¾ tons, and many of them return empty—for which empty haul the railways often receive no pay. When the mail business has assumed very large proportions and the R. P. O. cars have multiplied in ratio therewith, special trains are then added to carry the bulk of the mail, being run at very high speed and adding to the railway expense account in a far higher degree per unit of business than any other class of traffic.

In contrast to the above, baggage and express are very generally hauled in the same and much lighter and less costly car than the mail car, and increase in tonnage is accommodated by hauling greater loads per car. In the case of freight, increased density means larger car and train loads and greatly reduced costs of operating per ton-mile.

Despite these differences in conditions, the automatic scale has secured to the government a larger reduction in mail rates per ton-mile in the last ten years than the percentage of fall in freight rates, despite higher labor and material costs of railway operating. As a result, the mail business—which, according to evidence introduced before the Congressional Committee of 1899, was unprofitable at that time, has been made more unprofitable at the present time by the heavy rate reductions of 1906-7.

As the greatest reduction made deals with mail routes on which traffic is heaviest, a consideration should be given to the following conditions of handling mail on such routes:

HEAVY TRAFFIC MAIL ROUTES.

On very many of the heavy traffic routes where the principal reduction in pay occurred a large part of the mail is now handled in special mail trains run at excessively high rates of speed. Such trains introduce the following conditions:

1. A very much greater liability to accident. A large proportion of the deplorable accidents that have occurred on the American railways in recent years, have occurred to excessively high speed trains, accidents to such trains being almost invariably destructive to life and property. An examination of serious accidents on the Union Pacific System and Southern Pacific Company for the calendar year 1906 shows that 36 per cent. of the property damage from all causes, including negligence, were traceable to trains not under control and excessive speed, while 30 per cent. additional damage was due to causes that might prevent inferior trains getting out of their way, such as keeping main line on time of superior trains, failure to observe signals or orders, etc.

2. Mail trains run at excessive high speed are much more expensive to operate than other trains, for the following reasons:

(*a*) Fuel consumption per traffic unit is very much greater at high speed because of diminished tractive power of locomotives.

(*b*) A relative greater hauling capacity of locomotives must be consumed in moving trains at higher speeds.

(*c*) Excessive speed requires higher standards of track maintenance, double-tracking, block signals, heavy rail, better ballasted roadbed, etc., etc.

(*d*) High speed means increased wear and tear on equipment and track.

(*e*) High speed trains are expensive, delaying and adding to the cost of other traffic.

3. Speed of trains carrying mails has been constantly increased, a study made of the speed per hour made on fastest trains on which R. P. O. cars are handled on seventeen of the principal mail routes, giving the following results:

Average of fastest train on seventeen mail routes:

Year.	Speed, miles per hr.	Relative.
1905	42.21	136
1899	39.23	126
1890	34.35	110
1885	31.14	100

Average increase per year, 0.55.

With the above increase in speed, rates paid the railways have automatically decreased while expenses have largely increased to provide for the above greater speed and because of increase in prices of labor and materials of all kinds in the past five or six years. This increase in speed has been made coincident with growth of freight traffic, which is the railways' profitable business, the non-profitable high speed trains delaying the profitable ones, increasing their cost and incurring liability to accident.

4. Earnings of mail trains supposedly high are not higher than other passenger trains, which, as a whole, earn very much less per mile run than freight, relative figures being as shown by last report of the Interstate Commerce Commission—as 100 is to 218, while the cost of running passenger trains is as much—if not more. This is particularly the case with high speed passenger trains, which is the most unprofitable business in which railways are engaged. (On Union Pacific System last year earnings per passenger train-mile were $1.71, per freight train-mile $4.31.)

5. Passenger engines in hauling fast passenger trains on principal main lines at the present time have assumed, on account of increased weight of equipment and excessive speed required, enormous proportions. We now have in such service on our lines engines weighing exclusive of tender 222,000 pounds, this power being 60 per cent. heavier and twice as costly as locomotives used in the same class of service ten years ago, burning double the amount of fuel. Engineers running these locomotives receive higher pay because of the greater size of these engines—to say nothing of recent increases made in their schedules. Such heavy power moving at fast speed is extremely destructive to the roadbed, requiring a much higher standard of maintenance than formerly, maintenance of way cost in the past few years having gone up 50 per cent. Engine failures are largely confined to fast passenger trains and, in general, expenses are increased all along the line because of their introduction.

6. As illustrating the additions to expenses because of increased track maintenance on account of fast passenger and mail trains, we have made a study of statistics, using the Interstate Commerce report of 1906 as a basis, of seven roads having a large proportion of fast passenger service and seven roads having a moderate speed passenger service, but with a large proportion of freight service. On the roads first named the average cost of maintenance of way per mile was $2,951, and on roads in the latter class $1,565. The operating expenses per train-mile in the former class were $1.47, and in the latter $1.33. The roads in the former class, on account of large number of excessively high-speed trains, were obliged to double-track their lines, which directly increased maintenance expenses.

PAY FOR RAILWAY POSTAL CARS.

The large reduction made by Act of March 2, 1907, in pay for railway postal cars was made in face of large increase in the cost of constructing such cars, due to higher prices of labor and material and greater cost of meeting the more exacting specifications of the Post Office Department. Changing to steel construction, increases in weight, and generally heavier operating expenses, have created an extremely large increase in cost of moving these cars. The standard railway postal car of only a few years ago, 60 ft. long, weighed 80,000 lbs. and cost about $5,500. The standard railway post office cars, 60 ft. long, of wooden construction, used on the railways with which I am connected, weigh over 100,000 lbs. each, or one-fourth more weight, and costs 40 per cent. more, while our new standard postal cars of steel construction weigh 108,000 lbs. and cost over $9,000, or 60 per cent. more than the car of a few years ago.

An argument sometimes made in favor of a lowering of R. P. O. car pay is that for apartment cars used in runs where mail density does not require a full car, no additional compensation is allowed. But we feel that a fair consideration of the circumstances under which mail is handled as compared with other traffic will justify the conclusion that this is not an argument in favor of reducing R. P. O. pay, but rather for allowing the railway additional compensation for the apartment cars as well. Both services require the furnishing of special features in the way of traveling post offices not required, except for the convenience of the Post Office Department to enable it to do work while mail is in transit, such as ordinarily performed in office buildings. The full postal car is more expensive to the roads, as it always means additional car service, while in some cases of apartment cars the space not occupied by the traveling post office is adequate to take care of baggage and express, though very frequently this service also means additional car movement that would not be necessary but for the post office feature.

The saving to the railways from reduction in car mileage that would be possible if it were not obliged to furnish traveling post offices, but could use the space occupied by racks and other post office features by loading additional mail in cars, would be many times the revenue allowed for the railway postal cars.

To illustrate: The car mileage of postal cars (changing apartment cars to full cars on basis of length) is 232,180,000 per annum; the ton mileage of mail 484,683,135, or 2.09 tons per car. From figures obtained from the Post Office Department, average car weights shown on page 59, table "EE," special mail weighing of 1907, it is ascertained that storage mail cars, which, of course, contain no post office features, carry an average of 7.04 tons of mail. At this rate the whole mail business could be carried by the movement of 68,844,000 car-miles, or 163,336,000 less than actually employed, due to the post office features. The total railway postal car pay is only $4,567,366, or only 2.8 cents per additional car-mile, while the operating expenses chargeable to running these 163,336,000 car-miles, or 70 per cent. of the total movement, amount to $67,000,000.

But for the post office feature, the combined weight of an entire route could many times be handled in a single car such as is used for express instead of several heavy and expensive post office cars, while often extra cars for storage mail must be added, for which no extra pay is allowed, the cost of running these storage cars also not being included in the computation of cost of service, as no accurate statistics of their number or car mileage are available.

In addition to the furnishing of storage cars, although many R. P. O. routes are paid for on a basis of 40-foot cars, it is not economical for the railways to construct such cars which are not interchangeable with other equipment and which would have to be thrown aside if through growth of traffic larger cars are afterwards required. As a result, full 60-foot R. P. O. cars have for years been furnished on many 40 and 50-foot routes, the railway getting no credit for this, while on many other routes R. P. O. cars have been run in advance of the fixing of R. P. O. pay for them.

On a number of routes postal car pay has been allowed for running full cars in one direction only, classing such routes as half-lines. This obliges the railways to move the car in the opposite direction without pay, the small additional compensation of less than 4 cents per mile run received in one direction being entirely inadequate to compensate the road for the empty haul—to say nothing of allowing anything for moving it in the direction for which pay is received. To illustrate: The Union Pacific Railroad in one case between Council Bluffs, Iowa, and Odgen, Utah, 1,003 miles, receives no pay for handling east-bound a 60-ft. mail car, which is paid for west-bound only, six mail cars being required on this line. The R. P. O. pay per car-mile, including movement in both directions, is only 2.24 cents, or about what would be received for transporting a single passenger, although a standard passenger coach has a capacity for 70 passengers.

In connection with the railway post office, an item not often considered is the value of transportation furnished clerks in the railway mail and compartment cars. Figuring this at 2 cents per mile, which is about the lowest passenger fare, the total value of this transportation for clerks in railway post office cars would be $8,600,000 per annum, or $4,000,000 more than the railways receive for the handling of these cars, and the value of transportation in the case of apartment cars would be $4,000,000 per annum additional. In addition to this, a large amount of free transportation is required annually by the Post Office Department for inspectors and other officers of the Department.

The Post Office Department issues annually about six hundred traveling commissions to post office inspectors and other postal officials, and requires railway companies to honor such commissions for free transportation on all trains on all lines on which mails are carried. In some cases these commissions are issued to government officials whose official duties are in no way connected with the transportation of mails on railways. The railways have no control whatever over the issuance of these commissions, and cannot even secure from the Post Office Department a list of them, the Department holding that the list is confidential. These commissions are frequently used for personal travel in violation of the rulings of the Interstate Commerce Commission. In brief, the Post Office Department in effect arbitrarily issued about six hundred annual passes over every mail carrying railway in the United States, which is equivalent to about 200,000 annual passes.

POSTAL DEFICIT.

In investigating the subject of railway mail pay, we have been struck very forcibly with changes which have taken place in the revenues and expenditures of the Post Office Department since 1899, when this subject was last reviewed. Although postal operations still show a deficit, it is a fact that its revenues have increased in a remarkable degree, and the deficit is certainly not due to the amounts paid to the railways for

hauling mail, as these payments are relatively far less now than formerly. Revenues of the Post Office Department have grown from $102,000,000 in 1900 to over $191,000,000 in 1908, or 87 per cent., this increase in revenue in eight years being as great as the entire increase in the previous thirty-five years.

But in this same period of eight years there was an increase of $100,600,000, or 93 per cent., in Post Office Department expenditures, of which only $10,900,000, or 11 per cent., was paid to the railways, $33,935,000, or 34 per cent., going to Rural Free Delivery, $25,000,000, or 25 per cent., to postmasters and their clerks, and the balance to other items, as shown by chart marked "H" herewith.

The following statement shows for the year 1895 and for the years 1899 to 1908, inclusive, postal revenue and postal expenditures divided between amounts paid the railways,† cost of rural delivery, and other expenditures:

		Expenditures			
Year.	Revenue.	Paid railroads.	Rural delivery.	Other.	Total.
1895..	$76,983,000	$31,189,000*	....	$57,637,000	*$88,826,000
1899..	95,021,000	35,775,000	$150,000	65,607,000	101,632,000
1900..	102,355,000	37,315,000	420,000	70,005,000	107,740,000
1901..	111,631,000	38,161,000	1,778,000	75,616,000	115,555,000
1902..	121,848,000	39,519,000	3,998,000	81,269,000	124,786,000
1903..	134,224,000	41,377,000	8,102,000	89,305,000	138,784,000
1904..	143,583,000	43,971,000	12,682,000	95,709,000	152,362,000
1905..	152,827,000	45,482,000	20,824,000	101,093,000	167,399,000
1906..	167,933,000	46,953,000	24,774,000	106,543,000	178,270,000
1907..	183,585,000	49,831,000	26,643,000	113,754,000	190,238,000
1908..	191,479,000	48,155,000	34,355,000	125,842,000	208,352,000

*Includes $1,646,741 accrued in favor of Pacific railways in 1895, but not charged to postal expenditures.

Chart marked "Exhibit I" shows clearly that the ratio of expenses to receipts of the Post Office Department would in 1908 have been but 91 per cent. and no deficit but for the expenditures made for Rural Free Delivery, the amount paid the railways being now only 25 per cent. of the total revenue as compared with 41 per cent. in 1895.

In order to avoid a deficit, attention has been concentrated on this 25 per cent. of the postal expenditure, which we contend is at least not an unfair compensation to the railways for services rendered. Though the proportion of the total revenue going to the railways has fallen one-third in ten years, the deficit still remains, and is it reasonable to suppose that any reduction in railway mail pay would not be speedily absorbed in other directions? On the contrary, ought not efforts be concentrated to bring within reasonable figures the other expenses of the Department, which now absorb 84 per cent. of its revenue as compared with only 69 per cent. in 1900—despite an actual growth in postal revenue in the same time of $89,000,000, or 87 per cent.?

It will be noted from these charts that a reduction of 10 per cent. in the ratio of railway mail pay to total revenue can be entirely wiped out by an increase of only 3 per cent. in other postal expenses, while a retrenchment of 10 per cent. in the latter would have put the Department almost on a paying basis, notwithstanding the heavy cost of Rural Free Delivery. From 1895 to 1908 actual totals show that the railways' pay has increased 54 per cent. for handling 114 per cent. more mail tonnage, while in the same period other expenses of the Post Office Department have grown 178 per cent. revenues increasing 149 per cent.

Increased mail business means a direct increase in postal revenue, as postage remains the same regardless of tonnage, but carrying this increased business on the part of the railways means less proportionate revenue to them according to volume of tonnage, so that the proportion of the postal revenue they now receive is very much less than formerly. Labor, material, and the price of everything sold in commerce have advanced materially, as we all know, in the past seven or eight years; railway mail pay being practically the only thing that has decreased in the face of conditions that should have raised it.

†The railways are themselves large contributors to the revenues of the Post Office Department. It is ascertained that nine roads, covering 27,500 miles, pay annually $261,000 for postage stamps, or at the rate of $2,000,000 for the entire railway mileage of the country.

As a large increase in mail tonnage means to the Post Office Department about an equal increase in revenue with a decreased payment per ton to the railways through lower rates, the avoidance of a deficit would seem not a difficult matter if other postal expenses were kept at least within sufficient control, so they would not increase faster than the increase in volume of mail handled.

The Post Office Department enjoys this peculiar advantage of receiving with the growth of the country an increase in revenue directly in proportion to the increase in business handled. In disbursing this revenue, it must pay less to the railways in proportion to the density of business, thus retaining to apply on other expenses a larger net revenue year by year. It is reasonable to suppose that the cost of many branches of the Department should not increase in the same ratio as tonnage of mail (for example, that expenses of individual post offices and administrative and general expenses, should not grow in this proportion). Yet, regardless of these favorable influences, expenditures in other directions have absorbed the greater net revenues after paying the railways, and it is in these directions that the cause of the postal deficit must be looked for.

Chart, "Exhibit J," illustrates the growth of these expenditures, which since 1900 has been much faster than the rise in mail tonnage, comparison of 1908 with 1898 being shown below:

	1908.	1898.	Increase.	Per cent.
Ton-mileage of mails handled by roads	484,683,135	272,714,017	211,696,118	78
Postal revenues	$191,478,663	$89,012,619	$102,466,044	115
Less paid railways..	48,155,379	34,379,227	13,776,152	40
Net for other expenditures	$143,323,284	$54,633,392	$88,689,892	162
Other expenditures ..	160,196,507	63,654,297	96,542,210	152
Deficit	$16,873,223	$9,020,905	$7,852,318	87
Per ton of mail handled by railways:				
Postal revenues, cents	39.5	32.6	+6.9	
Paid to railways, cents............	9.9	12.6	—2.7	
Net applicable to other items,, cents	29.6	20.0	+9.6	
Other expenditures	33.1	23.3	+9.4	
Deficit	3.5	3.3	+0.2	

Note.—The increase in gross postal revenue per unit of mail handled by railways is no doubt due to increase in city mail not handled by railways.

RAILWAY CAPITAL AND VALUES.*

BY W. H. WILLIAMS,

Third Vice-President, Delaware & Hudson Company.

(*Continued from page* 808.)

Development of Jobbing Center.—The development of a wholesale or jobbing center is dependent, among other things, upon:

(a) The needs of the people as determined by climatic conditions, or the nature of their employment—whether in the mines, in the mills and factories, on the farms, or in the woods—and the ability of their customers to buy what are commonly regarded as luxuries. Each trade center, to attain success, must necessarily be governed by these local conditions.

(b) By the completeness of the market.

The merchants of the smaller towns only buy from the traveling salesman the articles necessary to carry along the trade until they can personally visit the larger trade centers, because of the inability of the salesman to carry with him a complete line of samples and to properly display all the goods. It cannot be expected that the merchant will travel to one trade center for his stock of boots and shoes; to another for his dress goods; to another for his cloaks and wraps; to another for his furs, and to still another for his millinery, when he can save both time and expense by going to one market which will supply all, or nearly all, of his needs. Therefore, the success of the market is proportionate to its ability to furnish any and all articles and of the quality desired. This accounts for the semi-annual pilgrimage of merchants from all points in the United States to the city of

*An address before the New York Traffic Club.

New York to buy their spring and fall stock of goods; New York being the only market having a complete line, both as to class and quality.

(c) Transportation facilities.

This can best be emphasized by an illustration of the work of the Pittsburgh Chamber of Commerce. By reason of the enormous tonnage of the Pittsburgh district, and the extraordinary efforts each railway made to secure at least its fair proportion of the traffic, it is doubtless true Pittsburgh enjoys rates as favorable, if not more so, than those of its competitors. Other jobbing centers, however, were constantly encroaching on Pittsburgh's territory, and an investigation disclosed the fact that other jobbing centers secured earlier delivery for their less carload freight; and in view of this, a determined effort was made to improve the service from Pittsburgh. The tonnage did not justify improved service, but the railways agreed to co-operate with the merchants in an earnest effort to regain that which properly belonged to Pittsburgh. Instead of passing the freight through the various transfer stations en route, each causing a delay of twenty-four hours in time of delivery, the freight was forwarded in through cars, and at the time the improved service to any one city was established, the wholesalers and jobbers of Pittsburgh were notified and they immediately placed their traveling representatives in the territory to solicit orders on the strength of the improved service. The results have been most satisfactory. The less carload tonnage to a number of smaller cities increased from 100 to 600 per cent., and this naturally has been followed by an increase in carload shipments. These results were obtained without any change in the freight rates either from Pittsburgh or the other trade centers. Co-operation has triumphed where individual effort had failed.

A couple of instances will serve to illustrate the point that the question of freight rates is a local one. One merchant complained that the rate from Pittsburgh to Bluefield, W. Va., on the Norfolk & Western, was two cents higher than from Cleveland, notwithstanding the fact that the distance from Pittsburgh was less. Investigation disclosed the fact that the shortest distance by rail was ten miles less from Cleveland than from Pittsburgh, also that Pittsburgh, Parkersburg, Baltimore and Washington enjoyed a lower rate to Norfolk than the rate from Cleveland, while Cleveland enjoyed a lower rate to Bluefield than did Pittsburgh, Parkersburg, Washington or Baltimore. The merchant was informed he could have the Cleveland rate to Bluefield if Pittsburgh would accept the higher rate which obtained from Cleveland to Norfolk. Inasmuch, however, as the tonnage from Pittsburgh to Norfolk is greater than the tonnage to Bluefield, they asked that no change be made.

Another merchant felt aggrieved because the rate from Pittsburgh to Altoona was 33 cents, while the rate from Philadelphia to Altoona was 38 cents, the distance from Pittsburgh to Altoona being only 113 miles, while the distance to Philadelphia was 235 miles. He felt the rate should be proportionate with the distance. Reversing the situation, however, and selecting a station about 113 miles from Philadelphia and about 235 miles from Pittsburgh, it was found the rate from Pittsburgh was 38 cents, and the rate from Philadelphia, 33. The merchant recognized that the existing rates were equally fair to Pittsburgh and Philadelphia.

Were the rates between Philadelphia and Pittsburgh proportionate to the mileage, it would be equivalent to establishing a wall midway between the two cities, and saying to the merchants to the east thereof that they must buy in Philadelphia, and to the west thereof that they must buy in Pittsburgh, and while it might be easier for the merchants of Pittsburgh and Philadelphia to secure their fair proportion of the trade, it would deprive the merchants of the smaller towns of the privilege they now enjoy of being able to buy in competitive markets.

If carried to a logical conclusion, would not a rate structure based on valuation ultimately lead to a flat mileage rate; and if so, will it not benefit the few dealers in the larger cities at the expense of the many in the smaller cities and villages?

CAPITALIZATION.

Much of the present misunderstanding regarding the relation between the valuation and capitalization of railways and other corporations would be eliminated were it possible to handle the shares of the companies in the same manner as those of joint partnerships. In the latter, each of the partners owns a fractional interest in the partnership, but there is no "par value" assigned to any fractional interest. Each stock certificate of a corporation states that the holder thereof is entitled to .... shares in the capital stock of the company, but also shows the par value per share. It would, however, be possible, and probably wise, to discontinue showing the par value and only show the number of shares for which the certificate is issued; dividing such number into the total number of shares outstanding would give the fractional interest of the holder. Were this position to prevail, it might cause a discontinuance of the present effort to secure a stock of a par value of $100, the market value of which will remain at $100, regardless of any conditions in the money market, and regardless of the earning capacity of the property.

We all know of roads which have been in existence fifty, sixty, seventy, or eighty years, and know of the improvements that have constantly taken place, permitting of more economical operation; and while the return to the stockholder is little, if any, greater to-day than forty years ago, it cannot be denied that the shippers and traveling public have been greatly advantaged by the economies that have taken place, as the freight rates and passenger fares have been materially reduced.

The greater part of the property of the present systems was acquired either through purchase, amalgamation, consolidation, or reorganization of other companies, and the price paid therefor by the present holder, and not the original cost of the material in place, was the basis on which the capital securities of the existing companies were issued. In some instances this may have been at thirty or fifty cents on the dollar, and in other cases at two dollars for each one dollar originally invested. The price paid was dependent on the then value as a "going concern," and this, of course, was affected by the condition of the property, its strategical location, its earning capacity, and its probable enhanced value to the new owners by reason of control of traffic thus secured to other lines owned by the purchaser.

Certainly it cannot be denied that a road between New York and Chicago, 950 miles in length, passing through a manufacturing district, is of greater value than a road 1,200 miles in length, between the same cities, but passing through a hilly and undeveloped territory a portion of the distance, and through a farming section for a greater portion of the remaining distance; yet the advocates of a physical valuation would have us believe that there is no difference in the value of the two if they can be reproduced to-day at the same cost. They unfortunately overlook the fact that it was not only the early construction of the shorter line, but its progressive management working to secure the location of new industries and build up those already established on the line, that had secured for it the commanding position it holds to-day. The success of these industries was in a measure dependent upon the service rendered on the road; any enhancement in value by reason of their location on the road would probably be construed by the courts as something which must be reckoned with in determining the "fair value" of the carrier's property.

We have already seen how the present companies came into existence, and why there cannot be established any reasonable proportion as between the percentage of material in place and the cost of road and equipment as it appears on the company's books.

(To be continued.)

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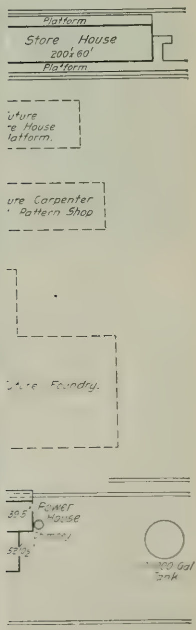
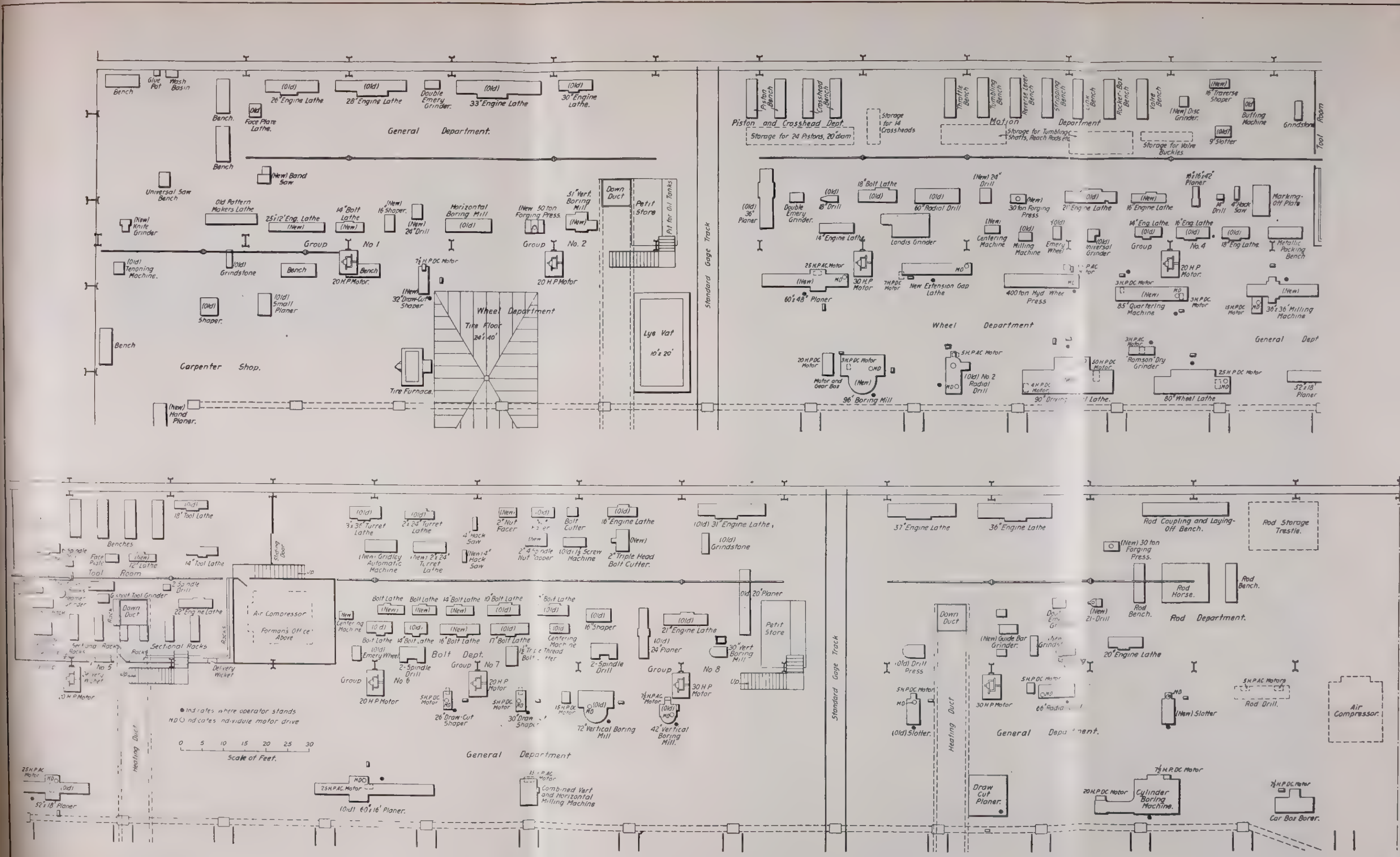




General Arrangement of Machine Shop; Battle Creek Shops of the Grand Trunk.

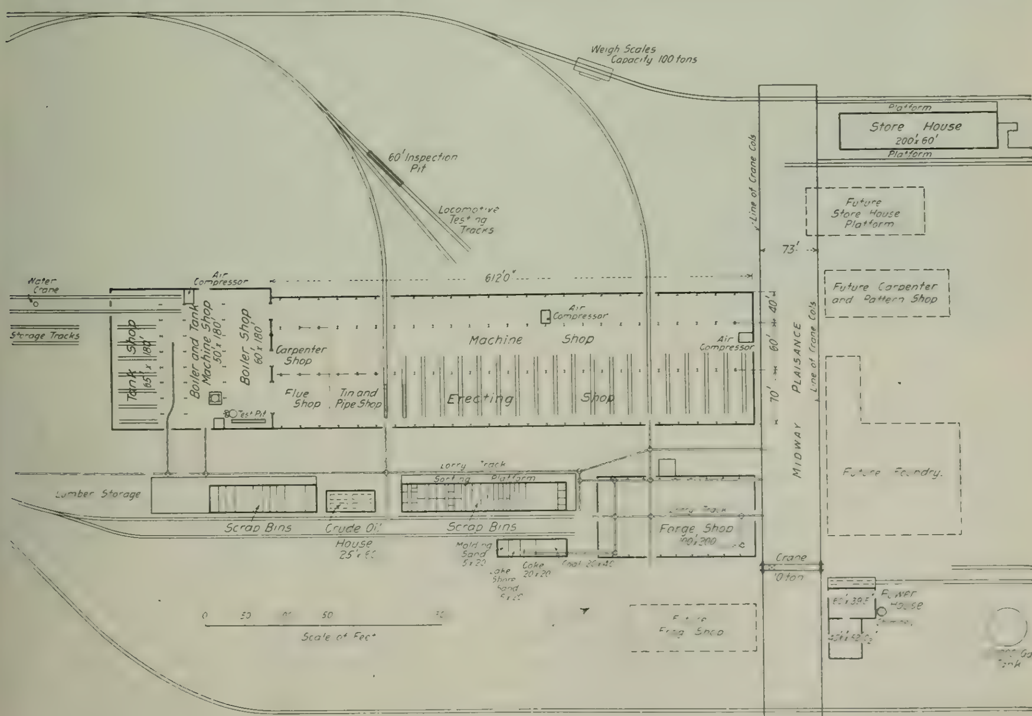
NEW LOCOMOTIVE REPAIR SHOP OF THE GRAND TRUNK, BATTLE CREEK, MICH.

[WITH AN INSET.]

The shops for the care of locomotives on the Grand Trunk system west of St. Clair river were removed from the old buildings at Port Hope to the new shops at Battle Creek the first of October, 1908. There are now 260 locomotives tributary to this division. The erecting shop has 25 pits, 18 of which are now in use, and the plant is turning out engines with light and heavy repairs at the rate of two engines per pit per month.

The general plans and cross sections of the large buildings were illustrated in *The Railway Age*, March 8, 1907. The general layout provides for a future extension of 100 per cent. to each building in such a manner that the area for extension is not between the structures, as in that case it would be necessary to carry material from different departments over this additional area. Ample provision has also been made for car shops, which are to be located east of the present buildings. The power house is located at the extreme east side of the locomotive shops so as to be central when the car shops are erected. The 75-ft., 10-ton, outside traveling crane serves all the shops, the storehouse and the platform which is used for the storage of heavy material, castings, etc. A future foundry, carpenter shop and pattern shop will be located on the north side of the crane runway opposite the large locomotive shop, and a frog shop will be built parallel

General View of the Battle Creek Shops.



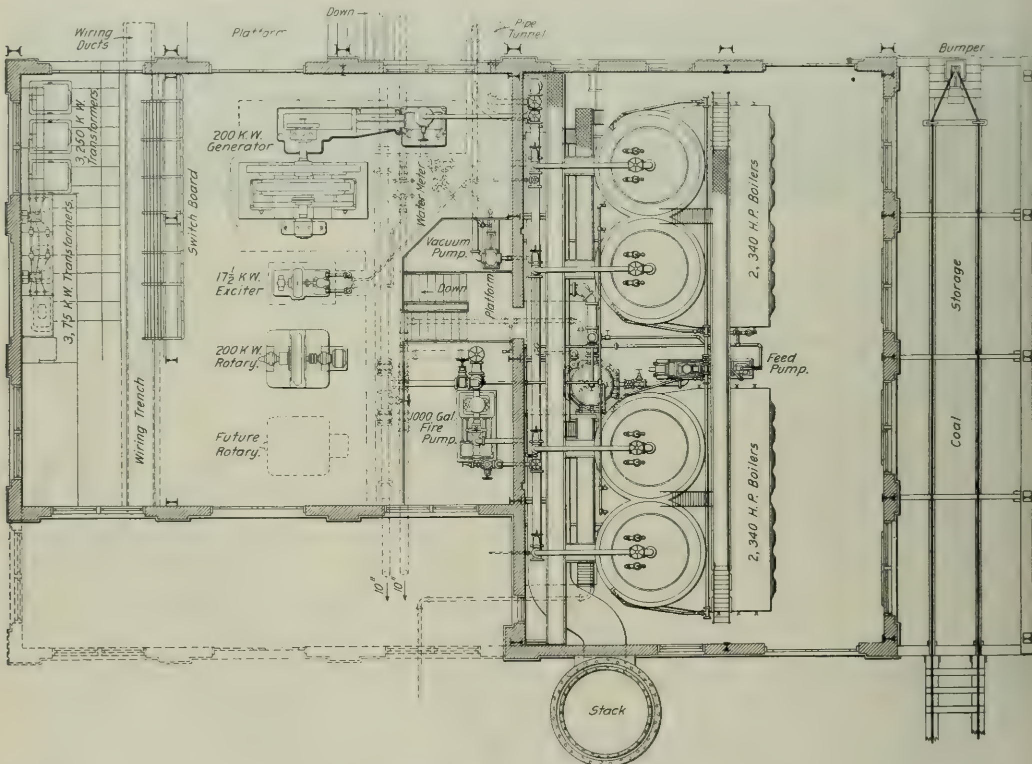
General Layout of Shops and Tracks; Battle Creek Shops of the Grand Trunk.

with the blacksmith shop and opposite the power house. All the buildings are parallel to the main line and all the yard tracks to the buildings connect with the main line so as to give through movement of material to and from the shops.

POWER HOUSE.

The power house is a handsome, substantial building with concrete foundation, which is carried up to a height of 5 ft. above the ground, and which supports the steel structure with its colonial shale brick walls and flat composite roof of asphaltum. The floors throughout the building are of concrete. The power house is not large, as the bulk of the electric power is purchased. The boiler equipment consists of 4 Wickes boilers, each 340 h.p. Coal is dumped into the bunker directly from the cars and fed into coal chutes, which are conveniently arranged before each firebox, and the labor of stoking is thus reduced to a minimum. The chimney is made of concrete with an air space; it is 175 ft. high and 9 ft. in diameter inside, and is large enough to permit of a considerable increase in the boiler plant when more power or steam is required. The chimney was built by the Metal Concrete Chimney Co., St. Louis, and is a fine example of smooth concrete work. The cost is said to have been 25 per cent. less than an equivalent brick chimney. High pressure steam is supplied to the engine room for power, to the forge shop to operate the steam hammers, to the locomotive shops to drive the heating fans and for boiler testing purposes, and to the office and store where it is reduced in pressure and used for heating purposes. Low pressure exhaust steam—and when this is insufficient steam reduced from high pressure—is used to heat the large locomotive and forge shops. The steam piping leading to the different buldings is suspended in an underground concrete tunnel covered with movable concrete slabs, which extend slightly above the surface of the yard and form a convenient footwalk down the midway.

In connection with the water system there is a storage tank of 100,000 gal. capacity with a hemispherical bottom. It is supported on a steel structure 125 ft. high, the total height to the top being 165 ft. The water pipes pass through the power house, and the piping valves are so arranged that the shops can be supplied either from this tank or from the city mains, and water can be pumped by a fire pump into the tank or from either the tank or the city mains into the shop water system. This pump is a Worthington fire pump with a capacity of 1,000 gallons a minute, and capable of maintaining a pressure of 75 lbs. There is a vacuum pump connected with the return from the heating system which reduces the pressure in the return pipes to an equivalent 10 in. of vacuum. These two pumps are placed in the engine room on the floor below the level of the main room.



General Plan of Power House.

In regard to electric power, after careful consideration it was decided that it could be purchased more economically than generated. Power is therefore obtained from a hydro-electric plant at Jackson Mich., 45 miles distant, which delivers it over a 3-phase 60-cycle 5,000-volt a.c. transmission line, provided, on entering the power house, with necessary lightning arresters. In the shops direct current at 220 volts and alternating current at 440 volts are used. To meet these requirements, there are two banks of transformers in the power house, one composed of 3 single-phase 250 kw. transformers by means of which the voltage is stepped down from 5,000 to 440 volts; and the other consisting of 3 single-phase 75 kw. transformers. A 250 kw. rotary converter is provided for

the desired 220-volt direct current. A small induction motor is used to bring this converter up to synchronous speed.

The main generator in the power house is a 200-kw. 440-volt 60-cycle 3-phase machine driven by a 300-h.p. simple non-condensing Corliss engine. There is also a generator exciter driven by a small vertical engine. This generator can be used to avoid complete shut-down in case of trouble with the transmission line or the generating plant. As more exhaust steam than that obtained from the fan engines and steam hammers is required for heating purposes in cold weather, it is profitable to utilize the live steam from these engines for heating. All the electrical apparatus in the power house was manufactured by the Westinghouse company.

The high tension apparatus, which can be operated from the switchboard by means of remote control switches, is located on two balconies, one above the other, beneath which the transformers are situated. In front of these and facing the balconies is the switchboard, and before it are located the generator, exciter and converter. Connected with the switchboard are two sets of a.c. bus-bars carrying 440 volts, one set for the generator and the other for the purchased power, and also the buses for the 250-volt d.c. circuit. The switchboard comprises the necessary panels for the control of the converter, the d.c. and a.c. generator and purchased power lines, as well as six a.c. and two d.c. feeders. The a.c. feeders are so connected that they can be thrown on either the generator or the purchased power buses. Beneath the floor behind the switchboard is a tunnel built of concrete; passing through this the feeders are carried in lead-covered cables through clay conduits from the power house to the fuse panels in the shops. Branches to motors and lighting circuits are connected to the feeders in surface boxes.

ERECTING AND MACHINE SHOP.

The erecting and machine departments are under one roof in a large building constructed of steel, concrete and brick, being of the self-supporting type and having floor dimensions 170 ft. x 612 ft. The concrete portion of the walls rises to the level of the window sills, from which point to the roof brick is employed, colonial shale brick being used on the outside face. The roof covering is felt and tar with the usual covering of gravel. The shop is well lighted by skylights and the surrounding windows of the clear story of the erecting shop, while the roof lighting of the machine shop is furnished through windows arranged saw-tooth fashion. The flashings and ventilators are of copper, and water from the roof is conducted to the sewer by 4-in. pipes inside the building, placed at intervals of 24 ft. Particular attention has been given to the lighting feature of the shop, and instead of ordinary window glass, corrugated glass was adopted. While this is not clear enough to distinguish objects outside, it produces a better diffusion of light and almost entirely eliminates shadows, preventing much of the annoyance due to direct sunlight. The interiors of the buildings are painted white and produce an excellent reflecting surface. While no pretense to ornamentation enters into the design of this building, yet it is clean-cut and presents an imposing appearance. A balcony extends along the machine shop side having a length of 588 ft. and a width of 40 ft. On this balcony are situated three heating fans having a total of 43,500 lineal ft. of 1-in. steam pipe coils. The heated air passes through down ducts and enters the concrete tunneus under the main floor; these tunnels lead to the diffusers along the wall which are slightly above the floor level. In this way the shops are not only comfortably heated, but a perfect circulation of air is satisfactorily maintained. A 60-h.p. engine drives each of these fans, the exhaust steam passing through the coils.

Interior View of Erecting Shop.

There are also located on the balcony toilet rooms and lavatories of approved design, and a supply of hot and cold water is provided. Individual lockers of the hospital type are placed along the walls of the lavatories. Metal urinals, which are also sanitary in design, are located on the ground floor at the columns on the dividing line between the erecting and machine shop bays. The shop floor is made of hemlock sleepers spaced 4 ft. apart in well tamped sand; and these are covered with 3-in. x 6-in. yellow pine.

In the erecting bay, which is 70 ft. wide by 612 ft. long, are

First Locomotive Into New Shops for Repairs.

Heavy Machine Bay; Grand Trunk Shops at Battle Creek.

25 engine pits, each 43 ft. in length and having a space allowance of 24 ft. between centers. Extending along the sides of each pit are recesses in which are hung air pipes and wire conduits. The former have connection with pneumatic tools. In the latter are two plug receptacles to permit of the use of extension incandescent lamps. Water and steam pipe valves are placed at the back end of each pit to be used in connection with the customary boiler tests. Between each two pits is a work bench attached to which are two extension lamps similar to those in the pits. Each of the benches is equipped with two heavy vises. All the supporting columns adjacent to the back end of the pits are provided with air pipe connections and plug receptacles which prove of great convenience.

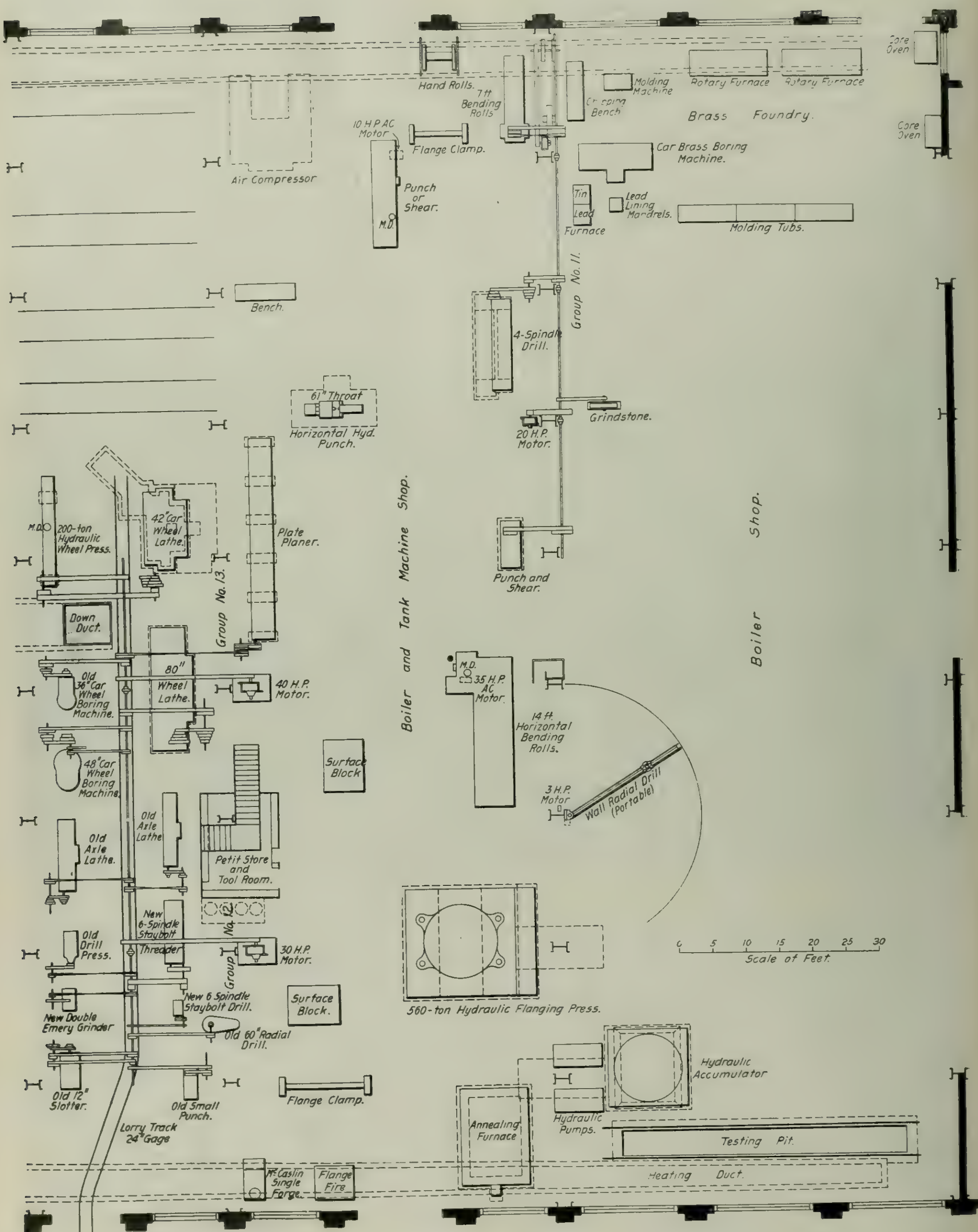
The erecting bay is equipped with two electric cranes, one 120-ton and the other 10-ton capacity. These are supported on separate runways attached to the steel frame of the building. The larger crane has ample head room to carry a locomotive the entire length of the shop over the others, while the smaller crane is used in the work of stripping and erecting the various parts of the engines. All the traveling cranes were supplied by the Morgan Engineering Company, Alliance, Ohio. Motor driven double emery wheels are placed along the walls and immediately in front of the locomotives, and assist materially in saving time on the various portions of the work. There are two tracks which enter the shop, one opposite the sixth pit from each end of the erecting shop. These are used for convenient transfer of engines to and from the shops. At one end of the erecting bay five pits are temporarily covered over, that portion being allotted to the pipe and tube department. A motor driven pressure-blower delivers a 14-ounce blast to these departments.

Running parallel with the erecting bay is located the heavy machine tool section of the shop. This section is 60 ft. wide and 212 ft. long. It is not at present entirely used for machine tools, about 120 ft. being occupied by the carpenter shop. The entire length of this section is also served by a 10-ton traveling crane. Most of the machines in this section are driven by individual motors. With the exception of the wheel and truck department and a majority of the larger tools, the other departments embraced within the machine shop on the ground floor are arranged under the balcony in the following order: Commencing 24 ft. from the west end, wheel and truck; piston and crosshead; valve motion; tool room; bolt and rod department. The tin, paint, air brake, brass finishing, machine repairs, belt and electrical departments are located on the balcony floor, which is made of reinforced concrete 6 in. thick. In order that each of the above departments may be self-sustained a sufficient number of machines of various types has been allotted to each, thus obviating the frequent handling of the work. In the central part of the machine shop there is a concrete and cement lye vat, 20 ft. long, 10 ft. wide and 10 ft. deep. This was made large enough so that a complete pair of driving wheels with their boxes, eccentrics and rods can be immersed in the lye and cleaned. They are easily handled for this purpose by the overhead electric crane. A small motor driven exhaust fan carries the fumes from this vat to the outside of the building.

BOILER AND TANK SHOP.

These departments are located at one end of the machine and erecting shop at right angles thereto, being constructed on lines similar to those of the erecting shop, and have floor dimensions 180 ft. x 205 ft. A brick curtain wall separates this shop from the erecting and machine shops, which prevents much of the noise from riveters extending beyond the boiler shop. An opening, however, admits of the transfer of boilers to and from the erecting shop, the boilers being passed through by means of a truck with a revolving top. The main boiler bay is 60 ft. x 180 ft., has ample capacity to accommodate nine boilers at one time, and is covered by a 30-ton double trolley crane. In the boiler machinery bay which has dimensions 50 ft. x 180 ft. an accumulator capable of exerting water pressure of 1,500 lbs. per. sq. in. has been installed. This is supplied by two motor driven pumps adjacent to it. The hydraulic tools consist of a large four post flanger and a horizontal punch having a 60-in. throat. In addition to these there are in the forge shop two heavy shears, a large punch and a bulldozer, which receive power from this plant. The riveting tower has not yet been equipped with its relative machinery. The pump for the accumulator was furnished by the Goulds Mfg. Co., Seneca Falls, N. Y., and is driven by a 40 h.p. three-phase motor. The Ferguson oil furnaces, supplied by the Railway Materials Company, Chicago, are used throughout.

Boiler Shop.



General Plan of Boiler Shop and Boiler and Tank Machine Shop.

The rolls were furnished by the Niles-Bement-Pond Company, New York, and are driven by a 35-h.p. motor. Williams & White, Moline, Ill., furnished the large shear, and the hydraulic riveter was supplied by R. D. Wood & Co., Philadelphia. A large annealing furnace forms a part of the equipment of this department; also a motor-driven splitting shears and punch. The brass department is at present located in a portion of the boiler shop and it is equipped with a duplex melting furnace, heated by oil fuel, made by the Rockwell Furnace Co., New York. Near this is a large 4-spindle boring machine for finishing bearings, built by the Niles-Bement-Pond Company, and this machine is driven by a 7½-h.p. motor. A 10-ton overhead crane and several jib cranes facilitate the handling of the work in this bay.

The tank shop is divided into two bays running parallel with each other, one in which truck wheels and axles are dealt with and the other dealing with repairs to frames and tanks, the tank bay having a floor space of 65 ft. x 205 ft., which gives ample room to place a tank and a frame on a single stall. A 20-ton double trolley crane is employed in this bay. The machine bay of the boiler shop has a floor space 30 ft. x 205 ft. Half of this bay is traversed by a 5-ton single trolley crane. The remainder is provided with a balcony, on which are located toilet rooms, lavatories and lockers, and in addition there is a hot blast fan for heating, with coils containing 15,500 lineal feet of 1-in. pipe. On each column in this building there are drops and lighting receptacles similar to those described in the machine and erecting shops. In the locomotive, boiler and tank shops, offices for the foreman have been provided. These are elevated above the floor in a second story, thus commanding an unobstructed view of the entire shop. The floor underneath is occupied by the air compressors.

FORGE SHOP.

The forge shop is 66 ft. east of the machine and erecting shop with the north end on the yard crane runway. The building has a self-supported steel frame with brick curtain walls, composition roof and cinder floor. The floor space is 100 ft. x 200 ft. and the height 24 ft. from the floor line to the bottom of the roof trusses. The building is divided into ten bays of 20 ft. each. The windows are 15 ft. 8 in. wide and extend from the concrete water table to the bottom of the roof trusses. The center of the roof has a monitor 10 ft. high and 20 ft. wide, with a pivoted sash, mechanically operated for ventilation and light, and this with the wall windows gives excellent lighting. Ribbed glass is used, which diffuses the direct rays of the sun so that men working close to the windows are not inconvenienced when the sun shines directly on the sides of the building.

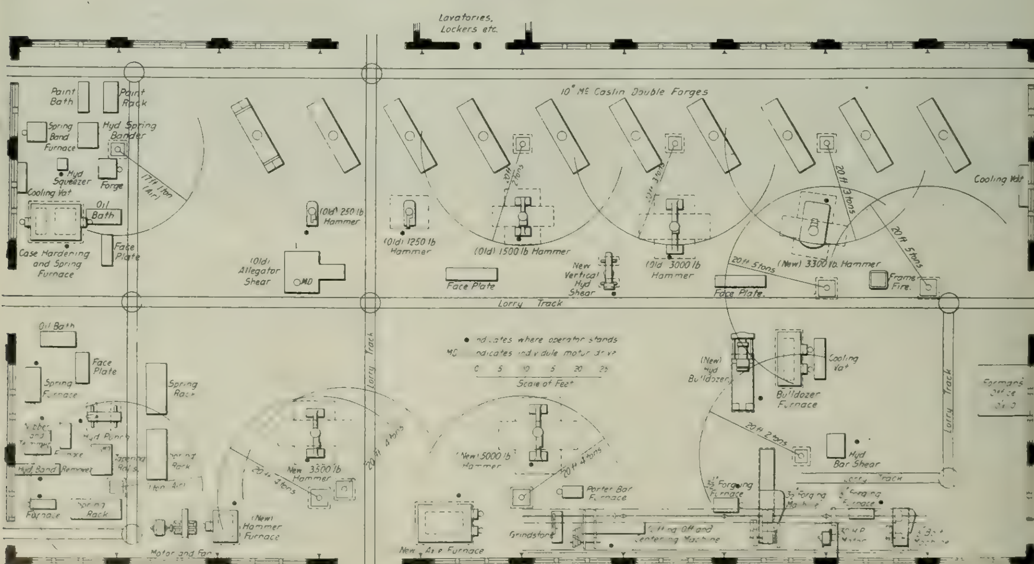
Battle Creek Tank Shop.

The toilet and locker rooms are located in a small wing, 20 ft. x 21 ft., two stories high, the first story for closets, urinals and shower baths, and the second for lavatories and lockers. All steam piping is carried in an underground tunnel in the center of the building to and from the steam hammers. The oil and water piping is carried underground in pipes laid in concrete and high pressure air pipes in roof trusses with outlets on columns. All material in this shop is handled by jib cranes and cars on a 24-in. industrial track, which serves all parts of the building. The coal and coke sheds are located just south of the shops and the industrial track runs into them, so that coal can be taken to all forges on a small car. The draft for all furnaces and forges is furnished by the American Blower Company's (Detroit, Mich.) blower, directly connected to a 100-h.p. induction motor. The air piping is galvanized iron and is carried overhead to forges and furnaces, except where

the down pipe would interfere with the jib cranes, when it is brought down along the wall and underground to furnace of forge. There are 10 McCaslin double forges on the west side of the building. All light work is done on the side next the wall while the inside floor space is occupied by 7 hammers which range from 250 lbs. to 3,300 lbs. Near the north end of the forges in the center of the building is placed a special fire, which is raised and lowered by air; this is used for welding frames and is close to a 3,300-lb. single frame hammer, both of which are covered by a jib crane and a yard crane for handling engine frames.

The hydraulic bulldozer, the hydraulic bar shear, the 3½-in.

Forge Shop.



General Plan of Forge Shop.

forging machine, the 1½-in. bolt forging machine, with their oil furnaces, are located in the northeast corner of the shop. Just south of this on the east side of the building is the axle department with axle furnace, 5,000-lb. hammer and double cut-off and centering machine. This machine and the two forging machines are run by a 30-h.p. group motor. The 3,500-lb. hammer and furnace are located just south of this and take care of the heavy forge work.

The spring department is located in the south end of the shop and contains the nibber and trimmer, tapering rolls with individual motors, a hydraulic punch and hydraulic spring bender with suitable furnaces conveniently located. There is a vertical hydraulic shear near the center of the shop for general purposes. All furnaces are of oil burning type, supplied from tanks located in a concrete oil house about 200 ft. south of the forge shop, under a pressure of 20 lbs. All forges are fitted with 22-ft. stacks extending through the roof, thus removing the smoke and gases by means of natural draft.

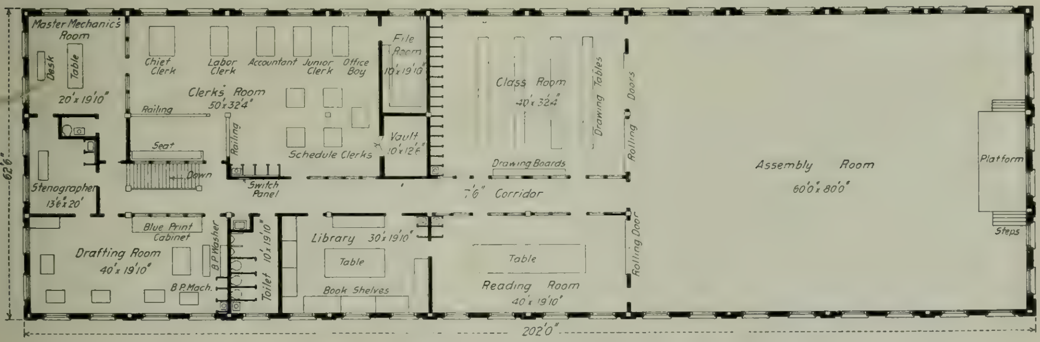
STORE AND OFFICE BUILDING AND OIL HOUSE.

The store and office building is a two-story structure, built of reinforced concrete and brick. It is 60 ft. x 200 ft. On each of the two sides there is a concrete platform 12 ft. wide. This platform is on a level with the first floor, which is occupied by the stores department; and the unloading tracks, which run on either side of the building, are located at a level convenient for unloading freight from the cars to the platform. These platforms extend to the center of the midway, where heavy material may be easily handled with the yard crane. The platform along the east side extends to and around the oil house, which is located about 150 ft. from the store and office building. On entering the building one finds himself in a spacious hallway; to the right is the clerk's office of the stores department and to the left is the storekeeper's private office; while directly in front is a stairway leading to the motive power department offices which occupy the second floor. Back of the stairway on the first floor are located the vault, filing and toilet rooms; and then comes the general store room which is fitted up with the necessary shelving, counters, scales, etc., and is very complete in detail.

The second story is occupied by the master mechanic and his staff. It is divided into two sections by a hallway running from the top of the stairway to the assembly rooms at the north end. The master mechanic's private office, which is located at the southwest corner, is a commodious room, 20 ft. square, finished in quartered oak with maple floor and tinted walls. Next to this is the stenographer's office, 14 ft. x 20 ft., and further on the clerks' room, 32 ft. x 50 ft.; adjacent to the clerks' room are the filing room and vaults. Continuing along the west side, the drawing class room is next; this is 32 ft. x 40 ft. It is fitted with tables, drawing boards, blackboards, etc., and across one end is a row of clothes lockers for those who attend the evening classes. Two evenings a week are devoted to the instructions of apprentices in Mechanical Drawing, Practical Mechanics and Electricity. Across the hall from the drawing class room is a reading room 20 ft. x 40 ft.; this room is provided with the latest periodicals. Leading from this room and also from the drawing class room are vertical rolling doors, which may be opened into the assembly room. The assembly room is 60 ft. x 80 ft., and will accommodate about 400 persons easily, making an ideal place for social functions, lectures, etc. Continuing along the east side and opening from the reading room is a well stocked library, and next to it the drafting room, 20 ft. x 40 ft.

The oil house is a single story building, 30 ft. x 40 ft., built of reinforced concrete and brick. The floor of the building is about 10 ft. above the ground level, which happens to be low at this point and makes a convenient place for the oil storage tanks, of which there are ten with a capacity of 8,000 gal. each. The oil house is divided into two rooms of equal size. One is used as a pump room for pumping the oil from the tank below and the other for the storing of oil in barrels. There are six oil pumps, three of which are power pumps and the others operated by hand. They are of the self-measuring type, made by S. F. Bowser & Co., Inc., Fort Wayne, Ind. The power pumps are operated by a 2-h.p. Western Electric motors, belted to a line shaft.

The Assembly Room.



Plan of Second Floor; Store and Office Building.

SEWERAGE.

It was necessary to install two sewer systems, as it is against the rules of the city board of health to dump raw sewage into the creek at this point because it would become a nuisance in the summer when the water is low, as the creek flows through the center of the city for two miles. It was a case of either putting in a purification plant or pump 1,000 ft. against a head of 25 ft. into the city sewer. There is such a small difference in elevation between the end of the sewer and the creek which is close by, that filtration beds would be overflowed several times every year by the high water in the creek; therefore it was decided to install the

pumping plant. The pump pit house is located south of the buildings and all sewage is brought to this point by gravity. The pumping apparatus consists of two separate units so that one is always ready in case anything goes wrong with the other. Each has a centrifugal pump directly connected to a vertical motor which is controlled by a float switch, and when water reaches the required height in the pit one pump starts up and pumps it out, and if this pump does not work the other pump will start when the level gets a few inches higher. All rain water and water used for washing out engines, cooling compressors, etc., is carried into the storm sewer and into the creek by gravity. The sewers are built of extra heavy double strength sewer tile with self-cleaning grades outside of the buildings, and inside the buildings all sewers are of cast iron soil pipe to a point 4 in. outside the buildings.

TELEPHONE SYSTEM.

A local telephone system, connecting all foremen's offices, small stores, power house and other departments, has been installed. The switchboard is located in the general office of the master mechanic. At present 14 telephones are used and provision has been made on the switchboard for a total of 25, which will be installed when the foundry, frog shop, carpenter shop and car department are added to the present plant.

TIME REGISTRATION.

Each workman is required to punch a time clock on entering the shop in the morning, when leaving and returning at noon and when leaving in the evening. Eight-day time registering clocks are used for this purpose. They are distributed in such a manner that they are convenient for a workman to punch without extra walking from his entrance to the building.

MOTORS.

The a.c. motor is used in all cases except where speed variations cannot be mechanically accomplished, in which case d.c. motors are employed. All motors from 5 h.p. and over are equipped with suitable starting devices, fuses and circuit breakers with low voltage release.

LIGHTING.

The general shop lighting is by Cooper-Hewitt Co.'s (New York) a.c. mercury lamps which give a very steady and efficient light. They use a set of balanced coils, star connected to the 440 volt shop feeders. This gives a voltage between the neutral wire and any phase of 255 volts, which operates them. They are self-starting and light up as soon as the switch is turned without tilting the tubes. They are connected two in multiple for each switch. The installation here is interesting because this is about the first large shop in the country to install the a.c. type of Cooper-Hewitt lamp. The incandescent lights for drop lights in the engine pit, erecting bay and foremen's offices are tapped directly off the 250-volt d.c. feeders. The lights for offices and store houses are incandescent and use transformers to step down to 440-volt a.c. to 100 volts. The yard lighting uses series arc lights. A special panel and constant current transformer is located in the power house for these, as the switchboard attendant turns them off and on.

COMPRESSED AIR.

The compressed air system is rather a novel departure from the usual practice, as a number of units distributed over the shops are used instead of a centrally located one. There are three 100-h.p. Ingersoll-Rand Co.'s (New York) air compressors, directly connected to 106 h.p. Western Electric inducing motors having Cutler Hammer magnetic starters that automatically maintain an air pressure of 100 lbs. One is located in the north end of the machine shop, one in the center and the other in the boiler shop; two of them can supply the maximum demand, one being available in case of emergency. These receive air from the outside. The air piping is carried overhead on the roof trusses and pipes to drops are carried down the column, piping for its pits being hung in the heating tunnel which extends along the end of the pits.

In all negotiations in regard to the new shops the railway company was represented by E. H. Fitzhugh, third vice-president of the Grand Trunk Railway System. He was assisted in his conferences with regard to the details of the work by W. D. Robb, superintendent of motive power, and by J. T. McGrath, master mechanic, who is now in charge of the operation of the shops. The contract for the concrete foundations and for the building superstructure was let to Henry L. Vander Horst, Kalamazoo, Mich. The contract for the steel work and its erection was let to the American Bridge Company, New York. The complete piping systems for air, steam, water and oil have been installed by John R. Kehm Company, of Chicago; while the Western Electric Company, through its New York office, had the contract for furnishing and installing all power and light wiring. The Arnold Company, Chicago, engineers and constructors, served the railway company in the capacity of designers and supervisors of the complete shop plant, including buildings and equipment, with the exception of the machine tool layout, which was handled by the railway company.

RAIL FAILURES ON THE ROCK ISLAND LINES.

Rail failures on the Rock Island lines for the six months ending October 31, 1908, are shown in the accompanying tables. This period is the first of the six-month periods covered by the reports on rail failures made by the railways to the American Railway Association; reports are also to be made regularly each six months thereafter. We are indebted to J. B. Berry, Chief Engineer of the Rock Island, for this data. He says that "when the trackmen become thoroughly familiar with requirements of the failed rail reports it is hoped that future series of diagrams will give more information than the present set."

Table I. shows total rail failures by months for the various sections. The 80-lb. re-rolled section weighs slightly over 73 lbs. per yard, being reduced from 80-lb. A. S. C. E. section.

TABLE I.

	Total failures				Total failures per 100 miles track.			
	80 lb.*	80-lb.	85-lb.	100-lb.	80-lb.*	80-lb.	85-lb.	100.lb.
May		9	1	1	....	0.38	0.19	22.22
June		18	5	2	...	0.76	0.95	44.44
July	1	7	...	...	0.80	0.29	....	.....
August	2	8	...	1	1.59	0.34	....	22.22
September		10	4	5	....	0.42	0.76	111.12
October		17	4	....	....	0.71	0.76	.....
Total	3	69	14	9	2.39	2.90	2.66	200.00
Track, miles	125.8	2,378.1	526.8	4.5	....	....	....	......

NOTE.—The track mileage is for each section.

*Rerolled.

While the mileage of the 100-lb. section is small, the rate of failures per 100 track miles is exceedingly large.

Table II. shows the life of failed rails. The noticeable feature is the extremely high rate of failure of the 100-lb. rail; also the high rate of failure of the 85-lb. section as compared with the 80-lb. section with life of three years or less.

TABLE II.

Life.	Failures per 100 miles of track 80-lb. rerolled.	80-lb.	85-lb.	100-lb.
1 year or less	....	....	....	200.0
From 1 to 2 years	3.80	....	0.95	.....
" 2 " 3 "	....	0.13	3.98	.....
" 3 " 4 "	....	0.17	....	.....
" 4 " 5 "	....	0.85	....	.....
" 5 " 6 "	....	0.25	....	.....
" 6 " 7 "	....	0.59	....	.....
" 7 " 8 "	....	0.85	....	.....
" 8 " 9 "	....	0.81	....	.....
" 9 " 10 "	....	0.77	....	.....
Over 10 years	....	3.44	....	.....

NOTE.—No. 80-lb. rerolled rail laid prior to 1906. No 80-lb. rail laid since 1905. No 85-lb. rail laid prior to 1905. No 100-lb. rail laid prior to 1907.

Table III. shows the several kinds of failures per 100 miles of track:

TABLE III.

Kind of failure.	Failures per 100 miles of track. 80-lb. rerolled	80-lb.	85-lb.	100-lb.
Broken rail	2.39	1.64	0.95	.....
Split end or head	....	0.46	1.14	160.0
Mashed head	....	0.04	0.57	40.0
Battered end or top	....	0.29	....	.....
Crack in web or through bolt holes	....	0.34	....	.....
Broken base	....	0.13	....	.....
Total	2.39	2.90	2.66	200.0

Broken rails cover nearly 57 per cent. of the failures of the

80-lb. rail, 39 per cent. being breaks in or at patented joints, and 6 per cent. in other joints; the remaining 12 per cent. are intermediate breakages. Nearly 36 per cent. of the 85-lb. failures were broken rails, 11 per cent. being at patented joints, and 25 per cent. intermediate breakages. Studies are to be made of these breakages in patented joints to see if they are due to the type of the joint.

The 100-lb. rail failures are all head failures and are extremely high, due mostly to soft steel. The head failures of 85-lb. rail are much higher than for the 80-lb. section.

Table IV. shows the rate of failures segregated according to manufacturers. The failures of the 80-lb. and 85-lb. sections rolled by the Illinois Steel Company have the lowest rate, but with the 100-lb. rail, which was all from this company, the failures are excessive.

Table IV.

	80-lb.			85-lb.			100-lb.		
	Miles of track.	Failures Tot'l.	Failures Pr 100 mls.	Miles of track.	Failures Tot'l.	Failures Pr 100 mls.	Miles of track.	Failures Tot'l.	Failures Pr 100 mls.
Penn St'l Co.	31.3	4	12.8	.....	..	....	....	..	....
Nat'l St'l Co.	43.0	2	4.7	.....	..	....	....	..	....
T. C. & I. Co.	0.79	2	....	.....	..	....	....	..	....
Ill. Steel Co.	2,199.0	52	2.4	515.9	13	2.5	4.5	9	....
Md. St'l Co.	104.1	9	8.6	....	..	....	....	..	....
Lorain Stl Co	.....	..	....	10.9	1	9.2	....	..	....

American McK. process rerolled 80-lb.—125.8 miles of track, 3 failures; 2.39 failures per 100 miles.

The rate of failure of the 80-lb. rail from the Tennessee Coal & Iron Co. is exceedingly high. This was open-hearth steel, only a small quantity being laid, and the two failures were due to defects in the head. This rail is showing splendid wearing qualities, being laid on curve and showing less than one-half the wear of Bessemer rail which was laid adjacent to it at the same time.

PUBLIC REGULATION AND CONTROL OF RAILWAYS.*

BY FREDERIC A. DELANO,
President, Wabash Railroad.

What I am most interested in discussing this evening and pointing out to you is the immense demands on the railways and the conditions which must exist before these demands can be met. Bear in mind, please, that in any case railways will be built and developed only by the capital of our people or of such foreigners as may be induced to invest in this country. This is just as true, whether the railways belong to the government, or whether they belong to and are operated by individuals. The only difference is that in the case of government ownership the government raises the money for the purchase or building of the railways by a guarantee of the bonds and stock; whereas under private ownership the investor buys from the railway company direct, and on its credit only. (A large portion of the investment in railways is indirectly from the masses of people whose funds in the hands of banks and insurance companies are invested in railway securities.) Regardless, therefore, whether the ownership of the railways is public or private, it is evident that public necessity exists for a constant and annual expansion; that this necessity requires an expenditure of something like $650,000,000 per year on the average; that this sum of money can only be raised from surplus earnings, or by borrowing. If, by borrowing, that borrowing must be on the credit of the borrower.†

In the face of this condition of affairs, it is not strange that railway officials feel a good deal of annoyance and are disposed to be irritated at the disposition of the legislatures, first to reduce their sources of revenue; second, to increase their expenses; third, to demand public improvements. For, bearing in mind, that railway men claim to be no better than the rest of humanity, they do claim to be human, and subject to the same desires and ambitions as the rest of the family. Indeed, I may say that in all my railway experience, I have never met a railway officer who did not want to spend money on his road as fast as the credit of his company, the ingenuity of his bankers, and the approval of his directors would permit. This is only reasonable and human. The manager of a single track road wants to make it a double track line; he wants to get rid of many bad grade crossings; he wants to adopt safety appliances; he wants to reduce his grades and curvature in order that he may show more efficient operation. Is it to be wondered at that he feels irritated and even peevish when the state legislature reduces passenger fares, or freight rates, to a point at which the operation of the road becomes unprofitable? Is it to be wondered at that he is irritated when the state limits the length of trains; limits his methods of operation; requires him to employ three brakemen when he thinks two are sufficient? Is it to be wondered at, when, on top of all these restrictions and requirements, sundry betterments and improvements are demanded; and finally, when politicians ride into office or win political preferment by their abuse of railway management and methods, that the patience of the railway man is well-nigh exhausted?

What is the remedy for these conditions? Evidently the remedy which the railways need more than any other is a rest from the attacks made upon them. Railway operation and management is complex and involves so many problems and commercial questions that what the railways need is more thorough study of the questions and less disposition on the part of all communities to jump at conclusions. Mr. Willard, Second Vice-President of the Burlington Company, covers the point well in a recent address made to a body of the employees of that company at Galesburg. He says:

"In my opinion, railway business, which really means all business, will recover its former proportions when the influences and forces at work during the last two or three years shall have ceased doing the things that have contributed so largely towards bringing about the depression which we all deplore. Perhaps that it not quite clear. I do not mean that laws already made must necessarily be unmade, that wages raised must be reduced, but we must have a rest. We must be given time and opportunity to work out the new problems that have been forced upon us during the last two years. We must be given a chance to find out what it is going to cost to meet the new requirements, and also how much our revenues are going to be reduced by reduction of rates. Perhaps it will be found that by new methods growing out of the exigencies of the case we will still be able to earn a surplus sufficient to justify the resumption of extraordinary expenditures as formerly. If not, then, either rates must be advanced or wages reduced, or improvements must wait or be carried on with borrowed money, and railways will be slow to increase their interest-bearing debt under such circumstances."

In dealing with questions of this kind there have always been two broadly different policies, one the policy of great freedom from restraint, the other of extreme repression. The pendulum of public opinion swings slowly from one extreme to the other. The first policy is not often heard of now; it is usually called by the French name, *laissez faire*, i.e., "Let things alone." This policy was first developed by the economists in reaction from the excess of regulation and interference with business which reached its extreme development in France during the reign of Louis the Fourteenth and under the primacy of Colbert.*

While this "Let things alone" policy is no longer popular, it might be well to point out the logic of it when applied to present day conditions in respect to railways. The theory of the policy is that objectionable economic conditions have within themselves the elements of their own cure. In other words, that if things are left alone, natural causes will produce a remedy. Thus, if railways are built and prove very profit-

*An address before the Hannibal Commercial Club, Hannibal, Mo., March 25, 1909.

†It is often said of borrowing that any one can borrow, but the terms at which one may borrow depend wholly on the credit of the borrower. During the last two years there are a good many cases on record where great railway companies have paid as high as 9 and 10 per cent. for the use of money, thus indicating very well their dire needs, as well as the extent to which their ability to pay their debts has been jeopardized.

*Colbert, in the years 1661-72 developed the industries of France in a most astonishing way. Later, under a system of well-meant paternalism all sorts of governmental offices and commissions were created to regulate these industries and protect the public; but soon this system of over-regulation reached a point where it broke down of its own weight and a sharp reaction to the *laissez faire* doctrine took place.

able, other railways will be built in competition, and competition will soon divide and diminish profits. If, on the other hand, railway building proves to be unprofitable, if state interference and hostile legislation tend to diminish profits below a reasonable point, railway building and development will cease.

Whether there is anything in this doctrine or not, it is, as I have already said, an unpopular one to-day, for the reason that communities are much too impatient to get results. People who believe in temperance are unwilling to wait for the slow process of education and the spread of morality to produce the desired results, but insist that temperate habits must be brought about by a law which will compel total abstinence.

In the same way, if the community thinks the rates they are charged are too high, they don't investigate the matter, but they straightaway get legislation compelling the roads to reduce rates, apparently entirely overlooking the economic results which will certainly flow from such a course.

In an undertaking where a large portion of the capital invested is in a fixed form—structures, buildings, etc.—capital once invested cannot be easily withdrawn. This is more true of railway investment than of any other form of endeavor, and so the public are inclined to jump at the conclusion that because capital has been invested in railways, and the railways cannot be taken away, and trains must be operated, they can with impunity "put on the screws." Without commenting on the morality of such a point of view it should be borne in mind that the railway is not a completed thing; that even some of our most perfect trunk lines are constantly undergoing change. Thus, one of the country's greatest railways is said to have been relocated in some stretches of its line, four different times, in order to get better gradients or alinement; for, after all, the final economic location of a railway is subject to change until it reaches perfection—the only perfect railway being the railway which is both level and straight. The amount which can be economically spent on a railway and still produce return on the expenditure depends, first, on the rate of interest paid for the money, and, secondly, on the volume of the traffic involved. A very trifling saving per ton of freight or per passenger handled, spread over a sufficient volume of business, will warrant the expenditure of very large amounts.

These instances are cited simply to show that a constant supply of money is needed for the improvement and development of existing railways, to say nothing of making extensions or building railways into new country. There is not a railway man who could not cite from his own experience dozens of instances where the expenditure of hundreds of thousands, and even millions of dollars would, in his opinion, be justified by reason of the economies produced, and yet, in such times as these, it is with most railways impossible to raise money. If this is true of improvements and betterments which increase the earning capacity, or reduce the cost of doing business to an extent sufficient to fully warrant them, how much more is it true of those forms of expenditures in which the public is vitally interested; for example, a better and safer track; better and more commodious stations; better and faster trains; better car equipment; the abolition of grade crossings, and many other things which I might mention that are necessary or very desirable, but do not produce an additional revenue.

The reverse of the policy which permits things to work out their own salvation is the policy of regulation which is so much in vogue to-day. Its theory is that all functions in which the public are generally interested must be either owned or subject to control by the state; that is, the community at large. I shall certainly not take the position that this is either an unfair or unworkable theory; but I shall endeavor to point out some of the difficulties which have arisen under its operation.

To begin with, it is only human nature that a man or group of men who put their money into an enterprise should desire the full control of it. In ordinary manufacturing or commercial undertakings every man has his own notions about the conduct of his business, and does not want to be interfered with, or dictated to by people who know less about his business than he does himself. Now, while it may be argued in the case of public service corporations that the people who have put their money into these enterprises, have done it with their eyes open and with full knowledge that they were subject to governmental regulation and control, there is nothing in that argument which makes public interference any more palatable to the man or group of men who are interfered with. The fact that the ordinary merchant does not like to be dictated to cannot be altered, even if you convince him that the law compels him to submit to that dictation. If the conduct of railways involves as many intricate and complex questions as the conduct of other business, then you will have to admit from the analogy of your own experience, that interference and dictation especially when it comes from those less familiar, less acquainted with the problems, is, to say the least, difficult to bear and very annoying.

There is a movement on foot in some of our states for legislatures to delegate their authority in the supervision and conduct of public service corporations to specially created commissions. Theoretically, at least, this appears to be a movement in the right direction; that is, it shifts the control from a body so large that it is difficult to clearly establish responsibility, to a small body on which responsibility can be fixed and of which a fair degree of expert knowledge can be expected. On the other hand, the plan is still experimental and is by no means a proved success. It is opposed to the basic principles of democracy which, as I understand it, maintain that the average common sense of a large body will produce better results in the long run than the special knowledge of a small body of men. It sometimes happens that even a well selected commission is not given a fair chance—the unreasonable is expected of it. Public opinion sometimes forces action when it should permit deliberation and careful study. It is unfair to expect a group of three, five or seven men, who have not been trained to transportation problems, to grasp, within a few months, subjects which are considered intricate by men especially trained by long experience. And yet, that is what many of our states demand.*

That dealing with these problems requires special knowledge and training can hardly be contradicted by any one when one reflects on the intricacies of other business. Is there a single vocation in life which is not more complex to-day than that same vocation was twenty-five or fifty years ago? Is there a single vocation, profession, commercial or manufacturing undertaking which does not demand a greater training and a greater degree of specializing to-day than it demanded twenty-five or fifty years ago? I feel that I may safely say there is not, and, further, that the railway is no exception to the general rule.

A year or more ago when the railways were smarting severely under the heavy depression in business, and concerted efforts were under consideration to advance rates of freight as preferable to any scheme of reducing wages, the railway officers of the country, in spite of their own convictions as to the justification for an advance, concluded to go slow and not make advances. Repeatedly, I have been asked by prominent manufacturers of railway supplies, "Why don't you advance your rates? This is the only way you can improve your credit, increase your purchasing power, and enable you to again come into the market and buy our goods." My answer has been, just as that of many others, that it was not feasible to advance

*In the case of the Interstate Commerce Commission we have a notable example. Here is a group of men who are required to exercise inquisitorial, administrative and judicial functions. We might as reasonably expect a court to act as prosecuting attorney, listen to the evidence, decide the case, and administer the law.

rates generally until the community at large was convinced of the justice of the proposition. Not until some headway was made against the hostility, which, rightly or wrongly, exists against the railways, can we get an advance in our rates which will be remunerative and which will again restore the purchasing power of the railways.

You may argue, as many have argued, that this panic started in Wall Street, and that it existed nowhere else—and, indeed, it is fortunate for the country that our immense agricultural sections have felt the panic and recession so very little—but if you do not know what the panic has been, I will advise you to go into the manufacturing sections of the country, to any of our large cities or the centers of the iron, coal, and coke industry. It is true that these industries have been talking brave just as many railways have been talking brave. In fact, it often happens that the officers of a railway corporation are in the same sort of position as the officers of a bank, when they fear a run on the bank. It won't do to admit to the public that your credit is weak, that you are well-nigh insolvent, that you are not earning the interest on your debts. You may at that very minute be trying to borrow money to tide you over the bad period. So it happens that the railway man must do the same thing that the banker or the manufacturer or the merchant does when he is put in a similar position. He puts a brave face on the situation. He makes light of his troubles. He urges that things are not so bad as they might be. He expects an improvement shortly, and says in fact all that he needs is a little temporary assistance.

Happily, that critical period is past, and we can now look at some of these questions squarely, and without any dissimulation. Many people who are despondent over the situation will tell you that there is a general spread of socialistic ideas, and that it is this which is causing the trouble. Personally, I am not alarmed on this score, because I have the utmost faith in the sound common sense of the American people; and while I realize that a little education is often a dangerous thing, and leads men to very ill-judged and mischievous conclusions, I feel sure that the public becomes more familiar with these difficult problems, they will become more and more conservative and cautious. Socialism is a dreaded word with many people; but, after all, it is a word which is so difficult to define, that scarcely two people understand the same thing by it. To some men it is synonymous with anarchy; to others it means state ownership, to others again, communism; some men picture it as a kind of Utopia, the ideal of all unselfishness, but admittedly well-nigh incompatable with human nature as it exists about us. These isms do not discourage me, because I believe that human nature, while much the same the world over, is gradually changing for the better; that our general education and our freedom of discussion are helping all the time to bring about a better understanding and a better condition of affairs.

Along these lines of discussion of these questions, government ownership is sometimes suggested. Personally, I would oppose government ownership, not for the effect it would have on the railways, but on account of the results to the government and the community. I have no fear that government ownership will be brought about from below, but I have much greater dread that it may be brought about from above. In other words, there is much less danger that the general public will demand government ownership of railways and the taking over of railway property by the federal government, than there is that the representative and large owners of railway property will become so tired of petty annoyances, interference, control of profits, etc., that they will be the ones to seek to bring it about. But there is no immediate danger of this; it will not come within your lifetime or mine.

In this connection, one thing often lost sight of is that when the government undertakes control of any large public function, there is no supervision or control over that operation. The government can not successfully supervise itself. Theoretically, the supervision is in the whole people, but the difficulty then is that "what is everybody's business is nobody's business." On the other hand, under private ownership of public utilities, there can be public supervision, criticism, and finally control, a degree of control which is practically not possible in the case of any governmental department.*

From the standpoint of the public, then, it seems to me that private ownership and public supervision and control is the ideal method unless it is pushed to an extreme where it necessarily breaks down. In other words, it can be pushed to the extreme where there is no incentive or inducement for private capital to enter; where even though the capital already invested may not be withdrawn, no new capital will come in; expansion and development ceases. We are nearer this condition of affairs in this country than the railway men care to admit; but actions speak louder than words, and you can see the results of diminished capital investment in railway enterprises, in the diminished purchasing of material and the cessation of improvements and betterments. The railway men of the country would like to see an end to this condition of affairs, but I for one say it would be better that the lesson so dearly bought should be learned and comprehended by all. I doubt very much if the country as a whole can be prosperous with the greatest single industry on starvation rations. There never was a time when there was a greater need for thorough study—courageous, patient, good-tempered study of such great public questions. Better the *laissez faire* policy than the "pin pricking" policy, the thoughtless tinkering with legislation, of which we have all seen so much.

As has been said already, the worst of this storm has passed, and even though conditions are still depressed, it is better that the railways should be patient than that they should adopt harsh or retaliatory tactics. For this, if for no other reason, it would be better that railways should continue to live on a starvation basis and from hand to mouth, than that any summary action, however justified it may be, should be taken. The railways of the country are suffering—and suffering sorely, there is no doubt about it; but they can afford to suffer if by so doing the community as a whole is learning the lesson which should be learned by such an experience. As a nation, we have had a sharp spell of sickness, and it would be dangerous for us to assume that because we feel better we have entirely recovered our strength. Let us thoroughly understand the cause of the malady, and after the disease has run its course we will be ourselves again, immune, I hope forever, from this particular complaint.

The great state of Missouri—one of the greatest in the Union in area and natural resources—is surely not ready to say that it invites no more capital for investment in railway improvements, expansion and extension; and even if not a single mile of railway were needed in this state to develop unoccupied areas, there is scarcely a mile of existing trackage in which some sort of betterment or improvement is not desired. How shall the capital to make these improvements be obtained? Certainly in one way, and one way only; that is, by making the enterprise reasonably profitable. And you will pardon me for suggesting it, for I cannot help thinking it is the wise course, that a public service commission, instead of busying itself solely in defining the duties which this road or that should perform and the improvements which should be made, might very properly study the sources of revenue of the railways, ascertain why it was that the roads were not

*It is to be remarked in this connection that in no municipal, state or federal operation in this country have we the degree of publicity in reports of revenue, cost of service or profits that are commonly given voluntarily by corporations to their stockholders, or the public. Also that in private undertakings there is necessarily a relation between income and out-go; whereas in our country in all public finances, we have as yet created nothing effective in this direction. We go merrily on spending money without knowing where the revenue is coming from, and when we get "hard up" we sell bonds or increase taxes. This period of adolescent finance cannot continue indefinitely, but in the meantime our people are failing to learn the most important lesson of political economy—a condition which, unless the lesson is learned, must sooner or later get us into serious trouble.

more profitable, co-operate with the management in effecting economies or increasing earnings, with the certainty that every dollar profitably invested in the railways will attract additional dollars to the state. I have not heard of any state commission that has gone about its work in this way, and perhaps public opinion has not arrived at the point where a commission so minded would have public support; but certainly a commission could safely assume this attitude, for it would be in a position to use its regulative power at any time in protection of public interests if it saw the railways gathering in excessive profits and failing to do their full duty to the public. My own experience in the study of railways of the country convinces me that even the richest railways are paying only moderate returns on the capital actually invested and are making large expenditures for betterments and improvements out of earnings.

Let me remind you that the capital invested in railways was invested with the hope of return—and while neither state nor federal government gave any guarantee of a return, neither did they place a limitation on it. Only in very recent years has any court suggested that the return should be limited. In other words, it now appears that while the bona fide investor here or abroad stood to lose all the money he put in (and cases are very numerous where he did lose all) he now finds the trend of recent decisions limiting the return to, say, 6 per cent. Remembering that the theory underlying the investment of capital is that the possible reward or return on the investment must increase about in proportion to the hazard incurred, does any one suppose that our railways, especially in the Far West, could have been built without any guarantee, if there had been an intimation that 6 per cent. was to be the limit of profit on the most successful operations? The answer to these questions I can safely leave to you, confident as I am of your fairness, and confident, too, that all we need is a more thorough knowledge of conditions and less disposition to cure every ill with a new law.

To prevent the accumulation of freight and baggage at stations, the French government has authorized the railways to remove all freight which is not taken away by the consignee himself within 48 hours of the time prescribed by the regulations, and to deliver it either at the address of the consignee or to a public warehouse. In the latter case, notice is to be given immediately to the consignee, and if his address is not known, to the shipper. When the baggage-room of a station is obstructed by an accumulation of baggage, the railway is authorized to deliver it itself to the residence, when given on the baggage, or to a public warehouse, and charge for such removal according to specified tariff. The permissible delay before removal is three days in Paris, five days at certain other stations specified by the Minister of Public Works, and eight days for all other stations.

HIGH SPEED HYDRAULIC FORGING PRESS.

This type of machine has practically replaced the steam hammer in Europe. It originated in the hydraulic forge press introduced for the manufacture of gun forgings, hammer plates and heavy general forgings. It was found that the heaviest steam hammers, notably the 125-ton hammer at South Bethlehem, Pa., and many large hammers in Europe, would work only on the surface of large ingots, overlapping if the blow was heavy, while the center of the ingot would stretch, making the grain large and accentuating imperfections. The

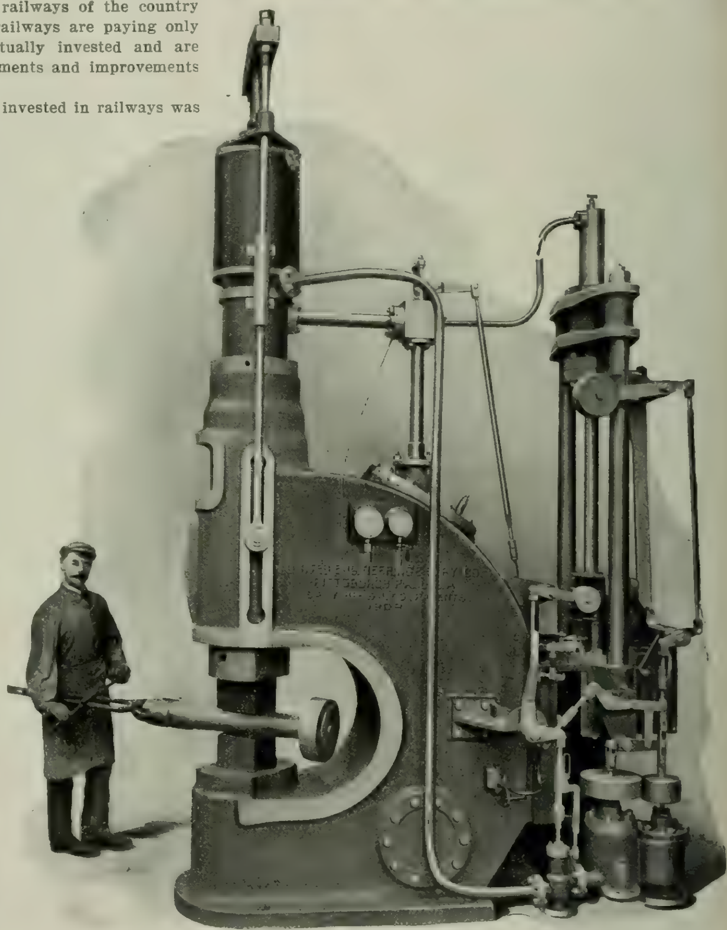


Fig. 1—Rapid Action Steam-Hydraulic Forging Press; Single Frame Type.

opposite result was obtained under the press, the sides and ends of the ingots bulging, showing that the metal was worked uniformly throughout the mass. The hydraulic press was found to be sufficiently rapid to manipulate and work the ingot for these large forgings, but the installation of high-pressure pumps, accumulations, pipe lines and valves was found to be expensive, both in first cost and maintenance and was not rapid enough for middle sized forgings. This led to the present type of high-speed steam hydraulic installations, which have been developed to a most efficient degree by Messrs. Davy Brothers, Ltd., Sheffield, England. The patents,

drawings and all information for America, Canada and Mexico have been acquired by the United Engineering & Foundry Co., Pittsburgh, Pa., which manufactures two types of these machines.

The single-frame type, shown in Fig. 1, is built in sizes from 150 to 400 tons capacity and the 4-column type, shown in Fig. 2, in sizes from 300 to 12,000 tons capacity. It is said that this type of machine has effectually supplanted the steam hammer, and so much so indeed, that but very few hammers of over 1,500 lbs. capacity have been installed in England, Germany, France or Austria within the past ten years, and that those previously operated are not now in use, having been replaced by the hydraulic press and the latter in their turn have been replaced by the high-speed steam hydraulic type.

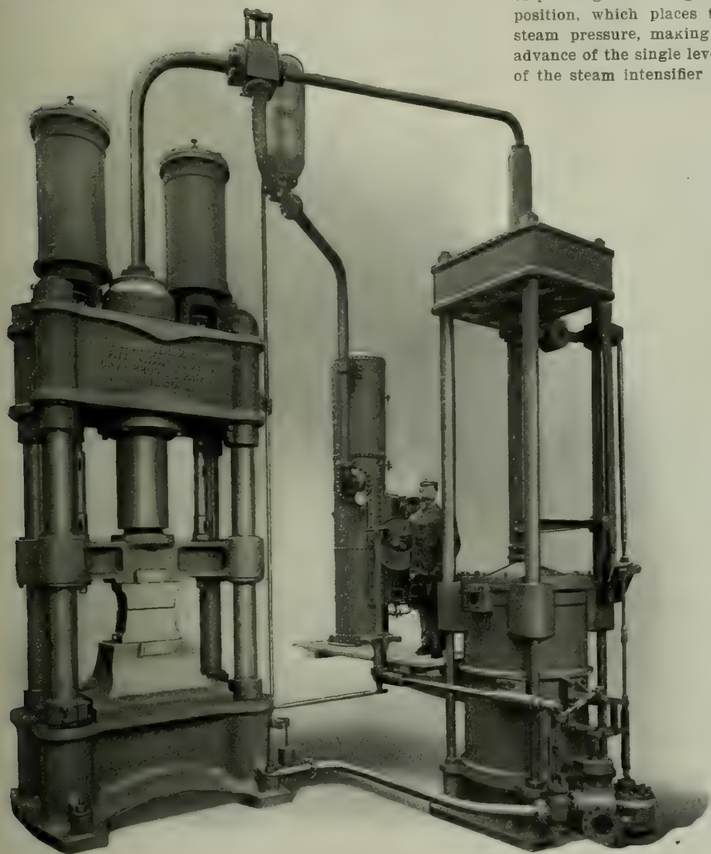


Fig. 2—Rapid Action Steam-Hydraulic Forging Press; Four Column Type, Single Cylinder.

The Davy high-speed type has a central plunger which is actuated by the water pressure from the steam hydraulic intensifier, located at the right of the press. The two steam balance cylinders are placed on the top of the entablature of the press, and the tank, seen in the center, contains air and water about 60 lbs. pressure. This tank is called the pre-filler. Beginning the operation with the forging dies together as shown in Fig. 2, the operator, by a movement of the single lever controlling gear, which is an important feature of this press, admits steam to the balance cylinders. The upper cross head is raised sufficiently to allow placing the forging between the dies. This operation forces the water from the press cylinder into the small intensifier cylinder until the plunger of the latter, and also its steam piston, is in its lowest position. Surplus water is then forced into the pre-filler, the check valve of which is opened by the first movement of the single lever. Should the cross head of the press be raised too high a forward motion of the single lever will exhaust the steam from the balance cylinders and permit the upper die to just clear or rest on the forging. The water from the pre-filler is under a light air pressure and simultaneously fills any space in the water system between the intensifier and the press cylinder. The machine is now ready to commence the work of pressing. The single lever is thrown forward of its center position, which places the balance cylinders under constant steam pressure, making a so-called "steam spring." Farther advance of the single lever opens the steam valve to the bottom of the steam intensifier cylinder. The piston ascends, forcing the water from the small cylinder into the press cylinder, thus forcing the upper die down against the forging. A backward movement of the single lever exhausts the steam from the intensifier and the press head lifts sufficiently to clear the forging, a forward stroke again presses the forging, and so on. The position of the single lever determines the angularity of the flat bar shown on the right of the intensifier in Fig. 2, which is operated by the movable roller attached to the intensifier piston rod. This controls the steam cut-off or stroke of the intensifier; or, in other words, the press head follows the motion of the operator's hand, both as to speed and direction. It can be operated as fast as 120 strokes per min. for small machines and up to as high speeds on large presses as it is possible to manipulate the forging. It will be noted that the operation requires only the handling of valves under steam pressure, thus avoiding much of the trouble in hydraulic presses. The quick bend in the flat bar referred to serves to throw out the steam and opens the exhaust valve through floating levers without affecting the single lever. This prevents any overstroke of the piston in case of slip or accident to the forging. A notable illustration as to the merit of the process is the German Government specifications for steel forgings worked by rolls, hammer or press. Forgings made from rolled or hammered steel must have an initial section at least eight times the finished section, while those made from pressed steel are required to be only four times the size of the finished section. It is claimed that the high-speed steam hydraulic presses will do double the work of the steam hammer with one-half the steam consumption. No especially massive foundations are used such as the steam hammer requires, and all noise, vibration and destruction to the machine is eliminated, thus making a large saving in the cost of maintenance. This type of high-speed steam hydraulic press, besides being used for all classes of forgings, is well adapted for die forging, flanging, pressing and shearing.

NOTES ON THE ALTON SHOP, BLOOMINGTON.

The Chicago & Alton shops at Bloomington, Ill., are built of massive stone masonry with small windows and high pitched roof, the architecture being suggestive of feudal structures which were built for purposes of defense. In addition to the great expense of such construction it has the disadvantage of being poorly lighted; there is a vast space in the roof which adds to the cost of heating, and it fixes the location of the shops in a permanent way after the growth of the road makes other points more desirable. Even on so old a railway as the Baltimore & Ohio a rule was adopted several years ago which made the new structures at division points of rather a temporary character, as it was thought a few years might make desirable some changes in the operation of the road which would make terminal structures at some points unnecessary.

The early division points on the Northern Pacific were occupied by rather neat and substantial brick and stone shops, roundhouses and offices. As the grades were reduced and larger locomotives bought, the length of runs was extended and some of the division points were rendered obsolete and abandoned. The permanent character secured by brick walls did not prove of much value as fire protection, for when fire occurred the wood interior and oil-soaked floors burned rapidly and completely destroyed the contents.

The Wabash has adopted a cheap method of construction for shop walls which uses a light wooden framework covered with a curtain of wire netting and cement plaster, and much of the wall space is filled with glazed sash. This requires light foundations and is as effectual in fire protection as heavier brick walls. This construction answers well for car shops where heavy overhead cranes are not required. At the Dunmore shops of the Erie the erecting shop with traveling cranes has the longitudinal girders supported by steel columns in the usual way, and these rest on detached piers. The spaces between are filled by suspended curtains of cement covered expanded metal, and no foundations for side walls are required.

At Bloomington the Alton is commencing in a small way to get more light and floor space by tearing out some of the massive stone walls and extending the tool room. Since the combination of the Alton with the Clover Leaf, Bloomington is not the most central point for the principal shops of the system, and if the substantial buildings were not at that place it is probable the main shops would be located elsewhere.

The new Pacific consolidation and switch locomotives with the Pilliod valve gear have been delivered, and some of them are in service, doing excellent work. Improvements in the way of reducing the number of levers are now contemplated and have been worked out, and will probably be introduced in future construction. This gear has all the advantages of the Walschaerts gear in being located outside the frame, where it can be easily inspected and repaired. It has also some advantage over the Walschaerts in imparting a quicker movement of the valve at the time when such acceleration is desirable. In the matter of repairs the Pilliod gear should prove superior to any other in general use, as the wearing portions are all pins and bushings which are cheaply turned on a lathe and easily applied, the cost of labor and material being very small compared with that required for links, eccentrics and straps. The main thing with the Pilliod gear is to keep the pin bearings properly lubricated, and for this purpose the oil cups should be forged or cast solid with the levers, so they will not be easily lost or broken, as is apt to be the case with small brass oil cups. Previous Pacific engines of the same size have the Walschaerts gear, and there will be a good opportunity to measure the relative merits of these valve gears, not only in steam performance but in maintenance. The new road engines have 16-in. piston valves, which are probably the largest now in use on locomotives. The by-pass valves for drifting are the Pennsylvania type with a port and rectangular plate directly above the piston valve. The heavy cylinder saddles are reinforced by two cross bolts 2¼ in. diameter with 2½-in. threads. The walls of the cylinders are 1¾ in. thick. The wrought-iron frames of the consolidation engines are 5 in. wide and over 37 ft. long, without any splice. The frames for the Pacific engines are not spliced at the cylinder ends, where the principal difficulty is found with spliced frames. Some of the cast-steel frames on previous Pacific engines of this road have broken in as many as 12 places. The tenders of these engines have a capacity of 8,500 gals. of water and 14 tons of coal, but they are not as high as those previously built. The capacity is obtained by greater length, and the wheel base is increased, which is considered an advantage in preventing derailment. The engines have friction side bearings for both trucks, and the tender drawbars are made flexible in their attachments, so that they do not tend to produce derailment as rigid drawbars often do.

A new practice in fitting cylinder bushing is now being used at this shop. The bushing is turned on one-half of its length ⅛ in. smaller in diameter than the other half, so that it is not necessary to press it into the cylinder for the whole length, but only half the length. Piston rods from engines in for general repairs are heated nearly red hot at each end in order to inspect for cracks, but this heating is not done in the forge, which often scores the surface of the fit. A small portable furnace is placed at a convenient point in the machine shop and on it lead is melted in a crucible. The piston rod end is immersed in the lead until it is well heated, and the expansion thus produced reveals any small cracks which might lead to complete fracture. Steel driving boxes are not slotted or otherwise finished for the bronze bearing fit. The bearing is cast into the box, which has a dam built around the face so that a hub liner is also cast solid with the journal bearing. The driving box is cored with dove-tail recesses, into which the bronze is cast, and this secures the bearing in position. The fit is also tapered longitudinally, so that the tendency is for any lateral pressure to make the bearing tighter.

The mudrings for large fireboxes are reinforced at the corners by welding on to the top a piece 1 in. thick, extending well around beyond the circular portion. A rectangular ring has little stiffness, and where there is a tendency to distortion the greatest stress is at the corners. Many mudrings are cut away at this point in order to provide space for the lap of the sheets, thus making them weaker, and a slight distortion causes them to leak. The reinforced corner is more rational and should prevent leakage of the rivets.

In the description of the American automatic stoker for locomotives (Strouse patents) in the *Railroad Age Gazette*, February 5, 1909, page 255, it was announced that this stoker had been ordered for 20 new engines for the Alton. These machine stokers are now being applied and one of them is in regular operation on a new consolidation engine in heavy freight service between Chicago and Bloomington. The engine, as fired by the automatic stoker, has handled on this run 60 loaded cars weighing 3,260 tons, which is 460 tons above the regular rating of this class of engines, the average speed being about 20 miles an hour. No hand firing is required over the whole run of 122 miles, and the regular working pressure of 200 lbs. is maintained much more uniformly than by hand firing. The result is the engine handles the train at a higher average speed. This is one of the principal advantages of an automatic stoker for locomotives. It does not get tired and there are no delays on account of low steam pressure, as is often the case when the fireman becomes exhausted toward the end of the run. It is evident that maximum tonnage haul can only be maintained over a whole division by a constant supply of steam at full working pressure, and when this fails the tonnage is cut down to suit the average conditions of pressure or the speed is reduced and the time over the division extended. The effect of the stoker on tonnage rating will thus be very favorable, and will result in shorter schedules with attendant economy in train operation.

General News Section.

The International & Great Northern has made with the American Refrigerator Car Co. a new contract under which refrigerator cars used by the road will be paid for by the day (at 60 cents) instead of by the mile.

A press despatch from Washington says that the Secretary of Agriculture has rejected the claim, which was presented by the New York Central, for about $36,000, the amount expended by the company in disinfecting cattle cars and cattle yards on the order of the government last autumn.

The Chamber of Commerce of New York has appointed a committee of seven to study the Panama canal from the viewpoint of commerce. The committee consists of John R. Dunlap, Alfred P. Boller, C. A. Pugsley, William L. Landers, Jacob W. Millen, Jules F. Sorzano and John D. Crimmins.

A workman was recently blown from the Manhattan bridge, New York, by a break in a compressed air pipe line. He fell 110 ft. and was killed. A large pipe runs up the towers on each side, carrying air at high pressure for pneumatic tools. A coupling gave way and a jet of air struck the workman.

At Winnipeg, April 6, officers of the Canadian Pacific reached a revised agreement with the shop men who have been on strike or nursing grievances for several months past. The only feature of the agreement made public is that strikers returning to work will be restored to their original places as regards their pension privileges.

The State Railroad Commission of Indiana has issued to the mayors and common councils of cities within that state a circular showing the number of trespassers killed and injured on railway tracks in the state during the past year, and calling upon these municipal officers to take the most effective measures possible to stop the use of tracks as thoroughfares. The commission presents a draft of an ordinance which may be adopted by any city in Indiana, imposing a fine for walking on railway tracks.

The New York State Public Service Commission, First District, has appointed a hearing for April 20 on the question of ordering the Interborough Rapid Transit Co. to provide separate cars for women on the express trains running in the subway. Cars assigned exclusively for women are running in the Hudson & Manhattan tunnel and giving satisfaction. The officers of the Interborough say that they are willing to run separate cars for women, provided the commission will issue an order requiring it. The Interborough is putting middle side doors into eight cars, to be used on an experimental express train. Officers of the company believe that this arrangement will be more satisfactory than to have side doors near the ends of the cars.

Officers of the Illinois Central have submitted to the city a tentative estimate that the cost of electrifying its suburban tracks from Flossmoor to Randolph street, Chicago, would be between seven and eight million dollars. President Harahan said that the road's engineers were still studying the subject. When conclusions would be reached could not be foretold, but electrification of the tracks along the lake front probably would eventually be done. L. C. Fritch, Consulting Engineer, submitted to the city officials a tentative plan for the rearrangement of the road's tracks preliminary to electrification, which would be necessary before the suburban tracks alone could be electrified.

Transportation Exhibition at Buenos Ayres Next Year.

The year 1910 will be the centenary of the independence of the Argentine Republic, and it is proposed to celebrate the anniversary by an "International Exhibition of Railways and Land Transport," which will be held at Buenos Ayres from May to November of that year. The president of the executive committee is Alberto Schneidewind, C.E., General Director of Argentine Railways, and the Secretary is Eduardo Schlatter, C.E. All industries embraced in the fields indicated by the title are invited to make exhibits, and a reasonable schedule of space-charges has been adopted. "No one is invited as a rival, for Argentine industries have not yet been fully developed, but a splendid market is open to all latest improvements and to all men of enterprise." The Argentine Republic has now 25,000 kilometers of railway lines and Buenos Ayres has 1,200,000 inhabitants. The 1,000 kilometers of electric tramways in the Republic might be multiplied tenfold within a short time. It is confidently believed that the influence of the exhibition will be felt throughout South America.

It is proposed to arrange the exhibits in 16 sections, as follows:

Section I., railways and tramways, moved by other than electric power; Section II., electric railways and electric tramways; Section III., automobiles; Section IV., bicycles; Section V., post offices, telegraph, telephone and other means of communication; Section VI., beasts of burden, horsemen and vehicles for teams; Section VII., ordinary public roads, bridle roads, highroads, suburban, street and sporting tracks; Section VIII., military transport and sanitary service in the transport of sick and wounded; Section IX., baggages, packing, etc.; Section X., municipal transports and vehicles, apparatus, etc., pertaining to the firewatch service; Section XI., decorative fine arts applied to the transport industry; Section XII., hygiene and sanitary assistance in land transports; Section XIII., providence, assistance and patronage in favor of workmen, employees of transport companies; Section XIV., galleries for the exhibition of national mechanical industries applied to transports, and gallery showing manufacturing in full action; Section XV., special national works; Section XVI., aeronautical experiments.

The executive committee consists of the following; all being railway officers or directors except Messrs. Pelleschi, Iturbe and Coloma:

Alberto Schneidewind, H. H. Loveday, J. A. Frias, Juan Pelleschi, J. A. Goudge, Emilio Lamarca, E. Schlatter, A. Iturbe, L. J. Dellepiani, Léon Girodias, Jose Pedriali, Manuel Moyano, Tomas Santa Coloma, Carlos Maschwitz, Alejandro Lértora, J. Percy Clarke and Fernando Guerrico.

Safety Measures in Indiana.

The Railroad Commissioners of Indiana, having been disappointed in their efforts to have certain laws passed by the recent legislature, have issued four letters to railway companies and city councils. The first letter urges city councils and town boards to enact ordinances to prevent the dumping of refuse on railway right-of-way; and the second asks action to break up the practice of trespassing on railways. The third letter, directed to superintendents of traction companies, asks for information as to what qualifications are required of employees, what method of examination is used, and what system is used to reward employees for faithful performance of duty. It is proposed to call a conference of the traction superintendents to assist the commission to prepare regulations. The fourth letter asks of steam roads the method of blocking switch frogs and rail intersections. The commission believes that the blocking now used by most of the roads is more dangerous than no blocks at all.

Memorial to W. H. Baldwin, Jr.

At Tuskegee, Ala., on April 4, there was unveiled a memorial tablet dedicated to the memory of William H. Baldwin, Jr., former President of the Long Island Railroad (1897-1905). The tablet is a portrait of Mr. Baldwin in marble, designed

by Karl Bitter, and it is supported on a brick monument made by the students of Tuskegee Institute, of which Mr. Baldwin was a trustee and a large benefactor. The inscription on the tablet reads: "A Man of Hearty Honesty and Goodwill, a Resolute Leader Toward Public Righteousness and Public Happiness." The monument is 16 ft. high and the tablet, of pink Tennessee marble, is 2 ft. wide and 6 ft. high. The portrait is carved in low relief. Beneath it is the figure of a negro youth holding in his extended hands palm branches. Other features combine to represent the triumphs of industry, the association of industry with literary work and the paying of the tribute to Mr. Baldwin, by the negro race, which has been so much benefited by his life and work.

Effect of Franchise Tax on the Long Island Railroad.

As an instance of the operation of the New York franchise tax law the experience of the Long Island Railroad is significant. In 1907 the lines of that company were assessed upon franchises to cross or occupy public streets upon the following valuations:

Long Island R. R. Co.	Borough of Brooklyn	$100,000
Long Island R. R. Co.	Town of Smithtown	10,000
Ocean Electric Ry. Co.	Borough of Queens	90,000
N. Y., Bklyn & M. Beach Ry. Co.	Borough of Brooklyn	10,000
Nassau County Ry. Co.	Town of Oyster Bay	13,000
Glen Cove R. R. Co.	Town of Oyster Bay	25,000
Babylon R. R. Co.	Town of Babylon	8,000
Huntington R. R. Co.	Town of Huntington	22,200
Northport Traction Co.	Town of Huntington	11,000
Total		$289,200

The taxes on these valuations, except that on the Long Island Railroad proper, were promptly paid; but in 1908 the assessments for practically the same property were fixed upon the following radically different basis:

Long Island R. R. Co.	Borough of Brooklyn	$13,400
" " " "	Borough of Queens	1,121,300
" " " "	Town of Hempstead	12,000
" " " "	Town of North Hempstead	18,600
" " " "	Town of Oyster Bay	5,900
" " " "	Town of Babylon	11,500
" " " "	Town of Huntington	800
" " " "	Town of Brookhaven	3,700
" " " "	Town of Southampton	12,000
N. Y., Bklyn & M. Beach Ry. Co.	Borough of Brooklyn	396,700
N. Y., Bklyn & M. Beach Ry. Co.	Borough of Queens	33,300
N. Y. & Rockaway Beach Ry.	Borough of Queens	259,300
Nassau Elec. R.R. Co. (Atl. Ave)	Borough of Brooklyn	3,128,850
Montauk Water Company	Borough of Queens	5,270
Ocean Electric Ry. Co.	Borough of Queens	90,700
Jamaica & So. Shore R.R. Co.	Borough of Queens	1,000
Nassau County Ry. Co.	Town of Oyster Bay	13,000
Glen Cove R. R. Co.	Town of Oyster Bay	35,000
Babylon R. R. Co.	Town of Babylon	8,000
Huntington R. R. Co.	Town of Huntington	40,000
Northport Traction Co.	Town of Huntington	11,000
Total		$5,221,320

A careful analysis of the amount of railway track crossing streets, or running within the limits of streets, for which the franchise tax was assessed, showed that the assessed valuation amounted to over $800,000 per mile of track. Traction lines occupying longitudinally the full length of streets were assessed at about $30,000 per mile, but steam railways which crossed public highways (the fee title to which in many instances was held by the railway company) either above or below grade, or at grade, were assessed in some cases upon a valuation of more than $1,000,000 per mile of track.

Attention may also be called to the fact that under the new public service law of this state a corporation is prohibited from capitalizing any public franchises, and yet under the franchise tax law a very high value is placed upon such franchises as assets subject to state levy.

Prior to 1908 no assessment was made for a franchise of steam railways crossing a public highway existing previous to the time of its construction unless the highway was 200 ft. or more in width; but the legislature amended the law in 1907 and compelled the payment of franchise tax on every highway crossing which existed at the time the tracks were built, regardless of width; and, as a result, the total assessment against the Long Island Railroad for 1908 was over $5,000,000. The Long Island Railroad has already paid its taxes in the few instances where the assessments were reasonable, and its management protests against the necessity which has been placed upon it of protecting itself through the intervention of the courts.

The valuations made for the year 1909 upon the property of the Long Island Railroad exceed those for the year 1908. The company feels obliged, in self protection, to resist the payment. No satisfaction, it is claimed, can be secured under the special law covering the matter to get the courts to pass upon it. The company has said to the state board that upon the assessment being placed upon some fair and reasonable valuation it was ready to pay its taxes immediately, but would not be subjected to extortion. In fact, the company has paid its franchise tax on several traction lines where a reasonable basis for valuation was made.

Although the company has not for years been able to pay a dividend to its stockholders, the total taxes paid by the Long Island system for 1908 amounted to more than 4 per cent. of the gross revenue of the company. With the increase in assessment, and the increase in the tax rate in Greater New York, its taxes for 1909 will amount to nearly 5 per cent. of the gross income, and if the special franchise tax is paid on the valuation made by the state board the total taxes will exceed 5½ per cent.

With such burdens placed upon it the officers of the company claim that the public can hardly expect the elimination of grade crossings, improved service or reduced rates of fare.

Signaling Schools on the Pennsylvania.

The Pennsylvania Railroad has established schools of signaling, one on each division. In 1902 there were on the lines east of Pittsburgh but 7,891 interlocking functions in operation, but in 1908 this number was 20,725—having just about tripled in a period of six years. These 20,725 functions are operated by 8,792 levers. A total of 12,408 signals are in service, on 3,385 miles of road, which is over 70 per cent. of the entire mileage. It represents a valuation of upwards of $5,000,000. Among the first pupils of the schools will be six special signal apprentices who have recently been appointed: Messrs. J. C. Stoll, Geo. H. Wion, E. E. Schultz, C. S. Snavely, Allen B. Cooke and Harry B. Appleton. One of them will be on each of six divisions, the New York, the Philadelphia, the Pittsburgh, the West Jersey, the Middle and the Maryland divisions. Three of the appointees graduated from State College, Pa., and the others from Purdue, Illinois State and Ohio Normal School.

Apprentices will serve a three years' course. The first year will be spent on mechanical work, with the repair and construction gangs; the second year in the office of the supervisor of signals, and the third year on outside work on electric and electro-pneumatic appliances. They will report to the supervisor of signals while taking this course. The next place open to these men is the position of assistant signal inspector in the signal engineer's office. After attaining this, they will be considered in line of promotion to the following positions: Assistant supervisor of signals, supervisor of signals, inspector, assistant signal engineer and signal engineer.

Western Society of Engineers Favors an Illinois School of Mines.

The Western Society of Engineers, through its President, Andrews Allen, has appointed the following committee to draft a memorial for presentation to the Legislature of Illinois petitioning for the establishment of a Department of Mines at the State University: A. Bement, Chairman; F. A. Delano, Bion J. Arnold, John M. Ewen, Isham Randolph and Capt. R. W. Hunt.

The State University of Illinois is one of the most important schools in the country. It ranks fifth among American universities in attendance. It has long maintained Departments of Civil, Mechanical and Electrical Engineering and a Department of Agriculture, but, notwithstanding that Illinois is the second largest coal-producing state in the Union, the university has entirely neglected the subject of mining, with the result that this industry has suffered seriously, and that the loss of life and destruction of property in the operation of mines is increasing. For this reason the Western Society of Engineers believes that in the interests of the people of the state in general, as well as of those engaged in the mining business, there should be established a department of the university

that will tend to develop a higher degree of skill in the conduct of the mining industry.

A. Bement on April 7 read a paper before the Western Society of Engineers on the mineral resources of Illinois, in which he stated that 280,000,000 tons of coal has been wasted in the coal fields of that state. He said that according to the best recent calculations it would appear that Illinois contains more unmined coal than any other state. The known coal areas of Illinois contain 132,384,256,000 tons of coal, and there is an estimated additional quantity of 69,015,522,000 tons. Calculations show that about one-half of 1 per cent. of the total available supply in the state has been used, but the 25 per cent. of coal produced from the thin and medium thick seams is shipped away, and the state is practically dependent for its fuel supply on the product from thick seams which contained originally about 34,000,000,000 tons, of which 930,557,772 have been taken out. Thus the fuel supply suitable for use under present economic conditions is only 16 per cent. of the original amount, for while the coal remaining is about 99½ per cent., the really desirable portion is but 16 per cent.

Railway Business Association Before New York Legislature.

At Albany on Wednesday last a delegation of railway supply men, representing the Railway Business Association, appeared before the Senate Committee on Judiciary to protest against any amendment of the public utilities act. President Cutler, of the American Brake Shoe & Foundry Company, was chairman of the delegation and George A. Post, President of the Standard Coupler Company, and President of the Railway Business Association, made the principal address. The Public Service Commissions, he said, already have great power with which they have not yet had time to become familiar. "If," he added, "the Legislature will adjourn this year without having placed any new restrictions upon railways or indulging in any experimental or purely anticipatory legislation at their expense, there will be hope where there is now fear, and confidence where now is distrust. * * * It is a serious question whether in two short years, no matter how conscientiously he may study, any man, previously untutored in railway affairs, can, as a public service commissioner, become so profound a railway specialist that he is ripe for the bestowal on him of omnipotence in all railway matters. We do not discuss the details of the proposed enlargements of the powers of the commissioners. Whatever they are they cannot be of any such importance as would warrant their being piled upon the pyramid of their present powers. Any augmentation of the powers of the commissioners over railways at this time will surely add to the complexities of a situation now replete with undigested novelties in legislation and will surely tend to disquiet those to whom railways must look for money to carry on their plans of improvement and expansion."

Mr. Cutler said, in part: "President Taft has declared that we need to try out the laws we have before experimenting with others. The short session of the Sixtieth Congress adjourned without having enacted any important new restrictions upon railways. The Governor of Texas in one regular and two extra sessions has been unable to persuade the Legislature of that state that new restrictions should be imposed at this time. The Legislatures of Utah and Idaho have voted that the establishment of railway commissions might better be deferred until a time of greater industrial and commercial certainty, and Legislatures of other states have taken a conservative attitude as to railway legislation."

American Society of Mechanical Engineers.

At the spring meeting in Washington, D. C., May 4-7, professional sessions will be held at which papers on the conveying of materials, gas power engineering, steam turbines, the specific volume of saturated steam, oil well pumping and various other subjects will be discussed. The papers to be presented are as follows: A Unique Belt Conveyor, Ellis C. Soper; Automatic Feeders for Handling Material in Bulk, C. Kemble Baldwin; A New Transmission Dynamometer, Prof. Wm. H. Kenerson; Polishing Metals for Examination with the Microscope, A. Kingsbury; Marine Producer Gas Power, C. L. Straub; Operating System for a Small Producer Gas Power Plant, C. W. Obert; A Method of Improving the Efficiency of Gas Engines, T. E. Butterfield; Offsetting Cylinders in Single-Acting Engines, Prof. T. M. Phetteplace; Small Steam Turbines, Geo. A. Orrok; Oil Well Tests, Edmund M. Ivens; Safety Valve Discussion; Specific Volume of Saturated Steam, Prof. C. H. Peabody; Some Properties of Steam, Prof. R. C. H. Heck; A New Departure in Flexible Staybolts, H. V. Wille.

Western Canada Railway Club.

At the meeting on April 12 a paper on "Reciprocal Demurrage" was read by H. R. Patriarche, Manager Canadian Car Service Bureau, Western Lines.

New York Railroad Club.

At the meeting on April 16, Walter V. Turner, M.E., Westinghouse Air Brake Co., Pittsburgh, Pa., will present a paper on "Development in Air Brakes for Railways, with a Brief Review of Past and Present Operating Conditions."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York, May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.

American Railway Industrial Association.—R. E. Wilson, Ry. Exchange, Chicago; May 11; Cincinnati, Ohio.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builder's Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8; New York.

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo; 2d Friday in month, except June, July and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Lackawanna, the Grand Trunk and the New York, Ontario & Western have agreed to prorate with the Toledo & Western, an electric line, on through freight shipments.

The Central New York Car Demurrage Bureau reported 74,514 cars for March, 1909. The average day's detention by the railways was 0.39 and by the consignees 1.33, making a total average detention of 1.72 days.

The Grand Trunk Railway has established a department of industries to facilitate the introduction of new industries at points on its system and the development of those already existing. The head of the new department is W. P. Fitzsimmons, for many years associated with the road.

It is again reported that the Railway Commissioners of Mexico are about to undertake a general revision of the tariffs of all the Mexican roads; and it is stated that the decision to enter upon this work is due to the suggestion of S. M. Felton, President of the Mexican Central, formerly President of the Chicago & Alton.

The Gulf, Colorado & Santa Fe has announced the opening for freight traffic of its new deep water port at Bolivar, Tex., about five miles northeast from Galveston, across the bay. The port is prepared to receive vessels of any draft, and is being rapidly equipped for the prompt and economical handling of all commodities, export and import. The lumber region of eastern Texas will now have direct connection with tidewater. The harbor and port improvements have been made largely at the expense of the Atchison, Topeka & Santa Fe.

Representatives of leading coal companies have applied to the United States District Court at Huntington, W. Va., for an injunction restraining the Kanawha & Michigan, the Ohio Central Lines, the Chesapeake & Ohio and the Norfolk & Western from putting into effect a proposed new freight rate on coal to the lakes. It is charged that the West Virginia railways have been coerced by Pennsylvania Railroad interests into raising rates in the interest of Ohio and Pennsylvania operators, and that the proposed increase in rates will absolutely shut out West Virginia coal from lake markets.

The Union Pacific and its western connections have asked the Interstate Commerce Commission to relieve them from the operation of its order in the Spokane rate case. The distance from St. Paul and Chicago to Spokane by the Union Pacific and the Oregon Railroad & Navigation Company is substantially 50 per cent. and 25 per cent. greater, respectively, than over the Northern Pacific or the Great Northern. Consequently, officers of the Harriman Lines argue, it is manifestly unfair to apply, over their longer lines, the rates which the commission has held to be reasonable rates for the shorter distance over the direct lines.

Representatives of various organizations of shippers in Texas, Oklahoma and Kansas met in Oklahoma City, Okla., on April 5 and organized the Southwestern Shippers' Association, the purpose being to get the advantage of water rates from Galveston. At present in this region rates are based mainly on the all-rail rate from the East. After officers of the new association had been elected, J. L. Powell, of Wichita, Kan., being chosen President, the Executive Committee decided to prepare a full table of rates which will be submitted to the railways for application from Galveston to Texas, Oklahoma and Kansas points, and the roads will be asked to equalize the rail rates from the eastern seaboard with the water and rail rates via Galveston.

The Southwestern Shippers' Traffic Association has adopted resolutions urging Congress to pass an act to give the Interstate Commerce Commission control of the transportation rates of coastwise steamships. The resolutions state that the monopoly of the coastwise traffic given by the laws of the United States to steamships of American registry has restricted competition between water carriers, and that this restriction of competition has made it possible for the rail carriers, through ownership of some steamship lines and threats of refusal to participate with independent water lines in through rates, absolutely to control the freight rates of the water carriers operating between Atlantic and Gulf ports, the effect being, it is alleged, to increase the freight rates of the water carriers far beyond a profitable basis for the service rendered to the detriment and often to the distress of the people of the Southwest.

STATE COMMISSIONS.

Wisconsin: Commutation Rates.

Albert B. Lieberman v. Chicago, Milwaukee & St. Paul.

Complaint alleging discrimination, in that the respondent has a commutation rate in effect between Oconomowoc and Milwaukee, and that it has withdrawn and refuses to restore a commutation rate between Watertown and Milwaukee; that the withdrawal of such rate is subjecting the citizens of Watertown to an "undue or unreasonable prejudice and disadvantage."

The respondent cannot be required to accept a less rate than the maximum rate prescribed by statute, unless it voluntarily publish a lower rate; and it cannot be compelled to establish commutation rates for a particular locality. When the citizens of a particular locality are subjected to "undue or unreasonable prejudice or disadvantage" by reason of the citizens of another locality enjoying a commutation rate, the commission has the power to order the railway company to establish such rates at both localities or to withdraw them from both; and in this case no unjust discrimination within the meaning of the statute exists and the petition is, therefore, dismissed.

COURT NEWS.

The Supreme Court of the United States on Monday last denied the motion for a rehearing in the case of the Waters-Pierce Oil Company in which the court had affirmed a decision by the Texas courts imposing a fine of $1,600,000 on the oil company and forbidden it to do business in the state.

The United States Circuit Court of Appeals for the Eighth circuit has sustained the decision of the Federal district court of Nebraska, holding that the Union Stock Yards Company, South Omaha, Neb., is a common carrier and subject to laws regulating interstate commerce. The company was prosecuted for having attached a yard engine to a car that had been received in interstate commerce which was not properly equipped with safety appliances.

The Supreme Court of Indiana on April 9 declared constitutional the full-crew law of that state, passed in 1907, and judgment was affirmed against the Pittsburgh, Cincinnati, Chicago & St. Louis for running its fast mail train from Richmond to Indianapolis with a crew of only four men. The train consists of seven mail cars and no passenger coaches, and the crew consisted of the engineman, the fireman, conductor and one brakeman. The statute says that any passenger, mail or express train of five cars or more must have a flagman in addition to the four named. The company answered that the train is supplied with mechanical devices which make any additional brakeman or flagman unnecessary; that this train is engaged in interstate commerce, and that the regulations imposed by Congress are the only ones that can lawfully be imposed; also that as this is a mail train the exclusive power of Congress to establish post-offices and post roads is infringed. The court said it was not a statute regulating interstate commerce, but merely a police measure to provide for the safety of citizens, and as such did not unreasonably burden interstate commerce.

The Oklahoma Supreme Court has rendered a decision enjoining the State Corporation Commission from enforcing its order requiring the Atchison, Topeka & Santa Fe to put on additional passenger service between Guthrie, Okla., and Gainesville. Tex. Chief Justice Kane, who rendered the opinion, held that the Santa Fe's service between Guthrie and Purcell and between Purcell and Marietta is inadequate. He

said, however, that the court could not modify an order of the commission except in a rate case, and that since a part of the order was unreasonable it would have to be entirely reversed.

The Supreme Court of Texas on April 7 rendered a decision upholding the order of the State Railroad Commission requiring the Chicago, Rock Island & Gulf to establish and maintain a depot for the accommodation of freight and passengers at Texhoma, Tex. The town of Texhoma is on the state line between Texas and Oklahoma. On the Oklahoma side, about 870 ft. from the state line, there is a station on the Chicago, Rock Island & Pacific, which company controls the Chicago, Rock Island & Gulf. The avowed object of the State Commission in ordering the Chicago, Rock Island & Gulf to build and maintain a station on the Texas side of the line was to secure for the State Commission control of rates on interstate passengers and shipments of freight on these connecting lines between Oklahoma and Texas. Of course, if there is a station in Texas where interstate passengers can get off and buy tickets and where freight for Texas points can be reshipped, it will be impossible for the connecting lines to maintain higher rates on interstate shipments into and out of Texas than on intrastate business. The Chicago, Rock Island & Gulf appealed from the order of the commission, claiming that it was an unreasonable and unjust exercise of authority in view of the fact that there was a station so near on the Oklahoma side of the line, and that it was an unconstitutional interference with interstate commerce. The appellate court of Texas sustained this contention but the supreme court rules against it. The constitution and laws of Texas require that passengers and property shall be received at starting places, junctions, sidings and stopping places. The court says that it does not want to be understood as holding that the mere stopping of the rails of a road at the state line makes a point at which a station must be maintained; but the state line is in law and in fact one terminus of the line of a railway intersecting it, constructed by a Texas corporation, because the powers of such a corporation cease at that line. If there is no "place" there the mere ending of the track there does not bring into existence the duty defined in the statutes. But the evidence shows that Texhoma, Tex., is such a "place" as the statute contemplates. The statutes deal with Texas railways and impose duties to be performed in Texas. The places at which stations are to be established are to be in Texas and not elsewhere; and it follows that the Chicago, Rock Island & Gulf does not meet the statutory requirement by using the station of the Chicago, Rock Island & Pacific in another state.

Fine for Not Filing Tariffs.

The decision of the United States District Court for the Southern district of Illinois in the suit of the Government against the Illinois Terminal Company was reported in these columns March 5, page 475. The fine against the Terminal Company was $12,000. The full decision, now at hand, shows that this punishment was based solely on the offense of transporting interstate freight for which the company had not filed and published tariffs. The freight, westbound, came from eastern connections but the Terminal Company had neither issued any tariff nor joined in any issued by the originating road. The fine was $2,000 on each of six counts, and each count represented a carload of bottles carried less than 16 miles. The decision, by Judge Humphrey, says:

"Effective railway regulation must begin with publicity of rates. The penalty for failure on the part of any carrier subject to the act to regulate commerce to publish and file its rates is as severe as the penalty for failure to strictly observe such rates after filing.

"The line of the defendant railway is entirely within the state of Illinois. The defendant is, however, engaged in the transportation of property moving wholly by railway from one state to another state. It is, therefore, as much subject to the act to regulate commerce as it would be if it owned and operated a railway connecting the points in different states between which moved the commodities mentioned in the indictment.

"By the amendment of June 28, 1906, transportation by rail of property moving in interstate commerce by a carrier which has not filed its rates for such service is a misdemeanor."

The fact that the failure to file the rates does not appear to have been part of any scheme to discriminate forbids great severity. The fact that the violation admitted is serious and goes to the very heart of the whole subject of railway regulation forbids that the penalty should be nominal. In view of all the circumstances the fine assessed upon this indictment is fixed at the sum of $12,000.

Suit to Prevent Advance in Missouri Passenger Rates.

A temporary injunction restraining the railways in Missouri from increasing their passenger fares from 2 cents a mile to 3 cents was issued by Judge George H. Williams, of the state circuit court at St. Louis on April 9. The suit was brought by direction of Governor Hadley. Circuit Attorney Jones in his petition alleges that the 18 defendant roads have entered into a combination to fix passenger rates in violation of the state anti-trust law and of the state constitution. It is also alleged that the tariffs of the railways unconstitutionally discriminate in that they enable those who buy mileage books to get a rate as low as 2 cents a mile while those who purchase trip tickets must pay 3 cents a mile. The hearing of the suit has been postponed for several days. Meantime no advance in rates over 2 cents a mile has been made. The advance to 3 cents was to have been made on April 10. It is believed that further conferences between the state officials and the officers of the roads will be held and that a compromise may be arranged. Gov. Hadley and Attorney-General Major have disagreed about the policy to be pursued by the state, Mr. Major wishing to push the 2-cent fare suit in the federal court, while, as already stated, Gov. Hadley directed that the injunction proceeding be started in the state court.

Proposed Readjustment of Rates to Utah Common Points.

The Traffic Bureau of the Commercial Club of Salt Lake City has sent a petition to the heads of all the railways—E. H. Harriman, Geo. J. Gould, B. L. Winchell, Geo. B. Harris, E. P. Ripley, Frank Trumbull, E. T. Jeffery and W. A. Clark—asking for a readjustment of transcontinental freight rates on a basis that will be more favorable to Salt Lake City and other Utah points. The principal complaint is made against the fixing of higher rates from the East to Salt Lake City than to San Francisco. It is asserted that if accurate statistics were available analysis of them would show that so small a part of the transcontinental traffic actually is affected by water competition that the benefit that the roads derive from discriminating in favor of points having ocean transportation is negligible compared with the harm that they do to interior points. A basis for the readjustment of all the various rates to Utah common points is suggested as follows:

(1) Between Utah common points and the Missouri river and differential rate territories.—Class rates governed by the Western Classification between Utah common points and the territory east thereof, taking Missouri river rates, not to be higher than the proportion of the Omaha-Sacramento mileage between Omaha and Ogden, or 59 per cent. of the class rates currently applied between Omaha and Sacramento, with usual differentials applying on Mississippi river and farther east, and commodity rates between Chicago, Mississippi river, Missouri river and adjacent rate territories on the one hand and San Francisco on the other, to be maxima between the East and Utah common points.

(2) Between California and Utah common points.—Present percentage basis of current rates between Utah common points and Missouri river to apply on all traffic, all points taking California terminal rates.

(3) Between Colorado common points and Utah common points.—Present percentage basis of class rates between Utah common points and Missouri river to obtain, commodity rates to be fixed as may be found to the mutual interests of shippers and carriers.

(4) Between Leadville, Colo., and Utah common points.—Eighty per cent. of the current class rates.

(5) Local Rates.—Class rates not to exceed rates per mile on same line toward Salt Lake City from Denver, Butte, Portland, Sacramento, and Los Angeles; Salt Lake City and Ogden to be placed on a parity; commodity rates to be equitable and helpful to industrial interests.

(6) Passenger Rates.—Not to exceed 2½ cents a mile in Utah, Nevada, Idaho and Wyoming.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1909.
(See also issue of April 9.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Baltimore & Ohio	3,992	$3,789,895	$842,911	$4,955,670	$666,902	$849,730	$136,223	$1,902,282	$128,438	$3,683,575	$1,272,095	$46,000*	$173,547	$1,052,548	$650,064
Buffalo, Rochester & Pittsburgh	568	402,407	56,182	470,759	36,983	133,067	7,156	154,206	12,839	344,251	126,508	77*	15,000	111,431	28,674
Chicago & Alton	998	571,891	260,133	916,387	79,082	116,374	38,480	340,749	26,952	601,637	314,750	981*	30,000	283,769	14,361
Chicago & Eastern Illinois	966	604,357	124,512	781,127	58,942	105,484	19,791	308,605	35,028	527,850	253,277	1,172*	26,500	225,605	‡11,041
Chicago, Indianapolis & Louisville	616	235,689	82,906	355,778	49,554	70,286	12,089	144,884	12,821	289,634	66,144	.....	21,500	44,644	25,260
Chicago, Milwaukee & St. Paul	7,516	2,845,160	742,668	3,931,520	356,445	605,280	104,070	1,854,248	81,221	3,001,264	930,256	9,819*	206,637	713,800	‡15,930
Chicago, Rock Island & Pacific	7,414	2,847,713	1,113,624	4,256,319	596,497	567,629	117,068	1,791,121	132,744	3,205,058	1,051,261	12,261*	170,925	868,075	283,434
Cincinnati, Hamilton & Dayton	1,036	357,918	105,611	524,087	74,002	108,590	19,886	266,024	19,488	487,990	36,097	.....	26,538	9,559	27,745
Cleveland, Cincinnati, Chic. & St. L.	1,982	1,251,654	447,973	1,884,704	141,478	373,974	68,336	854,333	44,749	1,482,870	401,834	4,509*	74,000	323,325	94,218
Denver & Rio Grande	2,516	1,018,743	258,066	1,340,473	151,392	291,883	35,831	562,865	43,552	1,085,523	254,950	1,539*	65,000	188,411	‡190,018
El Paso & Southwestern Co.	867	509,291	83,802	618,293	69,888	78,465	9,062	168,898	24,852	351,164	267,129	432*	17,167	249,530	......
Florida East Coast	584	131,200	198,153	391,454	28,459	37,269	10,372	111,048	7,590	194,738	196,716	.....	11,700	185,016	60,923
Galveston, Harrisburg & San Antonio	1,338	503,474	188,377	735,179	117,896	102,220	25,002	274,703	28,061	547,882	187,297	739	28,179	159,857	64,641
Grand Rapids & Indiana	591	231,714	77,655	332,020	43,546	62,828	8,683	146,709	12,985	274,751	57,269	1,908*	21,138	34,223	34,122
Great Northern	6,937	2,331,381	628,252	3,212,151	446,386	554,827	54,291	1,127,154	76,288	2,258,946	953,205	156*	182,072	770,977	353,254
Iowa Central	558	178,722	32,482	223,838	18,313	48,005	9,642	113,706	8,475	198,141	25,697	.....	7,318	18,379	‡38,353
Lake Erie & Western	724	248,370	46,478	313,678	26,234	78,824	9,782	135,378	9,316	259,534	54,144	.....	17,000	37,144	38,768
Lake Shore & Michigan Southern	1,511	1,962,618	617,754	2,985,516	214,707	592,623	79,436	1,115,572	63,150	2,068,488	917,028	5,575*	125,000	786,453	‡39,367
Minneapolis & St. Louis Ry.	1,027	176,675	58,826	258,632	25,147	45,562	9,168	122,835	11,547	214,259	44,373	14*	15,307	29,051	‡20,300
Minneapolis, St. Paul & S. S. Marie	2,395	557,923	148,393	748,478	87,840	95,597	17,787	294,596	21,097	516,917	231,561	15,726	54,366	192,921	72,629
Nashville, Chattanooga & St. Louis	1,230	687,687	170,721	923,256	164,054	168,667	32,925	325,161	25,821	716,628	206,628	4*	20,668	185,956	70,888
New York Central & Hudson River	3,587	3,620,212	1,755,045	6,083,491	515,228	1,302,792	147,535	2,688,403	182,176	4,836,134	1,247,357	56,852*	353,269	837,236	216,787
New York, Chicago & St. Louis	556	549,161	73,392	644,580	43,063	111,283	40,750	325,970	12,939	534,005	110,575	2,343*	26,000	82,232	‡54,093
New York, Ontario & Western	546	470,669	66,979	557,812	58,306	102,493	9,366	243,300	14,169	427,634	130,178	8,300*	12,500	109,378	49,224
Norfolk & Southern	582	140,076	43,469	196,009	19,502	20,573	3,725	62,070	12,291	118,161	77,848	660*	5,200	71,988	64,871
Oregon R. R. & Navigation Co.	1,327	536,973	216,923	815,210	69,208	65,589	24,126	276,517	30,536	465,976	349,234	6,950*	71,302	270,982	‡67,444
Oregon Short Line	1,456	815,093	257,580	1,157,439	69,232	136,783	15,621	248,723	29,349	499,708	657,731	1,317*	50,000	606,414	200,431
Philadelphia & Reading	1,006	2,269,601	427,393	2,813,303	225,868	503,041	33,196	937,796	52,028	1,751,929	1,063,374	27,497	61,369	1,029,502	358,289
St. Louis Southwestern	773	445,037	90,919	559,653	82,743	91,983	20,218	137,047	20,994	352,985	206,668	654*	15,118	190,896	59,760
St. Louis Southwestern of Texas	697	195,421	56,453	270,793	91,663	64,784	8,757	135,649	14,701	315,554	44,761*	306*	4,466	49,533†	26,726
San Antonio & Aransas Pass	727	174,824	68,219	259,810	46,627	25,754	4,513	119,355	8,527	204,776	55,034	.....	8,500	46,534	28,381
San Pedro, Los Ang. & Salt Lake	1,099	295,952	209,430	555,331	56,503	87,675	24,860	184,229	15,507	368,774	186,557	2,915*	23,391	160,251	157,030
Seaboard Air Line	2,613	1,004,510	319,424	1,464,539	185,084	207,721	53,148	463,876	43,698	953,527	511,012	622*	54,053	456,337	160,460
Southern Pacific—Pac. System	5,598	3,324,231	1,937,114	5,675,450	803,002	780,639	98,074	1,637,814	187,397	3,506,926	2,168,523	6,290*	245,038	1,917,195	328,421
Wabash	2,515	1,283,965	412,681	1,865,111	174,160	352,945	70,663	796,632	67,263	1,461,663	403,448	3,027*	68,215	332,206	121,999
Wisconsin Central	1,131	414,258	81,661	531,532	45,789	84,955	24,322	232,508	21,938	409,512	122,020	7	29,346	92,681	24,131
EIGHT MONTHS OF FISCAL YEAR.															
Baltimore & Ohio	3,992	35,881,818	8,628,273	47,284,007	5,675,359	7,084,886	1,050,607	16,476,670	974,500	31,262,022	16,021,985	365,353*	1,373,116	14,283,516	1,237,583
Buffalo, Rochester & Pittsburgh	568	3,911,252	603,718	4,704,844	594,810	1,124,573	65,500	1,421,001	110,334	3,316,218	1,388,626	327	120,000	1,268,953	‡177,680
Chicago & Alton	998	5,264,601	2,637,954	8,594,404	796,448	960,754	311,767	2,739,935	242,715	5,051,619	3,542,785	7,715*	240,000	3,295,070	672,432
Chicago & Eastern Illinois	966	5,434,367	1,160,609	7,002,313	764,024	1,262,047	130,221	2,495,191	279,013	4,930,496	2,071,817	12,279*	168,115	1,891,423	‡187,885
Chicago, Indianapolis & Louisville	616	2,265,086	891,769	3,482,781	539,736	554,847	98,921	1,169,620	108,336	2,471,460	1,011,321	.....	172,000	839,321	‡5,937
Chicago, Milwaukee & St. Paul	7,516	28,806,224	8,740,866	40,748,318	4,814,346	5,001,620	870,662	14,667,567	714,880	26,069,075	14,679,243	148,023	1,602,137	13,225,129	134,960
Chicago, Rock Island & Pacific	7,414	24,859,851	11,534,503	38,748,324	5,924,820	5,015,401	893,842	14,429,076	1,022,368	27,285,507	11,462,817	88,925*	1,456,564	9,917,328	438,085
Cincinnati, Hamilton & Dayton	1,036	3,671,572	1,132,615	5,353,169	631,879	1,020,175	171,263	2,308,763	167,629	4,299,709	1,053,460	.....	201,561	851,899	252,493
Cleveland, Cincinnati, Chic. & St. L.	1,982	11,010,779	4,688,318	17,351,577	1,844,825	3,092,032	558,067	6,948,618	352,531	12,796,073	4,555,504	25,629*	559,347	3,970,528	318,298
Denver & Rio Grande	2,516	9,947,580	3,293,022	13,868,697	1,547,423	2,332,703	303,434	4,823,476	414,215	9,421,251	4,447,446	34,268	519,750	3,961,964	‡856,523
El Paso & Southwestern Co.	867	3,784,279	637,023	4,634,383	557,409	633,717	74,870	1,262,237	184,444	2,712,677	1,921,706	13,188*	125,876	1,782,642	......
Florida East Coast	584	821,752	663,917	1,748,151	320,044	315,081	44,805	703,058	67,873	1,450,861	297,290	.....	88,700	208,590	120,384
Galveston, Harrisburg & San Antonio	1,338	5,078,599	1,444,146	6,867,361	880,798	834,364	173,195	2,672,815	213,977	4,775,150	2,092,211	15,408*	149,044	1,927,759	758,907
Grand Rapids & Indiana	591	1,792,341	1,073,831	3,086,970	343,419	443,124	81,385	1,208,399	107,839	2,184,166	902,804	1,495*	168,525	732,784	119,428
Great Northern	6,937	27,315,464	7,299,296	36,747,693	6,296,483	4,486,542	465,852	9,998,834	672,974	21,920,685	14,827,008	154,259	1,681,948	13,299,319	‡341,119
Iowa Central	558	1,544,658	351,864	1,994,389	175,891	371,959	71,403	889,438	69,025	1,577,716	416,673	.....	59,066	357,607	‡312,878
Lake Erie & Western	724	2,217,878	537,712	2,913,035	389,314	579,038	86,370	1,142,364	82,261	2,279,347	633,688	.....	136,760	496,928	‡35,832
Lake Shore & Michigan Southern	1,511	17,662,452	6,443,599	27,542,593	3,129,624	4,049,376	672,302	8,832,493	456,449	17,140,244	10,402,349	19,693*	1,023,647	9,359,009	314,184
Minneapolis & St. Louis Ry.	1,027	1,896,263	739,244	2,835,863	253,715	371,474	79,287	1,038,017	95,263	1,837,756	998,107	292*	123,793	874,022	36,986
Minneapolis, St. Paul & S. S. Marie	2,395	5,867,559	2,001,715	8,267,248	816,523	914,094	156,456	2,549,743	180,022	4,616,838	3,650,410	201,622	590,909	3,261,123	645,219
Nashville, Chattanooga & St. Louis	1,230	5,207,573	1,712,450	7,427,482	1,092,479	1,369,576	271,621	2,650,008	185,354	5,569,038	1,858,444	6,653*	160,668	1,691,123	75,897
New York Central & Hudson River	3,587	33,437,781	18,367,250	57,829,752	6,747,128	10,228,821	1,412,659	21,628,347	1,337,805	41,354,760	16,474,992	84,890	3,064,380	13,495,502	622,584
New York, Chicago & St. Louis	556	4,938,677	968,959	6,108,871	585,867	641,156	347,521	2,514,442	104,979	4,193,965	1,914,906	8,959*	237,510	1,668,437	‡341,634
New York, Ontario & Western	546	4,183,755	1,088,861	5,489,324	601,730	950,499	77,925	2,034,304	116,277	3,780,735	1,708,589	28,753*	120,416	1,559,420	‡29,811
Norfolk & Southern	582	995,396	425,785	1,532,416	212,887	165,970	33,468	497,286	116,921	1,026,532	505,884	815*	49,600	455,469	225,659
Oregon R. R. & Navigation Co.	1,327	5,883,714	2,271,486	8,660,355	860,158	578,833	174,801	2,350,583	233,137	4,197,512	4,462,843	22,385*	404,367	4,036,091	‡485,364
Oregon Short Line	1,456	8,326,186	2,660,144	11,687,572	1,029,356	1,083,503	146,735	2,244,559	237,193	4,741,346	6,946,226	125	398,048	6,548,303	1,254,791
Philadelphia & Reading	1,006	20,600,907	4,062,911	25,748,419	2,007,306	5,194,450	284,918	7,917,183	440,968	15,844,825	9,903,594	224,839	488,321	9,640,112	‡485,905
St. Louis Southwestern	773	3,597,824	813,184	4,604,494	621,342	749,753	168,752	1,132,223	159,724	2,831,794	1,772,700	4,544*	120,260	1,647,896	22,763
St. Louis Southwestern of Texas	697	1,798,212	621,029	2,591,669	671,411	528,473	70,098	1,111,731	122,982	2,504,695	86,974	2,009*	58,797	26,168	131,319
San Antonio & Aransas Pass	727	1,915,142	578,740	2,632,184	377,753	281,898	34,142	987,543	69,358	1,750,694	881,490	.....	70,200	811,290	222,636
San Pedro, Los Ang. & Salt Lake	1,099	2,690,146	1,638,550	4,637,357	726,748	634,577	192,920	1,532,990	137,306	3,224,541	1,412,816	19,812*	191,885	1,201,119	497,160
Seaboard Air Line	2,613	7,369,650	2,287,428	10,675,181	1,536,977	1,554,547	385,981	3,699,007	378,503	7,555,015	3,120,166	10,602*	407,553	2,702,011	632,095
Southern Pacific—Pac. System	5,598	32,538,482	17,425,332	35,520,955	6,558,383	6,746,691	887,989	14,424,834	1,577,874	30,195,771	23,325,184	68,998*	1,868,944	21,387,242	2,903,225
Wabash	2,515	11,407,472	4,383,926	17,210,443	1,848,350	2,622,604	539,469	6,653,947	552,662	12,217,032	4,993,411	11,557*	544,216	4,437,638	‡295,299
Wisconsin Central	1,131	3,592,366	1,046,998	4,959,105	528,008	629,836	195,660	1,813,097	163,684	3,330,285	1,628,820	3,431	235,296	1,396,955	‡9,138

*Deficit. †Loss. ‡Decrease.

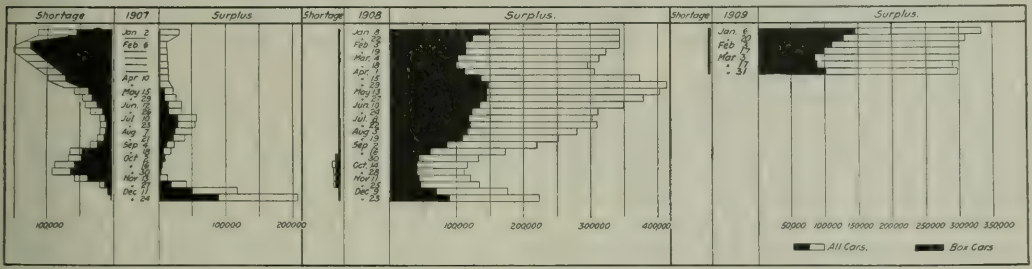
Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 43 B, giving a summary of car surpluses and shortages by groups from February 19, 1908, to March 31, 1909, says:

"The total surplus for this report is 296,600 cars, an increase of 5,182 since our last fortnightly bulletin. There is a decrease of 11,451 in surplus coal and gondola cars, and an increase of 12,885 in box. Eliminating the Canadian group, which shows an increase of 4,767, there is practically no change in the net situation in the United States.

"There are decreases in groups 1 (New England), 2 (Eastern), 3 (Middle) and 8 (Middle Western), which are offset by increases in groups 4 (South Atlantic), 6 (Northwestern), 9 (Southwestern) and 10 (Pacific).—Groups 2 (Eastern) and 3 (Middle), which include the heaviest coal handling roads, show substantial decreases in coal and gondola cars, while there are also slight decreases in these classes in groups 5 (Southern) and 6 (Northwestern)."

The accompanying table shows the surpluses and shortages for the period covered by the report and the chart shows the surpluses and shortages for 1907, 1908 and 1909.



Car Surpluses and Shortages in 1907, 1908 and 1909.

CAR SURPLUSES AND SHORTAGES, FEBRUARY 19, 1908, TO MARCH 31, 1909, INCLUSIVE.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
March 17, 1909	161	88,459	20,328	139,997	42,634	291,418	310	74	27	139	550
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10.365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125.739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	[illegible]	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103.509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113.776	30,088	134,217	44,432	322,513	697	141	249	162	1,249

Crop Conditions.

The crop reporting board of the bureau of statistics estimates that the average condition of winter wheat on April 1 was 82.2 per cent. of a normal, against 91.3 on April 1, 1908; 89.9 on April 1, 1907, and 86.6 the average condition for the past ten years on April 1. The decline in condition from December 1, 1908, to April 1, 1909, was 3.1 points as compared with an average decline in the past ten years of 6.0 points.

The average condition of rye on April 1 was 87.2 per cent. of a normal against 89.1 on April 1, 1908, and 89.2 the average condition for the past ten years on April 1.

A recent issue of the *Diario*, published in Lima, Peru, contains the budget proposals for 1909 for the district of Arequipa, Peru, and includes a sum of $10,000,000 for the construction of a highway or railway to Majes and Camana.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

O. B. Huntsman has been elected a Vice-President of the Texas & Pacific.

Frederick W. Stevens, General Counsel of the Pere Marquette, has resigned to become associated with J. P. Morgan & Co., of New York.

J. R. Parrott, Vice-President and General Manager of the Florida East Coast, has been elected President and General Manager, succeeding as President, H. M. Flagler, who remains Chairman of the Board of Directors.

Y. van den Berg, formerly First Vice-President of the Louisville & Nashville, and until recently connected with Ladenberg, Thalmann & Co., New York, has opened an office at 32 Nassau street, New York, to engage in the valuation and investigation of railway properties.

Richard A. Jackson, First Vice-President and General Solicitor of the Chicago, Rock Island & Pacific, has been elected President of the Rock Island Company, succeeding Robert Mather, resigned to become Chairman of the Board of Directors of the Westinghouse Electric & Manufacturing Co. He was born September 5, 1858, at Richmond, Ind. He graduated from Earlham College in 1876 and from the University of Virginia in 1879. In 1900 he became General Attorney of the Chicago, Rock Island & Mexico, now a part of the Chicago, Rock Island & Gulf. In August, 1902, he was appointed General Attorney of the Chicago, Rock Island & Pacific, and in November, 1904, was elected First Vice-President and General Solicitor.

Operating Officers.

D. C. Noonan, General Superintendent of the Minneapolis & St. Louis and the Iowa Central, has resigned.

C. E. Taylor, General Agent of the Atchison, Topeka & Santa Fe, has been appointed the Superintendent of Terminals at Chicago, succeeding C. B. Strohm, promoted.

S. C. Stickney having, on March 31, resigned as General

Manager of the Chicago Great Western, the duties of that office will be directly assumed by the receivers.

J. B. Flaherty, Trainmaster of the Midland Terminal, the Colorado Springs & Cripple Creek and the Florence & Cripple Creek, has been appointed the Superintendent, with office at Cripple Creek, Colo.

Wallace H. Gephart, General Superintendent of the Central of Pennsylvania, has been elected the President and General Manager, succeeding Col. C. M. Clement, President, resigned. The office of General Superintendent has been abolished.

Arthur P. Herbert, Superintendent of the Colima division of the National Railways of Mexico, has resigned and his former office has been abolished. The jurisdiction of the Superintendent of the Guadalajara division has been extended over the Colima division to Manzanillo.

C. W. Bradshaw, Superintendent of the Atlantic division of the Louisville & Nashville, with office at Etowah, Tenn., has been transferred as Superintendent to the Louisville, Cincinnati & Lexington division, with office at Louisville, Ky., succeeding C. A. Davies, deceased. A. B. Bayless, Assistant Superintendent of the Atlantic division, succeeds Mr. Bradshaw, with office at Etowah, and the position of Assistant Superintendent of the Atlantic division has been abolished.

Traffic Officers.

F. H. Behring has resumed his duties as an Assistant General Freight Agent of the Southern Railway, with office at Louisville, Ky.

George C. Conn, General Freight Agent of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed the Freight Traffic Manager of the Pere Marquette, succeeding J. N. Tittemore, resigned.

H. Lawton, formerly Freight Traffic Manager of the Mexican Central, has been appointed the General Freight and Passenger Agent of the Cananea, Yaqui River & Pacific and the Sonora Railway, with office at Guaymas, Sonora, Mexico, succeeding M. O. Bicknell, resigned.

W. A. Turner has been appointed a General Freight Agent of the Southern Railway, with office at Chattanooga, Tenn., reporting direct to the Assistant Freight Traffic Manager. The commercial offices at Chattanooga, Tenn., Nashville, New Orleans, La., and Dallas, Tex., will report direct to Mr. Turner. E. C. Morgan has been appointed a Commercial Agent at Chattanooga.

Engineering and Rolling Stock Officers.

L. L. Dawson has been appointed the Superintendent of Motive Power of the Ft. Worth & Denver City.

T. H. Croswell, Principal Assistant Engineer of the Northern Pacific, has been appointed the Chief Engineer of the Spokane, Portland & Seattle and the Astoria & Columbia River, with office at Portland, Ore.

W. J. Hill, General Foreman of the Atchison, Topeka & Santa Fe, has been appointed the Master Mechanic of the Oklahoma division, with office at Arkansas City, Kan., succeeding J. T. Lendrum, transferred.

Purchasing Officers.

J. Lowell White has been appointed the Purchasing and Supply Agent of the St. Louis, Brownsville & Mexico, with office at Kingsville, Tex.

OBITUARY.

William H. Sayre, First Vice-President of the Lehigh Valley Coal Co., New York, and Secretary and Treasurer of the Buffalo Creek Railroad, died at Bethlehem, Pa., April 7.

Levi B. Paxson, Consulting Mechanical Engineer of the Philadelphia & Reading, died April 10 at Reading, Pa. He was born in 1827 in Chester county, Pa., and began railway work on the Philadelphia & Reading as a brakeman. He later became Master Mechanic and then Engineer of Machinery. By 1888 he had become Superintendent of Motive Power. In August, 1899, he was made Consulting Mechanical Engineer.

Colin A. Davies, Superintendent of the Cincinnati division of the Louisville & Nashville, died on April 8, at Louisville, Ky., following a short illness from peritonitis. He was born March 15, 1855, at Louisville, Ky. After receiving an education in the public schools of Louisville he began railway work in 1871 as a rodman on an engineering corps of the Cumberland & Ohio, now a part of the Louisville & Nashville. From 1871 to 1881 he was connected with various engineering corps. In 1881 he was made Principal Engineer in charge of construction of the Pensacola & Atlantic division of the Louisville & Nashville. From March, 1883, to January, 1890, he was a Roadmaster of the various divisions of the same road. In January, 1890, he was appointed Assistant Superintendent at Birmingham, Ala., and in March, 1891, he was made Superintendent of the Cincinnati division at Louisville.

Major Lewis F. Rice, Architect and Civil Engineer, died April 12 at his home in Brookline, Mass. He was a graduate of Rensselaer Polytechnic Institute, and after graduation served for about a year as Engineer on Construction of the Brooklyn water works. He was later made Division Engineer of the Troy & Greenfield, now part of the Boston & Maine. In 1865 he became Assistant Engineer of the Reading & Columbia, now the Philadelphia & Reading. From 1871 to 1890 he was engaged in general practice as a civil engineer in Boston, Mass.

Benjamin Perry McDonald, of Ft. Scott, Kan., died on February 16 at Dallas, Tex. He was born at Lock Haven, Pa., on October 8, 1839. He moved to Kansas August 1, 1857, and has since been identified with the growth of that state. In 1866 he was elected Mayor of Ft. Scott and at the expiration of his term was re-elected. He early engaged in the mercantile and banking business and organized the First National Bank of Ft. Scott in January, 1871. He was elected a Director of the Missouri, Kansas & Texas at its annual meeting on May 15, 1872, and remained a director until his death. In 1873 he was elected to the Legislature of Kansas. In 1874 he built the line southeast from Ft. Scott to the coal fields, 12 miles, which

B. P. McDonald.

was afterwards bought by the Kansas City, Ft. Scott & Memphis. In 1881 he built 20 miles of railway on Long Island, New York, which is now part of the property of the Long Island Railroad. In 1888 and 1889 he built the Sherman, Denison & Dallas, now a part of the Missouri, Kansas & Texas Railway of Texas, and in 1901 and 1902 built the Ft. Scott, Iowa & Western, now owned and operated by the Missouri, Kansas & Texas. In 1902 he organized and built the Dallas, Cleburne & Southwestern, from Cleburne to Egan, Tex., of which company he was the President at the time of his death. This railway is now operated under a trackage contract by the Missouri, Kansas & Texas Railway of Texas. He was a Director of the Kansas City, Ft. Scott & Memphis and its predecessor companies from their earliest history until they were taken over by the St. Louis & San Francisco. He lived in Kansas when the Southern branch of the Union Pacific, now the Missouri, Kansas & Texas, was originally incorporated, knew the incorporators, and was always a great friend of the enterprise. In those early days his aid and support was of great benefit to the company. During the Receivership of H. C. Cross and George A. Eddy he was appointed by them as their Treasurer, and served as such during their whole term. He was one of the strong men of the West and his acquaintance was broad. People and employees knew him and respected him. He was of sound judgment and absolute honesty. He had a more intimate knowledge of the Missouri, Kansas & Texas history than any other man. He was buried from his old home at Ft. Scott, Kan.

Railroad Construction.

New Incorporations, Surveys, Etc.

Atchison, Topeka & Santa Fe.—The double-tracking work between Wyaconda, Mo., and Bucklin, 42 miles, has been resumed. Contracts for the improvements are let.

Bennettsville & Cheraw.—An officer writes that work will begin about April 19 on extension of the main line from Drakes, S. C., southeast to Brownsville, 6.6 miles, and that this line will be open for traffic about August 15. G. P. Bourdelat, Traf. Mgr., Bennettsville, S. C. (April 9, p. 820.)

Blue Valley Traction.—Incorporated in Missouri to build an electric line from Raytown, Mo., to and within the corporate limits of Kansas City, about 10 miles in all. The directors include: U. S. Epperson, J. M. Lowe, M. M. Sweetland, C. C. Craver, Jas. W. Jones, J. M. Devine, H. M. Dickson, Sam T. McDermott and C W. German.

Canadian Pacific.—According to press reports, a contract was recently given to Omaha contractors to build 80 miles of new line between Lethbright, Alb., and Calgary.

The Sheho section of the Central division has been extended from Leslie, Sask., westward to Wynwood, 22 miles.

Central Railroad of New Jersey.—An officer writes that a contract was given recently to Chas. A. Sims & Co. for grading work from Bowentown, N. J., east to Bridgeton, about three miles.

Clarion & East Brady (Electric).—An officer writes that the surveys will be completed by May 1, and that construction work will begin within 30 or 60 days after that time. (Jan. 29, p. 235.)

Cleveland, Southwestern & Columbus (Electric).—An officer writes that this company has begun operating the new connecting link in Ohio between its southern division and the old Mansfield-Bucyrus division, 45 miles. The new line was built for high-speed operation on a private 60-ft. right-of-way through Leroy, Lodi, West Salem, Polk, Nankin and Ashland to Mansfield. This improvement completes a connection from Cleveland south via Bucyrus to Columbus, and over other lines west via Springfield and Dayton to Indianapolis, Ind.

Clinton & Oklahoma Western.—Projected from Clinton, Okla., northwest to Trinidad, Colo., and from Clinton southeast to Lehigh, in all 400 miles. According to press reports grading has been begun from Clinton, Okla., northwest to Butler. It is intended to have the work on this section, including a steel bridge over the Washita river, finished in about five months. T. J. Nance, Pres., and J. H. O'Hearn, engineer in charge, both of Clinton. (Dec. 4, p. 1500.)

Concho, San Saba & Llano Valley.—Chartered in Texas with $200,000 capital and headquarters at Miles, Runnells county, to build a line from San Angelo, in Tom Green county, southeast to San Antonio, about 235 miles. Surveys now being made. The first section to be built will be from Miles southeast to Paintrock. Much land and many bonuses are said to have been arranged for by property owners along the proposed route, and all financial arrangements made to carry out the work. It is expected to have the line finished by the fall of 1910. D. E. Simms, Pres.; R. A. Love, First V.-Pres. and Gen. Mgr., Kansas City, Mo.; S. Roach, Second V.-Pres., and T. K. Wilson, Chairman of the board of directors.

Cumberland Northern.—Incorporated in Kentucky to build from Artemus, Knox county, Ky., north to Beattyville, about 75 miles. An officer writes that surveys are now being made and construction will begin as soon as the surveys are completed. E. L. Thomas, Secy. and Treas., Knoxville, Tenn.

Cumberland River & Nashville.—Projected from Corbin, Ky., west to Burnside, thence southwest to the Tennessee state line 100 miles, and from that point under the name of the Nashville & Northwestern to Clarkville, Tenn., 60 miles; work under way by the Monticello Construction Co. from Burnside, Ky., southwest to Monticello, 20 miles; grading finished on 13 miles. Plans are said to be ready for the steel bridge over the Cumberland river to be 1,100 ft. long and 190 ft. high. (March 19, p. 653.)

Cuyuna Range.—An officer writes that work will begin this summer on the proposed line from Deerwood, Minn., east to Duluth, about 125 miles. Cuyler Adams, Pres. and Gen. Mgr., Deerwood. (Oct. 30, p. 1274.)

Delaware & Hudson.—The report of this company for the year ended Dec. 31, 1908, says that the extension of the Quebec, Montreal & Southern from Pierreville, Que., to Ste. Philomene has been completed with the exception of the bridge at Nicolet. It is expected that the new line will be placed in operation about May 1. (Dec. 18, p. 1608.)

The Salem branch of the Greenwich & Johnsonville, connecting the Rutland and Washington branch of the D. & H. with the main line of the G. & J., has been completed and put in operation.

Great Northern.—The Vancouver, Victoria & Eastern, from Blaine, Wash., northwest to New Westminster, B. C., 22.8 miles, has been opened to operation.

Greenwich & Johnsonville.—See Delaware & Hudson.

Harrison & Mineral Belt.—Incorporated in Arkansas to build from Appleton, Ark., northwest to Harrison. It is intended to later extend the line northeast, via Protem, Mo., Houston and Salem to St. Louis, also southeast to Paris, Texas, making about 550 miles in all. J. R. Newman, Pres.; L. A. Saffer, Vice-Pres.; J. A. Flinn, Secy.; J. E. Northern, Genl. Mgr., and T. A. Norton, Ch. Engr., all of Harrison, Ark. (Nov. 27, p. 1460.)

Indiana Roads (Electric).—Plans are said to have been made to build a network of interurban lines connecting the principal cities in the Calumet region, including Gary, Hammond, East Chicago, Indiana Harbor and Whiting. The following companies are said to have franchises in these cities: Crown Point-Gary Co., Gary-Hobart-Valparaiso Traction Co., Hammond, Whiting & East Chicago Electric Co., Indianapolis-Chicago Traction Co., South Chicago Street Railway Co., and the Chicago, Lake Shore & South Bend Traction now operating a line connecting a few of the cities and which now proposes to build feeder branch lines.

Indian Creek Valley.—According to press reports, surveys have been made, and construction is to be started this spring, on a new branch east to Normalville, Pa. (March 19, p. 665.)

Lewis Creek.—Incorporated in Alabama, with $30,000 capital, to build from Toinette, Washington county, Ala., to Skidder, about 40 miles. G. E. Cochrane and J. T. Cochrane, of Mobile, are interested.

Mississippi Belt Line & Terminal.—Organized to build a terminal line connecting with several of the railways entering Jackson, Miss. Construction contract reported let to J. T. Crass and work is to be started about May 1. R. L. Bradley, of Jackson, Miss., is interested.

Missouri, Oklahoma & Gulf.—According to press reports this company, now operating a line from Wagoner, Okla., south to Calvin, 106 miles, has financial arrangement made for extension from Calvin south to Dennison, Tex., 111 miles. It is expected that funds will be ready for extension from Wagoner north to Joplin, Mo., as soon as the work on the southern end is finished. (March 16, p. 656.)

National Railways of Mexico.—According to press reports, Consul Charles M. Freeman, at Durango, Mexico, has given out a statement regarding the proposed line from that place southwest about 150 miles to the port of Mazatlan, on the Pacific coast, as follows: An agreement was made Jan. 7 in the City of Mexico between the National Railways of Mexico, the State of Durango, and the Maderero de Durango Co., of Durango, whereby the National Railways of Mexico are to begin work within four months on the line. The first 62 miles to be finished by August, 1910. The Maderero de Durango Co. wants the line built to secure an outlet for its timber from points along the proposed line. It is expected that about 2,000 men will be put at work on the line. The State of Durango and the Maderero de Durango Co. guarantee 6 per cent. interest on $1,992,000 U. S. currency for ten years. The agreement entered into does not call for the completion of the line to

Mazatlan, but only for 62 miles or as much more as can be finished for the $1,992,000 exclusive of the cost of rolling stock. (Feb. 12, p. 331.)

According to press reports, the old surveys for a lighter grade between Irapuato, Mex., and Guadalajara, made by the Mexican Central, are to be revised. The present grade of 2 per cent. is to be reduced to less than 1 per cent. before laying heavy rails, from Mexico City west to Guadalajara.

NORFOLK & WESTERN.—An officer writes that the work in Ohio, for which arrangements have been made, is as follows: Contract let to J. O'Kelly Construction Co., contractors, Ashland, Ky., for the first section east of Coal Grove. The remaining two sections east of Portsmouth, Ohio, will be completed by company forces.

The fourth section, between Higby, Ohio, and Renick, 11.2 miles, is being graded by company forces. Contract let to Jones Bros., contractors, Columbus, Ohio, for the masonry work on this section.

The fifth section, from Lockbourne, Ohio, to Valley Crossing, 4.7 miles, is being graded by company forces. Contract let to Jones Bros., contractors, Columbus, Ohio, for the masonry work on this section. (April 9, p. 821.)

OKLAHOMA & MIDLAND (ELECTRIC).—This company, it is said, wants to hear from contractors at once to build three miles of city line. H. H. Hoover, President, 207 E. Fourth street, Hobart, Okla.

PHILADELPHIA & READING.—Sealed proposals for work of construction in connection with the elimination of grade crossings on the Philadelphia, Germantown & Norristown, will be received at the office of the Chief Engineer, 520 Reading Terminal, Philadelphia, Pa., until May 11, 1909, as follows:

Contract No. 1.—Masonry, trestle and embankment from the south side of Green street to the south side of Brown street.

Contract No. 2.—Foundations for the steel viaduct from the south side of Brown street to the north side of Jefferson street.

Contract No. 3.—Bridges and viaduct ready for ballast from the south side of Green street to the north side of Jefferson street.

Contract No. 12.—Masonry, embankment, paving, water and drainage systems, fence and gates, new office building, scale foundation, concrete steps and pavement for yard at Master street.

PORT O'CONNOR, RIO GRANDE & NORTHERN.—Organized to build from Port O'Connor, Tex., north to San Antonio, 190 miles, with a number of branches, including one to Gonzales, in all 234 miles, of which about 100 miles is graded. According to press reports $350,000 is available and work is to be started at once from Victoria, Tex., south through Calhoun county to Port O'Connor. As soon as this section is finished work will be started north from Victoria to Yoakum, Gonzales and to San Antonio. (March 19, p. 657.)

QUEBEC, MONTREAL & SOUTHERN.—See Delaware & Hudson.

TEXAS ROADS.—Plans are said to have been made by N. P. Loash, Waterloo, Iowa, to build about 50 miles of railway north from Big Springs, Texas.

TOLEDO, ST. LOUIS & NEW ORLEANS.—Organized some time ago to build from Effingham, Ill., south to Brookport, on the Ohio river, opposite Paducah, Ky. According to press reports the project is being revived, and it is understood will be built as a joint terminal and belt railway for several lines that want to reach the Ohio and Mississippi river sections. N. M. Burns, Pres., St. Louis, Mo.; D. Reid, V.-Pres., Marion, Ill.; H. S. Ames, Treas., St. Louis, Mo., and T. W. Hall, Sec., Carmi, Ill.

TRINITY VALLEY SOUTHERN.—Plans are said to be under consideration to extend this road, now in operation from Dodge, Texas, east to Oakhurst, 6½ miles, southeast to Coldspring, 15 miles.

VALLEY ELECTRIC.—An officer writes that the route of this proposed line is from Hood River Valley, Ore., through the valley of the same name for about 20 miles. Surveys not yet finished. The work will include a steel bridge 75 ft. long, one of 100 ft. and some small trestles. E. F. Tolls, Pres.; H. B. Langille, Ch. Engineer, Hood River, Ore. (March 26, p. 727.)

VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

Railroad Financial News.

ATCHISON, TOPEKA & SANTA FE.—The company has asked the Kansas Railroad Commission for permission to issue $73,000,000 common stock. This is part of $148,000,000 authorized before the railway commission law of Kansas came into effect, and the present application is to guard against any possible technical objection to the conversion of outstanding convertible bonds into stock.

CAROLINA, CLINCHFIELD & OHIO.—Blair & Co., New York, are offering the unsold portion of $10,000,000 first mortgage 5 per cent. bonds of 1908-1938 at 96, to yield over 5¼ per cent. These are part of an authorized issue of $15,000,000, of which $5,000,000 are reserved for extensions, equipment and other future needs. The bonds are secured by a first lien on 238 miles of road from Fink, Va., to Spartanburg, S. C., and by a lien on the branch from Fink, Va., to Dante, 7¾ miles. The Carolina, Clinchfield & Ohio was described in the *Railroad Age Gazette* March 19.

CENTRAL NEW ENGLAND.—The company has asked the New York Public Service Commission, Second district, for permission to issue $12,910,000 50-year 4 per cent. bonds for refunding all of the outstanding obligations of the company. The Central New England is a consolidation of the Newburgh, Dutchess & Connecticut, Poughkeepsie & Eastern, Poughkeepsie Bridge Company and the Dutchess County Railroad. It is proposed to issue immediately $9,533,000 to refund the outstanding obligations of the consolidated company. The remainder of the proposed issue is to be used as opportunity offers to take up or discharge other obligations of the company which become due at different dates in the future.

COLORADO & NORTHWESTERN.—The property of the company was sold at auction on March 29 to a representative of the bondholders' reorganization committee, and the successor company, the Denver, Boulder & Western, was to take possession on April 1.

DENVER, BOULDER & WESTERN.—See Colorado & Northwestern.

JAMESTOWN, FRANKLIN & CLEARFIELD.—See Lake Shore & Michigan Southern.

LAKE SHORE & MICHIGAN SOUTHERN.—Stockholders are to vote May 5 on approving a contract for the lease of the Jamestown, Franklin & Clearfield, recently formed by consolidation of Lake Shore subsidiaries, to the Lake Shore & Michigan Southern.

MICHIGAN CENTRAL.—The directors have authorized an issue of $25,000,000 4 per cent. debentures of 1909-1929, of which $10,000,000 are to be sold in the near future to reimburse the company for advances made to the Detroit River Tunnel Co. Of the remaining $15,000,000 debentures part are to be sold to retire $10,000,000 5 per cent. notes maturing February, 1910.

NEW ENGLAND INVESTMENT & SECURITIES CO.—See New York, New Haven & Hartford.

NEW YORK CITY RAILWAY.—The old North Mount Morris Railroad, 1.57 miles long, and the only road owned by the New York City Railway, was sold at auction to John Johnson, of Brooklyn, N. Y., for $500. The purchaser assumed about $25,000 franchise taxes and assessments.

NEW YORK, NEW HAVEN & HARTFORD.—President Mellen has resigned as president and trustee of the New England Investment & Securities Co., which is the holding company for the Massachusetts trolley properties which the New Haven company was ordered to give up by the Massachusetts legislature.

SOUTHERN PACIFIC.—On April 7 the stockholders voted to increase the common stock by $100,000,000, of which enough will be set aside to provide for the conversion, at the option of the holder, of the 4 per cent. 20-year convertible bonds, of which $82,000,000 are to be offered to stockholders about April 20. (Feb. 26, page 436.)

Charles A. Peabody and Robert W. Goelet have been elected directors.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Temiskaming & Northern Ontario is asking prices on two 10-wheel passenger locomotives and four 10-wheel freight locomotives.

General Dimensions.

	Freight.	Passenger.
Weight on drivers	114,000 lbs.	114,000 lbs.
Weight, total	145,000 "	145,500 "
Cylinders	19 in. x 26 in.	19 in. x 24 in.
Diameter of drivers	57 in.	63 in.
Boiler, type	Ext. wagn top.	Ext. wagn top.
Boiler, wgk. steam press.	200 lbs.	200 lbs.
Heating surface, tubes	1,693 sq. ft.	1,693 sq. ft.
" " firebox	139 "	139 "
" " total	1,832 "	1,832 "
Tubes, number	245	245
" outside diameter	2 in.	2 in.
" length	13 ft. 2¼ in.	13 ft. 2¼ in.
" material	"Kerva."	"Kerva."
Firebox, length	103 in.	103 in.
Firebox, width	42 "	42 "
Grate area	29,25 sq. ft.	29.25 sq. ft.
Water capacity	5,000 I. gals.	5,000 I. gals.
Coal capacity	10 tons.	10 tons.
Tractive effort	25,800 lbs.	23,400 lbs.

Special Equipment.

Axles	Open-hearth steel.
Bell ringers	Sansom
Boiler lagging	Schlater's air cell asbestos
Brakes	Westinghouse, E. T. 6
Brake-beams	Simplex
Brake-shoes	Steel back
Couplers	Tower
Driving boxes	Steel
Headlight	Pyle-National electric
Injectors	Ohio, No. 8
Journal bearings	Canadian Bronze Co.
Piston and valve rod packings	U. S. metallic
Safety valve	Coale
Sanding devices	Wilson
Lubricators	Detroit
Springs	Montreal Spring Works
Staying	Monkbridge staybolt iron
Steam gages	James Morrison, Toronto
Steam heating equipment	Consolidated
Tires	Midvale
Valve gear	Stephens
Wheel centers	Open-hearth steel

CAR BUILDING.

The Norfolk & Western is in the market for 300 freight cars.

The Great Northern is in the market for 500 refrigerator cars.

The Long Island is figuring on 120 steel passenger motor cars.

The Western Pacific has ordered 1,500 freight cars from the Pressed Steel Car Co.

The Iowa Central has ordered 50 fifty-ton gondola cars from the Pressed Steel Car Co.

The Boston & Maine has ordered 1,000 gondola coal cars from the Laconia Car Co.

The Chicago & Alton has ordered two postal cars from the American Car & Foundry Co.

The Oklahoma Midland Electric Railway, Hobart, Okla., is in the market for two small gasolene motor cars.

The Lehigh Valley is said to be in the market for a number of 30-ton dump cars. This item is not confirmed.

The Chicago & Southern Traction has ordered the trucks for four new cars from the Baldwin Locomotive Works.

The Pacific Electric Railway, Los Angeles, Cal., has ordered 50 fifty-ton steel underframe flat cars from the Pressed Steel Car Co.

The Chicago & Milwaukee (Electric), reported in the *Railroad Age Gazette* of March 26 as being in the market for 12 pay-as-you-enter cars, has ordered 10 cars from the St. Louis Car Co.

The San Antonio Traction Co., reported in the *Railroad Age Gazette* of February 5 as being in the market for 10 semi-convertible cars, has purchased this equipment from the American Car Co. These cars will be 28 ft. long and will have Brill 27-G. I. trucks.

The Central Railroad of New Jersey, as reported in the *Railroad Age Gazette* of April 2, has ordered 15 coaches from Harlan & Hollingsworth. These cars will have a capacity of 75 passengers and will weigh 90,000 lbs. They will be 59 ft. 3½ in. long and 8 ft. 9¼ in. wide, inside measurements, and 67 ft. 6½ in. long, 9 ft. 10½ in. wide and 13 ft. 10 in. high over all. The bodies will be of wood and the underframes Commonwealth cast steel. The special equipment will include:

Axles	Central R. R. of N. J. specifications
Bolsters, body and truck	Commonwealth Steel Co.
Brake-shoes	Diamond S
Draft gear	Janney Buhoup
Heating equipment	Steam
Lighting system	Pintsch gas
Platforms	Commonwealth Steel Co.
Springs	Simplex
Trucks	Cast steel
Wheels	Forged steel

The Erie, reported in the *Railroad Age Gazette* of March 5 as asking prices on 30 steel underframe express cars, has ordered this equipment from the American Car & Foundry Co. These cars will weigh 60,000 lbs. and will be 60 ft. 1 in. long, 9 ft. ¼ in. wide and 9 ft. 1½ in. high, inside measurements, and 60 ft. 10¾ in. long, 9 ft. 10½ in. wide and 14 ft. 2⅝ in. high, over all. The bodies will be of wood and the underframes of steel. The special equipment will include:

Axles	Gould
Brakes	Westinghouse
Brake-beams	Damascus
Brake-shoes	Am. Brake-Shoe & Fdry Co.
Couplers	McConway & Torley
Draft gear	Westinghouse
Heating system	Ward Equipment Co.
Journal-boxes	Erie standard
Lighting system	Safety Car Heating & Lighting Co.
Springs	Railway Steel Spring Co.
Trucks	American Car & Foundry Co.
Ventilators	Globe, Adams & Westlake Co.
Wheels	Rolled steel, Carnegie Steel Co.

IRON AND STEEL.

The Interborough Rapid Transit Co. is in the market for 4,500 tons of rails.

The Buffalo, Rochester & Pittsburgh is asking bids on about 3,500 tons of bridge steel.

The Chicago & North Western has ordered 4,000 tons of bridge steel from the American Bridge Co.

The Lake Shore & Michigan Southern is said to have ordered 3,500 tons of rails from the Illinois Steel Co.

The Grand Trunk Pacific has ordered 22,000 tons of 80-lb. rails from the Algoma Steel Co., to be delivered at Ft. William, Ont.

The Chicago, Burlington & Quincy has ordered 4,000 tons of structural steel for bridge construction from the American Bridge Co.

The Panama Railroad will receive bids until April 15 for 50,000 four-rib, shoulder tie-plates for A. S. C. E. section 70-lb. rail and for 200 kegs 5½-in. by $\frac{9}{16}$-in. spikes. Requisition No. 1465.

General Conditions in Steel.—There has probably been less activity in steel during the past week than during any similar period since the open market was announced. Final action on the new tariff schedules seems necessary before there is any placing of contracts, a good number of which are known to be in the inquiry stage. As has been the case for several weeks past, the main activity has been in structural steel, although some rail contracts are reported placed this week.

RAILROAD STRUCTURES.

MEMPHIS, TENN.—According to press reports work is to begin at once on the Union passenger station to be used by all the roads entering Memphis except the Southern. Much

preliminary work has already been done. The total cost of the improvements will be about $6,500,000. (Oct. 30, p. 1267.)

New York, N. Y.—In the fire which destroyed the repair shops of the Interborough Rapid Transit Co., at Second avenue and 129th street, there were 11 steel and 6 composite cars burned. The loss was about $173,000, about $135,000 of which is charged to shop tools and cars.

Tacoma, Wash.—The Chicago, Milwaukee & Puget Sound has given the contract for the erection of three grain and general freight warehouses and the export lumber dock to the Burill Bridge & Dredging Co., and work is to begin at once. Contracts for the foundations of the warehouses were previously given to John Huntington, of Tacoma.

Oklahoma City, Okla.—The Oklahoma City Street Railway has prepared plans for a new eight-track car barn, 100 ft. x 160 ft.; an inspecting, washing and light repairing shed with four tracks, 50 ft. x 200 ft.; a machine shop with two tracks, 50 ft. x 125 ft.; a storeroom with one inside and two outside tracks, 85 ft. x 125 ft.; a woodworking shop with two inside tracks, 50 ft. x 100 ft.; a paint shop with two inside tracks, 45 ft. x 100 ft., and a two-story office building. The buildings will be of pressed brick with concrete roofs and each one story high, except the office building. Buildings and track will cover about 14 acres of land.

SIGNALING.

New Automatic Signals on the Rock Island.

The Chicago, Rock Island & Pacific has completed the installation of automatic block signals, giving indications in the upper quadrant, on the Iowa division, between Missouri Division Junction, near Davenport, Iowa, and Iowa City, double track, 71 signals in all, and all of them three-position. The signals are style "B" and style "S," made by the Union Switch & Signal Company. The installation includes one gauntlet over a bridge at Moscow, three sets of crossing bells and two interlocking plants, one at Missouri Division Junction and one at Iowa City. The gauntlet is protected by automatic block signals normally indicating stop. They are cleared only on the approach of a train. All other signals, except the home and distant signals at interlocking plants, are normal clear.

The plant at Iowa City protects the end of double-track and the apparatus is the General Railway Signal Co.'s all-electric. At Missouri Division Junction there is a mechanical machine, but the signals are of the automatic type. There are two single-arm home signals, both style "B" Union, and one two-arm home signal, both arms giving three indications in the upper quadrant. This is a model 5 type made by the General Railway Signal Company. Both plants have been in service some time but were modified to meet the requirements of automatic block signaling. The Iowa City plant has approach, detector and indication locking.

All signals are controlled by line circuits. "Cut sections" in the tracks are relayed except in special cases, as where crossing bells occur. The "distant" control circuit is taken through switch boxes on all facing point switches. In some cases the polarized line circuit is used, as where otherwise it would be necessary to use two line relays. Indicators are provided at all switches, there being 67 in all. The length of block varies to suit local conditions, from 2,000 ft. at the Moscow gauntlet to 20,460 ft. All wires from pole lines to apparatus are carried in cable to iron cable posts on which are mounted relay boxes or switch indicators, as the case may be. Thus underground wires are reduced to a minimum.

BSCO and Schoenmehl primary batteries are used for the control and operation of all automatic block signals. There are 16 cells to each signal, placed in Massey concrete wells. The gravity battery for track circuits is placed in the same well when possible.

All line relays are 500 ohms resistance, all track relays 4 ohms resistance. There are in use "Universal" and "R. S. A." relays made by the Union Switch & Signal Co.; model 9 relays made by the General Railway Signal Co., and type "E. B." made by the Hall Signal Co. All work was done by the railway company's signal forces.

Supply Trade News.

Among the recent orders received by Tate, Jones & Co., Inc., Pittsburgh, Pa., is an extensive one from the Erie Forge Co., Erie, Pa., for fuel oil burning equipment for use in open hearth furnaces.

The Helwig Manufacturing Co., St. Paul, Minn., manufacturer of pneumatic tools and other labor saving devices, has established a European office in Paris at 19 Rue De Lambre, in charge of A. L. Helwig.

E. D. Clapp, who was formerly the Chicago representative of the Jeffrey Manufacturing Co., Columbus, Ohio, and the Ohio Malleable Iron Co., Columbus, has associated himself with the W. K. Kenly Co., Chicago.

Morris B. Brewster has been appointed representative, at the Chicago office, 509 Great Northern building, of the American Locomotive Sander Co., Philadelphia, Pa., and the United States Metallic Packing Co., Philadelphia.

The Empire Car Co., Chicago, has been incorporated with $15,000 capital to build and repair railway cars and to manufacture and sell other merchandise. The incorporators are: J. B. Koon, P. J. Minogue and M. F. Sullivan.

The Whiting Foundry Equipment Co., Harvey, Ill., announces the appointment of L. G. Henes, with office in the Monadnock building, San Francisco, Cal., as its representative for cranes and foundry equipment for the states of California, Nevada and Arizona.

The Damascus Brake Beam Co., Cleveland, Ohio, in order to carry a larger stock of finished product as well as to make room for additional machinery for the economical manufacture of its trussed beams, is extending its Sharon plant. The management also has under consideration the purchase of a site for a branch factory between Chicago and Gary.

The Isthmian Canal Commission, Washington, D. C., asks bids until May 6 on semi-marine boilers, air compressor, fire-alarm system, electric motor, electric-driven wood-working machines, machine shop machines, tin and copper smith tools, drill chucks, vises, sheaves, shafting, rock drill steels, cypress water tank hose, lumber, etc. (Circular No. 503.)

H. F. Wardwell, formerly Chief Clerk to F. A. Delano, President of the Wabash, has become associated with the Hicks Locomotive & Car Works, Chicago, with office at Chicago. Mr. Wardwell served three years as a special apprentice in the mechanical department of the Chicago, Burlington & Quincy, and was subsequently Chief Clerk to Mr. Delano for four years.

The Consolidated Railway Electric Lighting & Equipment Co., New York, announces that this company stands alone and has no connection of any kind with any other electric car lighting company, notwithstanding rumors that have been persistently circulated to the contrary. It has perfected special machinery for the manufacture of its equipments for electric car lighting, and is prepared to offer better terms and lower prices than heretofore have been possible.

Among recent orders received by the O. M. Edwards Co., Syracuse, N. Y., for car window fixtures are the following: Window design, 7½-D1, for 30 passenger coaches, Chicago, Rock Island & Pacific. These cars are being built by the American Car & Foundry Co.; window design, 13-O-B-F-1, for 15 coaches, Central of New Jersey, being built by Harlan & Hollingsworth; window design, 13-O-D-1, for 63 cars, United Railways of St. Louis, being built at the railway company's shops.

The Buckeye Steel Castings Co., Columbus, Ohio, has opened an office in Chicago in charge of C. B. Goodspeed as Western representative. It occupies the rooms on the sixth floor of the Railway Exchange building, which were used by Julian L. Yale & Co., Chicago, who have been its Chicago representatives for several years. Fred J. Cooledge, who was formerly connected with Julian L. Yale & Co., has become associated with the Buckeye company, and will retain his headquarters at Chicago.

The Consolidated Supply Co., Chicago, announces that it will remove its offices on May 1 from 321 Dearborn street to 138 Jackson boulevard, in the Western Union building. It has just been appointed the selling agent, to all the railways having headquarters in Chicago, for the Alamo gas and gasoline engines, manufactured by the Alamo Manufacturing Co., Hillsdale, Mich. This engine was shown at the Coliseum during the recent Maintenance of Way convention at Chicago. The Alamo company makes a full line of standard engines for pumping and coaling stations, hoisting outfits, electric light plants, etc.

The Duntley Manufacturing Co., Chicago, which was organized about two months ago under the laws of Delaware, has announced its permanent organization. The officers are: President, J. W. Duntley, formerly President of the Chicago Pneumatic Tool Co., Chicago; Vice-President, A. W. Maconochie; Secretary, F. A. Rautenberg; Treasurer, Eugene McComas. The directors are J. W. Duntley, H. W. Davis, M. H. Tichenor, Samuel Deutsch and W. J. Calhoun. The company manufactures the Rockford gasolene motor cars for section men, signal, telegraph and bridge inspectors; also vacuum cleaners and calculating machines. The offices of the company are on the fourth floor of the Plymouth building.

TRADE PUBLICATIONS.

Triple Valve.—The Westinghouse Air Brake Co., Pittsburgh, Pa., has just issued instruction pamphlet No. 5,030, which supersedes the issue of May, 1907. This pamphlet covers the type K triple valve.

Coal Dealers' Supplies.—The C. W. Hunt Co., New York, has just issued a small pamphlet describing the line of coal dealers' supplies which it manufactures, including mast and gaff fittings, automatic railways, coal tubs, hoisting blocks, screens, valves and "Stevedore" hoisting rope.

Paints.—The Detroit Graphite Co., Detroit, Mich., has just issued a very attractive booklet entitled "The Home of Good Paint," giving a history of its plant from the beginning to the present time and telling how it is equipped to manufacture paint for various purposes. A copy of the publication will be sent to anyone interested.

Roofing.—The Barrett Manufacturing Co., New York, is mailing a leaflet which tells of the service of the coal tar pitch, tarred felt and gravel roofing on two large textile mills in Lowell, Mass. This roofing covers 1,500,000 sq. ft. in one case and 300,000 sq. ft. in the other, and was laid along the lines of the Barrett specification.

Gould Battery.—The Gould Storage Battery Co., Depew, N. Y., has just issued a catalogue on the Gould battery in isolated lighting plants. The information is divided into several chapters, one on the selection of the proper battery, another on the method of operation, another on details of installation, etc. A number of line drawings are included.

Bush Train Shed.—Lincoln Bush, Consulting Engineer, 1 Madison avenue, New York, and formerly Chief Engineer of the Delaware, Lackawanna & Western, has published in pamphlet form a reprint of an article in the *Railroad Age Gazette* of March 19, 1909, describing the Bush train shed at Scranton, Pa. Copies will be sent to those desiring them.

Who Makes What.—Daniel T. Mallett, publisher, New York, has just issued under this title a book of reference for buyers. It is a directory of manufacturers, products, foreign merchants, wholesale hardware merchants, jobbers and export houses. The book contains some 327 pages and the information is divided into five separate parts under the above headings.

Chicago, Burlington & Quincy.—Camp and ranch life in the Yellowstone country is attractively portrayed in a folder just issued. The country and its possibilities for big game hunting and sports, near Cody, Wyo., and the Cody road into the Yellowstone Park, are particularly interesting features. It is well illustrated with out-of-door scenes and contains a map of the district described.

Tie Plates and Angle Bars.—The Sellers anchor bottom tie plate is described in a catalogue recently issued by the Sellers Manufacturing Co., Chicago. The distinctive feature of this tie plate is that corrugations on the bottom engage the tie instead of flanges or claws. This tie plate is in use on 73 railways and many advantages are claimed for its use. The Sellers flat bottom tie plate and angle bars are briefly described in the publication.

Northern Pacific.—The Alaska-Yukon Pacific Exposition, which will be held in Seattle, Wash., from June 1 to October 16, this year, is well illustrated and described in a 50-page booklet issued by the Northern Pacific. The many side trips of interest that may be taken while at the exposition and the accommodations furnished on these tours are also described in the publication. A copy of the booklet may be secured by applying to A. M. Cleland, General Passenger Agent, at St. Paul, Minn.

Chinese Railways.

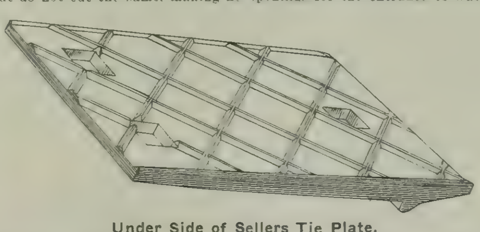
A consular report quotes a Chinese paper as follows: The ministry of communications has issued instructions to Taotai Chan, commanding him to make a careful survey from Kalgan to Kuei-huacheng and Shui-yuancheng, on the Shansi and Mongolian borders, so that the Peking-Kalgan Railway may be extended to the two cities and thence to Kulun (Urga, capital of Mongolia) and Kiakhta, on the Russo-Chinese frontier. It will further be extended to Kansuh and Hsinchiang, forming the great northwestern link as approved by the Chinese Government. It is estimated that from $10,000,000 to $15,000,000 will be required for extending the Peking-Kalgan line to Kiakhta via Kuei-huacheng and Kuiun, and it will take more than six years to build it. As Taotai Chan, who was educated in the United States, and is probably one of very few competent Chinese railway engineers who can build lines without foreign assistance, has shown skill and experience in building the Peking-Kalgan Railway, the ministry of communications will no doubt put the full responsibility of the extension on his shoulders.

Sellers Anchor-Bottom Tie Plate.

The Sellers anchor-bottom tie plate, with oblique corrugations, was described in the *Railway Age* two years ago (April 12, 1907, page 621). At that time the corrugations covered only about five-eighths of the length, there being a plain portion at each end. The design has since been improved by the extension of the corrugations to cover the entire bottom, as shown in the illustration herewith.

The advantages claimed for this design of tie plate are:

That the corrugations compress and engage the top fibers of the tie but do not cut the same, making no openings for the entrance of water



Under Side of Sellers Tie Plate.

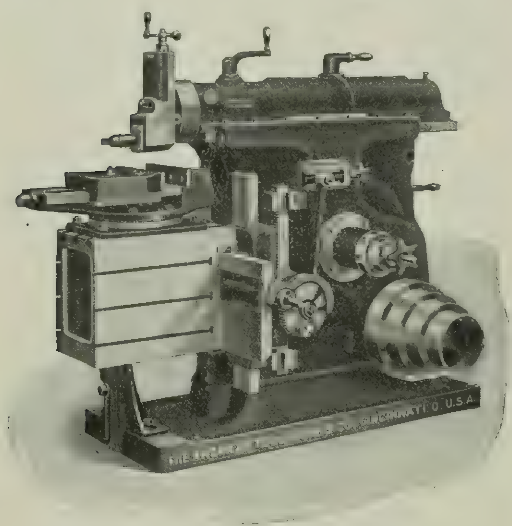
and other foreign substances which cause decay; the angular arrangement of the corrugations provides a maximum surface to resist lateral, or track-spreading, stresses; the corrugations grip the wood firmly without tearing it; the plate protects the spike, preventing necking, and maintains its position when once applied. The makers report having in their possession ties used with these plates for eight years, showing no wear of the plate into the tie, the wood showing only the imprint of the corrugations, which compressed the fibers to a depth of about ¼ in.; neither is there indication of any movement of the plate. These plates are made of rolled wrought iron to minimize abrasion between plate and rail, corrosion from brine drippings, and crystallization from repeated stresses. They are made in different sizes and thicknesses and are punched with two, three or four holes for different weights of rail. They can also be given combination punchings for use with two different sizes of rails.

They are made by the Sellers Manufacturing Co., Chicago, and are

in use on 73 roads. The company also makes a flat bottom plate for electric and elevated roads, punched for either ordinary or screw spikes.

American 21-in. Back-Geared Crank Shaper.

The shaper shown herewith is designed to be heavy and powerful, with extension base and 15-in. to 30-in. stroke. It is intended for high-speed work production, accuracy of alinement and durability. The column is deep and wide, tapering slightly toward the top. It is thoroughly braced internally, and is further reinforced outside on the line of strain by a wide deep rib cast integral with the wall. The column projects both front and rear at the top, providing a long bearing for the ram. The base, of extension type and pan design, is of large proportions, deep and strongly ribbed. A pad is placed at the end to receive the table support.



American 21-in. Back-Geared Crank Shaper.

The ram is heavy and designed for uniform rigidity throughout the entire length of stroke. It is thoroughly braced by internal ribs and has long wide bearings on the column with continuous taper gib, having end screw adjustment. The stroke of the ram is positive with 8 speeds, ranging from 7.7 to 96 strokes per minute. The length of stroke may be easily changed without stopping the machine, and the device for ranging the stroke is located on the ram near the head, and may also be operated while the machine is running. The rocker arm is heavy and thoroughly braced and gives the ram a practically uniform rate of speed throughout its entire stroke and also provides quick return. The machine is readily changed from single to back-geared through a convenient self-locking lever, and has a back-gear ratio of 24.3 to 1, which with the large cone pulley gives ample power for taking heavy cuts. The length of stroke is 21.5 in.

The head is operative at any angle within an arc of 100 deg. The down slide is fitted with continuous taper gib, having end screw adjustment. The down feed is long, the screw having an adjustable graduated collar reading to 0.001-in. The tool post is large for using holders with inserted cutters, and has a tool-steel tool post screw and serrated back plate. The down feed is 9 in. The table, of box form with three T-slots on both top and sides cut from the solid, is easily detachable, and is thoroughly braced internally to insure accuracy and stiffness. The vertical travel is 14.5 in. and the horizontal travel is 26.5 in.

The apron is accurately fitted to the cross rail and provided with continuous taper gib, with end screw adjustment. There are three T-slots on the face of the apron for clamping work when the table is removed. The cross rail, which is bolted to the column to prevent it from dropping away when the binder bolts are loosened, is of box farm, heavily ribbed. It is of good length to give the table a long horizontal range of travel. The bearings, scraped to surface plates, are extra wide. A telescopic elevating screw of large diameter, with ball-bearing thrust, facilitates elevating the rail. This screw enables the machine to be set on a concrete or other floor without requiring a hole through the floor to accommodate its travel. The elevating gears are of steel, cut from the solid.

The cross feed is of new design, variable and automatic, with a range of 0.008-in. to 2 in., obtainable while the machine is running. The slot head is located near the top of the column, conveniently operated and set by the star knob. It is supplied with graduations either side of zero, reading from 1 to 25 notches each of which represents 0.0008-in. feed. It is unnecessary to adjust the feed mechanism due to any change of position of the rail.

The rocker arm is made in double section at the top, and this, with the large opening through the column, permits a shaft 3.5 in. in diameter to be passed under the ram for keyseating. Larger shafts may be keyseated by setting over the table to allow the shaft to pass outside of the column, using the head set at an angle. The vise, of heavy pattern, is of new design with deep steel-faced jaws. It is clamped with four bolts to the swivel base, which is large, covering nearly the entire area of the table. The vise screw has a bearing at both ends and is always in tension when holding work.

The countershaft has tight and loose pulleys 16 in. in diameter by 4.25-in. face, to run 190 r. p. m. All gears, of coarse pitch and wide face, are cut from the solid with special cutters. The pinions in the driving train are cut from bar steel. All bearings are wide and scraped to surface plates. All running bearings are bushed, and the one for driving pulleys, large and cast integral with the column, is long and extends well into the center of the cone, which eliminates the necessity of an outboard bearing for the cone shaft. This bearing is bronze bushed. All shafts are of high carbon crucible steel accurately ground.

These tools are made by the American Tool Works Co., Cincinnati, Ohio, in 15-in. single-geared and 16-in., 18-in., 21-in., 25-in., and 30-in. back geared.

Granite Roofing With Six-Inch Solid Lap.

The Eastern Granite Roofing Co., New York, has improved its roofing by making a wider marginal lap than has formerly been customary with roofings of this class. This new lap is called "Safeguard," and is claimed by the makers to be a great improvement over any other wide marginal lap used on stone surfaced roofing. The "Safeguard" lap is a continuation of the sheet, extending 6 in. from the graveled surface, giving the lap a solid and strong foundation for nailing and a greater resistance against wind storms.

The older style laps consist of 4 in. of light single-ply felt extending beyond the narrow 2-in. margin of the sheet, thus giving only a 2-in. margin for nailing; the "Safeguard" lap gives 6 in. of margin, permitting double nailing when necessary in places where the roofing is exposed to heavy wind storms.

Granite Roofing With Wide Lap.

When laying Granite Roofing with this wider lap, it is not necessary to nail through the surface, all the nailing being done on the under sheet, as the cement is sufficient to hold down the overlapping sheet. All nails are thus entirely concealed, adding to the neatness and finish of the roofing, which presents the appearance of a continuous unbroken sheet. As there is no nailing through the upper or exposed surface, leaks from nail holes become impossible.

The sheets will lie with 26 in. of their surface exposed to the weather instead of the usual 29-in. width, adding considerably to the resistance of the roofing in wind storms.

ANNUAL REPORT

SEVENTY-NINTH ANNUAL REPORT OF THE DELAWARE AND HUDSON COMPANY:—YEAR ENDED DECEMBER 31, 1908.

The results from operation of the Coal and Coal Sales Departments of the Company were:

	Coal produced and purchased	On hand December 31st	†Receipts	†‡Expenses	Net.
1908....	6,814,200	353,782	$23,847,116 58	$22,993,999.99	$853,116.59
1907....	7,005,987	374,984	23,184,765.92	22,227,283.79	957,482.13
Increase.	*191,787	*21,202	$662,350.66	$766,716.20	*$104,365.54

*Decrease.
†Includes cost of coal added to stock during year.
‡Including taxes.

The results from operations of the Railroads of the Company were:

	Miles	Earnings	*Expenses	Net earnings	Pctg of expenses to earnings
1908....	845.26	$18,500,731.43	$10,811,720.87	$7,689,010.56	58 44
1907....	844.76	20,165,440.26	11,694,428.92	8,471,011.34	57.99
Decrease	†.50	$1,664,708.83	$882,708.05	$782,000.78	†0.45

*Excluding taxes.
†Increase.

The general distribution of the earnings and of the operating expenses of the railroads of the Company was as follows:

	1908.	1907.	Increase or *decrease*
Earnings.			
From coal freight traffic..	$9,106,819.84	$9,081,664.11	$25,155.73
From merchandise freight traffic	6,162,180.98	7,553,810.11	*$1,391,629.13*
From passenger traffic....	2,693,672.13	2,944,742.98	*251,070.85*
From express traffic......	189,656.38	198,800.11	*9,143.73*
From transportation of mails	132,315.96	132,021.87	294.09
From miscellaneous sources	216,086.14	254,401.08	*38,314.94*
Gross earnings	$18,500,731.43	$20,165,440.26	*$1,664,708.83*
Expenses.			
For maintenance of way and structures	$1,417,318.58	$1,879,545.69	*$462,227.11*
For maintenance of equipment	2,219,542.60	2,356,513.74	*136,971.14*
For traffic expenses......	204,849.29	191,668.69	13,180.60
For conducting transportation	6,528,112.31	6,900,430.56	*372,318.25*
For general expenses.....	441,898.09	366,270.24	75,627.85
Total expenses.......	$10,811,720.87	$11,694,428.92	*$882,708.05*
Net earnings from operation	$7,689,010.56	$8,471,011.34	*$782,000.78*
Percentage of expenses to earnings.......	58.44	57.99	0.45

Note—Decreases in *italics*.

GENERAL INCOME ACCOUNT OF THE DELAWARE AND HUDSON COMPANY, YEAR ENDED DECEMBER 31, 1908.

	1908.	1907.	Increase or *decrease*
Coal Department.			
Gross receipts	$23,847,116.58	$23,594,415.37	$252,701.21
Gross expenses (excluding taxes of $292,301.73)...	22,701,698.26	22,421,209.79	280,488.47
Net earnings	$1,145,418.32	$1,173,205.58	*$27,787.26*
Railroad Department.			
Gross earnings...........	$18,500,731.43	$20,165,440.26	*1,664,708.83*
Operating expenses (excluding taxes of $413,029.20)	10,811,720.87	11,694,428.92	*882,708.05*
Net earnings from operation	$7,689,010.56	$8,471,011.34	*782,000.78*
Other Income.			
Hire of equipment	$275,046.59	$91,600.41	$183,446.18
Outside operations ......Dr.	1,417.17	3,704.83	*5,122.00*
Dividends and interest on securities owned.......	803,599.38	1,117,672.44	*314,073.06*
General interest and discount	375,163.23	178,889.81	196,273.42
Miscellaneous items	52,283.39	172,433.48	*120,150.09*
Total other income...	$1,504,675.42	$1,564,300.97	*59,625.55*
Gross income	$10,339,104.30	$11,208,517.89	*869,413.59*
Deductions from Income.			
Rentals	$1,897,628.11	$2,353,527.58	*$455,899.47*
Taxes	705,330.93	568,589.47	136,741.46
Interest on 1st and refunding mortgage bonds (1943)	243,998.34	....	243,998.34
Interest on 1st mortgage bonds (1917)	350,000.00	350,000.00	....
Interest on D. & H. debenture bonds (1916).....	559,080.00	559,540.00	*460.00*
Interest on 1st lien equipment bonds (1922)......	450,000.00	258,750.00	191,250.00
Interest on car trust bonds (1909)	7,875.00	13,125.00	*5,250.00*
Interest on equipment debenture bonds (1914)...	44,000.00	52,000.00	*8,000.00*
Interest on divisional bonds	75,000.00	75,000.00	....
General interest and discount	707,299.73	485,352.05	221,947.68
Miscellaneous items	44,433.83	26,460.38	17,973.45
Total deductions.....	5,084,645.94	4,742,344.48	342,301.46
Net income carried to general profit and loss.....	$5,254,458.36 12.39% on $42,400,000.00	$6,466,173.41 15.25% on $42,400,000.00	*1,211,715.05*

FINANCIAL.

The Consolidated Balance Sheet shows an increase of Capital Liabilities of $10,488,540.77, the principal changes being as follows:

FUNDED DEBT.

On May 12, 1908, the stockholders authorized the execution of a first and refunding mortgage to an issue of $50,000,000 of the Company's First and Refunding Mortgage Gold Bonds, bearing interest not to exceed 4 per centum, payable semi-annually, free of all taxes, and for not less than thirty-five years.

(*a*) $6,500,000 of said bonds to be reserved to redeem and extinguish mortgage liens then existing to that amount on portions of the Company's property.

(*b*) $20,000,000 of said bonds to be issued at once for the purpose of discharging the Company's outstanding obligations maturing during the year 1908, and for construction work then in progress, or its general corporate purposes.

(*c*) $23,500,000 of the said bonds to be issued from time to time thereafter for the corporate purposes of the Company, but not before May 1, 1909.

The execution and form of this mortgage were duly approved by the Public Service Commission of the Second District of the State of New York by orders made on July 9 and July 29, 1908.

Upon application duly made to the Commission for its consent to the issue of $20,000,000 of the said bonds, for the purpose of discharging certain of the Company's outstanding obligations incurred before the passage of the Public Service Commissions Law, the Commission has authorized the issue of $13,539,000 of the said bonds, of which bonds aggregating $13,309,000 were issued and sold during the year.

The Commission originally reserved for further hearing the question of giving its consent to the issue of the remaining $6,461,000 of the said $20,000,000 of bonds. The Company had applied for the issue of these remaining bonds for the purpose of discharging its obligations incurred to pay the cost of the purchase by the Company in 1906 and 1907 of the outstanding securities of the Hudson Valley Railway Company and on account of the purchase by the Company, made in 1906, of additional coal lands in the State of Pennsylvania. Further hearings were duly had before the Commission upon the questions so reserved and were completed on September 8th last. The Commission, however, did not announce its decision as to the issue of these bonds until December 17th last, when it handed down an order dated December 7, 1908, refusing to consent to such issue. In this decision three of the Commissioners concurred; one Commissioner dissenting wholly from the decision, and another in part. The Company has taken proceedings to have this decision reviewed by the Supreme Court upon *certiorari*.

In accordance with the provisions of the Equipment Trust Indenture, dated June 1, 1907, $650,000 was paid to the Trustees on July 1, 1908, and of this amount $637,147.45 was expended in the purchase of thirty new consolidation locomotives.

The amount of Car Trust Certificates of 1909 shows a reduction of $150,000, the bonds maturing May 15, 1908, having been retired under Sinking Fund provisions of the mortgage.

The amount of Debentures of 1914 shows a reduction of $200,000, the bonds maturing January 1, 1908, having been retired under the provisions of their issue.

The Hudson Coal Co. Debenture Bonds of 1917 and 1918 show reductions of $100,000 and $125,000 respectively, or $225,000 in all, these amounts having been retired during the year under the provisions of their issue.

FLOATING DEBT.

The Floating Debt of The Delaware and Hudson Company on December 31, 1907, amounted to $10,754,949.87. This was increased during the year to $21,143,550 by the payment of the $6,000,000 Collateral Trust Notes of the Quebec, Montreal and Southern Railway Company, due February 6, 1908; by final payments on account of the purchase of coal lands in Schuylkill County, Pennsylvania, and by expenditures for railroad construction.

In July, 1908, the Delaware and Hudson Company sold $13,309,000

of First and Refunding Mortgage Gold Bonds at 95 and accrued interest, thus realizing on account of the principal of said bonds $12,643,550, which was used to reduce the outstanding temporary loans, leaving a balance outstanding on December 31, 1908, of $8,500,000. The discount on these bonds has been charged to General Profit and Loss.

MERGERS.

On May 23, 1908, the New York and Canada Railroad Company was merged with The Delaware and Hudson Company under Sections 53, 54, P. S. C., State of New York, and certificate of merger filed in the office of the Secretary of State on that date.

On July 17, 1908, the Cherry Valley, Sharon and Albany Railroad Company was merged with The Delaware and Hudson Company under Sections 53, 54, P. S. C., State of New York, and certificate of merger filed in the office of the Secretary of State on that date.

By virtue of said mergers there has been added to the physical property of your Company 170.71 miles of road, valued at $9,589,100, and the Stocks and Bonds decreased accordingly.

DIVIDENDS.

On December 30, 1908, a dividend for the year 1909, upon the outstanding $42,400,000 of Capital Stock of this Company, was declared out of the earnings for the preceding years at the rate of nine (9) per cent. upon the par value thereof, and amounting in the aggregate to $3,816,000, payable as follows:

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon February 27, 1909, and payable upon March 20, 1909.

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon May 29, 1909, and payable upon June 21, 1909.

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon August 30, 1909, and payable upon September 20, 1909.

Two and one-quarter (2¼) per cent. upon the Capital Stock in favor only of the stockholders of record upon November 29, 1909, and payable upon December 20, 1909.

GENERAL REMARKS.

IMPORTANT ADDITIONS AND BETTERMENTS.

In the annual report for the year 1907 there were reported as approaching completion the third and fourth tracks between Green Ridge and Carbondale, the second track between Schenectady and Delanson, and the second track between Watervliet and Waterford Junction, all of which work was completed and the tracks put in operation early in the year 1908.

On account of the installation of a heavier type of locomotive it became necessary to strengthen various bridges on the Susquehanna and Pennsylvania divisions—$186,843 has been appropriated for this work, of which sum $89,977.72 was expended during the year.

The extension of the Quebec, Montreal and Southern Railway from Pierreville to Ste. Philomene has been completed, with the exception of the bridge at Nicolet. It is expected that the new main line will be placed in operation about May 1, 1909.

The Salem Branch of the Greenwich and Johnsonville Railway Company, connecting the Rutland and Washington Branch of The Delaware and Hudson Company with the main line of the Greenwich and Johnsonville, has been completed and put into operation.

This branch consists of 10.20 miles of track, built at a cost of $387,865.13, the funds necessary to construct same being temporarily advanced by your Company.

During the year the Mechanicville Steam Power Plant was completed and began operations. The severe drought that prevailed during the Summer and Fall greatly retarded the production of electric power by means of water courses, and at the same time fully demonstrated the wisdom of construction of this plant. This drought affected the operations of the water power companies, making necessary the operation of the new Mechanicville steam plant for the maintenance of the service on your electric railways, the surplus power being sold to the water power companies.

A new high power line connecting this power plant with the substations at Lansingburg, Twenty-fifth Street, Watervliet and North Albany, will be built during the year 1909 by the United Traction Company.

COAL DEPARTMENT RELIEF FUND.

The report of the Coal Department Relief Fund for the year ending December 31, 1908, is as follows:

RECEIPTS:		
Balance on hand, January 1, 1908		$9,966.97
Contributed by employees in 1908	$1,718.39	
Contributed by The Delaware and Hudson Company, 1908	8,725.00	
		10,443.39
Total		$20,410.36
DISBURSEMENTS:		
Accident death benefits	$2,568.66	
Accident disablement benefits	15,059.33	
		17,627.99
Balance on hand December 31, 1908		$2,782.37

These funds were authorized by vote of the stockholders on May 10, 1887, since which time the benefits paid have amounted to $299,636.44, to which the Company contributed $150,952.36.

COAL DEPARTMENT OPERATIONS.

The colliers and washeries of the company were operated to their full capacity throughout the year, producing 6,526,871 tons of anthracite coal out of a total of 64,665,914 produced in the region. At the close of the year there were in the several storage plants 353,782 tons.

The Coal Department expenses include construction and betterments amounting to $650,282.95.

Taxes of the Coal Department for the year 1908 show an increase of $76,578.28.

RAILROAD DEPARTMENT OPERATIONS.

Owing to general depression in business which existed throughout the country the earnings from Passenger Service and from Merchandise show a material reduction.

The earnings from Coal Freight Traffic show a slight increase, due to the placing by the Company of an increased tonnage of its coal in markets securing to its railroad lines a longer haul.

The ratio of Expenses to Earnings for 1908 shows an increase of $^{45}/_{100}$ of 1% over 1907. The increases paid in wages of employees in Shop, Track, Engine, Train and Yard Service, in effect in 1908, were only in effect during portions of the year 1907.

Taxes of the Railroad for the year 1908 show an increase of $60,163.18.

ELECTRIC RAILWAY EARNINGS.

The earnings of the electric lines fell off during the general depression of business. They were particularly affected by reason of the partial closing down for several months of the plants of the International Paper Company, General Electric Company, and the American Locomotive Company.

There was a decrease in net earnings of the United Traction Company of $29,701.30; of the Hudson Valley Railway of $74,366.80; of the Troy and New England Railway of $905.30, and of the Schenectady Railway (including Electric Express Co.) of $55,196.57. The net earnings of the Plattsburgh Traction Company increased $1,478.99.

A dividend of 4 per cent. was declared on the capital stock of the United Traction Company for the year 1908. No dividends were declared by the other companies.

LITIGATION.

Early last year an amicable arrangement was made between the United States Attorney General and the Anthracite Coal Carrier Corporations to test the constitutionality of the so-called Commodity Clause of the Hepburn Act, amending the Interstate Commerce Act passed July 29, 1906, which statute attempted to forbid railroad corporations from transporting in interstate commerce any commodity mined, produced or owned by such carrier corporation, or in which it had any interest direct or indirect. In September last the statute in question was declared invalid by the United States Circuit Court for the Eastern District of Pennsylvania. From this decision an appeal was taken by the Attorney General to the United States Supreme Court, which appeal has been argued and is still under advisement by the Court.

In May and June, 1908, several parties claiming to be owners of Debenture Bonds of the Company brought vexatious suits against the Company, seeking to enjoin the payment of its June dividend. The same parties also attempted to present the matter of the payment of this dividend to the Grand Jury of this City under laims that such dividend was not declared out of profits. The Company promptly met all these attacks, and in each instance defeated the same.

The Annual Report of the Company for 1907 stated that certain stockholders of the Albany and Susquehanna Railroad Company had obtained a judgment against this Company for $1,070,923.24, from which the Company had taken an appeal. Upon the argument of this appeal before the United States Circuit Court of Appeals that Court announced that there was a preliminary question affecting to some extent the jurisdiction of the Court, and that it had therefore certified that question to the United States Supreme Court. It is expected that the decision of the United States Supreme court upon this question will be made at an early date.

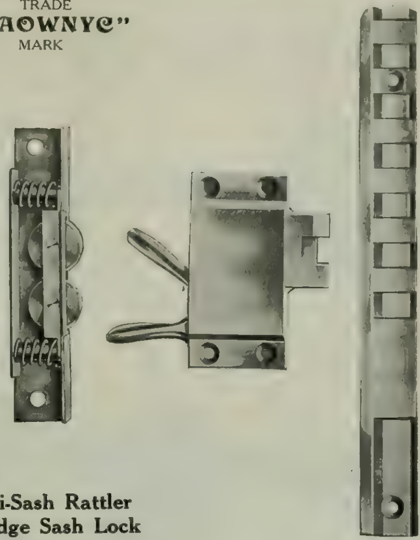
For many years disputed questions had been in litigation under leases made by this Company of what is known as the Genget Coal Properties near Scranton. All these questions have been set at rest by the acquisition of the fee of such property upon terms which the Company considered to its advantage.

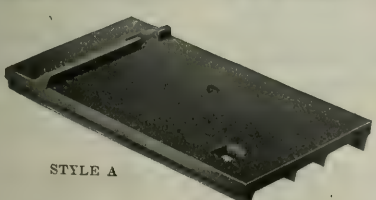
Questions are in litigation in respect to the contract under which the Company is operating the Ticonderoga Railroad, about 1.41 miles in length. The matter is pending before a Referee.

By order of the Board of Managers, L. F. LOREE, *President.*

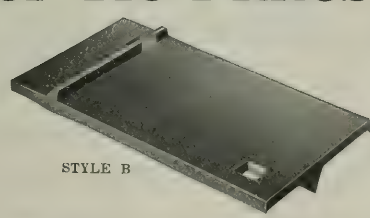
Construction and betterment included *in operating expenses* of coal department in 1908 amounted to $650,282.95, the largest single item being for sinking shafts and shaft improvements, which amounted to $150,826.35.

Expenditures on account of railroad department construction in 1908 amounted to $1,179,494.19, the largest single item being for additional main and side tracks, which amounted to $715,832.22.





STYLE A



STYLE B

ALPHABETICAL INDEX TO ADVERTISERS—CLASSIFIED DIRECTORY ON THE NEXT PAGE.

†Once a Month. *Every Other Week.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Accountant.
Whitehead, H. C.

Acetylene Lighting.
Commercial Acetylene Co.
Rushmore Dynamo Works.

Air Brake Fittings.
Fairbanks, Morse & Co.
National Tube Co.
Simmons Co., John.
Western Railway Equipment Co.
Westinghouse Air Brake Co.

Air Brake Hose—(See Hose).

Air Brakes.
Westinghouse Air Brake Co.

Air Compressors.
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Franklin Railway Supply Co.
Gardner Governor Co.
Independent Pneumatic Tool Co.
Murphy & Co., Christopher.

Air Hoists—(See Hoists).

Anti-Friction Metal—(See Babbitt Metal).

Anti-Rail Creepers.
Railway Specialty & Supply Co.

Anvils.
Eagle Anvil Works.

Architects.
Dodge & Day.

Asbestos.
Asbestos Protected Metal Co.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Asphalt.
Standard Asphalt & Rubber Co.

Augers Pneumatic—(See Pneumatic Tools).

Axles.
Block-Pollak Iron Co.
Cleveland City Forge & Iron Co.
Gould Coupler Co.
Johnson & Co., J. R.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Manganese Steel Rail Co.
Pittsburgh Forge & Iron Co.
Standard Steel Works Co.

Babbitt Metal.
Brady Brass Co.
Damascus Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Baggage Checks.
American Railway Supply Co.

Baggage Racks.
Rostand Mfg. Co.

Balanced Main Valves.
American Balance Valve Co.
Hammett, H. G.

Ballast Cars—(See Cars, Ballast).

Ballast Unloaders.
Bucyrus Co.
Fairbanks, Morse & Co.
Marion Steam Shovel Co.

Batteries, Electric.
Edison Mfg. Co.
Electric Storage Battery Co.
Railroad Supply Co.
Westinghouse Machine Co.
Willard Storage Battery Co.

Battery Chutes and Vaults.
Buda Foundry & Mfg. Co.

Bearing Metal—(See Journal Bearings).

Bell Ringers.
Ward-Packer Supply Co.
Western Railway Equipment Co.

Bells, Locomotive.
Lawrenceville Bronze Co.
National Tube Co.

Bending Rolls.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Blocks and Tackle.
American Hoist & Derrick Co.
Boston & Lockport Block Co.

Blowers.
American Blower Co.
Monarch Engineering & Mfg. Co.
Sirocco Engineering Co.

Blow Torches, Large Portable Oil.
Macleod & Co., Walter.

Blue Printing Machines.
Kolesch & Co.

Blue Print Papers.
Kolesch & Co.

Boiler Compounds.
Dearborn Drug & Chemical Works.
Jewell Engineering Co.
Johns-Manville Co., H. W.
Ward-Packer Supply Co.

Boiler Covering—(See Covering, Pipe and Boiler).

Boilers.
American Locomotive Co.
Baldwin Locomotive Works.
Carlin's Sons Co., Thomas.
Fairbanks, Morse & Co.
Hannoversche Masch.-Actien-Ges'aft
Hicks Locomotive & Car Works.
Vulcan Iron Works.
Yale & Co., Julian L.

Boilers, Steam and Water Heating.
Lord & Burnham Co.

Boiler Tubes.
Krupp (Prosser & Son).
National Tube Co.
Parkesburg Iron Co.
Simmons Co., John.
Tyler Tube & Pipe Co.
Worth Bros. Co.
Yale & Co., Julian L.

Boiler Washout Systems.
National Boiler Washing Co.
Yale & Co., Julian L.

Bolsters, Steel.
American Steel Foundries.
Atha Steel Casting Co.
Barney & Smith Car Co.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Commonwealth Steel Co.
Gould Coupler Co.
Pressed Steel Car Co.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Car Co.

Bolt and Nut Machinery.
Acme Machinery Co.
Ajax Mfg. Co.
Niles-Bement-Pond Co.

Bolts and Nuts.
Q. & C. Co.
Railway Specialty & Supply Co.

Boring Bars—(See Portable Tools).
Underwood & Co., H. B.

Boring Machines, Horizontal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring Machines, Metal.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Boring and Turning Mills.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Brakebeams.
American Steel Foundries.
Chicago Railway Equipment Co.
Cleveland Car Specialty Co.
Barney & Smith Car Co.
Davis Solid Truss Brake Beam Co.
Pressed Steel Car Co.
Standard Steel Car Co.

Brakejaws.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.
U. S. Metal & Manufacturing Co.
Western Railway Equipment Co.

Brake Levers.
Cleveland City Forge & Iron Co.
Dayton Malleable Iron Co.
Steel Car Forge Co.

Brakeshoes.
American Brake Shoe & Fdry. Co.
Buckeye Steel Castings Co.
Franklin Railway Supply Co.
Georgia Car Co.
Railway Materials Co.
Transue & Williams Co.
Wheel Truing Brake Shoe Co.
Yale & Co., Julian L.

Brakeshoes, Wheel Truing.
Wheel Truing Brake Shoe Co.

Brass Castings—(See Castings, Brass).

Brasses, Car and Engine—(See Journal Bearings).

Bridges, Buildings & Roofs.
Atlantic Equipment Co.
American Bridge Co.
Baltimore Bridge Co.
Interstate Engineering Co.
King Bridge Co., The.
Louisville Bridge & Iron Co.
Males Co., The.
McClintic-Marshall Constrn. Co.
Missouri Val. Bridge & Iron Wks.
Phoenix Bridge Co.
Riter-Conley Mfg. Co.
Scherzer Rolling Lift Bridge Co.
Shoemaker & Co., Lewis F.
Snare & Triest Co.
Virginia Bridge & Iron Co.
White & Co., J. G.

Bridges, Second Hand.
Johann, F. A.

Bridge Timber—(See Timber).

Bronze.
Brady Brass Co.
Damascus Bronze Co.
Lawrenceville Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Buckets, Automatic Grab.
Browning Engineering Co.
Link-Belt Co.

Bulldozers.
Ajax Mfg. Co.
Niles-Bement-Pond Co.
Williams, White & Co.

Bumping Posts.
Fairbanks, Morse & Co.
McCord & Co.
Mechanical Mfg. Co.

Cables, Electric.
Brixey, W. R.
General Electric Co.

Cableways.
Brown Hoisting Machinery Co.
Flory Mfg. Co., S.

Caboose, Jacks, Cast-Iron.
Dickinson, Inc., Paul.

Calculating Machines.
Kolesch & Co.

Car Axles—(See Axles).

Carborundum.
Carborundum Co.

Car Cleaner.
Ward-Packer Supply Co.

Car Closets.
Duner Co.

Car Couplers—(See Couplers).

Car Curtains.
Curtain Supply Co.
General Railway Supply Co.
National Lock Washer Co.
Pantasote Co.

Car Doors.
Ostermann Mfg. Co.
U. S. Metal & Mfg. Co.
Western Railway Equipment Co.

Car Flooring.
American Mason Safety Tread Co.
General Railway Supply Co.
Wood, Guilford S.

Car Heating.
Chicago Car Heating Co.
Consolidated Car-Heating Co.
Franklin Railway Supply Co.
Gold Car Heating & Lighting Co.
Johns-Manville Co., H. W.
Safety Car Heating & Lighting Co.

Car Lighting.
Bliss Electric Car Lighting Co.
Commercial Acetylene Co.
Electric Storage Battery Co.
General Electric Co.
Gold Car Heating & Lighting Co.
Safety Car Heating & Lighting Co.

Carlines, Pressed Steel.
Cleveland Car Specialty Co.

Car Movers.
Appleton Car Mover Co.
Fairbanks, Morse & Co.
Hubbard & Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Platforms, Steel.
Commonwealth Steel Co.
Standard Coupler Co.

Car Repair Material, Second-Hand.
Jennings, Geo. W.

Car Replacers.
Buda Foundry & Mfg. Co.
Kalamazoo Ry. Supply Co.
U. S. Metal & Mfg. Co.

Car Roofing.
Asbestos Protected Metal Co.
Bird & Son, F. W.
Bunker, Ed. A.
Chicago-Cleveland Car Roofing Co.
Drake & Weirs Co., The.
Excelsior Car Roof Co.
General Railway Supply Co.
Johns-Manville Co., H. W.
Standard Paint Co.
Standard Ry. Equipment Co.

Car Sills.
Carter Lumber Co.
Frost-Trigg Lumber Co.
Stone, F. B.

Car Trimmings.
Wood, G. S.

Car Trucks—(See Trucks).

Car Upholstery.
Aikman & Co., C. M.
Chase & Co., L. C.
Pantasote Co.
Collins & Aikman.

Car Wheels.
Barney & Smith Car Co.
Fairbanks, Morse & Co.
Griffin Wheel Co.
Krupp (Prosser & Son).
Lima Locomotive & Machine Co.
Lobdell Car Wheel Co.
Mt. Vernon Car Mfg. Co.
Railway Steel-Spring Co.
Standard Steel Works Co.
Wiener Co., Ernst.

Car Window Fixtures.
Curtain Supply Co.
Edwards Co., O. M.
General Railway Supply Co.
National Lock Washer Co.

Cars.
American Car & Equipment Co.
Atlantic Equipment Co.
Barney & Smith Car Co.
Bradley & Sons, O.
Buda Foundry & Mfg. Co.
Cincinnati Equipment Co.
Climax Mfg. Co.
Continental Car and Equipment Co.
Fairbanks, Morse & Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
German-American Car Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Hotchkiss, Blue & Co.
Illinois Car Co.
Lima Locomotive & Machine Co.
McGuire-Cummings Mfg. Co.
Middletown Car Works.
Milwaukee Car Mfg. Co.
Mt. Vernon Car Mfg. Co.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Ralston Steel Car Co.
Rodger Ballast Car Co.
Russell Car & Snow-Plow Co.
Standard Steel Car Co.
White Enamel Refrigerator Co.

Cars, Ballast.
Continental Car & Equipment Co.
Fairbanks, Morse & Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Males Co.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Rodger Ballast Car Co.
Standard Steel Car Co.

Cars, Dump.
Cincinnati Equipment Co.
Continental Car & Equipment Co.
Goodwin Car Co.
Hicks Locomotive & Car Works.
Hunt Co., C. W.
Jeffrey Mfg. Co.
Lima Locomotive & Machine Co.
Milwaukee Car Mfg. Co.
Oliver Mfg. Co., Wm. J.
Ostermann Mfg. Co.
Pressed Steel Car Co.
Ralston Steel Car Co.
Rodger Ballast Car Co.
Russell Car & Snow-Plow Co.
Standard Steel Car Co.
Wiener Co., Ernst.
Wonham & Magor.

Cars, Inspection.
Buda Foundry & Mfg. Co
Fairbanks, Morse & Co.
General Electric Co.
Kalamazoo Railway Supply Co.
Kenly Co., W. K.
Light Inspection Car Co.
Stover Motor Car Co.
Wiener Co., Ernst

Cars, Logging.
Buda Foundry & Mfg. Co.
Continental Car & Equipment Co.
Wiener Co., Ernst.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Cars, Rebuilt.
American Car & Equipment Co.
Atlantic Equipment Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
Hicks Locomotive & Car Works.
Illinois Car Co.
Males Co.
Milwaukee Car Mfg. Co.
Ostermann Mfg. Co.

Cars, Second-Hand.
American Car & Equipment Co.
Atlantic Equipment Co.
Beatty, W. R.
Cincinnati Equipment Co.
Fitz-Hugh, Luther Co.
Georgia Car Co.
Johann, F. A.
Males Co.
Milwaukee Car Mfg. Co.
Ostermann Mfg. Co.
Ralston, C. A.
Southern Iron & Equipment Co.
Wilson & Co., E. H.
Zelnicker Supply Co., Walter A.

Cars, Tip.
Continental Car & Equipment Co.
Hunt Co., C. W.
Jeffrey Mfg. Co.
Link-Belt Co.
Whiting Foundry Equipment Co.
Wiener Co., Ernst.

Castings, Brass.
Brady Brass Co.
Continental Car & Equipment Co.
Damascus Bronze Co.
Lawrenceville Bronze Co.
Magnus Metal Co.
More-Jones Brass & Metal Co.
National-Fulton Brass Mfg. Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corporation.

Castings, Iron and Steel.
American Brake Shoe & Fdy. Co.
American Steel Foundries.
Atha Steel Casting Co.
Barney & Smith Car Co.
Buckeye Steel Castings Co.
Bucyrus Steel Castings Co.
Commonwealth Steel Co.
Gould Coupler Co.
Hunt-Spiller Mfg. Corporation.
Krupp (Prosser & Son).
National Malleable Castings Co.
Ramapo Iron Works.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Works Co.
Vulcan Steam Shovel Co.

Castings, Malleable Iron.
Beaver Dam Malleable Iron Co.
Buckeye Steel Castings Co.
Dayton Malleable Iron Co.
Gould Coupler Co.
Illinois Malleable Iron Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Northwestern Malleable Iron Co.
Pratt & Letchworth Co.
Q. & C. Co.
Simmons Co., John.
Union Malleable Iron Co.

Cattle Guards.
American Bridge Co.
Buda Foundry & Mfg. Co.
Cook's Standard Tool Co.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.
Railroad Supply Co.

Cement.
Franklin Mfg. Co.
Johns-Manville Co., H. W.
Q. & C. Co.

Cement Machinery.
Krupp (Prosser & Son).
Link-Belt Co.
Vulcan Iron Works.

Cement, Metallic.
Smooth-On Mfg. Co.

Cement, Testing.
Hunt & Co., Robt. W.
Lehigh Valley Testing Laboratory.
Pittsburgh Testing Laboratory.

Center Bearings.
General Railway Supply Co.

Centering Machines.
Niles-Bement-Pond Co.

Central Power Plants.
Arnold Co., The.

Chains.
Carter Iron Co.
Link-Belt Co.
Murphy & Co., Christopher.

Charcoal Iron.
Parkesburg Iron Co.

Chemists.
Am. Bureau of Inspec. & Tests.
Dearborn Drug & Chemical Works.
Gulick-Henderson & Co.
Hunt Co., Robert W., The.
Jewell Engineering Co.
Pittsburgh Testing Laboratory.

Chimneys and Ventilators, Cast Iron.
Dickinson, Inc., Paul.

Chimneys for Headlights.
Star Headlight Co.
Storrs Mica Co.

Chisel Holders, Blacksmiths'.
Macleod & Co., Walter.

Chucks.
American Specialty Co.
Niles-Bement-Pond Co.
Standard Tool Co.

Clay Pipe.
Evens & Howard Fire Brick Co.

Claw Bars.
Jeffrey Mfg. Co.

Coal, Ash and Ore Handling Machinery.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Darley Engineering Co.
Fairbanks, Morse & Co.
Flory Mfg. Co., S.
Hunt Co., C. W.
Industrial Works.
Interstate Engineering Co.
Jeffrey Mfg. Co.
King Bridge Co.
Link-Belt Co.
Marion Steam Shovel Co.
McMyler Mfg. Co.
Mundy, J. S.
Northern Engineering Works.
Roberts & Schaefer Co.
Robins Conveying Belt Co.
Vulcan Iron Works.
Vulcan Steam Shovel Co.
Williams, White & Co.

Cocks, Iron and Brass.
National Tube Co.

Cold Storage.
Interstate Engineering Co.
Standard Asphalt & Rubber Co.

Concrete Mixers.
Fairbanks, Morse & Co.
Interstate Engineering Co.
Jeffrey Mfg. Co.

Concrete Reinforcement—(See Reinforced Concrete).

Conduits.
Evens & Howard Fire Brick Co.
Johns-Manville Co., H. W.
Wyckoff Pipe & Creosoting Co.

Conduits, Metal Flexible.
Franklin Railway Supply Co.

Consulting Engineers—(See Engineers).

Contractors.
Arnold Company.
Snare & Triest Co.
White & Co., James G.

Contractors' Machinery.
American Hoist & Derrick Co.
Atlantic Equipment Co.
Block-Pollak Iron Co.
Browning Engineering Co.
Bucyrus Co.
Carlin's Sons Co., Thomas.
Davenport Locomotive Works.
Fairbanks, Morse & Co.
Flory Mfg. Co., The S.
Hicks Locomotive & Car Works.
Industrial Works.
Jeffrey Mfg. Co.
Males Co.
Marion Steam Shovel Co.
Mundy, J. S.
Porter Co., H. K.
Robins Conveying Belt Co.
Rodger Ballast Car Co.
Standard Asphalt & Rubber Co.
Vulcan Steam Shovel Co.
Wiener Co., Ernst.

Copper.
Murphy & Co., Christopher.

Cordage.
Johns-Manville Co., H. W.
Samson Cordage Works.

Corrugated Bars.
Corrugated Bar Co.
Jones & Laughlin Co.

Correspondence Schools.
International Corresp. Schools.

Cotters.
Standard Tool Co.
Niles-Bement-Pond Co.

Counters, Automatic.
Veeder Mfg. Co.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Dayton Malleable Iron Co.
Franklin Railway Supply Co.
Gould Coupler Co.
Latrobe Steel & Coupler Co.
McConway & Torley Co.
National Malleable Castings Co.
Railroad Supply Co.
Standard Coupler Co.
Western Railway Equipment Co.

Covering, Pipe and Boiler.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Cranes.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Bucyrus Co.
Case Mfg. Co.
Chicago Pneumatic Tool Co.
Industrial Works.
Interstate Engineering Co.
King Bridge Co.
Link-Belt Co.
Manning, Maxwell & Moore (Inc.).
McMyler Mfg. Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Sellers & Co., Wm.
Whiting Foundry Equipment Co.
Wood & Co., R. D.

Cranes, Locomotive.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Industrial Works.
Interstate Engineering Co.
Link-Belt Co.
Manning, Maxwell & Moore (Inc.).
McMyler Mfg. Co.
Morgan Engineering Co.
Northern Engineering Works.
Whiting Foundry Equipment Co.

Crank Pins.
Krupp (Prosser & Son).

Creosoting.
American Creosote Works.
Barber Asphalt Paving Co.
International Creos. & Constn. Co.
National Lumber & Creosoting Co.
Percival Wood Preserving Co.
West Pascagoula Creosoting Works.
Wyckoff Pipe & Creosoting Co.

Creosoting Cylinders.
Petroleum Iron Works Co.

Crossarms.
American Creosote Works.
Barber Asphalt Paving Co.
Baxter & Co., G. S.
National Lumber & Creosoting Co.
Wyckoff Pipe & Creosoting Co.

Crossing Gates.
Buda Fdy. & Mfg. Co.
Railroad Supply Co.

Crossings—(See Frogs and Crossings).

Crossing Signals.
Federal Signal Co.
General Railway Signal Co.
Hall Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.

Crucibles.
McCullough-Dalzell Crucible Co.

Crushers and Pulverizers.
Jeffrey Mfg. Co.
Krupp (Prosser & Son).

Culvert Pipe, Clay.
Evens & Howard Fire Brick Co.

Cupola Blocks.
Evens & Howard Fire Brick Co.

Cupolas, Foundry.
Northern Engineering Works.
Whiting Foundry Equipment Co.

Curtains and Fixtures—(See Car Curtains).

Derails.
Buda Foundry & Mfg. Co.
Fairbanks, Morse & Co.
Kilby Frog & Switch Co.

Derricks and Derrick Outfits.
American Hoist & Derrick Co.
Industrial Works.

Despatching Systems, Telephone.
Western Electric Co.

Ditching and Excavating Machinery.
American Hoist & Derrick Co.
Browning Engineering Co.
Bucyrus Co.
Carlin's Sons Co., Thos.

Fairbanks, Morse & Co.
Flory Mfg. Co., The S.
Hicks Locomotive & Car Works.
Industrial Works.
Jeffrey Mfg. Co.
Males Co.
Marion Steam Shovel Co.
Mundy, J. S.
Robins Conveying Belt Co.
Standard Asphalt & Rubber Co.
Vulcan Steam Shovel Co.
Wiener Co., Ernst.

Doors, Extension Platform Trap.
Edwards Co., O. M.
General Railway Supply Co.

Doors, Folding.
Ritter Folding Door Co.
Wilson Mfg. Co., J. G.

Doors, Steel Rolling.
Kinnear Mfg. Co.
Wilson Mfg. Co., J. G.

Door Stops and Holders.
Edwards Co., O. M.

Draft Rigging and Attachments.
Butler Drawbar Attachment Co.
Cardwell Mfg. Co.
Commonwealth Steel Co.
Dayton Malleable Iron Co.
Farlow Draft Gear Co.
Franklin Railway Supply Co.
Gould Coupler Co.
McCord & Co.
Miner Co., W. H.
Standard Coupler Co.
U. S. Metal & Mfg. Co.
Ward-Packer Supply Co.
Western Railway Equipment Co.
Westinghouse Air Brake Co.

Drawbridge Machinery.
Fairbanks, Morse & Co.
Nichols & Bro., Geo. P.

Drawing Materials.
Higgins & Co., Chas. M.
Kolesch & Co.

Dredges.
Atlantic Equipment Co.
Bucyrus Co.
Industrial Works.
Jeffrey Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Vulcan Steam Shovel Co.

Drill Chucks—(See Chucks).

Drilling Machines.
Ajax Mfg. Co.
American Tool Works Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Drills.
American Specialty Co.
Niles-Bement-Pond Co.
Standard Tool Co.

Drills, Pneumatic—(See Pneumatic Tools).

Drills, Rock—(See Rock Drills).

Drill Sockets.
American Specialty Co.

Driving Wheel Centers.
American Steel Foundries.
Commonwealth Steel Co.
Hunt-Spiller Mfg. Corporation.
Krupp (Prosser & Son).
Pratt & Letchworth Co.
Scullin-Gallagher Iron & Steel Co.
Standard Steel Works Co.

Driving Wheel Lathes.
Niles-Bement-Pond Co.
Sellers & Co., Incorp., Wm.

Drop Hammers—(See Hammers, Drop).

Drying Apparatus.
American Blower Co.
Indiana Foundry Co., Ltd.

Dry Kilns.
American Blower Co.

Dump Cars—(See Cars, Dump).

Dust Collectors.
American Blower Co.
Macleod & Co., Walter.

DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

Dust Guards.
Franklin Mfg. Co.
Franklin Railway Supply Co.
Gould Coupler Co.
Harrison Dust Guard Co.
Symington Co., T. H.

Dynamos.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
General Electric Co.
Northern Electrical Mfg. Co.
Ridgway Dynamo & Eng. Co.
Rushmore Dynamo Works.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.

Electric Batteries—(See Batteries, Electric).

Electric Grinders.
Independent Pneumatic Tool Co.
Niles-Bement-Pond Co.
Northern Electrical Mfg. Co.

Electric Headlights.
Pyle National Elec. Headlight Co.
Rushmore Dynamo Works.

Electric Heating—(See Car Heating).

Electric Hoists—(See Hoists, Electric).

Electric Lighting & Power.
Arnold Co.
Crocker-Wheeler Co.
Electric Controller & Mfg. Co.
General Electric Co.
Gould Storage Battery Co.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.

Elevators—(See Hoisting and Conveying Machinery).

Engineering Instruments.
Kolesch & Co.

Engineers, Civil, Consulting and Contracting.
Am. Bureau of Inspn. & Tests.
Arnold Co.
Bogue, V. G.
Dodge & Day.
Edwards & Zook.
Fowler, Geo. L.
Interstate Engineering Co.
Jewell Engineering Co.
Keith, Herbert C.
Link-Belt Co.
Lovell, Alfred
Lucius, Albert.
Moreno, C. A.
Murphy, J. F.
Northern Electrical Mfg. Co.
Pittsburgh Testing Laboratory.
Stone & Webster Engrng. Corp.
Virginia Bridge & Iron Co.
Webster, William R.
Westinghouse, Church, Kerr & Co.
White & Co., J. G.
Whiting Foundry Equipment Co.

Engines.
American Blower Co.
Brown Hoisting Machinery Co.
Carlin's Sons Co., Thomas.
Erie Pump & Engine Co.
Flory Mfg. Co., The S.
Hannoversche Masch.-Actien-Ges'aft
Independent Pneumatic Tool Co.
Mundy, J. S.
Ridgway Dynamo & Engine Co.
Vulcan Steam Shovel Co.

Engravers.
Ringler Co., F. A.

Excavators.
Industrial Works.
Marion Steam Shovel Co.
Thew Automatic Shovel Co.
Vulcan Steam Shovel Co.

Exhaust Fans.
American Blower Co.
Crocker-Wheeler Co.
General Electric Co.
Sirocco Engineering Co.

Expanded Metal.
Corrugated Bar Co.
Jones & Laughlin Co.

Extension Platform Trap Doors—(See Doors, Extension Platform Trap).

Eye Benders.
Williams, White & Co.

Fans, Exhaust and Ventilating—(See Exhaust Fans).

Fence Posts—(See Poles and Posts).

Files.
Nicholson File Co.

Filters—(See Water Filters).

Fire Box Steel.
Worth Bros Co.

Fire Brick.
Evens & Howard Fire Brick Co.

Fire Clay.
Carborundum Co.
Evens & Howard Fire Brick Co.

Fire Door Opener, Pneumatic.
Franklin Railway Supply Co.

Fireproof Construction Material.
Asbestos Protected Metal Co.
Corrugated Bar Co.
Franklin Mfg. Co.
Johns-Manville Co., H. W.

Fittings, Cast and Malleable Iron.
National Tube Co.

Flat Keys.
Standard Tool Co.

Flexible Joints, Steam, Air, Liquid.
Franklin Railway Supply Co.
Moran Flexible Joint Co.

Flooring Composition.
General Railway Supply Co.

Flue Cutters.
Faessler Mfg. Co.
Independent Pneumatic Tool Co.
Murphy & Co., Christopher.

Flue Expanders.
Faessler Mfg. Co., J.
Independent Pneumatic Tool Co.
Krupp (Prosser & Son).
Niles-Bement-Pond Co.

Flue Welders, Pneumatic.
Draper Mfg. Co.

Flue Welding Furnaces.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Railway Materials Co.
Rockwell Furnace Co.

Flue Welding Machines.
Macleod & Co., Walter.

Flue Welding Tools.
Davis-Bournonville Co.

Forges.
Monarch Engineering & Mfg. Co.
Independent Pneumatic Tool Co.

Forging Machines.
Acme Machinery Co.
Ajax Mfg. Co.
Monarch Engineering & Mfg. Co.
Niles-Bement-Pond Co.
Williams, White & Co.

Forgings.
Barney & Smith Car Co.
Braeburn Steel Co.
Cleveland City Forge & Iron Co.
Georgia Car Co.
Goldschmidt Thermit Co.
Gould Coupler Co.
Krupp (Prosser & Son).
Manganese Steel Rail Co.
McGuire-Cummings Mfg. Co.
McInnes Steel Co., Ltd.
Middletown Car Works.
Mt. Vernon Car Mfg. Co.
Pittsburgh Forge & Iron Co.
Standard Steel Works Co.
Steel Car Forge Co.
Stoever Foundry & Mfg. Co.
Transue & Williams Co.
Vulcan Steam Shovel Co.

Foundry Equipment.
Hunt Co., C. W.
Monarch Engineering & Mfg. Co.
McCullough-Dalzell Crucible Co.
Whiting Foundry Equipment Co.
Wiener Co., Ernst.

Freight House Doors—(See Doors, Steel Rolling, and Doors, Folding).

Friction Buffers.
Gould Coupler Co.
Westinghouse Air Brake Co.

Frogs and Crossings.
Ajax Forge Co.
American Frog & Switch Co.
Buda Foundry & Mfg. Co.
Cleveland Frog & Crossing Co.
Conley Frog & Switch Co.
Continuous Rail & Safety Switch Co.
Elliot Frog & Switch Co.
Fairbanks, Morse & Co.
Indianapolis Switch & Frog Co.
Kilby Frog & Switch Co.
Krupp (Prosser & Son).
Morden Frog & Crossing Works.
New York Switch & Crossing Co.
Pettibone, Mulliken & Co.
Railway Specialty & Supply Co.
Ramapo Iron Works.
Union Switch & Signal Co.
Wiener Co., Ernst.

Furnaces, Annealing.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Billet Heading.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Bolt Heading.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Brazing.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Case Hardening.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Forging.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Hardening.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Lead Melting, Oil Fuel.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Liquid Fuel.
Monarch Engineering & Mfg. Co.
Railway Materials Co.
Rockwell Furnace Co.
Tate, Jones & Co.
Whiting Foundry Equipment. Co.

Furnaces, Metal Melting, Oil Fuel.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Plate Heating.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Scrap Melting.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Tempering.
Macleod & Co., Walter.
Monarch Engineering & Mfg. Co.
Rockwell Furnace Co.

Furnaces, Welding.
Macleod & Co., Walter.
Monarch Enginering & Mfg. Co.
Rockwell Furnace Co.

Gages.
Ashton Valve Co.
Crosby Steam Gage & Valve Co.
Niles-Bement-Pond Co.
Star Brass Mfg. Co.

Gas and Gasoline Engines.
Fairbanks,, Morse & Co.
Kalamazoo Railway Supply Co.
Otto Gas Engine Works.
Stover Motor Car Co.

Gas Holders.
Petroleum Iron Works Co.

Gaskets.
Johns-Manville Co., H. W.
McCord & Co.
Power Specialty Co.

Gasoline Motor Cars—(See Inspection Cars).

Gates, Railroad Crossing—(See Crossing Gates).

Gear Cutters.
Niles-Bement-Pond Co.

Gears and Pinions.
Atha Steel Casting Co.
Link-Belt Co.

Glue.
Baeder, Adamson & Co.

Gongs, Seamless Steel.
National Tube Co.

Governors.
Gardner Governor Co.

Grain Doors.
McGuire-Cummings Mfg. Co.

Grease, Lubricant.
Dixon Crucible Co., Joseph.

Graphite & Graphite Paint.
Detroit Graphite Co.
Dixon Crucible Co., Jos.
Detroit White Lead Works.
National Paint Works.
Sherwin-Williams Co., The.

Graphite Lubricant.
Dixon Crucible Co., Joseph.
Galena-Signal Oil Co.

Greenhouses.
Lord & Burnham Co.

Grinders, Portable Tool.
Buda Foundry & Mfg. Co.
Cook's Standard Tool Co.
Independent Pneumatic Tool Co.

Grinding Machines.
Buda Foundry & Mfg. Co.
Cook's Standard Tool Co.
Independent Pneumatic Tool Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.

Grinding Wheels.
Carborundum Co.

Grip Nuts.
Grip Nut Co.

Grip Sockets.
Standard Tool Co.

Hair Felt, Etc.
Baeder, Adamson & Co.

Hammers, Drop.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Sellers & Co., Inc., Wm.
United Engineering & Foundry Co.
Williams, White & Co.

Hammers, Electric.
Buda Foundry & Mfg. Co.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.
Northern Electrical Mfg. Co.

Hammers, Power.
Independent Pneumatic Tool Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
The Pittsburg Pneumatic Co.
United Engineering & Foundry Co.
Williams, White & Co.

Hand Cars.
Fairbanks, Morse & Co.
Georgia Car Co.
Kalamazoo Railway Supply Co.
Kenly Co., W. K.
Lima Locomotive & Machine Co.
Wiener Co., Ernst.

Hat Racks, Extension.
Rostand Mfg. Co.

Headlight Chimneys.
Storrs Mica Co.

Headlights.
Anderson-Lacy Elect. Headlight Co.
Macleod & Co., Walter.
Pyle Nat'l Electric Headlight Co.
Rushmore Dynamo Works.
Star Headlight Co.

Headlights, Acetylene.
Macleod & Co., Walter.

Heaters, Portable.
Macleod & Co., Walter.

Heating and Ventilating.
American Blower Co.
Sirocco Engineering Co.
Westinghouse, Church, Kerr & Co.
Yale & Co., Julian L.

Hoisting and Conveying Machinery.
American Hoist & Derrick Co.
Boston & Lockport Block Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Carlin's Sons Co., Thos.
Case Mfg. Co.
Darley Engineering Co.
Fairbanks, Morse & Co.
Flory Mfg. Co., The S.
Hunt Co., C. W.
Industrial Works.
Interstate Engineering Co.
Jeffrey Mfg. Co.
Link-Belt Co.
McMyler Mfg. Co.
Mundy, J. S.
Niles-Bement-Pond Co.
Northern Engineering Works.
Roberts & Schaefer Co.
Robins Conveying Belt Co.
Vulcan Iron Works.

Hoisting and Pumping Engines.
American Hoist & Derrick Co.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Bucyrus Co.
Fairbanks, Morse & Co.
Flory Mfg. Co., S.
Hunt Co., C. W.
Industrial Works.
Mundy, J. S.
Otto Gas Engine Works.
Vulcan Iron Works.
Vulcan Steam Shovel Co.

Hoists, Electric.
American Hoist & Derrick Co.
Case Mfg. Co.
Crocker-Wheeler Co.
Flory Mfg. Co., S.
General Electric Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Vulcan Iron Works.
Whiting Foundry Equipment Co.
Yale & Towne Mfg. Co.

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CONTENTS

We print this week the final instalment of Mr. Williams' admirably lucid paper on railway capital and values, which shows a little better than anybody else has shown how meaningless the craze for valuation is. Apart from the main contentions, which are well summarized, we wish especially to call attention to the paragraph which comments on Professor Adams' foolish depreciation accounting:

> If the Commission maintains its plan, and it be sustained, then the investment of new capital for reduction of expenses will be discontinued and it will only be employed for purposes that will increase the gross revenue.

We contemplate introducing a bill to require the Commission to repeat this solemn truth in unison at the commencement of each day's session.

As might have been foreseen the "multiple charter" issue has brought the final tribunals of Massachusetts and Connecticut into a butting collision. Whittling down to its pith the legal situation and its verbiage, the New York, New Haven & Hartford a few months ago "set up" a suit in which it asked the Supreme Court of Connecticut whether, the law of Massachusetts to the contrary notwithstanding, it, by a Connecticut corporation, could guarantee a security of the Massachusetts company which controlled the New Haven's Massachusetts trolleys. Stated more broadly the case at bar was whether the New Haven's Massachusetts charter gave that state general jurisdiction over the New Haven's acts. The Massachusetts Supreme Court, in effect, had said "yes." The Connecticut Supreme Court now says "no," and sanctions the guarantee of the holding company's security. On the face of the thing there is a legal deadlock, but with the New Haven corporation entrenched more strongly than ever behind its legal breastworks. In the fog of litigation over the status of the Massachusetts trolleys and the Boston & Maine merger the layman hesitates to tread, but it looks as though the only final outcome of a judicial character might be through the federal court of highest resort. That is a long and devious legal pathway and common sense suggests such positive legislation in Massachusetts as will cut the Gordian knot of litigation. For two years the trolleys and the merger have been snarled up in and between the legislature and the courts, and one would think that even the *quasi* sovereignty of the state of Massachusetts would begin to get tired and yield somewhat of its dignity to the situation and the facts.

PROTECTIVE COATINGS FOR STRUCTURAL MATERIAL.

The work of scientific and technical societies which has been directed to the discovery of the cause and prevention of the corrosion of iron and steel, has suggested that oxidizing agents, such as chromium compounds, might prove useful if intelligently applied, but thus far there has been little accomplished in the production of preventive pigments made on this principle. One useful suggestion is found in a paper on Protective Coatings for Structural Material, by R. S. Perry, presented at the meeting of the Western Society of Engineers, April 21, 1909. In shipping structural material and some parts of machinery they are exposed to sulphur gases from the locomotive and moisture from rain and fog, and it is desirable to give them a protective coating so that corrosion will not set in before the finishing paint is applied. The usual practice is to swab the metal with crude oil, or dip it in hot linseed or other drying oil, or by applying cheap paints as slop coats. Mr. Perry points out the objection to this practice as follows: "The crude oil leaves upon the surface of the metal, even after wiping, a quantity of non-drying mineral oil which interferes with the drying of the paint coat, which is afterward applied at the time of the assembling of the metal. It also prevents the paint coat from properly adhering to the steel surface, and this coat of crude non-drying oil, which still exists between the metal and the paint coat, is a source of never-ending trouble, causing peeling and shriveling. This crude oil treatment, therefore, should be avoided whenever it is intended that the steel is to be subsequently painted with oil paints. Where linseed oil instead of crude oil is used, a film of the oil is left upon the metal and rapidly oxidizes to a coast of linoxyn. This coat will protect the metal for a certain period of time, but is extremely porous and ultimately admits moisture. If, within this coating of linseed oil, there had been contained a proportion of pigment, or if the linseed oil had been developed by gums into a varnish or lacquer, then the excluding properties of the linseed oil would have been increased, and, if the formula were inhibitive in nature, the steel would be better protected from corrosion, and the application of future coats of paints, after assembling the steel, would have been practical and facilitated." He also recommends a new method, which is the first suggestion we have seen in which there is a practical application of chromium compounds for preventing corrosion. It is as follows: "It is sometimes desired to give to steel a thin adherent protective coating that is transparent and will allow of the inspection of the steel by the engineer, who desires to observe whether the metal is absolutely clean and free from rust before proceeding with the painting thereof. In a case like this, there is required a coating of oil containing

materials which will not interfere with the transparency of the oil coat and which, at the same time, are thoroughly inhibitive in nature. Such a compound may be prepared by the use of chromium compounds soluble in linseed oil, such as chromium resinate or chromium linoleate. By the use of these materials within an oil coat thorough inhibition is obtained, and at the same time there is added the excluding properties which these compounds afford. A thoroughly inhibitive and transparent coating is thus formed and is of most practical use. A paint coat applied to steel protected by this inhibitive oil coat amalgamates with the oil coat and becomes an integral part thereof, rendering at the same time the oil paint thoroughly inhibitive and causing close adherence to the metal surface."

GOVERNMENT RAILWAYS OF CANADA.

The Intercolonial, the Windsor Branch (maintained only and leased for operation) and the Prince Edward Island Railway are the government railways of Canada. The gross earnings of these roads for the 12 months, April 1, 1907, to March 31, 1908, amounted to $9,534,569, and operating expenses were $9,595,295, which leaves a loss from operation of $60,726. It must be remembered that this loss from operation is an entirely different figure from a deficit shown on a privately operated road after the payment of fixed charges. On the government railways there has been no charge whatsoever for interest on capital expenditure on the roads. As the total mileage operated of the three roads is 1,748 miles, and the Intercolonial has a mileage of 1,449, it is sufficient to examine the report of this road by itself.

Gross earnings for the year amounted to $9,173,559, and total operating expenses were $9,157,436, leaving net earnings of $16,123. This unprofitable result was not caused by a bad business year, for earnings last year were $867,575 greater than in the preceding 12 months, and both the number of passengers and the number of tons of freight carried were greater last year than in the previous year. Since operating expenses consumed nearly 100 per cent. of earnings, it is interesting to see how they are divided. Maintenance of way and structures cost $1,630,965, or $1,126 per mile of line. In itself, this is not an excessive figure, but it is high for the territory served. Maintenance of equipment cost $1,996,389. The unit costs are shown in the following table:

	1908.
Repairs and renewals, per locomotive...........	$2,117
" " " " passenger car	715
" " " " freight car	54

The expenses are so divided as to fall under four general heads: Maintenance of way and structures, which consumed 17.78 per cent. of gross earnings; maintenance of equipment, which consumed 21.76 per cent.; conducting transportation, which consumed 57.56 per cent., and general expenses, which consumed 2.72 per cent. It will be seen that maintenance expenses consumed a considerably greater portion of gross revenue on the Intercolonial than on the majority of even fairly well-managed, privately owned roads in the United States, but conducting transportation cost more than total operating expenses do on a number of roads in the United States.

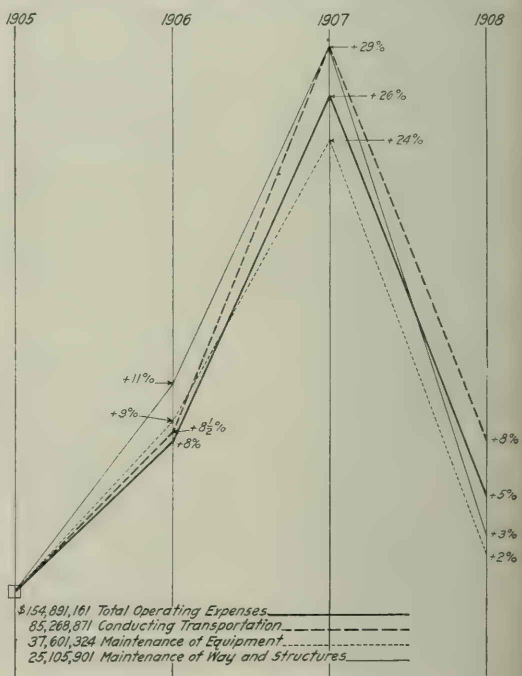
Products of mines, products of forests and manufactured goods, including rails, are the three classes of traffic which furnish the greatest tonnage. Each one of them furnished last year over 1,000,000 tons of freight, the products of mines furnishing the greatest, this tonnage totaling 1,371,280 tons. Under the head of products of forests it is interesting to note that 286,242 tons of the total tonnage of 1,151,923 was tons of pulp wood.

Freight statistics show that the average train load of revenue freight was 228 tons in 1908 as compared with 224 tons in 1907, and the average distance each ton was carried was 253 miles last year and 260 miles in the previous year. The average rate per ton per mile, which is not given in the report of the Department of Railways and Canals, but which is obtained by multiplying the total revenue freight tonnage by the average haul per ton and dividing this into the total freight revenue, is 0.58 cents.

The annual report of the Department of Railways and Canals from which these figures have been obtained does not give any general condensed balance sheet for the Intercolonial Railway such as is given in most annual reports of railways in the United States, but it does state that during the fiscal year ended March 31, 1908, there was spent on the Intercolonial, $4,382,494 and charged to capital account. The total capital expenditure on the whole road, together with the acquired Canada Eastern, has been $87,127,432, which sum is apparently not earning any interest charges at all. The study of these figures and others given in the annual report referred to should be of interest to any one who advocates government ownership, especially if he bear in mind that in general there is much less graft, honest of otherwise, under British party government than in the United States.

OPERATING RESULTS IN 1908.

Some months ago we commented on the unfairness of the Interstate Commerce Commission in seeking to minimize in the eyes of the country the effect of the hard times upon railway earnings. The Commission took the 1908 fiscal year, ended June 30, and compared it with the 1907 fiscal year,

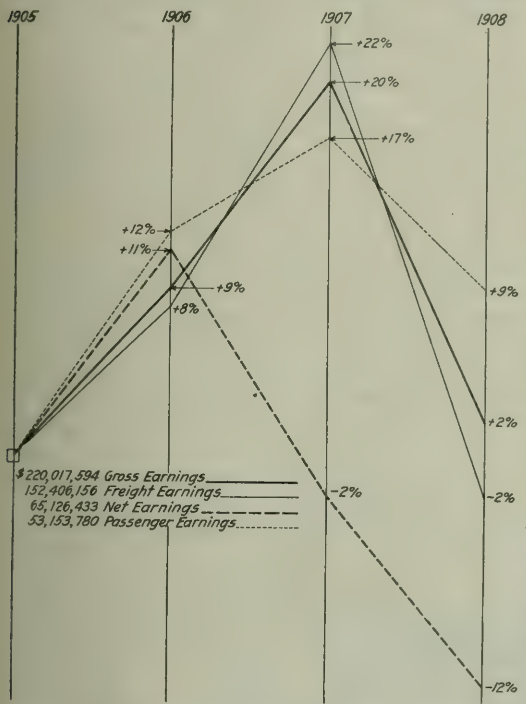


Operating Expenses of the Pennsylvania and the New York Central—Percentages of Increase from 1905 as a Base.

thereby mixing half a year of extraordinarily good times with half a year of bad times, and announced with pride that the reduction in earnings for all the railways in the country amounted to only 6¾ per cent.

The reports of the Pennsylvania and the New York Central, covering the calendar year 1908 (not the June 30 year) are now at hand. It will be recalled that the effects of the panic

did not strike the railways in 1907 until well along in December, and in some cases the effects were postponed even longer than this. The 1908 calendar year, however, shows pretty well what happened to the roads. During that year the New York Central lost 9.7 per cent. of gross and the Pennsylvania lost 17.3 per cent. The comparative showing of the New York Central would have been even worse, except for the fact that



Earnings of the Pennsylvania and the New York Central—Percentages of Increase from 1905 as a Base.

the comparison is with 1907—a year when the road was much troubled by the temporary paralysis that seemed to affect its operation and management. In 1908 it turned over a new leaf, but lost almost 10 per cent. of gross earnings.

The accompanying diagrams are composites of the operating experiences of these two roads and show increases and decreases per cent. from the year ending December 31, 1905, as a base. The first thing that strikes the observer is that gross earnings, total freight earnings, and the cost of maintaining equipment, way and structures, are all within 3 per cent. of what they were in 1905; that is to say, that the actual business done by the roads was practically on a 1905 basis this last year, but it is very noteworthy that the cost of conducting transportation has not declined as fast as earnings or as the other items of expense, illustrating the effect of the wage increases during the prosperous years, not yet adjusted to existing conditions. Two other things are especially noteworthy about these diagrams; one of them is that net earnings are 12 per cent. below what they were in 1905 in spite of the extraordinary efforts of the roads to cut down all unnecessary costs. Fixed charges, payable from these net earnings, have of necessity increased.

The other interesting thing is the comparatively slow fluctuation of passenger traffic throughout the period. We have called attention before to the fact that passenger traffic neither rises as fast as freight traffic in times of prosperity nor falls as fast in times of adversity, but maintains a course which comes much closer to being constant than does freight business. The passenger earnings of the New York Central and the Pennsylvania, viewed as a combined system, were 9 per cent. better in 1908 than they were in 1905, and the greatest increase they reached in 1907 was 17 per cent. above 1905, whereas freight earnings went up to 22 per cent.

LOBBYING WITH THE PEOPLE.

At the recent sessions of the legislatures of Utah and Idaho bills were introduced to create state railway commissions with large powers, especially for the regulation of rates. The railways thought that these bills were unwise and concluded to oppose them. They had been denounced on similar occasions before for lobbying at the state capitals. The Harriman Lines decided on this occasion to carry their fight direct to the voters and to "lobby" openly with them against the proposed measures, and they waged for several weeks a unique "campaign of education" on the railway question.

J. A. Reeves, General Freight Agent, wrote the open letter, extracts from which we published in our issue of April 9, page 809. Then the General Freight Department of the Oregon Short Line issued and circulated widely a 26-page pamphlet entitled, "Railroad Rates; Some Explanations and Suggestions," which outlined clearly, simply and concisely the principles and methods of railway rate-making. Other open letters also were sent out. On August 10, 1908, the Beaumont (Texas) *Daily Journal* printed almost a page editorial on the "Increase of Interstate Rates," which described in detail the ill effects that Texas has suffered from the drastic policy of regulations in that state. The Harriman Lines had printed a photographic reproduction of the page on which this editorial appeared and gave it wide circulation in Idaho and Utah. Similar use was made of the paper read by E. W. McKenna, Vice-President of the Chicago, Milwaukee & St. Paul, before the Western Railway Club on October 20, 1908, entitled "A Constituency without Representation," and also of the following editorials which appeared in the *Railroad Age Gazette* on the dates named: "One View of Railroad Capitalization," and "The Growing Problem of Adjusting Rates to Conditions," June 26, 1908; "Protectionism and Railway Legislation," December 18, 1908; and "Commodity Values and Freight Rates," January 8, 1909. This is only a partial list of the literature which the Harriman Lines circulated much as political parties circulate campaign literature. The results were significant. The Utah Commission bill was defeated in the Senate by a vote of 12 to 4, and the Idaho bill was defeated in the House of Representatives by a vote of 37 to 14.

There is an important lesson in this for the railways in all parts of the United States. A good many railway men have doubted the ability of the so-called "plain people" to pass intelligently on railway questions. A good many have thought that the method of lobbying at the state and national capitals is less troublesome and surer. But this method, besides being in many instances mutually corrupting to railways and to politics, breaks down just when the roads most need protection against unjust and harmful regulation. No doubt it is true that the average business man or farmer has neither the time nor the ability to acquaint himself thoroughly with the complexities of railway rate-making and operation. But in the long run all the great public questions in this country are settled by the people. If the people do not understand them they will settle them unwisely. In proportion as they have correct information and ideas they will settle them less unwisely or more wisely. One reason why the regulation of railways in the past usually has been unwise and unfair is that those who know the most about the railway business commonly have given the least time and effort to enlightening others about it. Meantime those who thought they could profit by disseminating misinformation and fomenting public prejudice

have been active. The shipper who hoped to get more advantageous rates, and the politician who hoped to ride the storm of anti-railway agitation into office, has been untiring. If the results have been bad for the railways, those who have not done what they could to protect them are as much to blame as those who have done all they could to harm them.

The railway is private property. But it is engaged in a public service. Being engaged in a public service brings it into constant contact with the public and makes all it and its officers and employees do matters of peculiar public interest. Whether railway men enjoy it or not, the public will always continue to take a special interest in railway matters. The roads will be more rather than less in the spotlight in the future than heretofore. The method of trying to protect them against unfair regulation by exerting proper or improper influence on legislatures and commissions is a temporary device. It may keep one legislature or commission from passing unwise laws or issuing injurious orders, but it will not keep an anti-railway legislature from being elected at the next election or a radical commission from being created or chosen. On the other hand, fair rates, honest practices and efficient management, supplemented by continuing effort to conciliate and educate public sentiment, will enable the roads to withstand unfair agitation permanently. Railway managers will see the wisdom of making more and more use in future of the plan of campaign that the Harriman Lines found effective in Utah and Idaho.

TEXAS & PACIFIC.

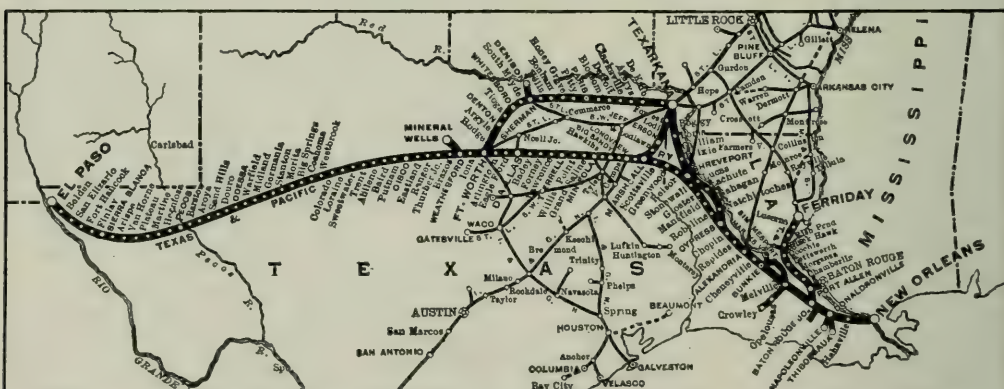
Of a total mileage of 1,885 miles operated in 1908 by the Texas & Pacific, 620 miles is known as the Rio Grande division. The division extends from Fort Worth, Tex., to El Paso, and when the property was taken over by the reorganization committee in 1887, considerable parts of this Rio Grande division were thought to be of questionable vallue. Since 1902, however, the country aong this line, especially in the Pecos valley region, has been rapidly developed, and land that was previously an absolute barren waste is now being put under cultivation and is yielding large crops of cotton and other produce. So closely is the development of the business of the railway connected with the development of the country through which it passes that the chief interest in the study of the property in 1908 lies in an examination of the conditions in southeastern Texas and southern Louisiana.

The crops were excellent last year as compared with 1907, and it is of course on the crops, especially on cotton, that the Texas & Pacific depends for a considerable part of its freight revenue. The tonnage of cotton carried by the railway last year totaled 200,000 bales as against 180,000 bales in the previous year. The tonnage of flour and miscellaneous agricultural products, as well as of live stock, increased. The cotton crop would have yielded probably a considerably greater tonnage but for the trouble experienced with the boll weevil in the Louisiana district. Notwithstanding the good crops, the general business depression caused a heavy decrease in the tonnage of manufactures and miscellaneous articles carried, and the annual report states that the transportation of this class of freight yields the greatest revenue, and the loss in revenue from this class was $829,156 last year.

Added to the misfortune of a bad business year there was the expense and damage caused by extraordinarily heavy rain storms, and it is estimated that the destruction caused by floods cost the Texas & Pacific $350,000 in earnings and $250,000 physically. From April to July some portion or portions of the company's lines were broken and traffic seriously interrupted.

The total operating revenues amounted to $13,900,000 last year as against $16,700,000 in the previous year, there being a decrease in revenue received from all sources, the decrease in freight revenue, however, being the most important. The receipts from this source were $9,400,000 in 1908 as against $11,300,000 in 1907, a decrease of 17 per cent. The falling off in freight revenue resulted from a decrease in tons of freight carried, which amounted to 8 per cent., and a decrease in the average haul from 212 miles in 1907 to 185 miles last year. It will be seen, therefore, that it was in what the Texas & Pacific calls its competitive or through freight tonnage that the greatest loss occurred. As a matter of fact, the local freight tonnage in 1908 was 2,600,000 tons, an increase of 19,000 tons, while the tonnage of competitive freight in 1908 was 2,400,000 tons, a decrease of 450,000 tons.

If the falling off in tonnage was in the best paying traffic, it seems rather surprising that the rate received per ton per mile increased, the rate being 1.03 cents in 1908 as against 0.99 cents in 1907; but this fact is probably accounted for by the shorter average haul, since, of course, freight is charged proportionately very much more for a short haul than for a long one.



Texas & Pacific.

For all that, expenses amounted to $10.300,000 last year as against $11.600,000 in 1907, so that the reduction in expenses was not proportional to the decrease in earnings, the Texas & Pacific made a very good showing last year in its expense account. The reduction in expenses came where it was most helpful and also where it showed the best management, that is, in transportation expenses. These expenses amounted to $5,700,000 last year as against $7.100,000 in the previous year and $6.000.000 in 1906. Maintenance of equipment decreased

slightly from 1907 figures, but the 1907 figures were materially larger than the figures for 1906. The total expense for maintenance of equipment last year was $2,200,000. Maintenance of way and structures cost $1,800,000, which is about $200,000 more than in 1907 and about $300,000 more than in 1906.

Cost of maintenance of way and structures per mile of first and second track (switch tracks and sidings being counted half) is shown in the following table. The table also shows the unit costs of maintenance of equipment:

	1908.	1907.
Maintenance of way, per mile........	819	752
Repairs, per locomotive..............	$2,005	$2,348
" " passenger car	801	1,041
" " freight car	56	63

During the last few years the Texas & Pacific has been spending considerable sums on the improvement of the roadbed and permanent way. Last year $304,800 was spent on this account, $100,000 of which was for ballast. The road probably needs all the expenditure for improvement that the company can afford. Of 1,925 miles of main track, 1,246 miles is laid with 75-lb. rails and 492 miles with 56-lb. rails. Twenty-one miles of 75-lb. rails were laid in track last year. It should be remembered, however, that an attempt to maintain roadbed of Pennsylvania standard in Texas country is as much of a mistake as it is to fail to maintain the roadbed in sufficiently good condition to economically handle the traffic offered. A road situated like the Texas & Pacific necessarily grows up with the country, and the fact that in the early days it was not much more than a streak of rust is nothing against it now.

Along with the other Gould roads, the Texas & Pacific is in need of money. It was not, however, in any more need of money on December 31, 1908, than on the same date in 1907, and that, after a year of business depression, is rather a good sign. Cash on hand amounted to $297.445 in 1908 as against $155,520 in 1907, and current assets totaled $2,113,613 last year as against $2,699,153 in the previous year. Current liabilities last year amounted to $8,320,085 as against $8.496,490 in the previous year. Both vouchers and payrolls unpaid and sums due other roads are somewhat less this year than last year, but the floating debt of bills payable has increased by about $700,000, being $5,865,398 last year. If the company can satisfactorily fund this floating debt it should be in a good position. Capital stock has been issued to the extent of $20,564 per mile, and bonded debt amounts to $30,658 per mile of line owned. There are obligatory interest charges of $836 per mile owned and conditional charges of $697, making a total of $1,533. The net revenue per mile of road owned last year amounted to $1,712, which leaves $179 earned per mile after the payment of obligatory and conditional charges.

The following table shows the results of operation for the years 1908 and 1907:

	1908.	1907.
Average mileage operated	1.885	1,885
Freight revenue	$9.401.569	$11.273.331
Passenger revenue	3,568,420	4,088,132
Total operating revenue	13,917,315	16,671,668
Maint. way and structures.	1,800,898	1,655,856
Maint. of equipment	2,171,407	2,245,957
Traffic	190,207	100,033
Transportation	5,735,105	7,145,760
Total operating expenses.....	10,288,808	11,577,940
Taxes	558,428	604,100
Net revenue	3,070,079	4,489,628
Improvement and equipment..	905,588	2,226,736
Surplus	342,071	940,720

GRAND RAPIDS & INDIANA.

The Grand Rapids & Indiana is controlled by the Pennsylvania Company, but operated separately. The Cincinnati, Richmond & Fort Wayne, the Muskegon, Grand Rapids & Indiana and the Traverse City are also controlled by the Pennsylvania Company and are operated as part of the Grand Rapids & Indiana. Of the 592 miles operated, nearly all is in the state of Michigan, with the remainder in the state of Indiana. The main line extends from Mackinaw City, at the junction of Lake Michigan and Lake Huron, almost directly south to Richmond, Ind., and from there the G. R. & I. gets into Cincinnati over the tracks of the Pittsburgh, Cincinnati, Chicago & St. Louis. There is a branch near the head of Lake Michigan to Northport, and two-thirds of the way down the lake, a branch from Grand Rapids to Muskegon.

Reductions in passenger fares from a maximum of two-and-a-half cents to two cents per mile became effective in Indiana on April 10, 1907, and in Michigan on September 28, 1907. It will be seen, therefore, that in 1907 the Grand Rapids & Indiana operated under the two-cent fare law only during three months, so that the year 1908 is the first one which gives a true index of the effect of this law.

Last year the total number of passengers carried amounted to 2,495,814, an increase of 6.64 per cent. over 1907. The average haul was less last year, so that the passenger mileage amounted to 79,318,038, an increase of but 3.58 per cent. over 1907. At the same time, passenger train mileage totaled 1,336,892, a decrease of 11.72 per cent. Earnings per passenger per mile were 1.85 cents, or 11.05 per cent. less than in 1907. The average expenses per passenger per mile were 1.97 cents in 1907, and for some reason are not worked out in the report for 1908, but by deriving them from figures that are given, it would appear that they were 1.64 cents, or 10.65 per cent. less than in 1907. It is evident, therefore, that the company attempted to and nearly succeeded in reducing passenger expenses proportionately to the reduction in passenger earnings through a reduction in passenger train mileage, and notwithstanding this reduced service, passenger earnings amounted to but $1,500,000, or 6.14 per cent. less than in 1907.

President Wood in his report gives point to the conclusions to be drawn from these figures by remarking that "anticipating a reduction in passenger earnings, an effort was made to offset this by reduced train service, which reduction, while permitting considerable saving in expenses, caused such complaints from localities affected that the service was restored." In other words, the company was between the devil in the form of the state railway commissions and the deep sea of public complaint.

Passenger earnings form relatively a greater proportion of gross on the Grand Rapids & Indiana than on the Pennsylvania Company itself, but are of course considerably less than half gross earnings. Freight earnings amounted last year to $2,600,000, a decrease of about $600,000 from the previous year. A large proportion, 31.48 per cent. last year, of the total tonnage is products of forests, and the falling off in tonnage of these commodities was very severe last year. A strong plea is made by the company's management for the preservation of the forests of northern Michigan. It is estimated that timber will be nearly exhausted in from 25 to 30 years, and on the face of it, there is no other class of commodities that can furnish tonnage to such a road as the Grand Rapids & Indiana to make up for the loss from the exhaustion of timber. The road's management, therefore, is particularly interested in seeing a comprehensive plan for the reforestration of exhausted timber lands put into effect.

The average train load was 273 tons last year, or 20 tons less than in the previous year, and the average haul was 96 miles, a decrease of about seven miles. This much shorter average haul accounts in part for average earnings per ton per mile of 0.73 cents as against 0.68 cents in 1907. The average net earnings per ton per mile were 0.12 cents in 1907 and 0.11 cents last year.

The company met its reduction in earnings by heavy reductions in maintenance charges and some saving in transportation charges. Total expenses, including taxes, amounted to $3,500,000 in 1908 and $4,200,000 in 1907. Maintenance of way and structures cost about $526,000 last year, a decrease of $248,000, and maintenance of equipment cost $649,000, a decrease of $243,000. It is impossible to make a comparison of the unit costs of maintenance between last year and 1907 because of the changes in accounting methods prescribed by the Interstate Commerce Commission, but the totals are not seriously affected and apparently show that the road made such

heavy reductions last year that a return to the former scale of expenditures will be speedily necessary.

Among the causes of a decrease in net earnings that were beyond the control of the management of the road was an increase of 8.5 per cent. in taxes, which brought the total of taxes paid in 1908 up to $249,000 or 5.72 per cent. of gross earnings.

The cost per mile of track is shown in the following table. The table also shows the unit costs of repairs of equipment:

	1908.
Maintenance of way, per mile	$889
Repairs per locomotive	2,148
" " passenger car	479
" " freight car	65

These are low costs for a "Pennsylvania" road.

A dividend of 3 per cent. was paid, and after charging $52,000 for additions and betterments and making a payment on account of principal of car trusts of $23,000, the company transferred to the credit of profit and loss, $13,400.

President Wood sums up the company's situation as follows: "A property which under reorganization can reduce the interest on its bonded debt to 4.19 per cent., and yet only return to its shareholders an average of 1.93 per cent. annually, during the twelve years since its reorganization, and nothing prior thereto, certainly cannot make these expenditures [for facilities increasing the earning power of the property and, in the very near future for the separation of grades in the larger cities] from its income, and more certainly cannot raise the necessary money for such improvements through the issuance of securities, except at a great loss and expense."

The following table shows the results of operation for the last two years:

	1908.	1907.
Average mileage operated	584	582
Freight	$2,587,087	$3,208,098
Passenger revenue	1,503,224	1,594,234
Total operating revenue	4,355,345	5,063,669
Maint. way and structures	525,601	773,935
Maint. of equipment	649,254	892,112
Traffic	120,026	124,044
Transportation	1,777,533	1,988,563
Operating expenses	3,233,495	3,940,894
Taxes	248,984	229,509
*Net earnings	872,866	893,266
Gross income	727,751	801,299
Net income	262,447	322,882
Dividends	173,730	173,730
Additions and betterments	52,390	65,222
Surplus	36,327	83,930

*This is before the deduction of rentals paid roads operated on a basis of net earnings or additions of rents from other roads.

NEW PUBLICATIONS.

American Electric Railways.—A report before the International Street Railway & Light Railway Congress at Munich, September, 1908. By Eugene Eichel, Berlin, Germany. 42 pages; 8 in. x 10½ in.; paper.

The report at hand is printed in German, and represents a good survey of the general subject of railway electrification in the United States, having special reference to electrification on standard lines rather than to street railways, although fairly complete street railway statistics are also published.

The Mechanical Engineering of Steam Power Plants. By F. R. Hutton. Third edition; rewritten. New York: John Wiley & Sons. 825 pages; 6 in. x 9 in.; 700 illustrations. Cloth. Price, $5.

This work is one of some magnitude and represents a compilation of a wide range of facts, information and general comment upon the various details of the power plant. While it does not enter sufficiently into detail to enable the reader or student to design any of the parts that enter into the making up of the boiler or engine or their auxiliaries, it does take each of these parts individually and separately in such a way that their functions and operations are made perfectly clear. It is descriptive rather than analytical. It is a long and interesting compilation of facts, which, however, does not go very closely into the correlation of those facts, nor does the author delve into the fundamental principles upon which their existence is based. In short, we have a very complete statement of the effect with but comparatively little consideration of the cause.

To illustrate this take any chapter in the book, that on water-tube boilers for example. The introductory paragraph gives a brief description of the characteristic features of the construction, and the differences existing between the water and fire-tube varieties. Then follow descriptions of the various constructions, starting with the plain cylindrical boiler, which is here regarded as in the water-tube class though not usually so ranked. The elephant boiler follows, and then an outline of the sectional design, with a statement of its advantages and disadvantages. The classes of the sectional boiler are described, and then there are detailed descriptions of the spheroidal, vertical and horizontal open tube, such as the Babcock & Wilcox and Thornycroft, with short concluding paragraphs on the closed straight and curved tube types. There are no conclusions, nor need there be, for the book is one of instruction and description of current types and practice. In this it is full and complete and the matter is presented in an admirably interesting manner. The same method of presentation is followed throughout the whole, dealing successively with the boiler, its methods of riveting and staying, the externally and internally fired and coil and flash boilers, the furnace, the fuel, the boiler accessories, and the care, management and inspection of boilers. The engine is treated in the same manner, the several chapters being devoted to the movement of the parts, the expansive working of the steam, the compound and multiple expansion engine, the turbine, foundations, the details, such as cylinders, pistons, crossheads, etc.; the valves and valve gearing and governors. Then come the auxiliaries, care and management.

Throughout the work it frequently becomes necessary to enter upon a mathematical analysis of the structure under consideration in the matter of its movements, and this is done in smaller type and is usually clear and concise to the reader who can follow it; but this class of work is avoided to as great an extent as possible and attention paid strictly to the descriptive feature of the text.

The book is one that would be of value to the student who is learning of the functions of the power plant and to whom a knowledge of the various types of construction is necessary; and to the lay owner who wishes to familiarize himself in a general way with his property and have some idea of what he is buying. It is difficult to determine from the preface as to exactly the class of readers the author had in mind, but he has succeeded in compiling a book of interest and value not only to the classes named but to the general engineer. It would be well, however, in future editions to greatly amplify the index, for, as it now stands, it is quite incomplete and does not do justice to the work.

Parallel Tables of Logarithms and Squares. By Constantine Smoley, C.E., New York. The Engineering News Publishing Co. 460 pages, 4½ in. x 7 in., flexible leather. Price, $3.50.

As this book consists simply of a series of mathematical tables, about the only review possible is that of a statement of the table of contents. More than half of the book is occupied with the parallel tables of logarithms and squares, of feet, inches and fractions of inches varying by $\frac{1}{32}$ in. from zero to 50 ft. and by $\frac{1}{16}$ in. from 50 to 100 ft. These values are all expressed in terms of feet and fractions thereof. For example, the parallel columns include the logarithm of the dimension and the natural square of the same. Thus, under the top heading of 3 ft. the column at the left gives the inches and fractions thereof in excess of 3 ft. So for 3 ft. 0$\frac{5}{32}$ in., for instance, we have the logarithm of 0.54504 and the square as 12.3047 sq. ft.

This is followed by a table of angles and logarithmic functions. In this table are given the logarithms of the sine, cosecant, tangent, cosine and secant, with the angle, for all bevels in which the natural tangent varies by thirty-seconds of an inch and the base or radius is a constant of 12 in.

The first part also contains a multiplication table of rivet spacing, in which the spacing varies by eighths of an inch

from 1⅛ in. to 6 in. and the number of spaces from one to 30. Finally there are the decimal equivalents of a foot varying by thirty-seconds of an inch. The second part contains the ordinary tables of the logarithms of numbers, of logarithmic functions, of natural functions, sines, cosines, tangents, etc., the ordinary trigonometrical formulas, and, what is rather unusual, a repetition of the table of decimal equivalents of the foot found in the first part, the reason or necessity for which are not quite apparent.

Letters to the Editor.

THE COST OF DEMURRAGE AND OF PER DIEM.

New York, April 15, 1909.

To the Editor of the Railroad Age Gazette:

A contrast is sometimes drawn between the 25 cents per day which railways pay each other for the use of each other's cars and the $1 per day which shippers and consignees pay the railways under the demurrage rules, and the point is made that the railways should not charge the public more than they charge each other. The usual answer to this argument is that the per diem is a reciprocal charge and can be put at this low figure because it is only available for car owners. The difficulty with this argument is that some railways are not car owners, that others do not supply their full share of cars, and lastly, that as the per diem is settled on balances, it only applies in cases where the car relation is not reciprocal.

The real answer to this argument is the fact that railways pay each other more per day for the use of cars than they exact from the public. This may sound like a paradox, but when you consider the fact that 48 hours free time is allowed to shippers and consignees, and often very much more than this, it will be seen that the charge of $1 a day, which is the occasional charge made only when cars are held over the free time, amounts to very much less than the per diem charge when compared with the total delay. The method of computing free time makes the average payment by the public very small.

For instance, if a railway borrows a car from another for two days it has to pay 50 cents; if a consignee or shipper holds a car two days only, he pays nothing. If he holds it three days, including a Sunday, it costs a railway 75 cents, while the consignee pays nothing. If a car arrives after 7 a.m. the free time begins next morning. The consignee holds the car three days for nothing; the railway pays 75 cents. If the car arrives after 7 a.m. Saturday the consignee can hold it free till Wednesday morning, four days; the railway pays a dollar.

If a railway holds a car three days it pays 75 cents; if a consignee holds a car for three days for loading or unloading he will pay $1, or 33 cents a day, for the whole period. This is, of course, larger than 25 cents, but such a small proportion of cars are held over the free time that in the aggregate the payment by the public is less than one-half the per diem rate.

There are no figures available covering the whole of the country, but four of the car demurrage bureaus report both detention and charges, and it will be seen that in each one the collection per day is very much less than the per diem charge. The bureaus thus reporting cover portions of the north, south and the central part of the country.

Figures Taken From Four Demurrage Bureaus, Showing Both Detention and Demurrage Charges.

Cars handled.	Days detention.	Average detention.	Charges.	Average charge Per car.	Average charge Per day.
751,927	1,126,732	1.50	$188,411	$0.25	$0.17
363,130	595,533	1.64	40,640	.11	.07
326,385	398,915	1.22	59,083	.18	.15
718,005	1,256,677	1.75	159,573	.22	.13
2,159,447	3,377,857	1.56	$447,707	$0.21	$0.13

That these are not exceptional cases is shown by the fact that the average detention for all the bureaus reported to the American Association of Car Demurrage Managers is, for the year 1908, 1.79 days, while the charges of the two largest bureaus, those of Pittsburgh and Chicago, show for the year 1908 an average charge per car of a little less than 22 cents; this is at the rate of 12 cents a day to the public, as against 25 cents to the railway.

It will be seen from the above that the railways are really more liberal to the public than to each other.

ARTHUR HALE.

THE RAILWAYS OF BRITISH COLUMBIA.

Montreal, Canada, April 8, 1909.

To the Editor of the Railroad Age Gazette:

In your issue of April 2 you print under the heading "The Railways of British Columbia," an article which I consider quite misleading.

Speaking of the Grand Trunk Pacific, you say: "It is stated that there is considerable friction between the English directorate of the Grand Trunk and the directors of the Grand Trunk Pacific, which is a Canadian corporation."

That is like a man having words with himself, for the two roads are directed by the same man; in other words, the Grand Trunk Pacific is the child of the Grand Trunk. The President, Sir Charles Rivers-Wilson, G.C.M.G., C.B., is a director of the Grand Trunk Pacific.

Charles M. Hays, who originated the idea of the Grand Trunk Pacific, is Second Vice-President and the head of the Grand Trunk on this side the Atlantic, and is also President of the Grand Trunk Pacific. Mr. Smithers, Vice-President of the old company, is a director of the Grand Trunk Pacific, and many—a majority, in fact—of the Grand Trunk Pacific directors are officers of the Grand Trunk.

Of Prince Rupert you say: "It is not by any means the ideal port and town site that it was believed to be when it was first selected." Surely the man who wrote that could never have seen Prince Rupert. The site is all that could have been hoped for, and as for the harbor, it is infinitely better than the management had any reason to hope for.

This is not merely a railway terminus or a railway port; it is to be a great port of the Dominion of Canada, for the development of which the Dominion government is spending a great deal of money. One-quarter of the town site is owned by the Province of British Columbia, and the Provincial government is at this moment spending nearly a quarter of a million building roads and sidewalks.

When the question of the Grand Trunk Pacific was before the public some four or five years ago the Liberal government appealed to the country, and the country voted something like two to one in favor of the project. This is a national affair, this Transcontinental Railway, and they have come to look upon it here in Canada as a thing to be proud of. Indeed, this is the first hint, so far as I have seen, in the public print that there was any disappointment in Prince Rupert. When the Panama canal is completed this will be the natural easy outlet for the wheat of the Canadian West bound for Liverpool.

The soundings and surveys have shown that in this magnificent harbor, 1 to 2 miles wide and 14 miles long, the largest ocean liners may manœuvre, and at the same time there is not an acre where they may not find anchorage. As a matter of fact all disinterested persons who have seen the new port pronounce it perfect.

As to the progress of the work, you must keep in mind that Canada is building for the future, and building a line, the like of which has never been attempted, in the first instance, on this continent. The Grand Trunk Pacific will cross from ocean to ocean without a single mile of mountain grade; in fact, the grade through the mountains is precisely the same maximum mount per mile as the prairie section—four-tenths of 1 per cent.

It will be possible for the Grand Trunk trains to cross the continent, saving from half a day to a day and a half over existing transcontinental lines. Its locomotives can take from four to eight times the tonnage from the fields of the Middle

West to the Pacific taken to-day by other lines, and when arriving at its Pacific port it will be nearly five hundred miles nearer Yokohama than any other Pacific port.

The wonderful resources of Canada have made the Canadian Pacific one of the great railways of the world, and they will justify the building of this additional high-class line. At all events that seems to be the conviction of the Grand Trunk management and of the Dominion government, who are assisting the builders. CY WARMAN.

A NEW DEPARTURE IN FLEXIBLE STAYBOLTS.

Hexham-on-Tyne, March 1, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Evidently H. V. Wille* is not aware that his investigation (in the reproduction of which, by the way, the compositor has dropped the index of the third power from the value of L in the second equation) was applied to the design of staybolts about eighteen years ago, and proposals for a simple form of flexible stay were then made.

The assumption of fixature at one end and freedom at the other, and the indication of buckling along straight lines of deflection, are not perhaps intended to present literally the actual conditions.

If ordinary fireboxes when subjected to cold water pressures imposed only tensional stresses on the stays, leaving movements due to expansion alone to be dealt with by deflection of the bolts, there would be strong reason for the adoption of a flexible design. But this is far from being the case in practice.

The Belpaire type of box is usually considered to be the most perfect as regards the direct balance of the pressures on the inner and outer fireboxes, yet it is evident that there are not inconsiderable areas of flat plate, at the parts where the crown and sides merge into the circumference of the barrel, which have no counterpart in the shape of the inner box, the adjacent staybolts exercise a resultant pull tending to distort the tube plate along the vertical and horizontal diameters, while they are necessarily bent by the resulting movement of the plates. Not unfrequently the flat plates of the shell are allowed to terminate beyond the length of the flat plates of the box, distortion being inevitable before equilibrium is attained.

The so-called radial staying of the crown sheet, so frequently adopted in America, affords direct equilibrium only along the top where the stays are normal both to the box and to the shell plate, and there is consequently no tension in the latter. In passing along toward the shoulders of the box the balance is no longer simple and direct, the internal pressure being in excess of the pull exerted by the stay; the tension in the shell plate increases from stay to stay as the corners of the box are approached, and this variation of tension involves a tangential resultant at the head of each of the stays, which produces a bending moment reaching its maximum value in the outer rows of roof stays and upper rows of side waterspace stays.

In some modern Italian locomotives, and to a less extent in German practice, the back end plate of the box is sharply inclined, while the shell plate is given less inclination, thus producing a divergent waterspace, which should be excellent for promoting circulation and for providing stays of greater length and flexibility just where the expansion is greatest. Yet the stay breakage is frequent, and is to be accounted for by the fact that though the corners of the box and of the shell are concentric at the foundation ring they rapidly diverge from that condition, and the stays next the back corners are exerting an outward pull which is sufficiently intense to acount for cracked and distorted plates and broken stays.

In German practice the back end plate is sometimes secured to the shell by a reversed flange, a form of connection which is excellent when applied to an end of circular form, but capable only of giving a short life with relatively high cost of maintenance when used with the straight waterspace legs of the locomotive firebox. The difference between the areas of the inner and outer flat surfaces is very great, and the flexure of the side plating near the back end rivets gives rise to grooving, which, with the frequent occurrence of cracked corners and leaky or broken stays, demonstrate that departure from correct principles is the chief factor contributing to the growth of maintenance charges.

The adoption of flexible stays in situations where the equilibrium of the normal forces involves bending moments on the bolts can only preserve the latter by permitting increased distortion of the plating. The full economical value of flexible staybolts, whether of Mr. Wille's ingenious high tensile pattern, or otherwise, can only be fully demonstrated by applying them to fireboxes of technically correct design, a minority of those in use with modern locomotives of high capacity.

J. D. TWINBERROW, A. M. INST. C. E., M. I. MECH. E.

*See page 307, *Railroad Age Gazette*, February 12, 1909.

RAIL JOINTS.

Nice-Cimiez (France), April 6, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The appearance of high rail joints and of high spots at the middle portions of the rail on the tracks of one of the eastern roads using the deep girder type is in so far instructive as it shows the difference in the effect of the wheel on molecular and on mechanical connection.

The efficiency of the latter depends on the tightness of the bolts and on the original shape of the surfaces of contact.

As long as the bolts are loosened and the shape of surfaces of contact altered, mechanical connection, supposed to replace the lack of molecular connection, remains useless.

The able presentation of the facts proving the uselessness of equal stiffness of the trailing and of the facing rail end in the article, "Einige Oberbau Fragen," in the *Organ*, No. 10, 1908, shows that homogeneous tracks are an illusion, confirmed by the necessity to sight for low spots and to raise them wherever they can be detected along the rail.

As stated in my letter, published in your issue of Jan. 22, 1909, it remains to be seen which growth of the bar, downward or upward, will outgrow the other. The original mechanical connection of the fish rail hardly will be subjected to premature alterations, thus proving that the rail ends, instead of being stiffened, must be relieved from the part of pressure exceeding their carrying capacity. MAX BARSCHALL.

RAIL BREAKAGES.

Baltimore, Md., April 17, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to the question of rail breakages, and especially to the letter of A. G. Wells on page 808 of the April 9 issue, the view expressed by Mr. Dudley and substantiated by Mr. Wells' experience as regards the quality of the sub-grade being responsible in large measure for rail breakages, is an interesting sidelight on the question.

The writer does not believe that, ordinarily, in the investigation of a given rail breakage enough attention is given to the question of tie spacing or to whether or not there were any loose or "pumping" ties in the vicinity of the failure. I have noted instances on a piece of track laid with 90-lb. rail and subjected to heavy traffic, where the ties were sometimes more than 30 in. between centers, and one space actually measured was practically 36 in. It would also be interesting to note whether or not the broken rail showed any evidences of having been injured by locomotive driving wheels slipping when starting the train, or if the flange of the rail had been nicked by a misstroke of a spike maul when the rail was laid.

J. W. RUPERT,
Inspector, Baltimore & Ohio.

RAILWAY AND COMMERCIAL SITUATION IN JAPAN.

Through courtesy of Professor Emory R. Johnson, we are enabled to publish the following transcript of a letter sent to him by Dr. Jinjiro Ito, Professor of Commerce in the Waseda University, Tokio. Dr. Ito took his Ph.D. from the University of Pennsylvania last June.

Waseda University,
Tokio, Japan.

Since writing to you last many economic problems have come into the foreground in Japan which call for special attention by students of commerce and transportation. The most important of these are the questions of shipping subsidies and the reorganization of the railway administration in Japan. I leave out of consideration entirely the still important and very interesting political change in China.

Business has been very dull for some time in the Far East, and the situation was made worse because the ports in northern Japan, Russia and northern China were closed toward the latter part of November. Many owners had to lay up their vessels, while some were run merely to keep their financial machinery going despite a heavy loss due to the lack of cargo. Numerous vain attempts have been made to improve the situation by appealing for Government aid, and by scheming for a combination of owners, etc. A few days ago the papers reported a radical reform at the Mitsubishi dock yard at Nagasaki, where a large number of employees were discharged. The outlook is not very encouraging.

There has been much talk of the abuse of the nation's money in the subsidies which, the papers claim, have been useless to the merchant marine of Japan; and an almost unanimous cry has been raised by the papers for the curtailment of the amount of money devoted to that purpose. At this moment, however, there is little likelihood of any change being introduced in our shipping policy, although a new subsidy will very probably be given to a South American line by transferring the money which would otherwise go to the same owners under the item of subsidy to the 'Frisco line.

Baron Goto, one of the most business-like statesmen in the present cabinet, seems to be determined to give a final stroke to the nationalization of railways in Japan. A few years since many private roads were taken over by the Government, and attempts were made to unify the various systems which, of necessity, differed in their equipment and organization, serving as they did various sections of the country. Local needs were disregarded, and when they were given due attention it was only through red tape—inquiry and order going back and forth many a stage on its way—in the process of which much time was wasted, and when the order was at length issued new conditions governed the situation and the rules were old again.

In view of this difficulty a reorganization has been proposed, the order being issued to-day. A new board with an autonomous power has been created—the Railway Bureau, which had been in the Department of Communication, and thus subject to the Minister of Commerce, and has been detached from the department and made subject to the Prime Minister. The board has power both to operate its own road and control private roads, of which there is very little mileage at present. The entire system of Japanese railways, except those in Formosa, is divided into five divisions corresponding to the territorial division of railways prevailing at the time of private ownership. The superintendents of the divisions are given a wide range of freedom and thus can manage the business of their own territory without recourse to the central board, which deals with only those questions which affect the entire system. It remains to be seen how the new system will work. You will be pleased to hear that this change has given Mr. Kinoshita another chance for promotion. He was made the traffic manager of the board.

Board of Railways.

(South Manchurian Railway Company coming under the control of the Board)

General Administration.
Construction.
Transportation:
- Chief secretary.
- Traffic manager.
- Chief engineer for operation.
- Chief engineer for maintenance.
- Chief engineer for car construction.
- Electric engineer.
- Steamship manager.

Accounting
Bureau of Railway Investigation.
Divisions (at present five, subject to increase).

THE MAXIMUM WEIGHTS OF SLOW FREIGHT TRAINS.*

BY C. S. BISSELL, M.AM.SOC.C.E.

It is hardly necessary to mention the great and growing importance of the subject of train weights. Study of the problem has given rise to many different forms of investigation which are constantly appearing in the railway journals and which are indicative of greater refinement in the making up of trains in the future. Most writers have endeavored to treat the subject in its entirety, comprehending the operation of both slow and fast trains, whereas the object of this paper is to present only the case of slow freight trains, and to outline briefly the history of the various steps which led to the conclusions finally reached.

The writer was called upon to formulate some method of estimating operating expenses, over proposed revisions or projected lines not constructed, such as would permit of the intelligent comparison of expenses on two or more projects or routes of haul. The locomotive was of a type weighing, with its tender, 168 tons, of which 173,000 lbs. rested on the driving wheels; and the train was to consist of cars weighing 20 tons each when empty, with a capacity of 50 tons. The speed was not to exceed 10 miles per hour on ruling grades, and no benefit derived from momentum was to be considered in fixing the train weight. The resistance due to curvature was to be allowed for by compensating the ruling grades at 0.05 per cent. per degree of curve.

The first principle of train resistance, namely, that a given train weight confined in a few cars requires less tractive power to move it than the same weight composed of many empty cars, led the writer to a form of equation involving the relation between the dead weight and the lading of the cars, which is evidently the same as if the average car weight or the actual number of cars had been used.

The tractive power of the locomotive was determined as the average amount which would usually be developed within the adhesive power of the driving wheels, considering that atmospheric conditions and steaming qualities remained practically constant at normal values. The tractive power was to be reduced by the proper amount for a constant speed of 10 miles per hour.

With these ideas, which indicated the general form of the equation, the paper† on "Virtual Grades for Freight Trains" by A. C. Dennis, M. Am. Soc. C. E., was consulted, with the result that the train resistance was taken at 4 lbs. per ton of train weight for full cars and 9 lbs. per ton for empty cars. Also, from this paper, was taken the reduction of 13.7 per cent. in the tractive power for the speed of 10 miles per hour.

Table 1.

Compensated grade, percentage.	Gross train weight in tons.	Compensated grade, percentage.	Gross train weight in tons.
0.300	3,292	1.260	953
0.655	1,898	2.130	555
1.055	1,238		

The hauls in Table 1 are from the records of the Pennsylvania Railroad Company, and represent a fair average of

*From the February, 1909, *Proceedings of the American Society of Civil Engineers*, page 141.
†*Transactions*, Am. Soc. C. E., Vol. L, p. 1.

actual train weight for one locomotive of the type described, for a speed of 10 miles per hour.

Using the values in Table 1, and increasing the train capacity 10 per cent. for overload, as a limiting maximum, the coefficient of tractive power was established at 0.232; and the complete expression for tractive power then became 0.232 × 0.863 × the number of pounds on the drivers, or 0.2 × the number of pounds on the drivers, in which the 0.863 is the complement of 13.7 per cent. Introducing now the factor for train resistance, and denoting the ruling grade percentage by g, the general equation is obtained:

$$\left.\begin{array}{r}\text{Tons of}\\ \text{train weight}\\ \text{behind tender.}\end{array}\right\} = \frac{0.2 \times \text{pounds on drivers.}}{9 - 5\,\dfrac{\text{Weight loaded on train.}}{1.1 \times \text{Capacity of train.}} + 20\,g} - \left\{\begin{array}{l}\text{Tons of}\\ \text{locomotive}\\ \text{and tender.}\end{array}\right\} \quad ..(1)$$

in which the "Capacity of train" is the sum of the capacities of the cars, and all tons are 2,000 lbs. in weight. For the particular case in hand, the weight on drivers is 173,000 lbs., and the weight of locomotive and tender is 168 tons; hence, with cars of any class loaded to the maximum, the equation assumes the special form:

$$\text{Net tons behind tender} = \frac{34\,600}{4 + 20\,g} - 168.$$

Using this equation and the values of g for the hauls given above, from which the coefficient of tractive power was derived, it is found to give the train weights within about the weight of one empty car, except in the case of the fourth haul, which it makes 64 tons too high; but, as the last haul is only 19 tons too high, it is reasonable to assume that the equation represents safe values in the case of this example. Also, it is reasonable to assume that since for empty cars the train resistance is 9 lbs. per ton of train weight, the values intermediate between 4 and 9 lbs. per ton will be given correctly by the equation for all partial ladings of the train. It will be noted that for a train of empty cars the equation becomes:

$$\text{Net tons behind tender} = \frac{34\,600}{9 + 20\,g} - 168.$$

Because the purposes for which this equation was derived are usually expressed in terms involving an annual paying tonnage to be moved, the form of the general equation is believed to present special advantages, and from it a table may be formed showing the tons of lading and the number of cars in the train, which is convenient in estimating operating expenses; and the possibility of using it in making up trains is also evident.

The equation has thus far fulfilled the requirements for which it was designed, but suggestions have been made which show that it can be greatly improved in point of accuracy of form and adaptability in making up trains.

One objection to the form is found in the fact that the car resistance per ton varies in a straight line, or, in other words, that it is proportional to a constant increment of lading. Every indication in nature goes to prove that probably the variation should be in proportion to an increment of lading which is constantly increasing, or to a decrement of similar character; in short, it should represent a curve instead of a straight line when depicted graphically. The grade resistance, $20\,g$, is evidently mathematically correct, being a simple case of a weight on an inclined plane; but the further suggestion of reducing the value of the tractive power for the grade involved with the dead weight of locomotive, tender and caboose, has a great advantage in point of accuracy over the method of simply subtracting such dead weight as indicated in the above equation, particularly in cases where the tractive power is determined by a dynamometer car. For general use, it seems advisable to express the relation of the train weight to the number of cars as the average total car weight. It can readily be seen that if the four axles and eight wheels of an ordinary car are identical in size and weight, then the total weight of the train divided by the number of cars is an average car weight, which is a true measure of the resistance per car. If the condition is not realized absolutely, the average car weight will be affected by an inconsiderable amount in the case of an ordinary mixed train.

In view of these considerations, the equation must necessarily be expressed in a form somewhat different from that given above, and, for this purpose, the writer makes use of the following values, which are selected from a number of tests made with a dynamometer car, in which R is the resistance of a train, in pounds per car, and W is the average weight per car, in tons of 2,000 lbs., for a speed of 10 miles per hour:

Table 2.

Point	R (lbs.).	W (tons).
A	160	20
x	195.7	40.2
y	199.0	42.8
B	216.0	72

Referring to Fig 1, upon which the points, A and B, are located, it is clear that the resistance per car will decrease from B to A, and will become zero when the number of cars becomes zero. Hence the line of variation must pass from B through A and through the origin of co-ordinates, zero. It must, therefore, be a curve; and such a curve is represented by the equation:

$$R = \frac{a\,W}{b + W};$$

its particular form for this case being,

$$R = \frac{249.6\,W}{11.2 + W},$$

which is the line, $S\,T$, in Fig. 1. Plotting the points, x and y, it is seen that they agree closely with the values given by the equation, thus confirming the assumption that the resistance per car varies as a curved line of this character.

Dividing the values of R by the corresponding values of W, and plotting the results to the scale on the right of Fig. 1, develops the curve, $M\,N$, of pounds per ton of train weight.

It is now possible to formulate the equation:

$$\text{Tons of train weight behind tender} = \frac{P - 20\,g\,m}{\dfrac{a}{b + W} + 20\,g} \quad ....(2)$$

in which P = the pounds of tractive power at the drawbar; m = the weight, in tons, of the locomotive and tender; a and b are constants; W is the average weight per car, in tons; and g is the grade, in percentage. The tractive power, P, is here reduced by $20\,g\,m$ (where the weight of a caboose may be included in m if desired), instead of subtracting the dead weight, m, after the division has been made. Substituting the known terms taken from Tables 1 and 2 and those derived for Fig. 1, an average value of P is found to be 32,100 lbs., and therefore the equation for train weight for this particular case becomes:

$$\text{Tons of train weight behind tender} = \frac{32\,100 - 3\,360\,g}{\dfrac{249.6}{11.2 + W} + 20\,g}.$$

This equation does not agree with the values in Table 1 as closely as do the results from Equation 1, but it is more rational in form, and is adapted to use in connection with records taken with a dynamometer car, from which the tractive power, P, and the constants, a and b, can be readily determined by experimental trials for any particular forms of locomotives or cars.

For the purpose of making up trains, an equation similar

to the above can be expanded into a table. Thus, for any particular division of the railway, the ruling grade, g, is known; assuming it to be 0.5 per cent., for example, the equation becomes:

$$\text{Tons of train weight} = \frac{30\,420}{\frac{249.6}{11.2 + W} + 10}.$$

From this may be prepared for all car weights a form similar to Table 3, which shows only three values of average car weight. The reduction for temperature, of course, must be determined by past experience. A similar table, prepared for each class of locomotive on the division, can be used for making up trains by a yard-master of very mediocre intelligence. The process of taking the continued sum of the car weights until the total indicated in the table is approximately reached, and then dividing the result by the number of cars to obtain the average car weight, is a simple one. The difference of a few cars more or less is then made up,

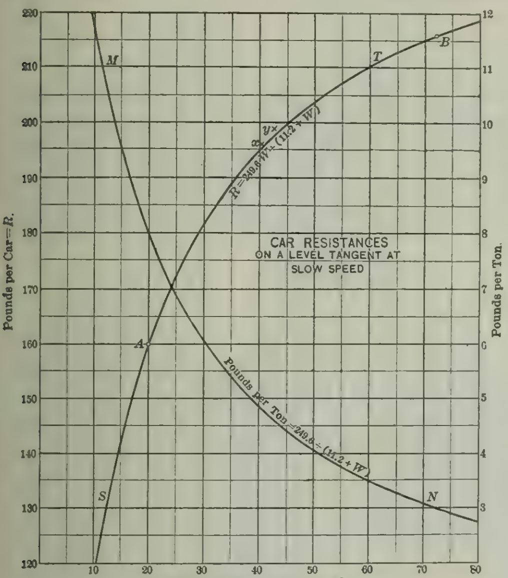


Fig. 1.

and the total train weight of the completed train is finally checked by a repetition of the process.

Table 3.

M. & N. Division—Locomotive Class H.

Average car weight.	Train weights for various temperatures: Summer.	45° — 25°	25° — 5°	Below 5°	Emergency
40 tons	2,046	1,840	1,636	1,535	1,023
41 "	2,058	1,852	1,646	1,544	1,029
42 "	2,071	1,864	1,657	1,553	1,036

This example of the manner in which trains may be made up is given to illustrate the practicability of dispensing with a "car factor," consisting of a predetermined number of tons to be added to each car in the train. Such a car factor is in reality a fictitious weight, and its use introduces the element of a "straight-line variation" in reaching the final result, which is questionable in point of accuracy. The following quotation is taken from "Tonnage Rating," an article by F. W. Thomas*:

Mr. Thomas says: "The most difficult problem after the rating has been ascertained and proven is to express the rating intelligently and in such a form that the despatchers, yard-masters, foremen or switch crews and conductors can understand and easily interpret the rating sheets.

"The most difficult thing to impress upon those interested is the fact that the rating is often governed by the number of cars in the train; the greater the number of cars, the greater the rolling resistance. In the eyes of the average trainmaster and despatcher a thousand tons, whether confined in 20 cars or in 50, is a thousand tons."

"You will note * * * that the maximum rating is shown in cars weighing 50 tons, and for every car added to the train above this given number of cars a reduction from the maximum rating must be made of from four to five tons. * * * I cannot say that this reduction is based on any fixed rule, beyond, as mentioned above, that it is the fruit of long investigation and a series of tests." * * *

The writer thinks that Mr. Thomas intended to say, in the instance above, "the greater the number of cars the greater the rolling resistance per ton of train weight," which is usually difficult to make clear.

As a matter of fact, the determination of the car factor is sometimes based on a "fixed rule," or rather a carefully wrought out series of experimental tests put into a rational mathematical form. This form usually is developed by equations, some of which represent straight lines, but whether or not this be true, the unfortunate fact remains that the use of such a far factor, when derived, constitutes a constant increment, thus introducing a form of straight-line variation into the calculation.

It may be asked, what objection can be made to such a variation, and in answer the writer appeals to the reason of those who are students of the problem here presented. Natural forces represented graphically, almost without exception, are forms of curves. The construction of a train is artificial, but the forces developed by the movement of the train are natural in their characteristics; and continued study brings with it the growing conviction that the graphics in this problem should be curves rather than straight lines. Granting this, the use of the car factor must be dispensed with, and a rigidly curvilinear method or equation must be formulated. If we conceive of a level railway tangent as an arc of 4,000 miles radius, the center of which is the earth's center, then Equation 2, as given above, is strictly curvilinear in its components and in its entirety; but if this conception appears to violate the sense in which the quantity "20 g" is used, there still remains the argument that grade is an artificial and not a natural element of force in this problem.

The economic issues dependent upon a true determination of maximum train weights, especially for slow freight trains, are of such grave importance that the writer feels justified in stating that any criticisms or suggestions which will throw more light on the subject will be welcomed by the majority of railway men.

The data upon which the foregoing developments are based are believed to represent normal conditions. They are the results of many tests, and of careful selection and reduction. In every case, however, they apply only to the slow speed of from ten to seven miles per hour. The equations are given to show only the form of variation, since it is apparent that the constants in them must be derived from experimental tests.

ELECTRIC HEADLIGHTS IN NORTH CAROLINA.

The legislature of North Carolina has passed a law requiring electric headlights to be used on all road locomotives within four years. The law specifies an "electric or power headlight" of at least 1,500 c.p. measured without the aid of the reflector. Of the engines of any company not now equipped, one-fourth must have the lights by April 1, 1910; one-fourth the next year; one-fourth the next, and all by April 1, 1913. The law does not apply to engines regularly used for switching, nor to those used only in the day time, nor to engines going to shops for

*American Engineer and Railroad Journal, April, 1907.

repairs. An engine may finish its trip notwithstanding the unavoidable disablement of its headlight, if the light was in good condition when the engine started out. A further exception is made of North Carolina roads "independently owned" operating 125 miles or less, and of roads outside the state which operate only 100 miles in North Carolina; further, the corporation commission, in its discretion, may make exceptions. Violation of the law is a misdemeanor.

BIG FOUR TRACK ELEVATION AT INDIANAPOLIS.

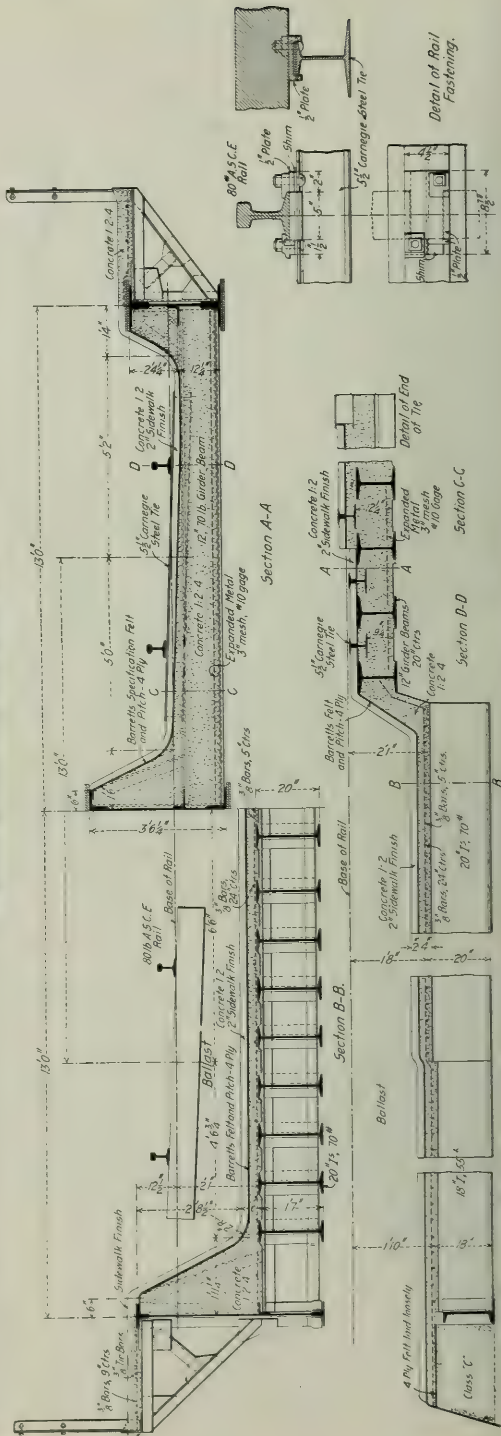
In 1905 and 1906 ordinances were passed by the City of Indianapolis, Ind., requiring the railways to elevate their tracks over certain streets in the western part of the city. The work provided for in those ordinances is part of a plan to separate ultimately the grades at all of the important crossings within the city limits.

Within the territory affected, the principal train movements are passenger, as all freight trains and heavy interchange cuts are handled over the Belt Railway, which connects with all lines. For this reason it was unnecessary to adhere to low grades, and a maximum gradient of 1 per cent. was allowed in some instances, so as to reduce the cost. The heaviest work encountered was between the Union Station and White river, a distance of about 4,000 feet. Within these limits there were ten tracks to elevate, four of which belonged to the Big Four, four to the Vandalia, one to the Peoria & Eastern and one to the Cincinnati, Hamilton & Dayton. Beside these tracks, it was necessary for the Union Railway Co., which operates the Indianapolis passenger terminal, to raise the approach to its Capitol avenue coach yard.

Top View of Freight Tracks Bridge over Kentucky Avenue.

The Vandalia first elevated its tracks, using the Big Four's tracks, which are adjacent, while the work was in progress. A description of this work was published in the *Railroad Gazette*, December 27, 1907, page 774. On its completion, in August, 1907, the arrangement was reversed, the trains of the Big Four, the Peoria & Eastern and the Cincinnati, Hamilton & Dayton being handled over the Vandalia, and the work of completing the elevation of the tracks of the other three roads was undertaken by the Big Four.

Three bridges were required to carry the tracks over the streets, the most important being at Missouri street and Kentucky avenue. These two streets intersect at an angle of 45 degrees at the crossing of the railway tracks, requiring a somewhat long and unsymmetrical span, the distance between abutments varying from 113 to 159 ft. The superstructure consists of a ballasted, waterproof concrete floor on I-beams, which are



Floor for Freight Tracks Bridge over Kentucky Avenue.

West Washington Street Bridge.

Top View of West Washington Street Bridge.

Freight Tracks Bridge over Kentucky Avenue.

Bridge over Kentucky Avenue and Missouri Street.

supported on transverse girders and columns along the curb line in the street. A street railway in Kentucky avenue necessitated a vertical clearance of 15 ft. 9 in. To get this, the tracks were raised 10.5 ft. and the street lowered 8.7 ft., the approaches having a 4 per cent. grade. Cross-sections and a photograph of this bridge are shown in the illustrations.

About 200 ft. northeastwardly from this bridge, Kentucky avenue is also crossed by two freight or running tracks of the Big Four, and the full depression of the street is continued under these tracks. They are on an 11 degree curve at this point and the distance between abutments is 90 ft. A very shallow floor was used in the span over the street railway tracks, the distance between base of rail and clearance line being only 18 in. To accomplish this, heavy Bethlehem steel I-beams were used, running transversely and spaced far enough apart to permit Carnegie steel ties to be placed between. The ties were inclined enough to take care of the necessary superelevation of the outer rail, and were concreted solidly in place. On the end spans, the distance between base of rail and clearance is 3 ft. 6 in., and a concrete floor similar to that on the other bridges was used, with wooden ties. Photographs of this bridge and details of the floor are shown in the illustrations.

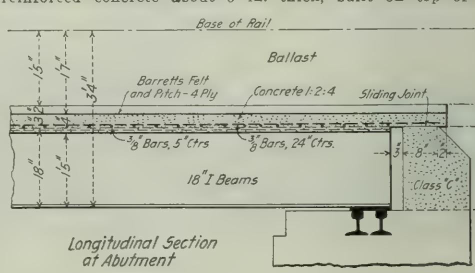
At West street, the crossing was comparatively a simple one, the angle of skew being only 11 degrees, with a transverse clearance between abutments of 60 ft. The I-beams, running longitudinally, and resting on transverse girders supported by columns in the center and on the curb lines of the street, carry four tracks. Under the two main tracks of the Big Four is the usual ballasted concrete floor, but it was desired to keep the C., H. & D. and the P. & E. tracks as low as possible over this street and a timber floor was used on the north half of the bridge. Creosoted, long-leaf yellow pine timbers, 6 in. by 12 in., were laid flat transversely on the I-beams, the joints caulked with oakum, and the entire floor then covered with a coating of hot pitch and gravel to prevent fire. The timbers are held in place from below by lag screws engaging the upper flanges of the I-beams. Malleable iron plates provide bearings for the rails, which are secured with steel clips and screw spikes. The vertical clearance above the roadway at this crossing is 12 ft., the tracks being raised about 12 ft. and the street depressed 3.5 ft., with 2 per cent. approaches.

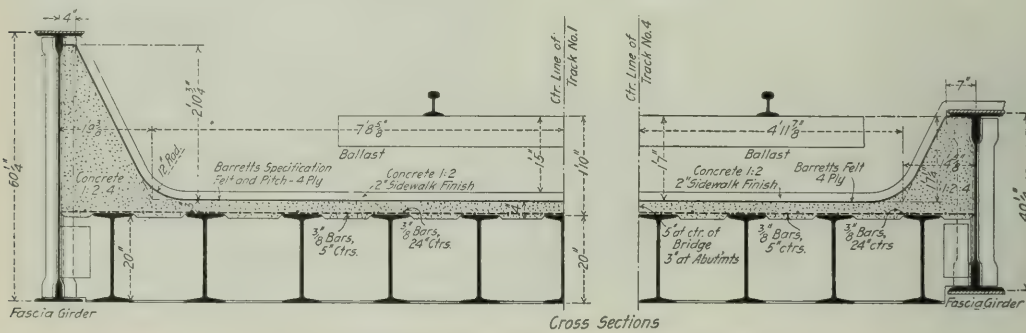
West of White river, there was a separation of grades at West Washington street. This street is crossed at an angle of 38 degrees by one track of the C., H. & D. and two tracks of the Peoria & Eastern. There was a connection with the west end of the P. & E. repair yard and roundhouse at Washington street. As a result of the elevation, the yards had to be rearranged and rebuilt, and a new coaling station, cinder pit and water lines had to be provided to accommodate the connection of the yard at its east end. Owing to the great height to which it was necessary to raise the tracks—14 ft.—the grade change extended over a distance of about 4,000 ft., although a 1 per cent. westbound and 0.55 per cent. eastbound gradient was used. The street was depressed about 5 ft., with 4 per cent. approaches, and crossed by a three-track, four-span, through girder bridge having an I-beam and solid concrete floor carried by girders for each track. The total length, out to out, is 154 ft. The transverse clearance between abutments is 80 ft., and the vertical clearance is 15 ft. 9 in. The columns are on the center and curb lines of the street. To handle the traffic, temporary detour mains were built and were in service until two of the three elevated tracks could be put in operation.

Except at the street crossings, the tracks are supported on earth fills, the material being pit strippings delivered in trains of 12-yd. dump cars from Eagle creek, about eight miles west. This material was sandy, and therefore readily adaptable to the method used in making the fills. The greater part of the filling was done by raising an unloading track, from which the banks were widened after the track was raised to grade.

The concrete floors of the bridges consist of flat slabs of reinforced concrete about 3 in. thick, built on top of the I-beams, crowned to provide drainage, and troweled to a smooth finish. This lower layer of concrete was extended well up the sides of the trough or fascia girders, so that the waterproofing could be carried well up above base of rail. Expansion joints of ½ in. were made over each line of columns, the reinforcing bars and concrete being stopped off square and the space between slabs calked with oakum and pitch. Four-ply Barrett specification felt was then applied over the entire slab, with pitch between all layers, and was carried down on the back of the abutments to a point somewhat below the bridge seat. On top of this was put a 2-in. protection layer of 1:2 concrete, which was also carried up the sides of the girders and finished off flush with the upper flanges. No expansion joints were made in the waterproofing or protection layer, these being carried continuously from one end of the bridge to the other. Thus far, no leaks have developed, this method of waterproofing apparently being effective.

The work was done under the supervision of W. M. Duane, then Chief Engineer of the Big Four, and C. A. Paquette, Assistant Chief Engineer. J. B. Hunley, Assistant Engineer, was in immediate charge of the work.





Floor for Bridge over Kentucky Avenue and Missouri Street.

RATES ON IRON AND STEEL—AMERICA AND GERMANY.

Opportunity for comparing the iron and steel rates of this country with those of the Government Railways of Germany is afforded in a report of the German iron and steel industry prepared for the Department of Commerce and Labor by its special agent, Charles M. Pepper. The report was prepared in compliance with an act of Congress of May 22, 1908, authorizing an investigation of trade conditions abroad. Much of the material contained in this report is being made a subject of comment in the debate now going on in Congress over the tariff bill.

The German government, through its control of railways as well as in other ways, has done much to foster the foreign business of the German steel manufacturing concerns, and in comparing the freight rates in that country with those made by our railways here the interest in the comparison is heightened by the fact that it affects a trade which is specially favored in Germany, whereas the rates on steel products here are fixed by the railways without any direct intervention by government authority, and merely in pursuance of the general policy of the railways of promoting industries by fixing rates which will stimulate traffic.

The German scheme of fixing rates on iron and steel products is thus stated in the Pepper report:

"In fixing the transportation rates ore is treated as primary raw material, the same as agricultural products, and is therefore given the lowest rates in the freight schedules. This treatment has been extended to the ores from the Meurthe-Moselle district in France. Iron and steel products come under special tariffs which have been devised by the government on the principle of encouraging the manufacturing industries."

The following tables, made up from data contained in the Pepper report and from figures obtained from the Pennsylvania Railroad, afford a comparison between our rates and those of Germany on steel and iron:

Freight Rates on Iron and Steel Products.

Place.	Miles.	Items.	Domestic rates per ton. Germany.	U.S.
Cologne to Antwerp .... Duncannon, Pa., to Phila.	132 134	Machinery	$2.629	$2.80
		Other mfrd. steel.	2.217	1.50
		Billets	1.60	1.50
		Pig iron........	1.60	1.15
Dusseldorf to Antwerp.. Chester, Pa., to New York	115 122	Machinery	2.441	2.20
		Other mfrd. steel.	2.067	1.80
		Billets	1.372	1.80
		Pig iron........	1.372	1.40
Cologne to Hamburg.... Johnstown to Baltimore.	264 262	Machinery	3.292	2.80
		Other mfrd. steel.	2.568	2.60
		Billets	2.424	2.00
		Pig iron........	2.424	1.85
Cologne to Bremen..... Williamsport to Baltimore	204 197	Machinery	2.52	3.00
		Other mfrd. steel.	2.04	2.00
		Billets	1.726	1.70
		Pig iron........	1.726	1.55
Dusseldorf to Bremen... Wilkesbarre, Pa., to Phila.	181 185	Machinery	2.256	....
		Other mfrd. steel.	1.824	2.00
		Billets	1.696	1.70
		Pig iron........	1.696	1.60

Comparison of rates on pig iron shows lower rates here in all the instances cited than for similar distances in Germany. From Luxembourg to Bochum, a distance of 194 miles, the rate is $1.272 per ton, against $1.14 per ton charged here from Erie, Pa., to Etna, Pa., a distance of 212 miles. From Luxembourg to Dortmund, 206 miles, the rate is $1.272, and from Erie, Pa., to Pittsburgh, 216 miles, $1.14. The difference in favor of our rates on iron ore is equally striking in the case of other similar comparisons of rates.

In the case of pig iron, also, our rates are also lower in most instances for both domestic and export shipments, the slightly higher rate quoted from Chester, Pa., to New York over the rate from Dusseldorf to Antwerp for domestic shipments being more than offset by the fact that the former distance is greater by seven miles. A similar explanation attaches to the rate on billets from Dusseldorf to Bremen, and the only case therefore noted in this table in which the domestic German rate on billets is lower than the rate for a similar distance here is on shipments from Dusseldorf to Antwerp, where the German rate is directly affected by the availability of water transportation on the Rhine between these two points. The rates on machinery and other manufactured iron and steel also afford a number of instances in which the rates here are below the German rates.

BUSH TRACK CONSTRUCTION.

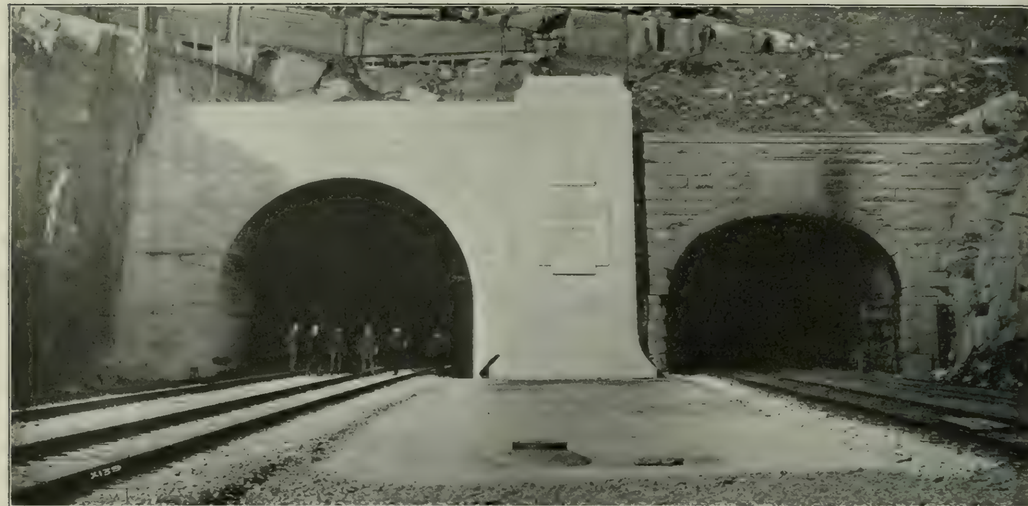
The track structure in the Bergen Hill (Jersey City, N. J.) tunnel of the Delaware, Lackawanna & Western was briefly described in the *Railroad Age Gazette* of November 6, 1908. It was invented by Lincoln Bush, then Chief Engineer of the Lackawanna, and now a consulting engineer in New York, who has patented the design.

The roadbed is of concrete laid on the rock bottom of the tunnel and reinforced by vertical rods between the tie blocks, to take care of shear in concrete between the blocks that might arise from creeping of track or from stress due to tightening wedges. The 7¾x7¾ in. wooden blocks 2 ft. 6 in. long are set in the concrete and spaced 22 in. apart on centers for supporting the rails. The tie blocks are notched at the outer end to form a shoulder and are set in the concrete when it is built. The concrete fills the space made by the notch in the tie block and prevents the lateral shifting of the block. A tapered wedge block holds the tie block tight against the concrete and can be driven in to take up any looseness due to shrinkage or wear. There is a small filler block at the inner end of the wedge, which is to be pulled out when it is necessary to drive the wedge in further. The wedge is held in place by a lag screw extending about 2 in. into it through the guard rail, where the guard rail type of track is used. The guard rail is fastened to the tie blocks by lag screws and is also anchored to the concrete by anchor bolts. The rail is fastened to the blocks by lag screws and wrought iron clips.

To replace the tie blocks, the lag screws fastening them to the guard rail are removed, the wedge withdrawn, the tie block moved forward (in the direction of the track) until the shoulder of the block clears the corresponding shoulder in the concrete; the tie block is then pulled out laterally without disturbing the adjacent tie blocks or rail fastenings and without raising the rail, thus avoiding any interference with traffic. An inch board could be put under the rail, resting on the concrete on either side of the tie block space, for temporary support.

Advantages of this construction are as follows: One man can readily replace the tie blocks and wedges, while with the ordinary type of ballasted track construction with long ties, it is necessary for a gang of men to dig out the ballast in order to replace a tie, and it is also necessary to protect traffic while the work is being done. In tunnels and subways where space is cramped, traffic is heavy and a track cannot be temporarily abandoned, and with the running rails, guard rails and third rails attached to the long ties, as is the case with electrified lines, it is extremely difficult and very expensive to maintain and tamp up track to surface and make tie renewals. With the tie blocks set in concrete, there will be no heaving of the track from frost in winter nor settlement of the track surface in the tunnel, as the lack of good drainage will not affect the track surface. So track maintenance requires only track inspection, instead of large maintenance gangs.

Tunnels and subways are ordinarily driven through rock or good earth, but even in places where poor materials are encountered the concrete construction with metal reinforcement will make a type of roadbed of ample stability. The tie blocks



Eastern Portals of New and Old Bergen Hill Tunnels.

Track Structure in New Tunnel.

View taken at one of the two open shafts in the interior of the tunnel. Old tunnel at the left.

are well imbedded in the concrete, which will prevent their bunching up in case of a derailment.

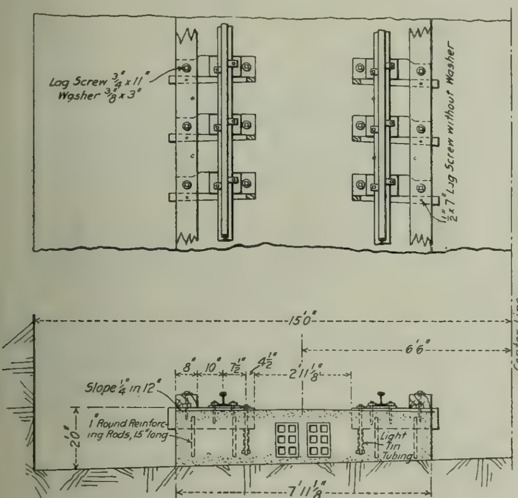
All timber materials are to be treated with 12 lbs. of creosote to the cubic foot. The tie blocks are long leaf yellow pine, roughed to 8 in. x 8 in. x 2 ft. 6 in., dressed to final shape and then creosoted. It is specified that the creosoted material should be properly piled and remain exposed to summer sun and air for about 3 or 4 months to permit the creosote vapors to escape. The wedges, which are of the same material, are similarly treated. In the Bergen Hill tunnel a plain wrought iron 6 x 12 x ⅝-in. tie-plate is used under the track rails, but for steam railway tunnels the revised design, with guard rails, provides for intermediate and joint tie-plates 7½ x 11/16 x 12 in.; and for steam railway tunnels, without guard rails, and for subways and circular tunnel tubes, the intermediate tie-plates are 9 x ½ x 10 in., and the joint tie-plates 10 x ½ x 11 in., the longest dimension of the tie-plate being the one in the direction of the rail. Lag screws with large pitch of thread are used to fasten the wrought iron rail clips. Each tie-plate is punched with four holes and the clip fastenings staggered. If the timber block becomes defective at the lag screw holes or a lag screw is twisted off or rusts off, the clips can be readily reversed and lag screws used in the extra holes through the tie-plate. The tie-plates are sheared from universal milled bars, ordered in multiple lengths of the tie-plates, and the four holes in the plate punched at one operation. The rail clips are also sheared from universal milled bars, ordered in multiple lengths of the rail clip, and two passes of the bar through a planer before shearing shape the clip to fit the rail flange perfectly. Cast iron rail clips cannot be perfectly molded to fit the rail flange, and experience shows that the flange of the rail tends to wedge up and lift the clip and lag screw with an imperfect fitting rail clip. Iron is used for the tie-plates and rail clips to prevent, to a large degree, rusting. It has been found by experience in the maintenance of track in railway tunnels that engine gases and dampness cause rapid rusting of rails and rail fastenings, and the attachment of the running rails to fixed metal track supports that cannot be readily replaced is impracticable for this reason.

The accompanying drawings show suggested types of construction for circular tunnel tubes and subways, as well as the type used by the Lackawanna. The Lackawanna used a guard rail through the Bergen Hill tunnel, the object being to prevent any derailed trucks from slewing a car and side swiping a train passing on the adjacent track. Where lighter equipment is used, such as in subways, there is little likelihood of trouble from broken flanges causing derailment, and a guard rail is not considered necessary.

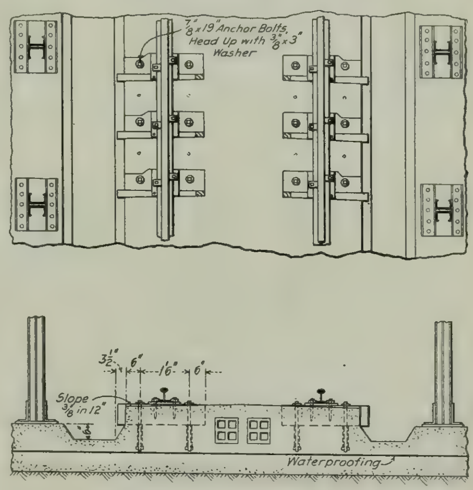
In the design without guard rail for subways and tunnel tubes, the tie-plate extends over the tie block and wedge, and the lag screw through it makes an efficient and practical attachment for holding the wedge in place and also utilizes the wedge area as additional bearing surface for the tie-plate. While the width of these tie-plates can be varied, yet it seems desirable to use a large tie-plate to make the mechanical life of the tie block equal to its physical life.

The trenches between the rails, in the tube and subway designs, afford an efficient means of cleaning and flushing out the tunnel and can be used to good advantage for temporary storage of track materials, such as tie blocks, etc. The construction of conduits for telegraph, telephone, or high-tension lines in the concrete roadbed reduces the volume of concrete and makes an efficient conduit construction.

If a third-rail construction is used the tie block can be extended to support the third rail, or a bracket construction can be attached to the tie blocks for supporting it.



Steam Railway Tunnel.



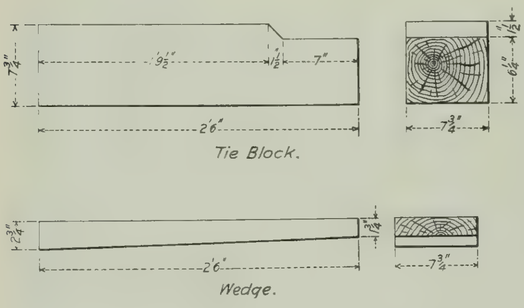
Subway Design; Openings at Sides.

The Lackawanna tunnel roadbed was finished in the middle of January, 1909. It was not opened to traffic until a month later, however, in order to give the concrete some time to harden. The company originally had under consideration the construction of a ballasted roadbed, and the plans provided for two 12-tube conduits throughout the entire length of the tunnel, one conduit adjacent to each side wall, with the conduits encased in concrete and the top of the conduit construction to be of such height as would not interfere with clearance. The tunnel was constructed in trap rock throughout its entire length, and had the conduits been placed in the side-walls it would have been necessary to quarry out considerable rock to provide room for the conduits and give sufficient strength to the side walls.

With the plans for ballasted track, the company provided for two lines of 8-in. tile drain throughout the length of the tunnel, one line on the outside of either track, and in this connection it provided for trenching out the rock so as to get a reasonably good depth for the tile drains below the ballast.

The new tunnel has been lined throughout its entire length with concrete, and down-drains are provided every 50 ft. in the side walls of the tunnel, as well as longitudinal drains about 5 ft. above the spring line of the arch for collecting water and diverting it to the down-drains. This tunnel runs close to the Jersey City reservoir, and there are a number of points where there is quite a large seepage of water. For this reason, in order to avoid difficulty with track maintenance, the original plans provided for the drains as noted.

The accompanying tables show an estimated cost of the ballasted roadbed construction for double track through Bergen Hill, in which are noted the details above described. So far as the amount of tunnel excavation and the cleaning up of muck under the roadbed are concerned, the cost would be the same whether ballasted track or concrete roadbed were used, but with the concrete roadbed the tile drains and trenching for ditches for the drains are eliminated. The estimated total cost, including the conduits, tile drains, creosoted ties, etc., as detailed, for the ballasted track, for a length of 4,280 ft., amounts to $62,568.87, which would be at the rate of $14.62 per lineal foot of double track. If the conduit construction is eliminated from consideration, the total cost amounts to $43,429.87, or $10.15 per lineal foot of double track. The detailed statement of actual cost of the concrete roadbed construction does not include any estimate for the concrete sub-base under the finished track superstructure. The statement in detail shows the actual cost for 4,280 lin. ft. of double track as taken from the company's invoices and records. This statement includes the two lines of 12-hole conduits. The railway company furnished sand, stone and cement for the concrete



Tie Block and Wedge.

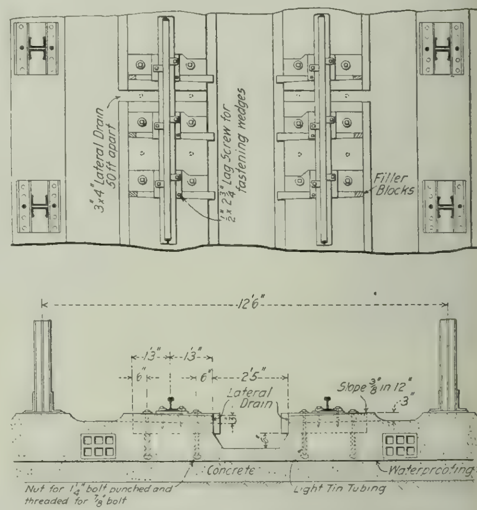
work, and the price of $6.25 per cubic yard, given in the detailed statement for concrete roadbed, includes the contractor's price plus the cost of material. The contract provided that the contractor would lay the conduits, the railway company to furnish the material and the contractor to receive the same price per cubic yard for the work as he received for the balance of the concrete work, namely, $3.50 per cubic yard. This price of $3.50 per cubic yard included everything excepting sand, stone and cement. The company assembled the tie blocks and rail, and the cost of these items is included in the detailed statement. The cost figures $14.26 per lineal foot of double track. Eliminating the conduit construction from consideration, the cost per foot of double track for concrete roadbed amounts to $13.18 per lineal foot of double track as against $10.15 per lineal foot of ballasted double track. Had the conduits been eliminated from the concrete roadbed construction, the superstructures could have been made about 4 in. less in height, which quantity would have practically made up for the area of concrete occupied by the conduits.

One inspector nights and one during the day will be all that is necessary for maintenance, for reasons already noted.

The following statement shows what it has actually cost the company per month to maintain ballasted track in the present old Bergen Hill tunnel, which is the same length as the new tunnel:

	Per month.
Foremen	$75.00
Laborers	400.00
Watchman	90.00
Total	$565.00

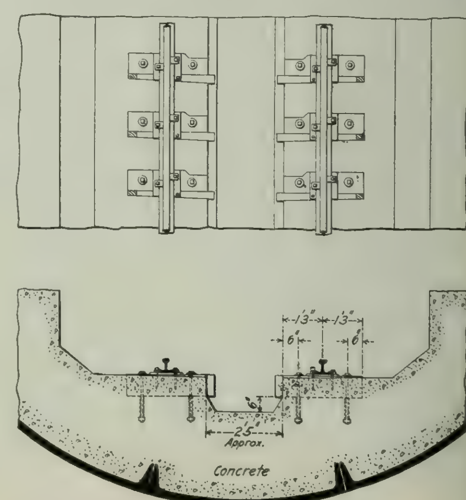
Capitalizing the investments for ballasted track construction and for concrete roadbed construction (including conduits) at



Design for Subways; Opening Between Rails.

4 per cent., and taking into consideration the difference in cost of maintaining, the saving per year in cost per mile of double track (with conduits) amounts to $7,107.32. Without conduits the saving per year per mile of double track concrete roadbed would be $6,389.42. What the comparative saving in renewals will be is a matter for future determination.

The proportions used in the track superstructure were one part of cement to six parts of Cow Bay gravel and sand; and in the sub-base the proportions were one part of cement to



Tube Track Construction.

twelve parts of crushed stone and sand for bringing the sub-base up to proper level.

Estimated cost of Ballasted Track Construction for Double track Through New Bergen Hill Tunnel.

Length of tunnel, 4,280 ft.

232	gross tons 91-lb. special open-hearth rail,	at $34.00	$7,888.00
520	pairs of angle bars	" 1.07	556.40
3,120	splice bolts	" $.03\frac{1}{3}$	104.00
3,120	nut locks	" .009	28.08
8,835	tie-plates, 6 in. x $\frac{1}{2}$-in. x 9 in.	" .131	1,157.38
520	joint tie-plates, 6 in. x $\frac{1}{2}$-in. x 11 in.	" .171	88.92
18,710	spikes	" $.01\frac{3}{4}$	327.42
4,677	creosoted y. p. ties, 7 in. x 9 in. x $8\frac{1}{2}$ ft.	" 2.10	9,821.70
6,737	cu. yds. stone ballast, delivered	" 1.00	6,737.00
17,976	lin. ft. of vitrified 6 hole conduits, 5 per cent. allowed for breakage	" .225	4,044.60
5,720	yds. drilling for wrapping conduit joints	" .095	543.40
2,035	cu. yds rock excavation for tile drains	" 7.00	14,245.00
8,988	lin. ft. of 8-in. drain tile; 5 per cent added for breakage	" .085	763.97
2,000	cu. yds. of extra concrete for conduits	" 6.25	12,500.00
8,560	lin. ft. single track laying and surfacing	" .20	1,712.00
586	cu. yds. concrete voids, occupied by conduits, but charged for by contractor	" 3.50	2,051.00
			$62,568.87

$62,568.87 ÷ 4,280 = $14.62 per ft. of double track.

If conduits are eliminated from consideration, the cost would be $43,429.87.

$43,429.87 ÷ 4,280 = $10.15 per ft. of double track.

Actual Cost of Concrete Roadbed Construction, Including Electric Wire Conduits, for Double-track Through New Bergen Hill Tunnel.

232	gross tons 91-lb. special open-hearth rail,	at $34.00	$7,888.00
520	pairs of angle bars	" 1.07	556.40
3,120	splice bolts	" $.03\frac{1}{3}$	104.00
3,120	nut locks	" .009	28.08
8,835	tie-plates, 6 in. x $\frac{1}{2}$-in. x 9 in.	" .131	1,157.38
520	joint tie-plates, 6 in. x $\frac{1}{2}$ in. x 11 in.	" .171	88.92
17,976	lin. ft. vitrified 6-hole conduit, 5 per cent. allowed for breakage	" .225	4,044.60
5,720	yds. drilling for wrapping conduit joints	" .095	543.40
9,360	creosoted y. p. tie blocks, 8 in. x 8 in. x 2 ft. 6 in.	" 45.00	5,616.00
9,360	creosoted y. p. wedges, $2\frac{1}{4}$ in. x 8 in. x 2 ft. 6 in.	" 45.00	1,579.50
17,680	intermediate rail clips	" .039	689.52
18,720	pieces round iron 1 in. x 15 in. for reinforcement	" $.06\frac{1}{3}$	1,185.60
1,040	joint rail clips	" .051	53.04
18,720	lag screwspikes, $\frac{7}{8}$-in. x $7\frac{1}{2}$ in.	" .046	861.12
9,360	lag screws for guard rail, $\frac{3}{4}$-in. x 11 in.	" .034	318.24
9,360	washers for guard rail, $\frac{3}{8}$ in. x 3 in	" .03	280.80
9,360	wedge lag screws, $\frac{1}{2}$-in. x 7 in.	" .013	121.68
18,555	lin. ft. of y. p. creosoted guard rail, 5 in. x 8 in.	" 45.00	2,783.25
4,680	guard rail anchor bolts, $\frac{7}{8}$ in. x 18 in.	" $.08\frac{2}{3}$	405.60
4,680	guard rail washers, $\frac{3}{8}$ in. x 3 in	" .03	140.40
4,680	anchor nuts, $2\frac{1}{4}$ in. sq. x $1\frac{1}{4}$ in. thick	" .08	374.40
4,680	tin tubes for anchor bolts	" .005	23.40
3,754.4	cu. yds. concrete	" 6.25	23,465.00
1,019.2	cu. yds. concrete voids, occupied by tie blocks, wedges and conduits, but charged for by contractor	" 3.50	3,567.20
Labor	and engineering for assembling and fastening complete, tie blocks, wedges, guard rails, rail, rail joints, screws, screw-spikes, etc., 8,560 lin. ft.	" .60	5,136.00
			$61,011.53

$61,011.53 ÷ 4,280 = $14.26 per lin. ft. of double track with conduits and wrapping.

Total cost, exclusive of conduits, is $56,423.53.

$56,423.53 ÷ 4,280 = $13.18 per lin. ft. of double-track.

Comparative Annual Costs.

Cost per year, ballasted track, with conduits:	
$62,568.87 at 4 per cent.	$2,502.75
Track maintenance, $565.00 per month x 12	6,780.000
Length of 4,280 ft.	$9,282.75
$9,282.75 x 5,280 ÷ 4,280 = $11,451.57 per mile.	
Cost per year, ballasted track, without conduits:	
$43,429.87 at 4 per cent.	$1,737.19
Track maintenance, $565.00 per months x 12	6,780.00
Length of 4,280 ft.	$8,517.19
$8,517.19 x 5,280 ÷ 4,280 = $10,507.20 per mile.	
Cost per year, concrete roadbed, with conduits:	
$61,011.53 at 4 per cent.	$2,440.46
Track maintenance, $90.00 per month x 12	1,080.00
Length of 4,280 ft.	$3,520.46
$3,520.46 x 5,280 ÷ 4,280 = $4,344.25 per mile.	
Cost per year, concrete roadbed, without conduits:	
$56,423.53 at 4 per cent.	$2,256.94
Track maintenance, $90.00 per month x 12	1,080.00
Length of 4,280 ft.	$3,336.94
$3,336.94 x 5,280 ÷ 4,280 = $4,117.78 per mile.	
Annual saving, concrete roadbed as compared with ballasted track, each without conduits:	
Ballasted track, 4,280 ft., yearly cost	$8,517.19
Concrete roadbed, 4,280 ft., yearly cost	3,336.94
Saving per year	$5,180.25

$5,180.25 ÷ 4,280 = $1.21 saving per year per foot of double track.

TRAIN ACCIDENTS IN MARCH.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of March, 1909. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Train Accidents in the United States in March, 1909.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
13.	Seaboard A. L.	Colon, N. C.	bc.	P. & Ft.	1	5
†15.	G., H. & S. A.	Sanderson.	xc.	P. & Ft.	2	15
15.	Louis. & Nash.	Cartersville, Ga.	bc	Ft. & Ft.	2	1

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
10.	Ark., La. & G.	Monroe.	mal ms.	Pass.	1	1
11.	C., B. & Q.	Peoria.	malice.	Pass.	0	0
12.	I. & G. N.	Tate's, Tex.	d. switch.	Ft.	1	0
24.	Union Pacific.	Granger.	neg. eng'r.	Ft.	2	0
29.	Penn.	Gallitzin.	unx.	Ft.	0	0
*31.	Union Pacific.	Castle Rock.	slide.	Pass.	2	0

Other Accidents.

Date.	Road.	Place.	Kind.	Train.	Kil'd.	Inj'd.
1.	C., H. & D.	Findlay.	boiler.	Pass.	2	0

The derailment at Gallitzin, Pa., on the twenty-ninth wrecked 10 freight cars. The report says that it was due to the breakage of an axle, a wheel or a rail. No person was injured, but the case is of interest as illustrating how a slight cause can make much trouble. The wrecked freight train was on track No. 1, but it blocked three tracks, Nos. 1, 2 and 3. An empty engine coming along a moment later on track No. 2 ran into the wreck and blocked track No. 4, on which passenger train No. 21 soon came along. This train had three engines, all of which were derailed; but its cars did not leave the track. No person was injured in any of the derailments.

The derailment on the thirty-first occurred in the Weber Canyon at 3.55 a.m. The train was running down grade so that the engineman was unable to check the speed at all after seeing the landslide. The mail car next the engine at once took fire from coals which had spread from the firebox, and the fire gradually spread until it consumed the first five cars of the train. The seven rear cars were pushed back by the passengers and thus saved from burning. The baggageman was burned to death in his car and the fireman was buried beneath the overturned engine. The bank at this point had never before caused trouble.

Of the electric car accidents reported in the newspapers in March, one, in Boston, resulted in the death of a motorman and the injury of 10 other persons, two of them fatally. A car delayed on a descending grade was run into by another, following, and eight cars, altogether, were involved in the smash.

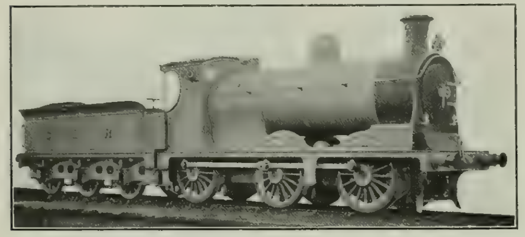
A society of locomotive engineers having established a school for the instruction in their calling for candidates for positions as enginemen and firemen, the Prussian Railway Minister has authorized the operating managements to assign to this and similar schools elsewhere rooms for their accommodation with fuel and light without charge, and to have the necessary furniture made in the shops and loaned to them.

[1] Abbreviations and marks used in Accident List: rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

GOODS LOCOMOTIVE WITH SPARK ARRESTER, CALEDONIAN RAILWAY.

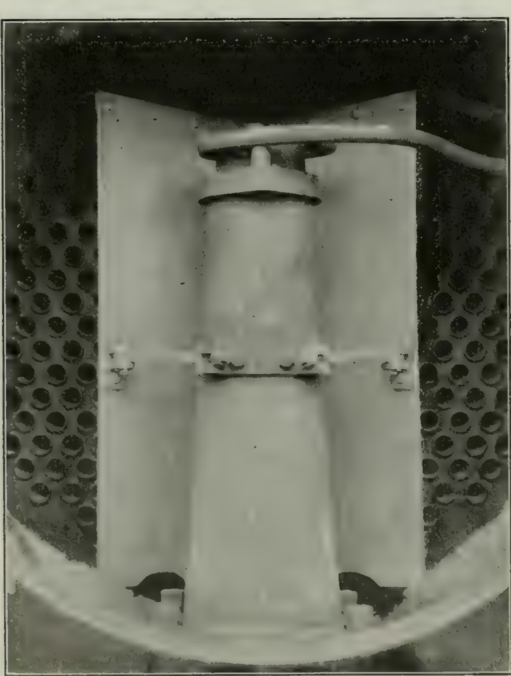
A new series of goods engines of the 0-6-0 type is being built at the St. Rollox works of the Caledonian Railway. A special feature in the design is the novel form of spark arrester fitted. The accompanying illustrations, for which we are indebted to J. F. McIntosh, chief locomotive engineer, show the general appearance of the first engine of the series, and also the construction of the spark arresting device.

The inside cylinders drive the crank-axle of the middle pair of wheels, the slide-valves working between the cylinders and being actuated by Stephenson valve gear. The crank-axle is of the built-up pattern with journals 8½ in. diameter by 7½ in. long, and the connecting rod bearing is 8½ in. diameter by 4 in. long. The leading and trailing axles have journals 8 in. diameter by 7½ in. long.



New 0-6-0 Goods Engine; Caledonian Railway.

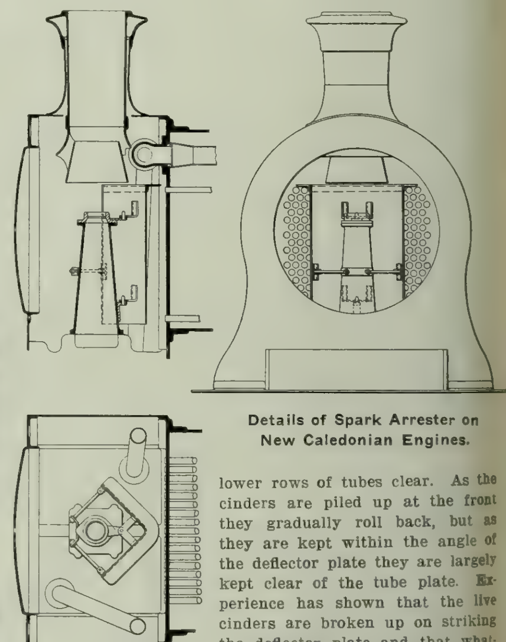
The boiler is made of steel plates with 275 tubes of mild steel, galvanized, 1¾ in. external diameter. The firebox shell is 6 ft. 5 in. long by 4 ft. 0½ in. wide at bottom, and the crown of the interior copper fire box is stayed with girder stays. The two Ramsbottom type safety valves mounted over the firebox are each 3-in. diameter, and adjusted for a working pressure of 160 lbs. per sq. in. The engine is equipped with a steam brake, and also has an ejector and "through" vacuum brake pipe, thus rendering it available for working express goods trains when required.



Spark Arrester on New Caledonian Engines.

The spark arrester consists of two vertical planes meeting at an angle a few inches in front of the vertical centre line of the tube plate. In plan the section of the planes is a "V" with the apex next the tubes, and the blast pipe in the opening of the angle. The arrester extends from the bottom of the hood down to the level of the lowest row of tubes. To permit of the cleaning of the tubes it is pivoted on its supports on the blast pipe and so can be easily turned to either side alternately to give free access to the tubes. Two diagonal stays at the front lock it in the central position and it can be entirely removed from the smokebox by lifting it free of the pivots.

The main purpose of the device is to deflect live sparks away from the current of steam issuing from the blast pipe and to induce piling up of the cinders in the front portion of the smokebox away from the tube plate, so keeping the lower rows of tubes clear. As the cinders are piled up at the front they gradually roll back, but as they are kept within the angle of the deflector plate they are largely kept clear of the tube plate. Experience has shown that the live cinders are broken up on striking the deflector plate and that whatever cinders are thrown out are black and consequently harmless.



Details of Spark Arrester on New Caledonian Engines.

The device is interesting as showing the possible differences in smokebox construction in England and the United States. The rather elaborate arrangements of the American locomotive contrast unfavorably with the simplicity of that shown here. Whether the same simplicity could be made to work with the difference in the coal used and the conditions of operation is doubtful.

In the following schedule of dimensions attention is called to the high ratios existing, especially that of the factor of adhesion and the ratio between grate area and heating surface.

The tender is carried upon six, 4-ft. diameter, wheels with a wheelbase of 13 ft. It weighs when full, with 3,000 gallons of water and 4½ tons of coal, 37 tons 18 cwts., giving a total weight engine and tender in working order of 83 tons 12 cwts.

The spark arrester was designed by Mr. McIntosh and is the

result of extended study and experiment. In actual working it has been so satisfactory that arrangements have been made whereby it will in future be fitted to all new Caledonian locomotives.

The following are some of the principal dimensions of the engine:

Cylinders, diameter	18½ in.
Piston stroke	26 "
Wheels, diameter	60 "
Boiler, height of center above rail	7 ft. 9 "
" length of barrel	10 " 3½"
" diameter of shell	4 " 8⅛"
Heating surface, tubes	1,284 sq. ft.
" " firebox	119 "
" " total	1,403 "
Grate area	20.63"
Steam pressure	160 lbs.
Maximum tractive force	17,800 "
Wheel base	16 ft. 9 in.
Weight in working order	102,368 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.70$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 831.77$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 62.23$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 9.27^{*}$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 79.72$$

$$\text{Displacement of 2 cylinders, cu. ft.} = 7.19$$

$$\frac{\text{Total heating surface}}{\text{Displacement of both cylinders}} = 178.58$$

$$\frac{\text{Grate area}}{\text{Displacement of both cylinders}} = 2.87$$

*Per cent.

NEW RAILWAY LAWS IN TEXAS.

Nine laws were enacted at the recent regular session of the Texas legislature and all but one of them have been approved by Governor Campbell. The particular one which met with the governor's disfavor was that authorizing the consolidation of the Wichita Falls lines. There are three of these roads, all owned by the same interests. The railway measures approved by the governor were as follows:

An amendment to the act defining the liability of common carriers for injuries to employees. The amendment provides that damage may be collected though the injury may be due in part to contributory negligence on the part of the employee injured or killed. The jury is to modify the amount of damages according to the degree of contributory negligence as compared with the company's responsibility.

After January 1, 1910, every locomotive must be equipped with an ash pan which can be emptied or cleaned without the necessity of any employee going beneath the locomotive.

The anti-pass law was amended, exempting from its operation members of volunteer fire departments, employees of express companies and employees of railways and immediate dependent members of their families.

No person shall be employed as locomotive engineer without having first served three years as a fireman; and the law prohibits the employment of any person as a conductor who has not first served two years as a brakeman.

Railway companies are forbidden to designate a station by any name other than that given by the United States Postoffice Department.

Railways in Texas must do all the repairing of their cars and other equipment in state. The new law prohibits any railway from sending its cars and locomotives out of Texas for repairs. This act will have the effect of causing the Texas roads to enlarge their shop facilities, it is supposed.

An act was passed to regulate the presentation and collection of claims for personal services, or for labor rendered, or for material furnished, or for overcharges in freight or express, or for stock killed or injured by any railway in the state, the fixing the attorney's fees to be recovered in cases where the amount of such claim does not exceed $200.

All trains must be run with a full crew, and a full crew on a passenger train shall consist of one engineer, one fireman, one conductor and one brakeman; on a freight, gravel or construction train, one engineer, one fireman, one conductor and two brakemen. A light engine shall carry a crew of one engineer, one fireman and one brakeman.

REPORT OF THE BOSTON METROPOLITAN IMPROVEMENTS COMMISSION.

Pursuant to an act of the Massachusetts legislature a commission of five members was appointed in 1907 to investigate and report on the advisability of any public works in the Metropolitan District (Boston), which, in its opinion, will tend to the convenience of the people, the development of local business, the beautifying of the district, or the improvement of the same as a place of residence . . . the control or direction of traffic or transportation, and the location of such docks and terminals as the district may demand. . . .

The report of the commission was submitted to the governor and to the mayor of Boston, March 15, and incorporated therein the report of George R. Wadsworth, Engineer for the Commission, recommending a proposed ultimate development of the present steam railway systems of the Boston terminal district.

Boston is served by four steam railway systems, comprising eight main lines and one short narrow gage line. Passenger traffic from the four divisions of the Boston & Maine from points in eastern and northern New England terminates at the North Union station, near the northerly limits of the city proper. Passenger traffic from the Boston & Albany, from the West, and from three divisions of the New York, New Haven & Hartford, from points in southern and western New England, terminates at the South Union station, about one and one-half miles from the North station. In addition to these three systems the Boston, Revere Beach & Lynn, a short narrow gage line, from Lynn, terminates in East Boston, across the harbor from the city proper, with ferry service to Boston.

The narrow gage road performs no freight service. Serving the three principal systems are twelve local delivery yards, each having a more or less rigid relation to one or another of the eight entering main lines.

The engineer's report comprises about 45,000 words and includes several tables of statistics, diagrams and drawings illustrative of the text, two of which are reproduced herewith.

In opening, Mr. Wadsworth says: The aim of managements of manufacturing enterprises throughout the world is to effect the greatest economies in the cost of production, consistent with the standard of quality and price in the manufactured product demanded by the consumer.

One of the most obvious steps in line with this aim is effective consolidation, which in the last 25 years has been most apparent among those particular interests which manufacture transportation, the railway companies.

Comparatively few years ago each of the eight trunk lines entering Boston represented a separate management and maintained its own terminal station for freight and passenger traffic. At the present time consolidation has progressed up to the point where there are four separate managements and three passenger terminals in Boston.

Any specific recognition of the present identities of the several steam railway managements and properties as deter-

mining factors, is believed to be wholly incompatible with logical suggestions for an ultimate and homogeneous development of the transportation lines within the terminal district.

That a due recognition of these corporate divisions, both physical and operating, must be made at the outset is obvious; but any system which will ultimately represent the highest type of public service, consistent with economy in operation and maintenance, must be developed along the broadest lines throughout the entire horizon.

Such a development is not possible under a system requiring more or less strict adherence to the interests of the several railway corporations involved. No definite recommendations would be warranted without having at hand comparative estimates based on designs embodying more or less detail. No detail designs or estimates have been prepared, and the entire road, located along the Atlantic avenue water-front of Boston proper between the North and South stations.

The suggested development of the terminal distributing system for local freight or tonnage for transhipment at piers or wharves would render possible the introduction of a "District System" of local delivery. That is, within certain limitations patrons would receive and deliver freight at the local station nearest their place of business, irrespective of the routing of the consignment.

Under prevailing conditions in Boston, and in fact in most other communities, patrons must receive and deliver freight at the local yard of the trunk line enjoying the haul, and in many instances this necessity entails a team haul of the goods entirely across the city. The adoption of the system of local delivery proposed would obviously eliminate a vast amount of

Suggested Ultimate Development of Boston Communications.

investigation has necessarily been in the nature of a preliminary study.

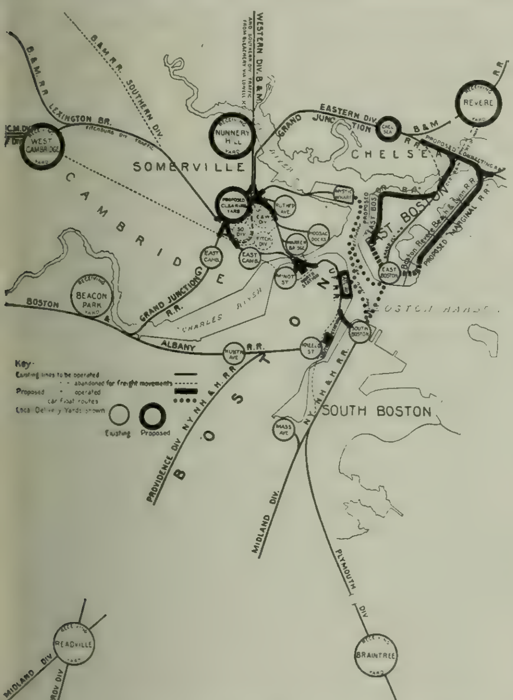
Particular stress is laid upon the necessity of eliminating the existing rigid features of operation which are due to the present condition of the various terminal properties consequent to development along independent and competing lines. In accordance with the development recommended all local yards for the receipt and delivery of freight as well as all piers and wharves within the terminal district, with few limitations have direct rail connections with all entering trunk lines. Extensions and revisions to existing properties are recommended to accomplish this result, among them the installation of a clearing yard and changes to increase the effective capacity of present connecting lines, the Grand Junction branch of the Boston & Albany, and the Union Freight Rail-

teaming through city thoroughfares. In this particular Mr. Wadsworth says: Revisions to the railway properties to facilitate the placing of cars, by rail, at the station nearest the place of business of the consignee, would not only effect an annual saving in teaming of about 6,000,000 ton miles, but would relieve the city thoroughfares of a considerable proportion of the team traffic, and at the particular points where today its intensity is the greatest. That is, by dividing the city into zones and districts, each district to be served as far as possible by its prescribed local freight station, the boundaries of the districts would quite properly lie along the thoroughfares in the now business center of the city.

The district system of delivery practically eliminates competition within the terminal district. We quote as follows: It is obvious from the scope of the development suggested

that as regards freight tonnage, actual competition among the present steam lines is practically eliminated within the terminal district and relegated to trunk line haul. The proposed district system of local freight delivery to a great extent retires the various points of strategic advantages in the matter of terminal deliveries at present respectively characteristic of the several railway systems, in favor of the broader policy of extending every advantage to all terminal patrons, irrespective of location.

For purposes of detour, as regards traffic from localities within 15 miles of Boston destined to points in northern and southern New England, certain revisions and extensions to existing terminal features in Boston will provide for the expeditious and economical transfer of through freight. To provide flexibility in the interchange of traffic among and between the entering trunk lines, the local freight stations and



Proposed Changes to Effect Flexibility in the System of Local Freight Distribution.

the water front, revisions and extensions to existing terminal features will likewise bring about this result and perform the function at a great saving in mileage over a belt line. For the purpose of stimulating industrial activity, by offering advantageous sites for manufacturing purposes, a belt line traversing territory within a radius of 20 miles of Boston would offer no inducements. Thirty-five years ago it is probable that a belt line proposition might have been prosecuted on a sound financial basis. To-day there is no valid reason for its construction even were the same subject to sound finance. The same results as to flexibility in traffic movements which a belt line would provide can be accomplished more advantageously, and at indefinitely less cost, in another and more direct manner. The sites of future industries, which shall represent the greatest efficiency in production must as a rule be on the water front at the foci of the arteries of transportation. There are millions of square feet of flats both at East and South Boston admirably adapted to this use, sites near a good labor market, where the housing of operatives is in well-established and neighboring localities. The mere fact that belt line routes are being operated successfully at other cities throughout the country is in itself no criterion as applied to Boston.

The conclusions regarding the development of the passenger system are prefaced by a division of traffic into its components. The following classes of service within the terminal district are believed to be distinct:

A. Through express traffic.

B. Suburban traffic. (Comprising local service of the present steam lines, serving largely to carry the business and shopping population from suburban home stations, on express schedule, direct without change, to a city station within five minutes' walk of actual destination, office, store or theatre.)

C. "Rapid transit" service. (Comprising urban and suburban service, as performed by the elevated and subway divisions of the Boston Elevated Railway, a distinctly "local" service with multiple unit trains, frequent stations and but limited express service.)

D. Street car service. (Whether performed on the surface or in the subways.)

Under this classification the two kinds of service performed by the suburban and rapid transit systems of transportation are entirely distinct. The former implies express service from suburban stations ultimately 30 miles or more from the city proper direct into a special distributing system in the city, where passengers may leave trains at one of several stations. Rapid transit service, as the properties are built and operated at present, implies a convenient service from the near suburbs into the city proper with frequent stations, trains making all stops, and no express tracks or service.

The permanent way clearances of the present elevated and subway structures are not sufficient to accommodate standard multiple unit equipment of the modern type for suburban service, a car approximately 10 ft. wide by 60 ft. long. Equipment of this type cannot be operated over the present rapid transit properties.

The type of the present "L" and subway car, with side seats, center exit and end entrance, is perhaps the best general type for the service required; that is, for a system where the running time between terminals is limited, not so much by the speed between stations as by the rapidity of loading and unloading passengers at the frequent stations.

On the other hand, this type of equipment, which sacrifices the comfortable cross seats to the demands for the rapid handling of passengers at the stations, is not conducive to the comfort of patrons for a 30-mile run from the suburbs, where the schedule is limited rather by the actual speed of the train between stations, than by the time consumed in loading and unloading at the comparatively infrequent stops.

Although at its inception the elevated and subway system might have been laid out and designed for the ultimate joint use of suburban and rapid transit traffic, the transition is considered impracticable and inadvisable to-day. Future subways or "L" structures should be designed as extensions to the present system, which should remain distinct to perform its important and characteristic service in the general system of distribution within the terminal district.

Any development which maintains the terminal features of the present system involves the transfer of all passengers at the terminal stations to some secondary distributing system. If a primary distributing system can be installed and operated a greater number of passengers can be landed within easy walking distance of destination without transferring to surface, subway or elevated lines.

Any new stations within the business center of the city which will serve all suburban trains will be of great benefit to a certain portion of the public who daily enter the city and likewise reduce the number of passengers to be handled at the present stations.

The main features of the present system of operation at the passenger terminals is outlined as follows:

The operation is strictly terminal, there being no through or loop movements at the terminal stations. Operation on this terminal basis obviously entails reverse movements for all except spot trains from the train shed to the terminal storage yard for passenger equipment. The so-called spot trains, always for local or suburban service, are not turned, nor do they leave the trainshed, except on outbound schedule. The locomotive inbound cuts off in the trainshed and a second locomotive is put into service for the next outbound run of the train.

Most of these reverse movements of inbound trains after discharging passengers from the train shed to the terminal yard, where locomotives and cars are turned, cleaned, restocked and again made up in the proper order for outbound service, must cross inbound traffic at the entrance to trainshed yard. This is also true in movements of trains for outbound service, made up in the terminal yard and backed into the train shed for the loading of passengers and baggage prior to regular schedule movement outbound.

Provision must always be made at the entrance to any yard serving two or more divisions or systems, by an adequate system of signal sand interlocking, for the crossing of numerous movements of regular traffic. This class of cross traffic movement can only be avoided by the installation of a more or less complex system of track grade separations at the entrance to the yard.

The observance of a proper system of signals renders this operation for regular traffic reasonably safe and expeditious, but as the traffic requirements increase the idle movements and crossings incident to terminal operation multiply rapidly, thus increasing the possibilities of accident or congestion and consequent delay.

These reverse movements of trains that have completed their run, as well as movements into the train-shed of empty trains prior to loading, in fact all movements incident to a regular day's business, are to the despatcher as much a part of the regular operating schedule as the movement of trains listed for public service in the time-table. Up to a certain limit, so long as this schedule is strictly maintained, there is no congestion, no matter how intense the traffic may be.

As traffic requirements increase additional trains become necessary, and during rush hours platform service tracks must be cleared more quickly. Ordinarily every additional train entails three crossings of traffic at the neck of the trainshed yard. The intensity of traffic at this point increases, and with it the possibility of congestion. Upon the slightest upset to the schedule, the stability of the system is shaken, and results detrimental to regular and dependable public service become very far-reaching.

Based on the present rate of increase of passenger traffic the railway managements will soon be confronted with the economic necessity of providing, both at the North and South stations, increased facilities, not merely to accommodate with safety and regularity traffic immediately in hand, but in anticipation of the requirements of service for many years' growth, at a like or greater rate.

The system devised should provide for the greatest flexibility in operation, a characteristic which is virtually insurance against indeterminate operating or traffic requirements which may arise in the future.

After considering various possibilities towards increasing the effective capacity of the present terminals, a subsurface connection between the North and South stations is recommended. Such a connection eliminates the necessity of strict terminal operation, and renders possible certain economies of operation which cannot otherwise be affected. We quote as follows:

It should again be noted that all suggestions for construction and operation are contingent upon the complete electrification of all lines entering the city, at least within the terminal district.

The need of through schedule, long distance trains, from northern to southern New England points through Boston, and *vice versa*, is practically negligible so far as affording any argument for building a connection between the two stations.

With a connection between the two stations, and all platform tracks in each train room leading into the connecting tracks, every train movement would become a forward or through movement, provided the location of the present terminal yards for the storage, cleaning and turning of terminal equipment were transposed. That is, trains from the Boston & Maine system would proceed through the city and the South station into terminal yards on the New Haven property adjacent to South bay. On the other hand, trains from the Boston & Albany and the New Haven systems would proceed to a terminal yard on Boston & Maine property north of the Charles river.

This feature is a fundamental requirement of the system it is proposed to develop.* * *

This recommendation toward the ultimate transposition of the present yards for the storage of passenger equipment is in no sense a radical suggestion, as it is eminently in line with the requirements for facility and economy in operation and the rebuilt yards for electrified equipment would be the same whatever the identity of the equipment served.

In addition to the economies which would be effected by the operation and maintenance of two terminal yards for passenger equipment as proposed, instead of the seven yards which maintain under existing conditions, the present switching movement between the terminal station and the terminal yards would be practically eliminated.

Under the present system of operation the road engines of many inbound trains cut off in the train shed, and after unloading, the trains are pulled to the terminal yards by switch engines. In fact a large number of engines are now maintained and operated for this distinct class of service, for movements between the train shed and the terminal yards.

Under the system proposed, providing for through movements, the road engine (electric locomotive or multiple unit train) inbound, would continue with its train to the terminal yards and outbound would pull the train from the terminal yard, no switch engine service being required. As $12,000 per year is a fair average cost for maintaining and operating a single switch engine, the saving thus effected rapidly capitalizes permanent improvements to eliminate switch-engine service.

Depressed train rooms, with separate groups of tracks for through express and for suburban service, are provided at both stations, all platform tracks leading to the connection between the stations. In each case the passenger concourse is maintained essentially at street grade, the track grade of the train room being about 23 feet below. An additional station, for suburban traffic only, is recommended in connection with the proposed subway, about midway between the present terminal stations.

The narrow gage Boston, Revere Beach & Lynn Railroad, now terminating in East Boston is standardized, extended under the harbor by a tunnel and entered into the connection proposed between the two stations.

So far as operating limitations are concerned, the plan recommended places Boston at the intersection of several through lines of transportation. Passenger traffic from all lines enters one distributing system, which may be extended in the future as conditions may warrant. The physical properties present no obstacles to the operation of trains from any line through the distributing system to any other line or return. In short the operation may conform strictly to the requirements of traffic as such requirements may develop.

RAILWAY CAPITAL AND VALUES.*

BY W. H. WILLIAMS.
Third Vice-President, Delaware & Hudson Company.

(*Concluded from page 846.*)

Both the public and the common carriers are more or less familiar with those sections of the Act to Regulate Commerce which require the Commission to investigate any and all complaints regarding violations of the Act; and which authorize the Commission to institute inquiries on its own motion; to fix reasonable maximum rates, to establish through routes and joint rates, and determine the division of rates; to award damages; to regulate the allowance to shippers for service; and to prescribe the rules and regulations governing the issue of tariffs, etc.

It is doubtful, however, if other than the accounting officers of the carriers are familiar with the provisions of Section 20, and in view of the relative importance of that section to the subject under discussion, it seems desirable that the same be quoted in full.

That you may understand the manner in which the Commission is working under Section 20, I desire to quote the following extracts from Professor Adams' address of October 11, 1907, before the Government Accounting Officers at Washington:

"The government has recently undertaken to do something quite different from that which it has ever undertaken to do before. It has undertaken to exercise a controlling influence upon the administration of railway properties through the agency of their accounts. . . .

"I assume, further, that you will not take it amiss if I place some emphasis upon the political aspect of this new step which the government has seen fit to take, political, not in its party sense, but in the broad sense of political science. What do these orders of the Commission relative to accounts mean for our government? What do they mean as a form of control of aggregations of capital which, under present conditions, are a menace to the stability of this nation? And I further call attention, in passing, to the fact that the success of what the Interstate Commerce Commission is undertaking in this regard, aiming, as I have remarked, at the control of railway accounts, will serve as a model, if it succeeds, for the control of all forms or agencies of consolidated capital which endanger the perpetuation of the principles upon which our government rests. . . .

"Now, there is one thing in which this government is wofully deficient, and that is in the development of any governmental administrative agencies, so far as industrial affairs are concerned. The marked difference between the German constitution and the American constitution is that we overestimate the exercise of judicial functions and underestimate the exercise of administrative or supervisory functions, whereas in Germany the reverse is true. They have a perfect administrative supervision, although the expressions at least of the rights of the individual are less definite and direct than in this country. It is with no intent to disparage the importance of judicial administration, or of that method of procedure which aims to redress wrongs by passing judgment upon complaints, but if my view of this situation is correct, the other method of making effective governmental control over industrial affairs contains the greater hope, and the significance of the twentieth section of the act to regulate commerce is that it provides a practical means within a limited area of working out the theory of administrative supervision. . . .

"Call to mind that the aim of the supervision of accounting is to exercise influence upon the administration and management of railway property; call to mind, further, that the function of accounts is to record facts, and that true accounting is nothing more, nor nothing less, than the correct statement of what, in fact, has taken place, and the measurement of that fact in an appropriate figure. Now, control over the manner in which those facts are recorded, and the assignment of some degree of personal responsibility upon some specially designated official, must result in a very direct influence upon the administration of railway properties. . . .

"The method by which it is hoped that this will be accomplished is found in the order promulgating these accounts. . . .

"The order holds the accounting officer of each railway responsible for the proper application of the rules laid down, which, in effect and to the extent that the law has jurisdiction over this matter, makes every accountant in this country the agent of the United States government for the execution of the law.

"Now, you may say this is setting up a partnership, as it were, with the carriers. That is true. If you go back to the fifteenth century and ask what is a corporation, a very significant answer is made. At the time the corporation originated, as an entity in English law, the corporation was regarded as an arm of the state. There was some function which the state desired to perform, or to have done; which the state, for some reason, did not desire to perform directly and immediately. It, therefore, selected certain men and said: We will incorporate you, give to you the liberty of doing this thing, and you will be responsible for the doing of it. The East India Company is an illustration of a corporation of this kind, the corporations that established the state of Pennsylvania and all of our plantations are illustrations of corporations of this kind. Everywhere the corporation was conceived to be a part of the government, and within the limits that the government chose to exercise its supervision, the corporate official was responsible to the government.

"Now, in the industrial development that has characterized the life of the English-speaking people the modern corporation seems to be more or less of a purely private affair. Our industrial philosophy led to the complete separation of state and industry. As a result of this policy, while great benefits have accrued, certain evils also have shown themselves, and the time has come when it is necessary to select certain of these corporations, at least, and restate for them the old and original theory of the corporation. I do not know that this explanation was present in the minds of Congress when it passed the twentieth section of the act to regulate commerce. I do not know whether what I have said was consciously recognized by the members of the Interstate Commerce Commission when they framed the order under which the operating accounts were promulgated; but this I do know, that through the agency of accounts and by means of that order which imposes upon certain officials of the railroads the personal responsibility of executing the Commission's orders relative to accounts, a long step has been taken toward the realization of the sixteenth century theory, and to my mind the correct theory, of corporations. Such, then, very concisely stated, is the political aspect of this government supervision over railway accounting which marks the most recent phase of railway legislation."

In connection with this address by Professor Adams, your attention is called to the following clause in the Report of the Interstate Commerce Commission for the year 1907:

"If Congress designed by the provision which it made for a prescribed system of accounts that the Commission should do what lies in its power to guarantee the sound financing of railways, the making of an inventory appraisal of railway property cannot longer be delayed."

There is nothing in the Act to Regulate Commerce which justifies anyone in supposing that Congress expects the Commission to "guarantee the sound financing of railways." Section 20, however, provides a means by which the Commission and the public can be kept fully informed regarding the operation and policy of each company. Their present operations are conducted under contracts with the states; such contracts being commonly known as charters. Neither party can ignore the provisions thereof without the due consent of the other. Two attempts to have Congress pass a bill providing for a physical valuation of the railways have failed of passage by Congress. It has been stated, however, that the Commission may find it possible to undertake such an investigation under the provisions of the Emergency Currency Act. If this be their position, they are seeking to accomplish by indirect means something to the securing of which by direct means Congress has withheld its approval.

What Professor Adams (and possibly the Commission) has in mind is not a question of *regulation*, but a question of *control* over the operations not only of the common carriers, but of all manufacturing and commercial establishments whose business is not confined exclusively to one state. He seeks to secure this control by a physical valuation, and a system of accounting.

The present plan contemplates requiring the carriers to add to their cost of property any and all amounts which, in the past, have been expended for Construction or Additions and Betterments and charged to Operating Expenses, Income Account, or to Profit and Loss Surplus, thus changing the General Ledger accounts as they exist to-day.

In the event of a physical valuation of the properties the companies will be required to ignore the facts as set forth on the present books of the companies, and open up a new set of books, using as a basis the figures obtained by means of a physical valuation.

The present plan does not contemplate any valuation appearing on the books for franchises, good will, etc., notwithstanding the fact that property is of no value without the right to use it. To carry this theory to a logical conclusion, the book accounts should be ignored from time to time, as the

*An address before the New York Traffic Club.

physical value of the plant changes with the commercial conditions; whether this be due to changes or fluctuations in the price of material entering into the construction changes in land values, or other causes. No plan has yet been suggested as to the manner in which they purpose making an adjustment between the proposed accounts and the securities outstanding.

Can we afford to place in the hands of a Commission, composed of a few men, the power to write up and down, at will, the value of the carriers' property, especially when we bear in mind that the membership of the Commission is constantly changing; that different men have different views regarding valuation; and that we already have the experience of the Michigan Central, where such a Commission, by a slight change in the interest rate, made a difference of $20,000,000 in the value of the property of that company within two years? Shall either the rates or the capitalization of the companies be dependent on so unstable a basis?

The suggestions of the Commission regarding other matters affecting the capital accounts of the companies are equally objectionable and unfair to the railways. For example:

First.—They have established depreciation accounts without setting up appreciation accounts; notwithstanding the repeated rulings of the courts that depreciation and appreciation must be treated alike.

The depreciation accounts as promulgated also interfere with the ability of the operating officer to analyze his expenses, inasmuch as they require the roads to include in their operating expenses amounts other than those actually expended, making it especially difficult for those not familiar with accounting systems to distinguish as between theoretical and actual expenses.

Second.—They overlook the right of the railways (and common to all corporations) to capitalize discounts on securities sold.

Discounts on securities sold represent the increased commercial risk of the investor as compared with other investments in commercial pursuits, and the right to capitalize the same has been passed on favorably by the courts.

Third.—Contrary to almost uniform practice of the railways, they contemplate the charging to Operating Expenses of from 50 to 70 per cent. of the cost of reduction of grades, changes of line, revision of yards, etc. They ignore the fact that the net returns of a property can be increased as much by the reduction of expenses as by an increase in revenues. A penny saved is a penny earned; but usually to earn an additional penny a railway has to spend six-tenths of a cent for operation. A reduction of $1,000 in expenses is equivalent to an increase of $2,500 in gross revenue. In either case the net earnings of the company are increased just $1,000.

If the Commission maintains its plan, and it be sustained, then the investment of new capital for reduction of expenses will be discontinued, and it will only be employed for purposes that will increase the gross revenue.

The public are equally interested with the railways in this question of capitalization. Interference with their ability to secure the necessary capital with which to continue the development of existing lines and construction of new ones must correspondingly adversely affect their ability to properly serve the public. The present tendency is to restrict the ability of the roads to raise new capital, while at the same time increasing the expenditures for non-revenue producing property through legislation requiring the elevation of tracks, erection of new interlockings, block signals, new stations, and increased passenger train and other service that is unremunerative.

The action of the Interstate Commerce Commission on the subject of depreciation affected the net earnings applicable to fixed charges, dividends, new construction, etc., to the extent that such charges exceeded the actual expenditures during the year. For example, one road showing for 1906 a surplus of $1,400,000, charged for depreciation in 1907 $1,200,000, and the surplus for the year 1907 was approximately $200,000. The actual net returns of the two years were practically identical, the difference being caused by the substitution, under the instructions of the Interstate Commerce Commission, of "theoretical bookkeeping" for a record of the facts.

The public, not understanding the cause of the great difference in the performance of the railways, as indicated in reports to the Commission, became alarmed regarding their investments, and this assisted in hastening the panic of 1907.

In an address delivered in 1907, L. F. Loree stated:

"In the past the energy, courage and skill of the railway officers have been devoted to new construction, to the bettering of the line and grade of the old roads, to a great improvement in the structure of the track and equipment, and in methods of operation, particularly in getting better loads for cars and engines and the lowering of cost through reduction of train and ton mileage.

"The vindication of the wisdom with which the railways have used the new moneys furnished them is that with a doubling of the capital they have quadrupled the movement; that whereas in 1882 it required a capital investment of more than 12 cents to provide for the movement of a traffic unit, in 1905 it required a capital investment of but 5¾ cents to provide for this movement.

"That the public has not been unfairly dealt with is evidenced by the fact that whereas in 1882 a charge of 1½ cents was made for the movement of a unit of traffic, in 1905 this charge had been reduced below one cent. . . . .

"The problem which is facing the railroads and the people is not how the railroads will be able to maintain this traffic, but how they will be able to handle the enormous traffic which they will be called upon to handle. It is hard to convey an adequate idea of the seriousness of this problem. In the eighties a growth of 10 per cent. in traffic meant an increase of 5,000,000,000 traffic units per annum, but now it means an increase of nearly 20,000,000,000 traffic units. With a growth of railway mileage which even last year, when the quantity constructed was larger than for many years past, showing an increase over the total of less than 3 per cent., with nineteen-twentieths of the railways only single track lines, and with a large portion of these nearly up to the limit of their carrying capacity; with an equipment absolutely inadequate and being but slowly augmented, owing to the destruction of vast quantities of old and obsolete cars and engines, it seems clear that neither during these years of the past, nor in the immediate future, will the proportionate growth of capital outlays in any way correspond with the proportionate growth of traffic."

In the year 1906, the amount of new securities authorized by the railways was about $2,700,000,000, and the amount actually issued was but $1,600,000,000. Of the latter sum, $500,000,000 was for conversion purposes, so that the net increase in capital securities outstanding was about $1,100,000,000 par value. This was considerably above the amount realized on sale. Some of the proceeds were paid out on disroads; some used to increase cash on hand or materials in stock, and for other purposes. It is probable that not more than $800,000,000 was devoted to construction and equipment. To this latter amount should be added a possible $100,000,000 for construction and betterments contributed by the companies and charged by them to Income or Operating Expenses. This $900,000,000 is probably distributed as follows:

New lines	$200,000,000
Additional tracks	125,000,000
New equipment	400,000,000
Terminal facilities	175,000,000
Total	$900,000,000

Can we afford to vest in any commission the determination of these great questions, fraught with such vital consequences to the prosperity and development of both the railways and the country? Shall not the stockholders be permitted to operate the property owned by them, under such governmental *regulations* as may be deemed necessary to secure equal service to all, and at rates not unreasonable?

CONCLUSIONS.

Now, gentlemen, I think we have proven:

First.—That a general valuation of railway property such as proposed by the Interstate Commerce Commission cannot lawfully be used for any federal purpose, either of taxation, or of determining the reasonableness of a rate, or of fixing the value of railway securities.

Second.—That before any valuation of railway properties—whether it be the cost of material in place or the value as a "going concern"—can be generally used for purposes of taxa-

tion, it will be necessary to amend the constitutions of several of the states.

Third.—That for the purpose of determining the reasonableness of a rate, the cost of the property to the present holders thereof, and the valuation of the plant as a "going concern," must be ascertained.

Fourth.—That the questions of reasonableness of rates do not arise with regard to the whole of any carrier's business, but as to parts thereof for particular services, and that the only valuation which could be of utility in solving these questions would be of the particular portion of the carrier's property specially employed to perform the service.

Fifth.—That in the determination of the reasonableness of a rate the value to be applied is the *then* value as a "going concern," and a valuation to-day would not apply to conditions existing to-morrow.

Sixth.—That before undertaking a valuation for any purpose, it is not only desirable but necessary that a basis fair to all interests be determined, and that the purpose for which it is to be used shall be clearly defined. It otherwise is susceptible of conversion, as Mr. Shields points out, to mean "nothing more nor less than confiscation."

Seventh.—It is not wise to give any political body the power to write either up or down, at will, the assets of a corporation.

PFLASTERER'S CONTROLLED MANUAL BLOCK SYSTEM

George S. Pflasterer, chief signal officer of the Nashville, Chattanooga & St. Louis—who, by the way, reports direct to the president, although his title is "Inspector"—has patented a controlled manual block system for single-track, in which he provides "control" for permissive as well as absolute blocking; and we understand that the railway company proposes to install the system at some point near Chattanooga. Mr. Pflasterer gave an exhibition of his system last month before the Nashville Association of Railroad Officers, a miniature installation having been set up in the shops of the company. He proposes to have track circuits throughout the length of his block sections, and to so control the signals that he can authorize permissive movements by signals for trains following one another, while at the same time maintaining absolute blocking as against opposing trains; and so locking the signal levers that a signalman can never give a clear signal when he should give a permissive or cautionary signal. That is to say—assuming a line on which trains run eastward from A to B—A can give a permissive signal when the block is occupied by a train which he has sent forward to B, yet cannot give a clear signal; nor can he give either a clear or a permissive signal if the block is occupied by a train which has started from B to A. With this system the delivering of permissive cards to enginemen is made unnecessary, and Mr. Pflasterer hopes therefore to increase the capacity of his line over that of lines where a similar system is used with less complete locking and where the semaphore signals are used for only two indications—clear and stop. In his patent Mr. Pflasterer calls this "Controlled Manual Semi-Automatic Block Signaling." He provides for using intermediate automatic signals where the block sections are long. If there is an interlocking in the block signaled line he would use purple for the night stop indication for diverging routes, thus making it unnecessary for a train ever to pass a red signal at high speed at night.

In connection with this exhibit Mr. Pflasterer recalled the long record of the use of the space interval on the Nashville, Chattanooga & St. Louis between Wauhatchie and Chattanooga, six miles, four-fifths of which is single track. The records of this line are familiar to old readers of the *Railroad Gazette*. Over it are run the trains of three different companies, and time-table rights and the ordinary despatchers' "orders" have been unknown here for 20 years. Since June 30, 1888, there have been run 425,855 trains, or an average of 1,731 a month (and a larger number over the double-track section); and the only collision was one occurring under permissive blocking, where a freight car was damaged to the amount of about $2. In this installation there are no track circuits, but there is an electric indicator by which, if the operator at B starts to clear a signal for a train to enter the single track line from B to A, when a clear signal has been given at A, he is warned by the ringing of a bell. As one may readily believe, this fine record is due (says President Thomas) to rigid discipline. The plea that good discipline is beyond attainment because a part of the enginemen and trainmen belong to other companies evidently has not found a place in this superintendent's philosophy.

RESERVOIRS FOR PETROLEUM DREGS FOR RUMANIAN STATE RAILWAYS.

In an article published recently by the *Revue Générale des Chemins de fer* are illustrations of storage tanks used on the Rumanian State railways for petroleum dregs and also of an elaborate design for an elevated tank used for filling the oil compartment of the locomotive tender, as these petroleum dregs are used as fuel on this railway. These reservoirs are of a novel construction, which has been arrived at only after many experiments and it is thought they are of sufficient interest to warrant our illustration and some brief description of them.

The reservoirs are of two kinds. One kind serves to store the necessary supply at the station or warehouse. They are filled with the oil dregs brought in by the tank cars. The others are intended to fill the locomotive tanks by gravity.

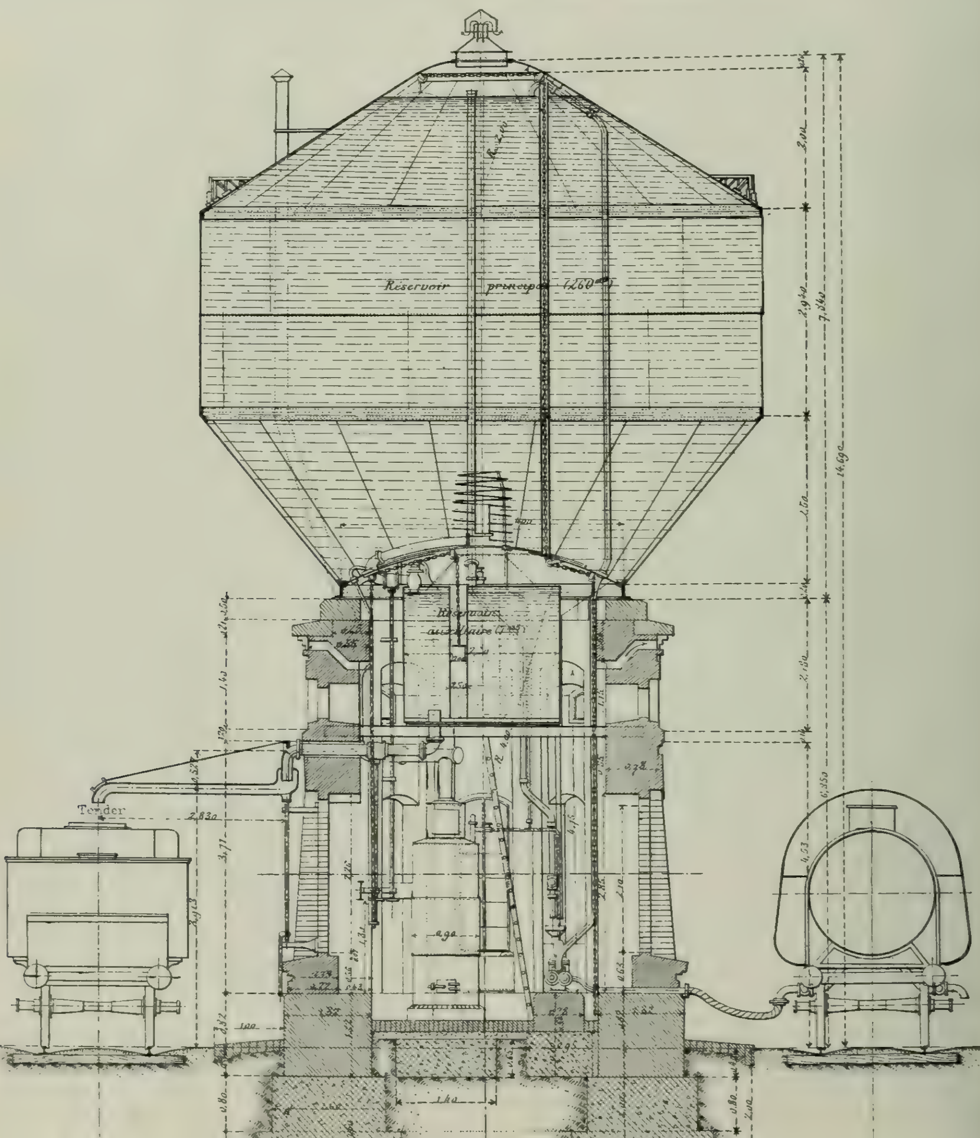
The passing of the oil dregs from the tank cars to the supply reservoirs and from the latter to the distributing reservoir is accomplished by a system of pipes and sluices, and the passage of the oil dregs from the distributing reservoir to the tender is by gravity.

When these petroleum dregs were first used as fuel for locomotives the Rumanian railways built in several places cisterns with oak staves, made tight by means of clay. These cisterns leaked badly and they were replaced by stone work covered on the inside with a coating of cement. These also were unsatisfactory, as the walls cracked and the oil escaped through the masonry. The railways then decided to replace these reservoirs by others of sheet steel. The storage reservoirs vary in capacity from 200 cubic meters to 2,300 cubic meters. They are of soft sheet steel, with the bottom plates set upon a sand bed surrounded by a low masonry wall. The longitudinal seams are riveted with a double row of rivets and the vertical seams are single riveted. The thickness of the sheets, in order to get a good, tight rivet, is not less than 5 mm. The tanks have no covering to protect them against cold, but are furnished with a steam coil for heating the oil. They are also provided with an indicator and float gage, and a ventilator is placed in the top for the escape of volatile gases.

The distributing reservoir, which is here illustrated in vertical section, is also of sheet steel and is placed on a masonry tower at such height that the oil dregs can run by gravity into the tender. The supply for the tender is drawn from a smaller reservoir, which is called the auxiliary reservoir, and permits the gaging of the quantity of oil distributed to the locomotives. The upper principal reservoir is not protected against the cold, but the dregs flow by a strainer which is surrounded by a heating coil and thence to the auxiliary reservoir, which itself is protected against cold by its situation in the tower, and it maintains the temperature of the dregs obtained from the heating coil above. In the masonry tower there is a vertical boiler and steam pump provided with valves and pipes by the aid of which the oil is forced from the tank cars to the upper reservoir. The drawing represents the distributing reservoir of the Pascani station. The principal reservoir has a capacity of 260 cubic meters; the auxiliary

7 cubic meters. The boiler has a heating surface of 7 square meters, and the Worthington steam pump a capacity of 15 to 20 cubic meters per hour. The sluice valves permit the attendant to open or close the filling pipes by working a hand wheel. An ingenious gage allows the reading on a graduated scale of the quantity of oil dregs, expressed in kilos, as distributed to the locomotives.

These distributing reservoirs are of three sizes, 66 cubic meters, 100 cubic meters and 260 cubic meters, and in some places under certain conditions they also serve as storage reservoirs. They are arranged with a track on each side, in order to be accessible on one side to the tank car which brings the oil dregs in and on the other side to the locomotive which is to obtain its supply of oil. The storage reservoirs, on the contrary, must be situated far from the main tracks, as they might be knocked down by the derailment of an engine and the dregs flowing over the tracks might occasion disaster. The capacity of the storage reservoirs now in service or in course of construction on the State railways of Rumania reach a total of 30,000 cubic meters.



Reservoir for Petroleum Dregs; Rumanian State Railways.

General News Section.

The Indo-European Telegraph Co., with its connections, has telegraphed direct from Calcutta to London, 6,900 miles, without retransmission. This is said to be the longest distance ever worked either on land or by cable. The number of repeaters employed is not stated.

Representative Dawson, of Iowa, has introduced in Congress a bill for a full-crew law. Representative Hardwick, of Georgia, has introduced a bill fixing the wages and hours of labor of railway telegraphers, and requiring them to be licensed; and another bill to require the use of the block system.

Wireless telegraph stations for use when telegraph wires are out of order have been established at the office of the *Buffalo Evening News*, Buffalo, N. Y., and of the Pabst Brewing Co., Milwaukee. The Waldorf-Astoria hotel in New York and the Bellevue-Stratford in Philadelphia communicate with each other in this way, and also with steamships on the Atlantic ocean.

According to an Indiana paper, engine No. 6,622 of the Cleveland, Cincinnati, Chicago & St. Louis on Wednesday, April 14, hauled 100 empty cars from Paris, Ill., to Terre Haute, Ind., 21 miles, in 85 minutes. The estimated weight of the cars was 1,714 tons. There were 37 box, 3 platform and 60 coal cars; length of train about 4,200 ft., or more than three-quarters of a mile.

The Pennsylvania Railroad reports that on its Pittsburgh division in the month of March 92 per cent. of its passenger trains reached the end of their runs on time. On the whole Western Pennsylvania Grand division, where 8,764 trains were run, 95 per cent. reached destination on time; 98 per cent., however, made their schedule speed, having begun their trip on the division behind time.

The St. Louis & San Francisco announces that by June 1 it will run passenger trains through to and from New Orleans by way of the Louisiana Railway & Navigation Company's line and the New Orleans Terminal Co. A car ferry will be used to cross the Mississippi river at Baton Rouge. For several months the road had expected to reach New Orleans by way of the Yazoo & Mississippi Valley, but the negotiations with that end in view fell through.

The New York Central and the Delaware & Hudson have notified the New York State Public Service Commission at Albany that they will comply with the order recently issued by the commission requiring the use, in the Adirondack forest preserve, of locomotives which will not throw sparks. Each road will have two oil-burning engines this summer. Engines not burning oil will be prepared specially for service in the forests and will be inspected by the Public Service Commission.

President Taft, who has several times expressed the opinion that the work of the Interstate Commerce Commission ought to be divided, separating the judicial from the non-judicial functions, has appointed a committee to examine the proposition with a view, evidently, to preparing an intelligent report on the matter for presentation to Congress next December. The committee consists of the Attorney-General, the Secretary of the Interior, the Secretary of Commerce and Labor and the Solicitor General.

The Railroad Commission of Indiana, following the example of the New York State Public Service Commission, has issued to the electric interurban railways of the state a circular calling for full information as to the discipline and management of the employees of each company. The inquiries include all of the different classes of employees engaged in operating trains, and cover methods of selection and of testing employees' ability, records of good and bad conduct and recognition of proficiency and faithfulness.

The legislature of New York has passed and the Governor has signed two laws to strengthen the law passed last year requiring railway employees to be paid twice a month. The new acts provide that prosecution of a railway for violation may be carried on in any county along the line of the road, and make violation a misdemeanor subject to a fine of $100 to $1,000. The labor commissioner is no longer required to give ten days' notice to a company which he intends to prosecute. The validity of the original law is now being tested in the courts.

An officer of the St. Louis & San Francisco, investigating the telegraph service on the lines of that company, estimates that more than one-third of the telegrams transmitted are unnecessary, and that the average message contains 10 per cent. more words than are necessary. In the month of December last the five relay offices of the road sent and received 240,415 railway messages (and repeated messages apparently are counted but once). *The Frisco-Man*, reporting these facts, prints a number of examples of railway messages which were two or three times longer than was necessary.

At a recent meeting of members of the Brotherhood of Railroad Trainmen in Chicago resolutions were adopted stating that the substitution of electricity for steam power on the railway terminals of the Chicago switching district would add materially to the present dangers to which employees engaged in the switching of freight cars are exposed, and requesting the legislative representatives of the Brotherhood to oppose any legislation providing for any such change. All other lodges of the Brotherhood in Illinois and all classes of railway employees were asked to join in this protest.

The Cleveland, Cincinnati, Chicago & St. Louis by double-tracking its line between Indianapolis and Mattoon, 129 miles, and reducing the steep grades, has been enabled to reduce the number of freight train crews on that division almost two-thirds. Before the double-tracking the road had in its employ 42 regular freight crews; now it has 15. Nineteen men who were conductors are now working as brakemen. An engine is now able to haul from 50 to 75 cars where, before the road was rebuilt, the average load was 30 cars. Also the trains are able to make better time, not being delayed on sidings to make way for superior trains.

The New York State Public Service Commission, Second district, reports that for the month of February, when 50,161 passenger trains were run in the state, 88 per cent. reached division terminals on time, the best record thus far shown by the reports made to the commission. The average delay for each late train was 27.4 minutes. The best percentage for February was reported by the Lackawanna, 97. The best division percentages were: New York, Susquehanna & Western division of the Erie, 100; Northern of New Jersey division and Jefferson division of the same road, 99; Harlem division of the New York Central, 99; New Jersey and New York division of the Erie, 98; Utica division of the Lackawanna, 98.

The Boston & Maine is perhaps the first railway to join in the general undertaking to inform people of the discoveries that tuberculosis can be prevented from spreading, and even cured by the newly discovered methods. The railway does not find its duty in being a healing agency, but it has a plain duty to perform in doing all that it can do to prevent the spread of disease among people using its facilities and who are thrown together by the very act of transportation. George B. Leighton, a retired railway president, is at the head of the New Hampshire Red Cross organization, and this railway work is due to his activities. The method is purely educational and consists in posting at the stations a distinctive Red Cross bulletin of a size 12 in. x 20 in., giving in the fewest possible words the methods of contagion, cure and prevention.

The Buenos Ayres Exhibition.

The International Exhibition of Railways and Land Transport, to be held at Buenos Ayres next year, as announced in these columns last week, will be opened on May 25, and it is

the intention of the Executive Committee to close it on November 25. Applications for admission should reach the Executive Committee by July 31 of this year; and exhibits requiring special foundations or those requiring power or other extensive preparation should be arranged for by June 15. The Secretary is E. Schlatter, Buenos Ayres, Argentine Republic.

Bridge Over Colorado River.

The new five-span single-track bridge of the Arizona & California across the Colorado River at Parker, Ariz., is shown in the accompanying photograph. The railway is projected from a point on the Santa Fe, Prescott and Phoenix, about five miles north of Wickenburg, Ariz., northwesterly to a point on the Santa Fe Coast Lines near Bengal, Cal., 205 miles. The eastern part is in operation as far as the Colorado river, 113 miles. It is to be a low grade line across the Rocky Mountain divide and will be mostly tangent, with easy curves. It is a part of the Santa Fe system. A large mineral development is expected from the construction of this line; part of it is already being realized.

Colorado River Bridge; Arizona & California.

This bridge is a parabolic truss bridge. It was commenced during the latter part of 1907 and was completed last fall. W. B. Storey, Chief Engineer of the Santa Fe, and A. F. Robinson, Bridge Engineer, represented the Santa Fe in the work, but the immediate construction of the bridge was in charge of J. A. Jaeger, Chief Engineer of the Santa Fe, Prescott & Phoenix, assisted by H. L. Fishel, Division Engineer, and Mr. Patton, Bridge Engineer. The steel superstructure was fabricated by the American Bridge Company, New York, steel being ordered under the plans of the Santa Fe System. The bridge was erected by the Missouri Valley Bridge & Iron Co., Leavenworth, Kan., which also had the contract for all the substructure construction. The total length of the bridge is 1,710 feet, consisting of two timber trestle approaches and five river steel spans, each 284 feet long, resting on six concrete piers. The piers were all built with pneumatic caissons, the foundations of the two shore piers being about forty feet below water and the rest from eighty to one hundred feet below low water. The grade line of the bridge is fifty feet above low water and thirty-seven feet above high water, allowing ample room for river steamers to pass below. The site of this bridge is at the foot of one of the canyons of the Colorado, and at the head of a wide valley.

Railway Legislation—"Nothing Doing."

New York put its Public Service Commission into effect January 1, 1908, and Vermont, whose lawmakers assemble in October instead of January, imitated New York the same year. After this start it was predicted that the idea would quickly spread from Portland, Me., to Portland, Ore. Most of the state and territorial legislatures convene early in January of the odd years for a session of 60 to 90 days, and with eight exceptions all have been sitting this winter. But though half the legislatures have already adjourned, and most of the others are winding up, not one enactment on the subject has come from any of them so far. It isn't that advocates have been lacking, or measures haven't been drawn. Bills in that direction have been introduced in a score of states or territories, but there has not been motor power enough behind them to get results.

The legislatures of West Virginia, Indiana, Kansas, South Dakota, Idaho, Utah, Nevada, Oklahoma, Iowa, Nebraska, Colorado, Maine, New Hampshire and New Mexico, in all of which public service commission bills were introduced, have adjourned without passing them. Kansas was the only state in which the bill was advanced to the dignity of an issue, but it was beaten by the home rulers. The following legislatures, which are still in session, have bills before them: Connecticut, New Jersey, Missouri, Illinois, Minnesota.—*Evening Post, New York.*

Proposed Electrification of Part of the Grand Trunk Pacific Railway.

The following resolution was introduced into the New Brunswick legislature by Hon. J. R. Burchill, on April 14, relative to the proposed electrification of part of the Grand Trunk Pacific Railway:

"Whereas, In the opinion of this house the time has arrived when a vigorous policy of protection and conservation of our forest lands should be adopted, and

"Whereas, The line of the proposed Transcontinental Railway runs through a large area of our forest lands owned by the crown and private corporations and individuals, and it is important that all proper and reasonable means should be had to safeguard those lands through which the proposed railway will pass from devastation by fire, and

"Whereas, The Grand Falls Power Company are now developing the water power at Grand Falls and within a short period will be in a position to supply electric power for manufacturing and other purposes and transmit the same, and

"Whereas, It is estimated by competent engineers that the said power at Grand Falls is capable of developing a minimum of one hundred and twenty thousand electric horse-power, which should be amply sufficient to furnish power to operate the said lines of railway through said timber lands by electricity, besides furnishing sufficient power for manufacturing, lighting and other purposes.

"Therefore resolved, That in the opinion of this house immediate steps should be taken by the government to have a conference with the federal government at Ottawa, the railway commission and the commissioners of the Grand Trunk Pacific Railway Company with a view to requiring the said company to operate its line of railway through the forest lands of New Brunswick by electric power, at which conference all owners of forest lands and other parties interested should have an opportunity of being present, and that the Grand Falls Power Company be also requested to have a representative present at such conference for the purpose of giving such information in regard to the power to be developed at Grand Falls as may be requested.

"And further resolved that a copy of the resolution be signed by Mr. Speaker and forwarded to his honor, the Lieutenant-Governor, with the request that the same be transmitted to His Excellency the Governor-General and council through the proper channel."

The above resolution was passed unanimously on April 17, with an amendment proposed by the premier, J. D. Hazen, to the effect that the province of Quebec be invited to join in the proposed conference, and that the electrification of the International Railway from Campbellton to St. Leonards, 112 miles, also be considered. In commenting upon it editorially, the St. John's *Standard* suggests that the eastern section of the Intercolonial, as well as a considerable stretch of the Canadian Pacific, might also well be considered, inasmuch as they are nearer Grand Falls than some portions of the Grand Trunk Pacific which it is proposed to electrify.

Open Cars N. G.

Robert McCulloch, President of the United Railways of St. Louis, says that the ordinary open street car is no longer suitable for that company's business, and only 50 such cars will be used in St. Louis this summer. All the rest have been discarded and these 50 will be used only when the rest of the company's cars are insufficient to carry the passengers. Mr. McCulloch says that summer cars are "inconvenient, out of date, useless, hazardous and unnecessary. * * * Passengers have to scramble over one another to get into seats, and the use of curtains to protect passengers against rain is not at all satisfactory." The open cars were all right when horses were the motive power, but now the speed of the cars provides the necessary breeze to keep passengers comfortable in hot weather. In the standard cars now in use the windows can be lowered sufficiently to give all necessary or desirable circulation of air.

A Thirty-Year-Old Tie.

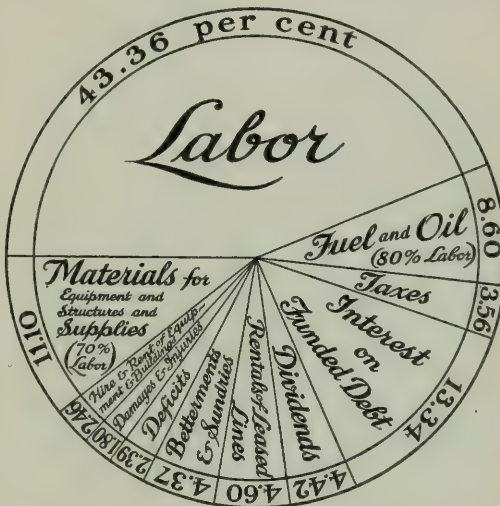
Herewith is shown a block cut from one of several railway ties of *lignum vitae* found in the main line of the New York, New Haven & Hartford near Readville, Mass., a few weeks ago. The ties had been in the track for 30 years. At the time of their removal as curiosities the ties were in perfect preservation and the specimen block shows not the slightest

Lignum Vitae Tie Thirty Years Old.

sign of decay. So tightly held are the two spikes that they cannot be removed without destroying the surrounding wood. At the point in the roadbed where the *lignum vitae* ties were found ordinary chestnut ties have been renewed every eight years. It is supposed that the exotic ties came originally as thick planks from South America to Boston and, after delivery on the wharf, in some way became mixed with a cargo of ordinary railway ties and were laid without discovery of their character.

Effect of Business Depression on Railways.

Slason Thompson, Manager of the Chicago Railway News Bureau, has gathered statistics showing that the reduction in the annual gross earnings of American railways due to the falling off in business following the panic of 1907, was over 330 millions. This statement is based on reports of earnings for the 12 months ending November 30, 1908, and is published to show the deceptive character of the statement made by the Interstate Commerce Commission, which showed a loss of only



164½ millions. The commission's figures were for the year ending June 30, 1908, thus including four or five months of good business, whereas Mr. Thompson shows 12 months nearly all lean. He calculates the loss in net earnings at 129 millions instead of 111 millions.

The foregoing comparisons are said to be based on reports from companies operating 216,460 miles of line, though a part of the figures for the earlier year (to Nov. 30, 1907) appear to be estimates. Mr. Thompson prints a diagram, reproduced herewith, showing how the gross receipts of American railways for 1908 were distributed.

Lectures at the Hicks Locomotive & Car Works.

With the idea of raising the efficiency of the organization as a whole, F. M. Hicks, founder of the Hicks Locomotive & Car Works, Chicago, has arranged for a series of lectures to be given to its employees by speakers from the Sheldon School of Salesmanship on the basic principles of business success. The first of this course was delivered on Saturday, April 10, at the Hicks works to about 400 mechanics and office men by A. F. Sheldon, President of the Sheldon School. Mr. Sheldon spoke on "The Relation of Employee to Employer," and showed that an institution is best served when all, from the lowest employee to the highest officer, have at heart its success, and the allotted work of each man is performed to the best of his ability.

He brought out that the value of each employee increases as he lessens the amount of supervision that his work requires. The best results from any given effort are secured when all work together as a unit, feeling that the success of not only the institution, but of each individual, depends on the united energy, intelligence and interest of all. In other words, the

interest of all is the net result of the interest manifested by each individual employed.

The other lectures in the course are "The Composite Salesman," "Success Habits" and "Laws of Mutual Success." Copies of the following synopsis of the first lecture were placed in the hands of the foreman for distribution among the employees:

1. A man's success depends on his value.
2. His value depends on the amount of supervision he needs.
3. The amount of supervision depends upon the number of errors of omission and commission that he makes.
4. Errors of omission and commission depend upon the positive and negative forces of mind and body.

Positive forces.	Negative forces.
Health	Disease
Strength	Weakness
Loyalty	Disloyalty
Ambition	Apathy
Courage	Fear
Honesty	Dishonesty

5. A man to be able to reduce his errors of omission and commission must have endurance of body, ability of mind, reliability of soul and action of will.
6. All people are classified into four grades: (a) "I don't care"—indifference; (b) "I hope"—student; (c) "I'll try"—adept; (d) "I will"—master.
7. The results of any business are the sum of the efforts of all its employees, from the lowest to the highest. If the general character of the employees includes a certain amount of indifference, inefficiency, unreliability, and any of the negative qualities, the results will be poor and will react not only on the business but on the character of the man.

International Association for Testing Materials.

The fifth congress of the International Association for Testing Materials will be held in Copenhagen, September 7-11, 1909. The American Society for Testing Materials is affiliated with the International Association.

Railway Business Association.

The membership to date of this association includes 148 manufacturers of railway materials and equipment, contractors in railway construction and dealers in miscellaneous railway supplies. In the *Railroad Age Gazette* of February 26, 1909, appeared a list of 132 members and the following 16 additional ones have been added since that time:

Brill, The J. G. Co., Philadelphia, Pa.
Clow & Sons, W. E., Chicago, Ill.
Dudgeon, Richard, New York.
Edwards, The O. M. Co., Syracuse, N. Y.
Faessler, J. W. Manufacturing Co., Moberly, Mo.
Hart Steel Co., The, Elyria, Ohio
Hartshorn Co., Stewart, East Newark, N. J.
Lake Erie Iron Co., Cleveland, Ohio.
Lobdell Car Wheel Co., Wilmington, Del.
Locomotive Finished Material Co., The, Atchison, Kas.
Lufkin Rule Co., Saginaw, Mich.
McQuesten Co., Geo., Boston, Mass.
Marshall Car Wheel & Foundry Co., The, Marshall, Tex.
Marvin Manufacturing Co., Franklin, Pa.
Railroad Age Gazette, New York.
Springlake Iron Co., Fruitport, Mich.

Gas Producer Tests.

A series of gas producer tests is now being conducted in the mechanical engineering laboratory of the University of Illinois.

The object of these tests is to provide impartial data on the efficiency and operation of small producer plants of this general class, using different grades of anthracite coal. A rather elaborate line of investigation has been planned and the producer plant has been equipped accordingly.

The plant, as installed by the Otto Gas Engine Works, consists of a 60-h.p. suction gas producer with one wet scrubber, gas receiver and a 22-h.p. gas engine. In order to facilitate testing, a Schutte-Koerting steam ejector of 12,000 cu. ft. capacity per hour has been placed beyond the first scrubber and is used to produce the suction in the producer.

The work is proceeding under the general direction of C. M. Garland, instructor in the mechanical engineering laboratory, in co-operation with A. P. Kratz, a graduate student, for whom the work is to constitute a thesis investigation.

"University Extension" for Prevention of Accidents.

The Executive Committee of the Museum of Safety and Sanitation, New York City, has detailed Dr. Wm. H. Tolman, the Director, for field work, and he will start May 1 on a lecturing tour. Railway clubs, chambers of commerce, manufacturers' associations, engineering, insurance and architectural societies and other such organizations may avail themselves of this illustrated exposition of devices and methods for reducing damage suits and preserving efficiency, for the cost of the lantern operator ($10), if not too far removed from the itinerary.

Steel Ties.

In his annual report, E. H. Utley, General Manager of the Bessemer & Lake Erie, says:

"The use of the steel tie continues to increase our confidence in its utility and I think it is within reasonable bounds to assert that within the next three years the Bessemer road will be double-tracked between Conneaut Harbor and North Bessemer with steel ties, and that by that time the price of first-class white oak wooden ties will be considerably over $1 each, whereas the steel ties are selling to-day at about $2, and that the management of the Bessemer road can feel that, aside from the few ties that may be destroyed by reason of derailments (and which have a scrap value of at least half of their purchase price), for the next 20 to 40 years the question of tie renewals will not enter into the calculations of expenses for maintenance of way."

Ten Thousand Miles Without a "Stop."

At Boston on April 12, a 30-h.p. automobile completed a run of 10,074 miles, which the machine had made over the roads of Massachusetts, New Hampshire and Rhode Island since March 18th—25 days—without having its motor stopped. This is published as the world's record for a non-stop run. The machine was a Maxwell four-cylinder touring car. The run was made under the auspices of the Bay State Automobile Association, and it was between Boston and Worcester, Providence, Newburyport, Nashua, Falmouth and South Framingham. There were three drivers, working in eight-hour shifts, and three observers.

Malay Railway Progress.

With the completion in December of the Johore State Railway, which connects with the Federated Malay States Railway, Singapore is now connected by rail with Penang, nearly 500 miles. The Johore State Railway itself is 121 miles long, mostly through swamps and dense jungle. It is said that the work cost less than the estimate of $6,492,800, or about $53,660 per mile. In this estimate the 80-lb. rails and the fine rolling stock form large items. The work throughout was done by petty contract. The ruling gradient of 1 per cent., and a minimum curvature of 3 deg., has been strictly followed, thus allowing a speed up to 40 miles an hour. There are 49 girder bridges, while no less than 409 culverts were built. Of the girder spans there are 19 of 100 ft. each, five of these being over the Muar river and three over the Segamat, the remaining 11 being distributed either as double or single spans over the remaining portion of the line. The largest of the locomotives that will be used will have cylinders 15½ x 24 in., with a pressure of 180 lbs., and driver wheels 4 ft. 6 in. in diameter. The length over buffers is 57 ft. 11 in., and the average weight on drivers is 19,300 lbs.

Canadian Society of Civil Engineers.

At a meeting of the Electrical Section on April 22 a paper entitled "The Use of Aluminum as a Conductor" was read by Julian C. Smith.

American Society of Civil Engineers.

At the meeting held April 21 two papers were presented for discussion: "The Maximum Weights of Slow Freight Trains," by C. S. Bissell, M. Am. Soc. C. E., and "Sampittic Surfacing," by W. W. Crosby, M. Am. Soc. C. E. These papers were printed in the February number of Proceedings.

American Society for Testing Materials.

The twelfth annual meeting will be held at the Hotel Traymore, Atlantic City, N. J., on Tuesday to Saturday, inclusive, June 29-July 3, 1909. Special hotel rates have been secured for members of the society and their guests and will hold good till Monday, July 5. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., is Secretary.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; May 11: St. Louis, Mo.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York, May 19, 1909; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago; May 11; Cincinnati, Ohio.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.: N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg, Chicago; June 1-5; Chicago.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug., and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 17-19; Chicago.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June July, and Aug.; St. Louis.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R. East Buffalo, N. Y.; September, 1909; Denver.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

One western newspaper says that within two months this year more than 30,000 settlers from the East have located in the state of Washington.

The Missouri House of Representatives has passed a bill to give the State Railroad Commission power to fix passenger as well as freight rates.

Traffic officers of Missouri lines have decided to protest to the Missouri Railroad Commission against the distance tariff on coal, which the Commission has ordered to be applied on May 1.

From May 15 the Southern Storage & Demurrage Bureau will increase from 120 hours to 240 hours the free storage time allowed at New Orleans on coastwise freight in cars, warehouses and on wharves.

The Metropolitan Steamship Line will on May 3 resume running its passenger steamers, the Yale and the Harvard, through between New York and Boston. These steamers start at 5 p. m. and run through in about 15 hours.

The Illinois Manufacturers' Association has adopted resolutions asking the President of the United States, in filling vacancies on the Interstate Commerce Commission, to appoint one or more men whose interests are actively identified with those of the manufacturers and shippers of the country.

The executive committee of the Western Passenger Association has adopted a resolution in favor of abolishing the practice of checking baggage from a traveler's residence to point of destination, which has been adopted in a number of cities. The question is docketed for discussion at the regular meeting of the Association on May 6.

The Wells-Fargo Express Company, under its last contract with the National Railways of Mexico, has a monopoly of the express business throughout nearly the whole of Mexico for a period of ten years. Its operations now cover all the railways except the Mexican (Vera Cruz) Railway. In the contract with the government the company is prohibited from raising its rates except when authorized by the state.

The Corporation Commission of Oklahoma on April 14 announced a hearing on the question of whether the Chicago, Rock Island & Pacific and the St. Louis & San Francisco should not be required to carry freight at single line rates. The hearing will be on May 11. The Chairman of the Commission said that the Rock Island and the 'Frisco have been fixing some rates that make the cost of transportation over both roads lower than it would be over a single line, and that as the Corporation Commission considers these roads under the same control and management, it does not approve of this practice.

The motor car service which the Chicago & North Western has been giving on its line between Beloit, Wis., and Janesville, has been discontinued, and regular steam train service has been established on the schedules on which the motor car had previously been operated. The North Western has been running on this line a McKeen motor car that had no baggage compartment. The service was used a good deal by commercial travelers with baggage, and all heavy baggage had to be carried on steam trains. It was decided that the car would be better adapted to service elsewhere, and it has been put on the line between Lincoln, Neb., and Fremont.

Officers of the Harriman lines state that while they have asked the Interstate Commerce Commission to modify its order in the Spokane rate case so that it will not apply to these lines, they have no intention, regardless of whether the Commission complies with their petition or not, of withdrawing from business to and from Spokane. Their desire is that the Commission shall not treat the rates that it has ordered applied from Chicago and St. Paul to Spokane as reasonable maximum rates over the long mileage via the Harriman lines, because if this were done it might be construed as making all of the intermediate rates on the Harriman lines prima facie unreasonable. In other words, they do not wish, because they may by their long lines between these points meet the com-

petition over the relatively short lines of the Hill roads, to be compelled to reduce their rates to intermediate points to the same basis.

The Chicago, Rock Island & Pacific and the St. Louis & San Francisco have both announced that, following the example set in Missouri, they will make a maximum passenger rate of 2½ cents a mile in Arkansas, beginning May 1. In Arkansas, as in Missouri, the validity of the state 2-cent fare law is being contested in the federal courts. The roads in that state got an injunction restraining the state from enforcing the 2-cent fare law, and restored their rates to a 3-cent basis. The reduction to 2½ cents is made voluntarily and without any previous understanding with the state officials. There is no doubt that the other lines in Arkansas will also adopt the same rate.

The Attorney-General of the United States, writing to Morris & Co., the Chicago beef packers, and advising them of the discontinuance of the grand jury's inquiry concerning alleged rebating by railways, calls upon Messrs. Morris & Co. to abandon the practice of using arbitrary valuations on dressed beef when making claims against the railways for loss or damage in transportation. It appears that this use of arbitrary values was the basis of the charges made before the grand jury that the railways had made excessive allowances to the packers. The Attorney-General says, however, that this practice began long before rebating was made illegal, and that it is practised by other large packers; and in his belief it was not adopted with the deliberate intent of obtaining unlawful concessions. The Attorney-General proposes to request the Interstate Commerce Commission to prescribe rules for the guidance of the railways in their investigations of claims made upon them for loss or damage of freight.

INTERSTATE COMMERCE COMMISSION.

A common carrier, in order to build up and foster industries on its own lines, cannot lawfully refuse to carry the products of like industries located on connecting lines. (15 I. C. C. Rep. 620.)

Necessity for Specific Complaints.

Charles A. Sanford v. Western Express Co. Same v. Wells Fargo & Co. et al. Opinion by Commissioner Clark.

Where rates generally are attacked all parties should have an opportunity to have notice of the charges which must be met. In these complaints specific rates were attacked and beyond a decision in those respects we cannot legitimately go. In the general adjustment of rates individual instances of seeming discrepancy are noticed which are inexplainable from a cursory examination, but often when such instances are made the subject of specific complaint circumstances and conditions before unknown are brought out tending to justify the apparently unreasonable relation. The Commission consequently moves with great caution in condemning a rate or practice and does so only when the facts before it amply warrant such action. Complaints dismissed.

Rates on Bituminous Coal to Winston-Salem.

Board of Trade of Winston-Salem, N. C., and City of Winston v. Norfolk & Western. Opinion by Chairman Knapp.

Complainants allege that rates on bituminous coal in carloads from the Pocahontas, Va., district to Winston-Salem, N. C., and Durham are unreasonable and ask that defendant be required to establish the same rates to these points that are made by it to points east of Norfolk, Va., and Lynchburg. Reparation is also asked. Circumstances and conditions of transportation are different at main-line points from Lynchburg to Norfolk than at Winston-Salem and Durham on branch lines to the south from the main line, and defendant may make higher charges to the latter points. But under the circumstances shown the rate charged Winston-Salem on soft coal in carloads is unreasonable to the extent that it exceeds $2.10 per ton, and the charge to Durham is unreasonable to the extent that it exceeds $2.20 per ton. Reparation is denied.

Competition Determines Express Rates.

Arthur S. Phillips v. New York & Boston Despatch Express Co. Opinion by Commissioner Harlan.

Complainant alleges that defendant's express charge of 60 cents per 100 lbs. from Boston, Mass., to Bristol Ferry, R. I., 58 miles, is unreasonable when compared with defendant's 50-cent charge from Boston to Fall River, 51 miles; and that the Bristol Ferry minimum of 25 cents per package is excessive when compared with the Fall River minimum of 15 cents per package; but the record does not sustain the contention. The dissimilarity in the conditions affecting express traffic to Fall River and Bristol Ferry explains and justifies the relation of the defendant's rates to the two points.

Defendant meets at Fall River the keen competition of another express company, which not only carries express matter to that point at a materially lower rate, but also maintains a minimum charge of 15 cents per package. In addition it performs a free pick-up and delivery service both at Boston and Fall River. Defendant is fairly entitled to adjust its rates to meet this competition, and in doing so cannot be said to be guilty of an undue discrimination against Bristol Ferry, where no such competition exists.

The right of an express company to maintain a free package pick-up and delivery service at one point while not maintaining such a service at another point must necessarily be controlled by the conditions existing at each place. Because such a service is maintained at Fall River, where the volume of the traffic is large and a wagon service can be conducted economically, it by no means follows that a like service must be maintained at Bristol Ferry, where the traffic is small and the cost of keeping up a wagon service might more than absorb all the revenue.

STATE COMMISSIONS.

The Railroad Commission of Illinois has announced that it will give a hearing in Chicago on May 5 on a number of petitions for additions to and changes in its classification of freight. The docket contains 62 proposed changes.

The Erie Railroad has notified the New York State Public Service Commission that it will comply with the order of the Commission requiring a passenger train to be run each way, daily, except Sunday, over the Conesus Lake branch.

The Railroad Commission of Missouri has ordered that, effective April 20, the rate on blasting powder for a distance of 30 miles or less shall not exceed 6 cents per 100 lbs. in carloads or 15 cents per 100 lbs. in less than carloads. The order was issued in the case of the Excelsior Powder Manufacturing Co. against the St. Louis & San Francisco.

The Texas Railroad Commission has issued notice to express companies doing business in that state that it is advised that they are applying on state business certain rules, classifications and rates that they have adopted for interstate business; that this is in violation of orders of the commission; and that if the practice continues the commission will proceed against them.

The Missouri Railroad Commission has ordered that a formal hearing shall be held at Jefferson City on April 28, at which all parties in interest will be given an opportunity to show cause, if any there be, why certain new schedules of freight rates which the commission has prepared shall not be applied. This is in accordance with the plan of the state authorities to fix freight rates just a little higher than those held confiscatory by the federal court.

New York: The Erie Bond Issue.

In re application of the Erie to issue $30,000,000 bonds.

The Erie having filed application for a modification of the order entered March 2, 1909, by the Public Service Commission, Second district, on its application to issue $30,000,000 5 per cent. collateral trust bonds, and having also submitted for approval by the commission a collateral indenture, the commission has approved the collateral indenture and has modified its order in the following respects:

The order provided for the refunding of $11,380,000 of the

coupons accruing during the next five years on the company's general lien and convertible bonds and this refunding had to be agreed to by not less than 90 per cent. of the holders thereof. This has been reduced to 75 per cent.

The order provided for the exchange of the proposed bonds for notes authorized by the commission March 31, 1908, such issue amounting to $15,000,000, but in such exchange the order provided that the bonds should be exchanged for the notes only on the basis of par value. This provision is now modified to make the exchange of bonds for a like amount in par value of notes, the bonds to net the company in its treasury not less than 87½ per cent. Such modification is granted on the showing that the notes already issued, amounting to $10,500,000, were sold by the company at or nearly their face value and that since such sale their market value has been about par.

While the order provided that the bonds not issued for refunding purposes may be sold in the market at not less than 87½ and the proceeds used for improvements and additions to the property, the provision in the order for exchange of the bonds for notes on a par basis without deduction was based on a general statement made on behalf of the company which apparently indicated that it was the intention of the company to make the exchange on a par basis. This statement appears to have been erroneous in that it did not take into account the market value discount in the sale of the bonds.

COURT NEWS.

The Supreme Court of North Dakota rendered a decision on April 16 holding constitutional the state law fixing maximum coal rates and enjoining the Northern Pacific, the Great Northern and the Minneapolis, St. Paul & Sault Ste. Marie from continuing to charge their present tariffs and requiring them to adopt the rates fixed by the state.

President Taft has remitted the fine of $6,000 imposed in the case of Fred L. Pomeroy, Freight Traffic Manager of the New York Central, who was convicted of giving rebates illegally in connection with the sugar rate prosecutions. Mr. Pomeroy died in November, 1906, and the President's action was based on representations that Mr. Pomeroy had left his widow with little or no means of support.

The United States District Attorney at Little Rock has received instructions from the Department of Justice to prosecute the St. Louis, Iron Mountain & Southern on 59 counts for the alleged giving of rebates to T. H. Bunch, proprietor of an elevator at Argenta, Ark. Bunch and Wilbur C. Stith, formerly Traffic Manager of the Missouri Pacific-Iron Mountain System, pleaded guilty to the receiving and the giving of these alleged rebates and were fined.

The Supreme Court of Missouri rendered a decision on April 13 holding that a railway complies with the law requiring it to run a passenger train daily each way over its line when it runs a mixed train including both freight and passenger cars daily each way. The decision was rendered in a case carried up from Benton county, in which the Missouri Pacific was fined $100 because it did not run daily each way an exclusive passenger train. The Supreme Court reversed the decision of the lower court.

The Atchison, Topeka & Santa Fe is being prosecuted before Judge Landis in the Federal Court at Chicago for alleged violations of the federal law restricting the hours of labor of telegraph operators. The evidence showed that the operators at Corwith, Ill., worked 4½ hours, then were off duty 3 hours and then worked 4½ hours. Counsel for the railway contended that this was a compliance with the law prohibiting operators at day and night stations from being kept on duty more than 9 hours a day. Counsel for the government contended that the 9 hours' service must be continuous. Counsel for the Santa Fe moved that the case be taken from the jury and decided by the court upon the point of law involved, and Judge Landis took the matter under advisement.

Judge Trieber in the Federal court at Little Rock, Ark., on April 19 made a ruling which it is believed establishes a new precedent. He some time ago enjoined the state from enforcing rates fixed by the Railroad Commission. The railways then fixed rates which were substantially higher than those that had been prescribed by the Commission. The Commission appealed to Judge Trieber against the rates fixed by the railways upon the ground that they were excessive. The court found that the rates fixed by the railways were excessive and ordered them to put in rates that should not be more than one-third more than the rates originally ordered by the Commission. He said that while ordinarily a court has no power to fix rates it has power to fix the rates which shall be charged while litigation involving the question of whether a permanent injunction shall be issued is pending. Passenger rates were not affected.

The Supreme Court of South Carolina on April 13 overruled the demurrer of the Columbia, Newberry & Laurens in the suit of that road opposing the order of the state railroad commission requiring the company to make improvements at Slighs, thus sustaining the statute empowering the commission to make such orders. The commission had ordered the construction of additional tracks at Slighs and the improvement of the station building. It appears that the road carried out the improvements but protested against the legality of the order. In court the company's attorneys argued that the statute should be held unconstitutional because it does not require the commission to give the railway the benefit of a hearing before making a decision, and also because it "attempts to take the whole and entire management of the railways of the state out of the hands of their owners." The court held that, although the statute does not require the commission to give notice of hearing, the constitution does require that a commission shall exercise its power only by due process of law, and this is sufficient. Due process of law requires that the railway shall have opportunity to be heard. The claim that the statute takes the management of the railway property away from the owner is brushed aside as having no foundation.

The Alabama Rate Law.

At New Orleans on Monday of this week the United States Circuit Court of Appeals denied a rehearing in the suits concerning the Alabama rate laws recently decided against the railways. Under these laws passenger fares throughout the state must be not over 2½ cents a mile, and the freight rates on 110 commodities are fixed.

The *Washington Herald*, discussing the action of the court in this case, says:

"An interesting sequel to the remarkable railway war of nearly two years ago in Alabama, wherein the contending forces on one side were Governor Comer and the legislature, and on the other Judge Thomas G. Jones, of the Federal court, and the Louisville & Nashville and other railway companies, has been written in a recent opinion of the United States Court of Appeals for the Fifth Judicial Circuit. In 1907 the Alabama legislature ordered the reduction of railway passenger fares to 2½ cents a mile and the establishment of lower freight rates, besides providing an elaborate system of enforcement, with heavy penalties, the whole warranted injunction proof.

"Judge Jones, a man of strong will and positive views, when applied to by the railways, counsel for which set up the usual pleas of confiscation and destruction of property rights, enjoined the new statutory rates in sweeping decrees directed against every state official. For a time it looked as if there would be open conflict between the Federal court and the state officials.

"Now comes the Court of Appeals to wipe out every one of the injunctions issued by Judge Jones. Since 1907 ex parte injunctions against the regulation and fixing of public service rates have become less frequent and less approved of in our higher courts. The present opinion shows the influence of two recent decisions of the United States Supreme Court. * * * Following the precedent of these two decisions, the Court of Appeals dissolved the injunctions against the Alabama railway rates on the broad ground that no real case of confiscation had been made out. No satisfactory evidence had been presented to the court that the lower rates would

have affected the property rights of the complainants. The evidence before the court consisted merely of affidavits giving opinions as to the effect of rates which had not had a day's trial. Speaking generally of the attitude of the courts the opinion says that 'the courts cannot, as a rule, yield their right of judgment to the opinions of interested experts who are not even subjected to cross examination.'" * * *

Nevada Railway Law.

The Nevada legislature at its recent session passed an amendment to the Railroad Commission act giving the Commission full power to regulate passenger fares and freight rates, repealing the maximum rate law and strengthening the powers of the Commission generally. This law has received the governor's signature and is now in effect. The law prohibits the giving or acceptance of free railway passes; but railway employees and their families, ministers of the gospel, and representatives of charitable institutions are excepted.

Passenger Rates in Missouri.

The Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific last week announced independently that they would reduce their passenger rates in Missouri to 2½ cents a mile. They took this action in the hope that it would conciliate the officers and people of Missouri. Following these announcements, all the railways in Missouri announced 2½ cent rates, effective May 1.

Judge Smith McPherson, of the federal court, who rendered the decision holding the Missouri 2-cent fare law unconstitutional, rendered an amended decree on April 17, in which he reserved exclusive jurisdiction of the Missouri rate cases, and by implication indicated to the state officers who are seeking in the state court at St. Louis to prevent the railways from advancing their passenger rates that they will get themselves into trouble if they do not respect the jurisdiction of the federal court. Attorney-General Major of Missouri has announced that he will prosecute the state's appeal to the Supreme Court of the United States against the decision, holding the 2-cent fare law unconstitutional.

Freight Car Balance and Performance.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting statistical bulletin No. 42, covering car balance and performance for October, 1908, says:

"During the period covered by this report there was a further decrease in the number of surplus cars, as well as in the number of cars reported in bad order. The surplus good order cars averaged during October 112,974 daily, or 5.28 per cent. of the total equipment on the lines of the companies reporting. Adding 3.85 per cent. as the "excess" shop cars, and adjusting our averages as in previous reports, we secure figures that compare favorably with the performance in normal months.

		Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
		Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.	Inc. surp.	Exc. surp.
		cars.	cars.	cars.	cars.	cars.	cars.
December,	1907	21.9	23.9	289	316	$1.98	$2.17
January,	1908	20.8	24.9	277	325	1.81	2.17
February,	1908	19.7	23.8	271	328	1.82	2.20
March,	1908	21.2	25.5	290	348	1.95	2.34
April,	1908	19.6	24.5	258	324	1.83	2.29
May,	1908	19.3	24.8	254	329	1.72	2.22
June,	1908	19.6	24.7	276	347	1.88	2.37
July,	1908	20.0	24.8	275	342	1.84	2.26
August,	1908	20.8	25.1	292	354	1.98	2.40
Septmbr,	1908	22.0	25.2	320	367	2.24	2.57
October,	1908	23.8	25.9	346	376	2.33	2.54

"The miles per car per day, which average 23.8 without the elimination of idle cars, figure 25.9 after the adjustment, indicating an exceptionally good performance by those cars actually in service. There is a similar increase in the ton miles per car per day, which reaches 376 in the adjusted averages, but six tons lower than the record average for October, 1907. The average earnings per car (adjusted) are 3 cents

CAR BALANCE AND PERFORMANCE IN OCTOBER, 1908.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	72,472	659,393	278,610	133,446	174,065	369,694	15,579	136,886	26,319	111,926	99,922	2,078,312
Average number of system cars on line	51,518	441,040	202,775	91,801	116,747	284,805	6,132	96,357	14,337	59,539	74,617	1,439,668
Railroad owned cars: Av. foreign on line.	29,880	173,046	72,114	30,547	42,439	106,039	12,043	48,137	23,987	42,254	18,986	599,472
Total cars on line	81,398	614,086	274,889	122,348	159,186	390,844	18,175	144,494	38,324	101,793	93,603	2,039,140
Excess	8,926	....	....	....	....	21,150	2,606	7,608	12,015	....	......	....
Per cent. cars on line to total owned:												
Home	71	67	73	69	67	77	39	71	55	53	75	69
Foreign	41	26	26	23	24	29	78	35	91	38	19	29
All railroads	112	93	99	92	91	106	117	106	146	91	94	98
Private cars on line	2,968	40,317	12,437	2,380	6,174	14,353	2,013	7,756	2,222	7,513	4,149	102,282
Total, all cars on line	84,366	654,403	287,326	124,728	165,360	405,197	20,188	152,250	40,546	109,306	97,752	2,141,422
Per cent. of cars in shop	5.62	9.60	9.83	8.86	12.61	5.33	3.75	15.38	5.93	5.73	8.42	8.87
No. of freight engines owned	1,121	9,833	3,794	2,216	2,574	6,274	440	2,485	714	2,325	2,124	33,900
Av. cars on line per freight engine owned	75	67	76	56	64	65	46	61	57	47	46	63
Total freight-car mileage	43,288,756	489,500,133	180,746,066	81,438,108	117,584,079	314,150,660	28,210,210	89,990,194	32,140,668	107,494,969	84,857,742	1,569,401,585
Average miles per car per day	16.6	24.1	20.3	21.0	22.9	25.2	45.1	19.9	25.6	31.7	28.1	23.8
Per cent. loaded mileage	73.2	67.4	68.1	69.8	72.5	73.9	73.0	72.8	72.0	72.2	75.6	70.7
Ton miles of freight, inc. Co. freight	485,178,289	7,325,503,197	2,699,820,319	1,121,302,921	1,629,460,098	2,787,972,865	407,128,080	1,255,533,626	377,404,473	1,581,617,294	1,176,051,756	20,846,972,918
Average ton miles, including Co. freight:												
Per car mile	11.2	15.0	16.2	13.8	14.1	14.7	14.8	14.0	11.9	14.7	13.8	14.6
Per loaded car-mile	15.3	22.2	23.9	19.7	18.0	20.2	20.3	19.4	16.6	20.4	18.3	20.8
Per car per day	186	361	332	290	324	363	694	279	307	467	391	346
Gross freight earnings	$5,518,764	$46,615,986	$16,654,953	$8,386,473	$11,697,110	$24,041,146	$3,493,037	$11,631,839	$4,106,934	$14,871,294	$7,921,531	$154,939,067
Average daily earnings: Per car owned	$2.46	$2.28	$1.93	$2.03	$2,20	$2.72	$7.23	$2.75	$5.03	$4.29	$2.56	$2.51
Per railroad owned car on line	2.19	2.45	1.95	2.21	2.42	2.60	5.99	2.60	3.46	4.71	2.73	2.57
All cars on line	2.11	2.30	1.87	2.17	2,33	1.89	5.58	2,47	3.27	4.39	2,61	2.33

lower than during September, although close to the highest averages produced in 1907.

"The resumption of a general car interchange noted in our previous bulletins is quite marked in October, the proportion of cars on their home lines dropping to 69 per cent. as compared with 73 per cent. in September. This movement was naturally accompanied by a further increase in the per cent. of loaded mileage, which reached 70.7 per cent. The increase in tons per loaded car noted in September seems to have been only temporary, and the average for October was 20.8, only slightly higher than July and August."

The Tehuantepec Railway.

The railway across the isthmus of Tehuantepec last year carried across the isthmus 38 million dollars' worth of merchandise in shipments which originated at or were destined for points in the United States. The Panama Railroad during the same time carried 12 million dollars' worth originating in the United States. These figures are given in a report from the Department of Commerce and Labor. The Tehuantepec Railway is 190 miles long. It was built mainly with British capital but is controlled, at least in part, by the Mexican government.

An officer of the Canadian Pacific tells a reporter that he expects to ship wheat to Europe over the Tehuantepec Railway. He has recently visited Mexico and expects that the railway will build grain transferring houses at the Pacific and the Atlantic termini. Lines of steamers already running between Vancouver and Manzanillo could conveniently take wheat to the Tehuantepec road. The proposed wheat shipments are to be made from Alberta. Calgary, the principal city on the Canadian Pacific in Alberta, is about 600 miles east from the Pacific coast.

The Illinois Manufacturers' Association and the Railways.

The Illinois Manufacturers' Association last week issued a "Legislative Bulletin" in which it was charged that the cessation of improvements by the railways and the laying off of employees have not been made necessary by anti-railway agitation and legislation, but by financial mismanagement of the roads. The bulletin was issued in reply to recent addresses by B. L. Winchell, President of the Rock Island, and D. Willard, Vice-President of the Burlington, in which they urged a cessation of anti-railway legislation to give the roads a chance to recover from the effects of the business depression. It was charged specifically in the bulletin that the Burlington and the Rock Island had watered their stock, and that that was the real reason why "18,000 men were turned out by the Burlington to shift for themselves or starve." It was added "that reckless and unconscionable financiering has done a hundred times more injury to the country than all the mistakes of the legislatures."

The bulletin was received with disfavor by some members of the association. Rudolph Ortmann, a member of the association's board of directors, issued a statement in which he said that many of its members did not approve of what had been said: He added: "We are not concerned with the question of whether or not charges made in the bulletin are true, but we severely condemn their being made upon the authority of the association. Many of us regard the circular as scurrilous and undignified as well as ill-advised and extremely unwise. Mud-slinging is not the way that dignified and substantial business men would win their fights."

F. A. Delano, president of the Wabash, wrote a letter to each of the directors of the association, protesting against its tone and asking them if they thought that such attacks better the feeling between shippers and the carriers or help the situation in any way. Some members of the Manufacturers' Association are circulating a petition to its board, strongly condemning the tone of the bulletin and asking them to see that no more such pamphlets are issued.

J. M. Glenn, secretary of the association, has issued a statement defending the charges made in the bulletin and asserting that the railways are trying to "boss" the association and that the circulation of the petition referred to is due to railway influence. In reply to Mr. Glenn's statement, Mr. Ortmann said that it was untrue that the petition was being circulated at the instance of the railways—that it was not necessary for the railways to tell substantial business men such as belong to the association what is or is not a dignified and business-like manner of carrying out its purposes.

Effect of 2-Cent Fare Legislation on the Rock Island Lines.

Frank Nay, General Auditor of the Chicago, Rock Island & Pacific, has compiled statistics regarding the passenger business of the Rock Island Lines which seem to show with absolute conclusiveness that 2-cent fare legislation has not tended to stimulate the growth of passenger traffic. The Rock Island lines have mileage in 13 states. The statistics that Mr. Nay has compiled show that while the number of passengers carried one mile during the fiscal year ended June 30, 1908, was greater in every state than in the preceding year, except one, the increase in passengers carried was proportionately as great in the states where 3 cents a mile or more was the fare as in the states where the 2-cent fare was in effect. It is a curious fact that in New Mexico, where the fare was 4 cents a mile, the increase in passengers carried was the greatest. The revenue from passenger traffic decreased in every state where the 2-cent fare was in effect and the revenue from passenger traffic increased in every state where the 3-cent fare was in effect. The following statistics show results on the entire system, figures for decreases being indicated by asterisks:

	State.	Interstate.	Total.
Pass. 1 mile, year ended Jun. 30, '08	383,765,426	498.225,918	881,991,344
Pass. 1 mile, year ended Jun. 30, '07	346,223,377	379,010,129	725,233,506
Increase	37,542,049	119,215,789	156,757,838
Per cent. of increase	10.8	31.5	21.6
Pass. rev., year ended Jun. 30, '08	$7,343,016	$9,350,095	$16,693,110
Pass. rev., year ended Jun. 30, '07	8,019,461	8,134,079	16,153,539
Increase or decrease	676.445*	1,216,016	539,571
Per cent., increase or decrease	8.4*	14.9	3.3
Av. revenue per passsenger per mile:			
For year ended June 30, 1908	$1.91	$1.88	$1.89
For year ended June 30, 1907	2.32	2.15	2.23
Decrease	0.41*	0.27*	*0.34
Per cent. of decrease	17.7*	12.6*	*15.2
Loss in revenue, from decrease in rates, year ended June 30, 1908 (pass. 1 mile multiplied by decrease)	†$1,616,337	†$1,382,433	†$2,998,771

*Decrease. †These will not figure exactly owing to omission of fractions.

The following is a statement of percentages of increase and decrease in state (intrastate) passenger traffic by states for the roads comprising the Rock Island lines for the fiscal year ended June 30, 1908, compared with the results for the fiscal year ended June 30, 1907, percentages for decreases being starred.

		Pr ct. of inc. or dec. Passengers 1 mile.	Passengers revenue.
States in which 2 cent maximum passenger fare became effective just prior to the early part of fiscal year ended June 30, 1908:			
Illinois		2.5	14.1*
Iowa		25.0	2.4*
Nebraska		11.7	14.6*
Misouri.		22.4	7.4*
Kansas		1.0	19.8*
Oklahoma		10.8	8.8*
Minnesota		18.7	10.7*
Arkansas		2.6	22.3*
Total, for 2-cent states.		10.9	11.0*
States in which the maximum passenger fare was 3 cents or 4 cents (as indicated) during two years ended June 30, 1908:			
Colorado	3 cents	23.4	18.9
Dakota	3 "	32.7	29.9
Louisiana	3 "	0.8*	3.8
Texas	3 "	3.8	15.2
New Mexico	4 "	51.4	54.3
Total for 3-cent and 4-cent states		9.8	16.1

*Decrease.

It is believed that the foregoing statistics are the most complete and accurate that have ever been made public regarding the effect of reductions in passenger fares.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1909.
(See also issues of April 9 and 16.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$182,969	$67,408	$281,813	$28,704	$50,861	$7,684	$95,785	$8,214	$191,248	$90,565	$535*	$11,489	$78,541	$50,075
Ann Arbor	301	69,222	26,133	104,388	17,127	13,310	2,824	55,884	3,901	93,046	11,342	326	11,369	299	3,442
Atlanta, Birmingham & Atlantic	642	132,148	28,907	172,770	25,368	32,881	12,639	72,800	8,219	151,908	20,862	.....	8,000	12,862	‡14,543
Bangor & Aroostook	515	208,645	30,535	249,795	40,474	25,911	2,683	78,311	10,663	158,042	91,753	.....	1,500	90,253	44,270
Central Vermont	411	163,285	52,159	237,598	22,634	37,742	6,451	128,909	6,552	202,288	35,310	349	12,500	23,159	24,291
Charleston & Western Carolina	340	100,066	18,560	125,356	21,495	14,520	2,469	41,441	4,157	84,082	41,274	.....	4,100	37,174	9,899
Chicago & Erie	270	255,956	55,110	343,665	18,418	80,531	11,493	174,562	7,614	292,618	51,047	218	11,083	40,182	19,734
Chicago Great Western	818	379,909	123,791	557,585	61,927	170,407	35,558	315,034	37,019	619,945	62,360*	828*	20,614	83,802†	‡89,160
Chicago, Indiana & Southern	329	209,291	14,701	230,890	19,534	45,736	6,361	95,014	6,766	173,411	57,479	365*	12,500	44,614	‡10,724
Chicago, Lake Shore & Eastern	670	252,523	....	280,585	28,542	72,130	1,281	90,685	5,328	197,966	82,619	.....	3,000	79,619	65,950
Chicago, Rock Island & Gulf	492	181,703	58,099	251,391	13,817	15,291	5,971	89,406	7,826	132,311	119,080	.....	6,261	112,819	35,923
Cincinnati, New Orleans & Texas Pac.	337	453,302	109,406	595,700	33,073	111,030	18,036	202,510	18,590	383,239	212,461	385*	20,262	191,814	115,682
Colorado Midland	337	106,076	19,208	154,755	21,491	26,884	9,944	74,401	6,468	139,188	15,567	626*	7,650	7,291	‡2,769
Detroit, Toledo & Ironton	438	68,870	8,746	90,175	25,591	19,473	2,294	53,518	3,760	104,636	14,461*	.....	6,979	21,440†	‡18,941
Duluth, South Shore & Atlantic	593	128,551	53,618	195,620	29,461	27,316	6,833	84,293	6,103	154,006	41,615	573*	16,000	25,042	7,732
Fort Worth & Denver City	454	267,536	111,122	397,594	61,090	60,596	6,541	138,605	15,178	282,010	115,584	9,488*	8,458	97,638	9,850
Georgia	307	169,468	49,925	233,636	29,263	41,494	8,618	92,994	6,349	178,718	54,918	.....	1,123	53,795	30,907
Georgia Southern & Florida	395	105,742	51,288	180,334	19,735	24,486	5,338	66,830	8,122	124,511	55,823	1,191	8,058	48,956	18,384
Gulf & Ship Island	307	123,309	24,044	156,839	34,218	19,922	1,093	51,156	6,884	113,273	43,566	.....	5,850	37,716	25,369
Hocking Valley	347	282,436	52,262	351,929	46,875	77,164	7,064	133,605	12,631	277,339	74,590	1,577*	18,019	54,994	7,864
Houston & Texas Central	789	280,920	93,045	405,240	52,065	61,742	17,627	163,771	19,367	314,572	90,668	.....	19,632	71,036	5,796
International & Great Northern	1,159	453,558	128,390	622,826	106,467	106,989	19,556	272,691	21,507	527,210	95,616	.....	17,000	78,616	115,834
Long Island	392	177,984	279,169	477,135	73,411	104,523	10,234	285,680	17,735	491,583	14,478*	34,118	21,714	2,044†	‡55,168
Mason City & Fort Dodge	386	110,846	26,413	146,265	11,924	39,133	1,761	69,209	586	122,613	23,652	1,011	8,937	15,726	‡6,870
Mobile, Jackson & Kansas City	403	86,121	22,603	117,815	21,616	15,334	1,846	37,814	10,041	86,651	31,164	.....	3,309	27,855	26,473
Morgan's La. & Tex. R.R. & S.S. Co.	351	232,812	95,468	352,623	52,155	35,277	7,333	132,156	13,284	240,205	112,418	116*	16,000	96,302	27,577
Northern Central	462	604,273	132,622	787,803	126,394	207,631	13,783	411,176	20,626	779,610	8,193	307	19,515	11,014†	‡32,648
Peoria & Eastern	351	148,384	44,450	210,279	18,661	46,914	5,535	87,394	4,532	163,036	47,243	.....	8,800	38,443	‡7,565
Rutland	468	104,242	55,968	186,004	22,815	32,877	5,225	80,505	8,844	150,266	35,738	.....	8,441	27,297	16,404
St. Louis, Brownsville & Mexico	454	60,986	41,824	109,301	17,601	15,742	3,130	38,296	6,014	80,783	28,518	60	4,000	24,577	8,003
Texas & New Orleans	450	188,996	68,837	277,461	54,446	35,849	8,077	104,140	9,356	211,868	65,593	1,014	11,600	52,979	36,805
Toledo & Ohio Central	441	185,886	38,408	233,376	30,697	59,455	4,442	93,195	4,734	192,523	40,853	1,283*	13,309	26,261	‡57,700
Toledo, St. Louis & Western	451	192,898	29,164	238,701	25,212	28,136	6,200	93,307	7,728	160,583	78,118	.....	11,500	66,618	19,819
West Jersey & Seashore	356	97,842	164,554	283,328	69,858	60,221	6,901	147,453	7,979	292,412	9,084*	1,870	17,112	24,326†	‡50,572
Wheeling & Lake Erie	442	333,373	32,157	382,208	27,373	93,694	5,985	148,226	15,689	290,967	91,241	1,929	20,822	72,347	47,454
Wisconsin, Minnesota & Pacific	271	30,233	11,952	46,146	10,505	3,469	868	22,373	289	37,504	8,642	8*	3,443	5,190	‡1,864

EIGHT MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$1,502,667	$667,471	$2,403,718	$310,731	$462,646	$59,975	$800,857	$66,392	$1,700,601	$703,117	$5,471*	$91,796	$605,850	$263,178
Ann Arbor	301	758,614	315,312	1,151,092	164,269	158,227	24,187	462,755	32,672	842,110	308,982	16,825	90,950	234,857	‡18,248
Atlanta, Birmingham & Atlantic	642	961,409	312,274	1,356,824	170,164	242,204	76,863	517,621	55,127	1,061,979	294,845	.....	55,000	239,845	7,290
Bangor & Aroostook	515	1,418,243	380,596	1,890,133	348,072	219,516	23,311	574,222	83,890	1,249,011	641,122	.....	12,000	629,122	292,417
Central Vermont	411	1,454,066	684,283	2,317,445	330,530	383,501	59,886	1,090,655	54,963	1,919,535	397,910	6,794	75,675	329,030	‡51,718
Charleston & Western Carolina	340	689,250	182,352	930,374	184,126	119,744	19,772	346,885	27,756	698,283	232,091	.....	32,800	199,291	23,974
Chicago & Erie	270	2,072,617	519,479	2,833,430	273,284	653,382	91,846	1,349,197	61,785	2,429,494	403,936	2,261	90,247	315,950	229,516
Chicago Great Western	818	3,832,349	1,297,812	5,553,276	744,125	1,055,625	290,431	2,469,588	254,672	4,814,441	738,835	6,000*	148,833	584,002	‡237,999
Chicago, Indiana & Southern	329	1,659,699	164,238	1,885,279	203,877	367,391	59,957	731,961	55,480	1,418,665	466,614	12,936	112,542	367,008	77,866
Chicago, Lake Shore & Eastern	670	2,392,008	....	2,616,144	223,077	601,960	9,010	839,470	49,418	1,722,935	893,209	.....	24,000	869,209	‡25,145
Chicago, Rock Island & Gulf	492	1,427,822	501,468	2,028,372	434,303	159,392	48,440	765,347	68,592	1,476,075	552,297	1,169*	28,555	522,573	‡89,156
Cincinnati, New Orleans & Texas Pac.	337	3,913,472	967,317	5,146,618	547,783	1,016,268	134,044	1,575,486	140,207	3,413,788	1,732,830	12,565*	157,756	1,562,509	599,197
Colorado Midland	337	1,107,140	257,176	1,581,794	196,259	213,756	78,512	650,336	47,404	1,186,267	395,527	2,853*	60,249	332,424	34,648
Detroit, Toledo & Ironton	438	857,963	109,237	1,065,302	190,143	222,463	19,415	477,752	35,562	945,335	119,967	96	55,830	64,233	130,080
Duluth, South Shore & Atlantic	593	1,052,285	612,514	1,776,446	278,168	218,817	69,943	683,789	52,909	1,303,626	472,820	8,234	133,783	347,271	‡67,559
Fort Worth & Denver City	454	2,138,976	1,179,794	3,472,567	536,616	492,705	58,210	1,060,144	116,227	2,263,902	1,208,665	5,421*	70,176	1,133,068	‡36,629
Georgia	307	1,330,396	499,285	1,946,897	366,395	275,936	66,349	793,487	57,012	1,559,179	387,718	.....	12,860	374,858	43,147
Georgia Southern & Florida	395	744,358	411,130	1,309,845	120,122	221,350	40,414	485,642	68,682	936,210	373,635	11,709	66,434	318,911	116,557
Gulf & Ship Island	307	945,614	241,322	1,265,337	267,729	194,372	11,210	416,947	58,129	948,387	316,950	.....	33,808	283,142	‡11,247
Hocking Valley	347	3,499,370	579,321	4,209,621	429,270	991,623	60,297	1,261,149	96,455	2,838,794	1,370,827	.....	45,522	158,096	152,953
Houston & Texas Central	789	2,974,779	971,036	4,194,266	551,631	564,469	122,763	1,530,601	155,519	2,924,983	1,269,283	.....	94,903	1,174,380	66,369
International & Great Northern	1,159	4,109,541	1,169,619	5,630,910	908,704	872,154	127,458	2,211,720	164,125	4,284,161	1,346,749	.....	174,000	1,172,749	935,051
Long Island	392	1,699,837	3,454,021	5,371,954	656,833	816,022	110,902	2,470,019	141,748	4,195,524	1,176,430	618,952	173,708	1,621,674	548,858
Mason City & Fort Dodge	386	917,221	297,999	1,291,864	144,423	195,177	13,761	549,984	5,617	908,962	382,902	4,209	53,873	333,238	‡36,963
Mobile, Jackson & Kansas City	403	772,342	208,623	1,048,382	164,614	122,807	13,132	326,518	71,672	698,743	349,639	.....	27,221	322,418	161,608
Morgan's La. & Tex. R.R. & S.S. Co.	351	2,315,792	699,912	3,221,403	562,218	333,562	65,687	1,170,806	100,231	2,232,504	988,899	9,469	129,115	869,253	187,180
Northern Central	462	5,746,498	1,333,600	7,528,886	617,301	1,672,384	100,660	3,419,171	156,219	5,965,735	1,563,151	5,355	156,117	1,412,389	‡334,880
Peoria & Eastern	351	1,271,356	456,966	1,885,505	226,665	301,972	41,057	741,721	36,422	1,347,837	537,668	.....	71,412	466,256	‡81,193
Rutland	468	1,003,375	692,961	1,907,700	272,506	256,472	48,726	732,440	49,180	1,359,324	548,376	.....	73,860	474,516	109,083
St. Louis, Brownsville & Mexico	454	487,240	240,507	781,475	136,095	105,576	22,526	287,378	43,144	594,719	186,756	747	35,361	152,142	12,418
Texas & New Orleans	450	1,685,155	552,824	2,392,591	428,114	340,120	47,060	1,004,489	66,576	1,886,359	506,232	5,245*	73,045	438,432	33,180
Toledo & Ohio Central	441	2,443,957	427,704	2,969,005	403,926	470,935	42,927	956,239	42,736	1,916,763	1,052,242	23,004	110,906	964,340	56,496
Toledo, St. Louis & Western	451	1,804,915	321,807	2,286,444	257,821	305,837	45,443	781,739	62,836	1,453,676	832,768	.....	92,000	740,768	‡77,934
West Jersey & Seashore	356	970,814	2,195,581	3,348,214	511,238	462,248	83,601	1,402,733	62,432	2,522,252	825,962	54,478	136,899	743,541	‡120,049
Wheeling & Lake Erie	442	3,199,717	336,116	3,766,194	435,904	876,959	47,070	1,307,393	116,761	2,782,087	984,107	8,022	173,662	818,467	138,601
Wisconsin, Minnesota & Pacific	271	321,247	120,480	476,340	98,903	47,985	2,883	178,101	2,389	330,261	146,079	54	22,074	124,060	17,298

*Deficit. †Loss. ‡Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. H. Campbell, Acting General Counsel of the Grand Rapids & Indiana, has been appointed the General Counsel.

Edward S. Keeley, Freight Traffic Manager of the Chicago, Milwaukee & St. Paul, has been elected the Fourth Vice-President, a new office.

Chester M. Dawes, General Solicitor of the Chicago, Burlington & Quincy, has been appointed the General Counsel, succeeding the late J. W. Blythe.

William H. Field, Treasurer of the Houston & Texas Central, has resigned, effective May 31. He has been connected with that road since March, 1902.

E. M. Hyzer.

Edward M. Hyzer, whose appointment as the General Counsel of the Chicago & North Western, with office at Chicago, was announced in these columns in our issue of April 2, was born on December 10, 1854, at Janesville, Wis. He was educated in the public schools and studied law under the late Judge John B. Cassoday, of the Wisconsin Supreme Court. He was admitted to the bar in 1879. For the past ten years he has been the Wisconsin attorney for the Chicago & North Western. He was also at the time of his appointment as General Counsel a member of the law firm of Cary, Upham & Black, of Milwaukee, Wis., with which he had been connected for the past six years.

Edwin Gould, President of the St. Louis Southwestern, has been elected also the President of the Wheeling & Lake Erie, succeeding F. A. Delano, resigned.

Barton Corneau has resigned as General Attorney of the Chicago & North Western to become Special Assistant to the Solicitor General of the United States, Lloyd W. Bowers, who was formerly General Counsel of the Chicago & North Western.

J. C. Vinson has been appointed the Auditor of the Sonora Railway, the Cananea, Yaqui River & Pacific, the Arizona Eastern, the Gila Valley, Globe & Northern, the Arizona & Colorado, the Maricopa & Phoenix and the Phoenix & Eastern, with office at Tucson, Ariz., succeeding W. G. Sherlock, resigned.

Operating Officers.

H. W. Baldwin has been appointed the Trainmaster of the Cincinnati division of the Erie, succeeding R. E. Woodruff, promoted.

S. J. Polhemus has been appointed an Assistant Superintendent of the Pullman Company, with office at Buffalo, N. Y., succeeding Edward Cox.

J. R. Harrington has been appointed the General Superintendent of the Columbus, Delaware & Marion (electric), with office at Columbus, Ohio.

J. B. Sparks has been appointed the Superintendent of the line between Orendain and Tequila, Mex., of the Cananea, Yaqui River & Pacific, with office at Guadalajara, Mex.

P. W. Drew, Superintendent of Telegraph of the Wisconsin Central, has been appointed the Superintendent of Telegraph of the Chicago division of the Minneapolis, St. Paul & Sault Ste. Marie, with office at Chicago. (See explanatory item under Traffic Officers.)

Traffic Officers.

Don Morrison has been appointed a Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, with office at Winnipeg, Man.

John J. Mossman, General Agent of the Wabash at Buffalo, N. Y., has been elected also the President of the Canadian Freight Association.

C. F. Vigor has been appointed a Traveling Freight Agent of the Minneapolis & St. Louis and the Iowa Central, with office at Cincinnati, Ohio.

W. H. Allen, District Passenger Agent of the Wisconsin Central at Pittsburgh, has been transferred as District Passenger Agent to New York, succeeding H. S. Head.

S. C. Payson has been appointed a General Agent of the Atchison, Topeka & Santa Fe, in charge of freight and passenger traffic, with office at San Diego, Cal.

George A. McFarland has been appointed a General Agent of the Wabash, with office at 515 Francis street, St. Joseph, Mo. This is a new agency established on April 15.

W. A. Nelson, General Agent, Freight department, of the Erie, with office at Jamestown, N. Y., has been appointed a Commercial Agent of the Erie Despatch, with office at Chicago.

J. K. Hudson has been appointed the General Freight Agent of the Detroit & Mackinac, with office at Bay City, Mich. W. G. MacEdward has been appointed the General Passenger Agent, with office at Bay City.

S. W. Bradford, Traveling Freight Agent of the Missouri Pacific-Iron Mountain Lines, has been transferred to Pittsburgh, Pa., succeeding D. C. Wood, Traveling Freight Agent, who succeeds Mr. Bradford, with office at San Antonio, Tex.

A. N. Brown, General Freight Agent of the El Paso & Southwestern System, has been appointed also the General Passenger Agent, succeeding V. R. Stiles, resigned. He will have charge of both passenger and freight traffic and will have the title of General Freight and Passenger Agent, with office at El Paso, Tex. Eugene Fox, General Agent, Freight and Passenger departments, with office at Chicago, has been appointed the Assistant General Freight Agent, with office at El Paso. F. W. Pullen, Chief Clerk in the general traffic department at Chicago, succeeds Mr. Fox, with office at Chicago.

Effective May 1, the name of the Wisconsin Central will be changed to the Minneapolis, St. Paul & Sault Ste. Marie, Chicago division, and the general offices will be moved from Chicago to Minneapolis, Minn. A two-story addition to the office building of the Soo Line at Minneapolis is now being completed for this change. J. C. Pond, General Passenger Agent of the Wisconsin Central, will keep his headquarters at Chicago, with the title of Assistant General Passenger Agent. F. E. Signer, General Freight Agent, and V. L. Freeland, Assistant General Freight Agent, have been appointed to similar positions respectively with the Soo, and will make their headquarters at Chicago. The headquarters of E. G. Clark, Assistant General Freight Agent, have been transferred to Minneapolis.

Engineering and Rolling Stock Officers.

T. J. Raycroft, General Foreman of the Chicago, Burlington & Quincy, has been appointed the Master Mechanic of the Sterling division, with office at Sterling, Colo., succeeding E. D. Andrews, transferred.

M. C. Blanchard, Acting Roadmaster of the Atchison, Topeka & Santa Fe, has been appointed a Roadmaster, with office at Newton, Kan. L. Bradley, who has been on a leave of absence, has been appointed Roadmaster of the M. & M. and Little River districts, succeeding F. Powers, Acting Roadmaster, assigned to other duties. The headquarters of Roadmaster William Eglinton have been moved from Arkansas City, Kan., to Mulvane.

OBITUARY.

Capt. Benjamin F. Bond, Special Passenger Agent of the Baltimore & Ohio, died April 19 at Baltimore from heart disease. He began railway work as clerk in the freight office of the Baltimore & Ohio at Baltimore, and at the time of his death had worked for the Baltimore & Ohio for 44 years.

Railroad Construction.

New Incorporations, Surveys, Etc.

ALASKA CENTRAL.—A contract is said to have been given to Watson & Snow to finish 20 miles of this line, on which grading has been completed, from mile 52 north to mile 72. Track laid on the line from Seward, Alaska, north to Turnagain bay, 52 miles.

ALGOMA CENTRAL & HUDSON BAY.—The Ontario government has granted a subsidy of $5,000 per mile for 30 miles of line on the Manitoulin & North Shore, between Little Current, Ont., and Sudbury. (March 19, p. 659.)

AUGUSTA, GREGORY & SOUTHERN.—Incorporated in Arkansas, with $200,000 capital, to build from Augusta, Woodruff county, south about 14½ miles to the extension of the Missouri & North Arkansas. The directors include: J. L. Comer, M. Gregory, R. H. Fitzhugh, T. E. Bonner, I. J. Story, T. E. Stanley, H. M. Wood, E. Roddy and A. H. Campbell.

BANGOR & AROOSTOOK.—This company has renewed the petitions for three important branches in Aroostook county as follows:

From Masardis, Me., on the Ashland Junction-Fort Kent line, northeast to a connection with the main line at Stockholm, about 48 miles.

From Ft. Kent west to St. Francis, 15 miles.

From Ft. Kent east through Frenchville to Madawaska, thence southeast via Grand Isle to Van Buren, 40 miles.

CHICAGO & NORTH WESTERN.—Plans for track elevation on the south side of Milwaukee, Wis., are said to have been approved by the City Engineer. The work is to be started at once.

CHICAGO, MILWAUKEE & PUGET SOUND.—According to press reports, this company is making surveys for a branch from Beverly, Wash., south along the west shore of the Columbia river, thence along the eastern slope of Gable mountain to Hanford.

COOS BAY, OREGON & IDAHO.—Incorporated in Oregon, with $25,000 capital, to build an electric or steam line from Coos Bay, Ore., east via Roseburg to Boise, Idaho. The incorporators include W. Grimes, J. C. Gray, H. Sengstacken, J. V. Pugh, J. R. Smith and P. Hennessey. Company headquarters at Marshfield, Idaho.

GREAT NORTHERN.—Plans have been filed, and it is said that work will be begun at an early date on the proposed line from Winnipeg, Man., south to Noyes, Minn.

HAMPSHIRE SOUTHERN.—Projected from Romney, W. Va., southwest to Petersburg, about 40 miles. W. B. Conwell, Pres., Fairmount, W. Va.

HARRISON & MINERAL BELT.—Contract said to have been let to A. T. Clements, contractor, Vineyard, Ark., for work from Appleton, Ark., north to Harrison. (April 16, p. 871.)

IDAHO NORTHERN.—Press reports indicate that about 40 miles of extensions will be built this year.

KANSAS CITY, MEXICO & ORIENT.—An officer writes that work has been resumed between Sweetwater, Texas, and San Angelo, 78 miles, and it is expected to have this section finished within the next few months. All the grading has been done and track-laying, bridge building, etc., now under way. Work under way on passenger and freight stations at San Angelo.

Press reports quote President Stilwell as having said that trains will be in operation from Kansas City, Mo., southwest to San Angelo, Tex., by August 1, and that it is expected that the Pacific coast extension will be completed next year.

MANITOULIN & NORTH SHORE.—See Algoma Central & Hudson Bay.

MISSOURI PACIFIC.—Press reports from Kansas City, Mo., indicate that contracts have been let for ballasting the line between Kansas City, Kan., and Pueblo, Colo.; also between Coffeyville, Kan., and Little Rock, Ark., and between Little Rock and Leeper.

NEBRASKA, KANSAS & SOUTHERN.—The Kansas Railway Construction Company has a contract to build this line from Garden City, Kan., northeast to Stockton, 162 miles. According to press reports the grading work from a point 16½ miles northeast of Garden City to Stockton has been sublet to Scott & Smith, contractors, Memphis, Tenn., and St. Louis, Mo. (March 19, p. 656.)

NORTH COAST.—According to press reports, grading contracts have been given to Casse & Eschbach and to Contractor Dingle on a 12-mile section from Kiona, Wash., west to Grand View. Between Kennewick and Grand View, near Prosser, a large amount of grading is yet to be done, including some heavy cuts and fills. R. E. Straborn, Pres. and Gen. Mgr., Spokane, Wash. (Aug. 14, p. 741.)

PENNSYLVANIA SYSTEM.—The record of the mileage of the road on December 31, 1908, shows that the total length of main line on the Lines East of Pittsburgh and Erie is 5,314 miles, with 1,823 miles of second track, 569 miles of third track, 467 miles of fourth track, and 4,251 miles of sidings, a total of 12,424 miles. There was an increase during 1908 of 20 miles of first track, 26 miles of second track, 2.5 miles of third track, 10.5 miles of fourth track and 21 miles of sidings, a total increase of 80 miles. On the lines west of Pittsburgh the mileage is 2,914 miles of first track, 1,192 miles of second track, 183 miles of third track, 87 miles of fourth track and 2,307 miles of sidings, a total mileage of 6,683 miles. During the year there was an increase of 5 miles of first track, 9 miles of second track, 7 miles of third track, 2.5 miles of fourth track and 23.5 miles of sidings, a total increase of 47 miles. The mileage of the Vandalia Railroad is: First track, 925.5 miles; second track, 82 miles; third track, 8.5 miles, and sidings, 643 miles, a total of 1,659 miles. During the year there was an increase of .19 of a mile of first track, 14.15 miles of second track, 8.34 miles of third track and 5.66 miles of sidings, making a total increase of 28.34 miles. The grand total of all lines, including those operated by and associated in interest with the Pennsylvania Railroad, is 11,235 miles of first track, 3,327 miles of second track, 785 miles of third track, 564 miles of fourth track and 8,066 miles of sidings, a total of 23,977 miles. Of this 6,287 miles of first track are east and 4,948 miles are west of Pittsburgh and Erie.

PENSACOLA, ALABAMA & TENNESSEE.—According to press reports, plans are complete to build the first 10 miles of an extension towards Mobile, Ala.

ST. LOUIS, OKLAHOMA & TEXAS.—Location surveys said to be under way on about 100 miles from Mt. Vernon, Texas, northwest; also south of Mt. Vernon. M. J. Smith, Ch. Engr., McAlester, Okla. R. C. Sturgeon is in charge of the surveys.

SAN ANTONIO & RIO GRANDE.—Press reports from Houston, Texas, indicate that 11 miles of track have been laid in Hidalgo county. Connection will be made with the San Antonio & Aransas Pass at Falfurrias, in Starr county. (March 19, p. 657.)

SOUTH BRUNSWICK.—Organized in Virginia, with $55,000 capital, to build from a point on the Southern east of Lawrenceville, in Brunswick county, Va., south to a point on the Seaboard Air Line, near Garysburg, N. C., about 25 miles. P. D. Camp, Pres., and J. C. Williams, Gen. Supt., Franklin, Va.

SOUTHERN.—According to press reports, W. J. Oliver, contractor, Knoxville, Tenn., is to resume work on the double track improvements from Lynchburg, Va., to Durmid, and from Asheville, N. C., to Craggy. The latter work includes the construction of a concete viaduct over the French Broad river at Asheville. About one year will be required to complete the contracts, which were suspended about 18 months ago.

TENNESSEE, ALABAMA & KENTUCKY.—Incorporated in Tennessee to build from Louisville, Ky., south to Chattanooga, Tenn.

WISCONSIN & NORTHERN.—This company is said to have plans complete for building 30 miles this summer to complete the line from Shawano, Wis., north to Crandon. All grading is finished except on two miles. (Oct. 23, p. 1228.)

Railroad Financial News.

Atchison, Topeka & Santa Fe.—The Kansas Railroad Commission have approved the issue of $73,770,000 stock previously authorized by the stockholders and set aside to provide for the conversion of $47,714,000 4 per cent. convertible bonds of 1905-1955 and $26,056,000 5 per cent. of 1907-1917.

Boston & Maine.—Governor Draper, of Massachusetts, sent to the legislature April 21 a message relating to the railway situation. It suggests the creation of a corporation which, under limitations, shall have the right to purchase and hold stock in the Boston & Maine, with power, temporarily or otherwise, to finance such corporations. He suggests that if a charter is granted its power be strictly limited. Among other things, it shall be provided that a majority of the directors of the corporation shall at all times be citizens of Massachusetts. The corporation shall have its principal office and place of business in Boston. The Governor suggests that if such a corporation is authorized it could acquire the $11,000,000 Boston & Maine stock recently sold by the New York, New Haven & Hartford. The New Haven company officials are said to favor such a bill.

Buffalo & Lackawanna Traction.—See Buffalo & Lake Erie Traction.

Buffalo & Lake Erie Traction.—The New York Public Service Commission, Second district, has authorized this company to lease for 999 years the property of the Buffalo & Lackawanna Traction. The Buffalo & Lake Erie Traction runs from Erie, Pa., to Buffalo, N. Y., entering Buffalo over the tracks of the Buffalo & Lackawanna Traction.

Erie.—See an item in regard to the issue of bonds by this company under State Commissions.

Grand Trunk.—A full year's dividend of 5 per cent. has been declared on the first preferred stock, and a half year's dividend of 2½ per cent. has been declared on the second preferred. In 1908 dividends on both these stocks were deferred.

Great Northern.—The company has sold $2,131,000 Eastern Railway of Minnesota, Northern division, first mortgage 4 per cent. bonds of 1898-1948 to Clark, Dodge & Co., Lee Higginson & Co. and Moffat & White. There were in January, 1909, $9,700,000 of these bonds outstanding.

Keokuk & Des Moines.—A dividend of 1 per cent. on the $1,524,600 preferred stock has been declared payable May 1. In 1908 1¼ per cent. was paid on this stock, and from 1905 to 1907 nothing was paid. A majority of the capital stock of the company is owned by the Chicago, Rock Island & Pacific.

Mexican Railway.—Glyn, Mills, Currie & Co., London, England, from March 24 to 27 received applications for £500,000 ($2,500,000) of a new issue of £1,000,000 ($5,000,000) 4½ per cent. second debentures, due in December, 1960. The offering price was 92½ per cent.

A dividend of 3$\frac{7}{16}$ per cent. has been declared for the last half year of 1908 on the first preferred stock, making 7$\frac{7}{16}$ paid for the year 1908. Eight per cent. was paid in 1907.

Michigan Central.—J. P. Morgan & Co., the First National Bank and the National City Bank, all of New York, are offering $10,000,000 4 per cent. debenture bonds of 1909-1929 at 95. This is part of a recently authorized issue of $25,000,000.

New York, New Haven & Hartford.—See Boston & Maine.

Portland Railway Light & Power.—Bond & Goodwin, New York, are offering the unsold portion of $1,000,000 three-year collateral trust 5 per cent. notes of 1909-1912 at 99¼, yielding 5¼ per cent.

Public Service Corporation of New Jersey.—Holders of $6,250,000 convertible notes of 1906-November 1, 1909, are given the privilege of converting, between April 15 and May 1, their notes into stock at par.

St. Louis & San Francisco.—The syndicate formed in December, 1908, by Speyer & Co., New York; Speyer Bros., London; Lazard Speyer-Ellissen, Frankford-on-Main; the Deutsche Bank, Berlin, and Teixeira de Mattos Bros., Amsterdam, to take over $30,000,000 general lien 5 per cent. bonds of the St. Louis & San Francisco has been liquidated. The syndicate has bought additional bonds of the same issue. The amount is said to be about $5,000,000.

Seaboard Air Line.—The following sub-committee representing the various interests has been formed to prepare a plan of reorganization for submission to the full committee: Thomas J. Hayward, of Baltimore, representing the Continental Trust Co. of Baltimore, which is trustee for the 4 per cent. bonds; James A. Blair, of New York, representing the stock of the Seaboard Company; John Skelton Williams, of Richmond, representing the old Seaboard Air Line stock; Ernst Thalman, of New York, representing the collateral trust bonds, and Russell G. Fessenden, of Boston, representing both bonds and stock. C. Sidney Shepard, of New York, chairman of the general reorganization committee, is ex-officio chairman of the sub-committee.

Sixth Avenue Railroad (New York).—The quarterly dividend, 1¾ per cent., due April, 1909, and guaranteed by the Metropolitan Street Railway, is not to be paid at present. President Curtiss says:

"Because of the unsettled state of affairs of the lessee company, and the fact that certain franchise taxes imposed on its companies' property have not been paid by the lessee company, which taxes are in litigation, your directors have decided not to declare the usual dividend at present."

Southern Railway.—J. P. Morgan & Co., New York, have bought an additional $5,000,000 development and general mortgage 4 per cent. bonds and offer to exchange these bonds, together with other bonds of the same issue previously bought, at 80 for 6 per cent. notes of the $15,000,000 issue due May 1, 1911, at 100¼.

The Southern has drawn by lot $3,891,000 6 per cent. convertible notes due May 1, 1911, but redeemable at the option of the company in 1909 for redemption at par.

Western Maryland.—The $1,250,000 receiver's certificates of April 1, 1909-1911, have been sold by the receiver.

FOREIGN RAILWAY NOTES.

A consular report gives the following information concerning recently issued imperial ordinances dealing with the management of railways in Japan: Heretofore railway administration has been in charge of the department of communications, but by the new plan a board has been formed which will take over the entire management of the railways, independent of the cabinet. The premier will have a general control, but the present minister of communications has been appointed the first president of this board, in addition to his other duties, and will no doubt perform all the functions generally incident to that office. The accounting will be done by the board, entirely separate from the other affairs of the government. It is believed that this step will correct the method which followed the sudden nationalization of the railways after the late war.

The report of the South Australian Government Railways for the half-year ended December 31, 1908, has been issued by the railway commissioners. Earnings are less by $204,170 than in the same period of 1907, and working expenses are $215,345 greater. The following table shows results for the last half of 1908, as compared with the corresponding period of 1907:

	Southern Province.		Northern Territory.	
	—Half-year ended December 31—			
	1907.	1908.	1907.	1908.
Approximate earnings	$4,507,500	$4,308,000	$41,475	$36,805
Approximate working expenses	2,225,000	2,441,750	32,465	31,060
Net balance	$2,282,500	$1,866,250	$9,010	$5,745
Working exp. p. ct. to earnings	49	57	78	84
Train mileage run	2,529,757	2,616,813	15,873	15,590
Earnings per train-mile	$1.79	$1.64	$2.60	$2.35

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Boston & Maine is said to be in the market for 28 passenger, 20 mogul and 10 switching locomotives. This item is not confirmed.

The Temiskaming & Northern Ontario locomotives reported in the *Railroad Age Gazette* of April 3 as being built by the Canadian Locomotive Co., will have the following additional special equipment:

Axles	Open-hearth steel
Bell ringers	Sansom
Boiler lagging	Carey, 85 per cent. magnesia
Brake-beams	Simplex
Brake-shoes	Steel back
Couplers	Tower
Driving boxes	Steel
Headlight	Adams & Westlake
Injectors	Ohio, No. 8
Journal bearings	Canadian Bronze Co.
Piston and valve rod packings	U. S. metallic
Safety valve	Coale
Sanding devices	Wilson
Lubricators	Detroit
Staying	Monkbridge staybolt iron
Steam gages	James Morrison, Toronto
Steam heating equipment	Consolidated
Tubes	"Kerva"

The Canadian Pacific, as reported in the *Railroad Age Gazette* of April 9, has ordered two Pacific locomotives from the American Locomotive Co.

General Dimensions.

Weight on drivers	140,000 lbs.
" total	214,000 "
" tender	131,000 "
" engine and tender	345,000 "
Cylinders	21 in. x 28 in.
Diameter of drivers	69 in.
Boiler, type	Wagon top
" working steam pressure	200 lbs.
" outside diameter, front end	67½ in.
Firebox, width	70 "
Firebox, length	94 "
Heating surface, tubes	2,765 sq. ft.
" " firebox	194 "
" " total	2,959 "
Tubes, number	193
" outside diameter	2¼ in.
" superheater, number	22
" superheater, outside diameter	5 in.
" length	19 ft. 6 in.
Grate area	45.7 sq. ft.
Tractive effort	30,400 lbs.
Water capacity	5,000 Imp. gals.
Coal capacity	10 tons.

CAR BUILDING.

The Boston & Maine is said to be in the market for 900 thirty-ton steel underframe box cars. This item is not confirmed.

The Northern Pacific has ordered one 55-ft. all-steel combination passenger and baggage gasolene motor car from the McKeen Motor Car Co.

The Columbus Railway & Light Co., Columbus, Ohio, has ordered 30 pay-as-you-enter cars from the American Car Co., for delivery in September.

The Wabash-Pittsburgh Terminal, as reported in the *Railroad Age Gazette* of April 2, has ordered 500 fifty-ton self-cleaning, hopper bottom gondola cars from the Standard Steel Car Co. These cars will weigh approximately 37,500 lbs. and will be 30 ft. long, 9 ft. 5½ in. wide and 6 ft. 10 in. high, inside measurements, and 31 ft. 6 in. long, 10 ft. wide and 10 ft. high over all. The bodies and underframes will be of steel. The special equipment will include:

Axles	Open-hearth steel; Carnegie Steel Co.
Bolsters, body	Standard Steel Car Co.
Bolsters, truck	Simplex; American Steel Foundries
Brakes	Westinghouse
Brake-beams	Waycott; Damascus Brake-Beam Co.
Brake-shoes	Streeter type, steel back; American Brake-Shoe & Foundry Co.
Brasses	Damascus Bronze Co.
Couplers	Simplex; American Steel Foundries
Door fastenings	Simonton
Draft gear	Miner tandem, Class G springs
Journal boxes	McCord
Paint	Suydam
Side bearings, roller	Stucki patent
Trucks	Andrews cast steel; Am. Steel Foundries
Wheels	33-in. cast-iron; Standard Steel Car Co.

The Long Island, as reported in the *Railroad Age Gazette* of April 2, has ordered 114 fifty-ton box and 20 fifty-ton gondola cars from the Pressed Steel Car Co. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 39 ft. long over running board, 10 ft. 1¼ in. wide over all, and 12 ft. 8⅝ in. high, over running board. The bodies will be of wood and the underframes of steel. The gondola cars will be 37 ft. 5 in. long, 9 ft. 4 in. wide and 3 ft. 10½ in. high, inside measurements, and 40 ft. 2 in. long over flooring, 10 ft. 2 in. wide and 8 ft. 8 in. high, over all. The bodies will be composite and the underframes of steel. The special equipment will include:

Axles	Open-hearth steel
Bolsters, body	Steel
Bolsters, truck	Steel
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Cast-iron
Brasses	Ajax Metal Co.
Couplers	Sharon
Draft gear	Westinghouse
Journal boxes	Cast iron
Paint	L. I. R.R. standard
Roofs	Winslow, with steel carlines
Springs	Union Spring & Mfg. Co.
Trucks	Arch bar
Wheels	Cast-iron

The box cars will have Wagner doors and the gondola cars will have swing side and drop end doors.

IRON AND STEEL.

The Buffalo, Rochester & Pittsburgh is in the market for 3,500 tons of bridge steel.

The Idaho & Washington Northern has ordered 2,000 tons of rails from the Illinois Steel Co.

The Chicago, Indianapolis & Louisville has ordered 2,500 tons of rails from the Illinois Steel Co.

The Pennsylvania Lines West are in the market for 1,100 tons of structural steel for track elevation in Chicago.

The Pennsylvania Tunnel & Terminal Co. is said to have ordered 10,000 tons of conductor rails from the Cambria Steel Co.

The Carolina, Clinchfield & Ohio is said to have ordered 5,000 tons of rails from the Tennessee Coal, Iron & Railroad Co. and 7,000 tons from the Carnegie Steel Co.

The Great Northern has ordered 11,000 tons of rails from the Illinois Steel Co. This is in addition to a previous order for 6,500 tons, reported in the *Railroad Age Gazette* of January 29.

The Minneapolis, St. Paul & Sault Ste. Marie, reported in the *Railroad Age Gazette* of April 2 as being in the market for 6,000 tons of rails, has placed that order with the Illinois Steel Co.

The New York Central Lines have ordered 3,500 tons of 100-lb. rails from the Illinois Steel Co. These rails will replace 80-lb. sections now in track on the Lake Shore & Michigan Southern, which latter will be used in construction work on the Lake Erie & Pittsburgh.

General Conditions in Steel.—There is a reported feeling in United States Steel Corporation circles that a gradual but steady improvement in business is evident. When price reductions were announced not long ago, business was brought almost to a standstill, since consumers held off in hope of getting still lower prices. As prices reached a low limit, there was a gradual resumption of buying and the reports of the last sixty days indicate a large volume of business. Reports credited to Pittsburgh and Cleveland say that a cut in rail prices is again being discussed, and that a western road has prepared specifications for its 1909 rail requirements, but will not place any contracts at present, due to a belief that rail prices will be cut.

RAILROAD STRUCTURES.

Antigo, Wis.—The Chicago & North Western is said to have plans made for building machine and repair shops at Antigo.

Chicago.—The Grand Trunk has given a contract for the erection of a one-story passenger station at South Halstead and Forty-ninth streets to the Charles A. Moses Construction

Co., Chicago. It will be of brick, 50 ft. x 125 ft., and will cost $25,000.

Elkhart, Ind.—The Cleveland, Cincinnati, Chicago & St. Louis is said to have plans ready for building an eight-stall roundhouse to replace the structure recently destroyed by fire.

Ft. Worth, Tex.—The Texas & Pacific will rebuild the roundhouse, machine shops, coal chutes, etc., that were burned on April 3. The new roundhouse, contract for which has been given to the O'Rourke Construction Co., Ft. Worth, Tex., will have 36 stalls and will be entirely of fireproof material. The machine shop will have dimensions of 75 ft. x 175 ft. and boiler house will be 30 ft. x 60 ft. New water tanks and coal chutes are also included in the plans. The new structures will cost approximately $105,000. (April 9, p. 823.)

Milwaukee, Wis.—See Chicago & North Western under Railroad Construction.

Norfolk, Va.—Of the bids for building the proposed offices and freight sheds recently opened by the architect of the Norfolk & Southern, the one of West Richardson, contractor, Hampton, Va., amounting to $124,224 was the lowest figure covering both buildings. The bid of the Central Carolina Construction Co., Greensboro, N. C., for the office building was $64,083, and the bid of West Richardson for the freight sheds was $52,504. These separate bids will probably be accepted since their total is considerably less than the lowest single bid, that of West Richardson.

Roscoe, Tex.—According to press reports, new shops and roundhouse for the Roscoe, Snyder & Pacific will be built.

St. Johns, Quebec.—Press reports indicate that the Canadian Pacific will replace its present single-track bridge over the Richelieu river with a double-track steel structure. Plans and estimates have been prepared.

San Angelo, Texas.—See Kansas City, Mexico & Orient under Railroad Construction.

Wenatchee, Wash.—The Great Northern has prepared plans for a roundhouse, turntable, ash pits and coal chutes to be erected on property recently acquired at this place. Additional trackage facilities will also be added and it is probable that a freight shed will be built especially adapted to expedite the handling of fruit. (Jan. 1, p. 38.)

SIGNALING.

The New York Central is to erect automatic block signals on the West Shore division from Newburgh northward to Kingston, 31½ miles. These signals will be electric motor, with semaphores moving in the upper quadrant, and normal danger. The line is double track and trains are now run under the telegraph block system. The contract has been awarded to the Hall Signal Company.

The Philadelphia & Reading has asked for bids until noon of May 26 for block signals for the reconstructed line, which is to be built in connection with the grade revision between Green street and Broad street, Philadelphia, 2.2 miles; and also for the signal bridges necessary on the new line between Norris street and Broad street; also for two signal cabins. W. Hunter, Chief Engineer, Philadelphia.

The Tata Iron & Steel Company, of India, is building works near Kalimati station, and about 20 square miles have been taken on a long lease for the purpose. The manager of the different parts of the work will arrive from the United States early in January. A railway of 45 miles is already under construction. Orders for traveling cranes, rails, fishplates, stone crushers, weigh bridges, etc., have already been placed. Of these a large portion have already been shipped and 4,000 workmen are already employed on the site of the new plant for different work. It is said that the works will be ready to manufacture finished products by the end of December, 1910. The engineer in charge of this enterprise, as well as his first assistant, are Americans, and besides having thorough training as engineers have had practical experience in millwork near Pittsburgh and the selection of equipment for the works is in their hands.

Supply Trade News.

The Eastern Granite Roofing Co., New York, has moved to new offices at 17 Battery place.

The Bucyrus Co., South Milwaukee, Wis., recently sold a locomotive pile driver to the Canadian Pacific.

The Isthmian Canal Commission, Washington, D. C., is asking bids up to May 17 on hand and push cars; warehouse trucks; blacksmith', machinists', carpenters' and track tools; drills; rope; pulleys, etc. (Circular No. 506.)

The Homestead Valve Manufacturing Co., Pittsburgh, Pa., reports several sales of Homestead valves for use on pressure of 5,000 lbs. The Homestead valves are not blow-off valves only but are successfully used on the highest known pressures.

W. A. Campbell, formerly with the Hicks Locomotive & Car Works, Chicago, has been appointed the Sales Manager of the General Railway Equipment Co., Chicago, the organization of which was announced in the *Railroad Age Gazette* of April 9.

Tate, Jones & Co., Inc., Pittsburgh, Pa., have received an order through the Erie City Iron Works from the Union Pacific Railway at Omaha, Neb., for complete oil-burning equipment for use in connection with Erie City "Economic" boilers.

A. V. Kaiser & Co., Philadelphia, Pa., are in the market for a second-hand air compressor giving approximately 3,500 cu. ft. of free air per minute at 40 to 50 lbs. air pressure, running at a speed of from 75 to 100 r.p.m. and at 125 lbs. steam pressure.

The Carnegie Steel Co., Pittsburgh, Pa., has added to the 1,550 h.p. of Crocker-Wheeler form W motors already in use in its Duquesne plant by the purchase of three more motors of the same type, especially designed for rolling-mill work, aggregating 225 h.p., made by the Crocker-Wheeler Co., Ampere, N. J.

The Horace L. Winslow Co., Old Colony building, Chicago, has been incorporated with $25,000 capital to do a general contracting and engineering business. The incorporators are: Horace L. Winslow, formerly with Julian L. Yale & Co., Chicago; C. R. Powell, vice-president of the American Car & Equipment Co., Chicago, and F. De Anguera.

R. D. Carver, Assistant General Sales Agent and General Manager of the Chicago office of the Pittsburgh Steel Co., Pittsburgh, Pa., died of pneumonia on April 11 at his home in Chicago. He was born at Cincinnati, Ohio, in 1865. Prior to his connection with the Pittsburgh Steel Co. he was Secretary of the Southern Steel Co., Birmingham, Ala.

The Sight Feed Oil Pump Co., Milwaukee, Wis., is receiving bids for the erection of a new factory on Reservoir avenue. The structure will be of brick with steel trusses, concrete foundation, saw-tooth roof and one story high. Upon its completion the machinery now in use, together with some additional new equipment, will be installed in the new building.

F. P. Jamison & Co., Seattle, Wash., have leased a four-story fireproof building at 2140 Pacific avenue, Tacoma, Wash., and Cadwalader Jones, formerly of Spokane, Wash., and a member of the firm, is placed in charge. The company is one of the largest dealers on the Pacific coast in contractors' tools, mine and logging equipment, cars, locomotives, etc. A complete stock will be carried at the Tacoma office. Branch offices are maintained also at Spokane and Vancouver.

The Hurley Track Laying Machine Co., Chicago, recently closed a second contract with the Erie Railroad whereby it leases a machine for track laying. This machine will be used on the Genessee River connecting line in New York. The work is expected to start from Cuba, N. Y., the latter part of April. The Erie had a Hurley track laying machine in use last summer on the Guymard cut-off, and the results were so satisfactory that it is now using it wherever practicable.

Frank N. Johnson, formerly president of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., and well known in the railway supply trade, committed suicide on April 10. He was

connected for a number of years with the Simmons Hardware Co., St. Louis, Mo., and in 1903 was elected president of the Scullin-Gallagher company. He resigned from that company in 1907 and practically retired from active business. He was 60 years old, and a member of the St. Louis, Country and Noonday clubs of St. Louis, and of the St. Louis Railway Club.

Last week we printed a notice to the effect that E. D. Clapp had associated himself with the W. K. Kenly Co., Chicago. In becoming Vice-President and a Director of the W. K. Kenly Co., Mr. Clapp ceases to be the direct Chicago representative of the Jeffrey Manufacturing Co., Columbus, Ohio, and the Ohio Malleable Iron Co., of the same city; but he will continue to represent both concerns, as the W. K. Kenly Co. has been given the Chicago agency for the latter concern as well as for the products of the forge and foundry department of the Jeffrey Manufacturing Co.

W. H. Dayton, who for several years has been connected with the Railroad Supply Co., Chicago, and recently with the New York office of that company, has gone to St. Louis and will be associated with E. W. Hodgkins in the railway supply business under the firm name of Hodgkins & Dayton. This firm will represent the following companies as sales agents for St. Louis and southwestern territory, with offices in the Security building: The Railroad Supply Co., Chicago; the Dressel Railway Lamp Works, New York; Paul Dickinson, Inc., Chicago; Chicago Bridge & Iron Works, Chicago, and the Wyandot Refineries Co., Crawford, Ohio.

The Automatic Car Coupler Co., Los Angeles, Cal., the incorporation of which was announced in the *Railroad Age Gazette* of April 9, was organized under the laws of California to take over the patents of the Norwood-Bonney coupler and to manufacture and place the coupler on the market. The Norwood-Bonney coupler is in service on most of the cars of the Redondo Electric Railroad and is giving satisfaction. An order has also been received for equipping about 100 cars on another railway with this coupler. The officers of the company are: President, Frank R. Bonney; Vice-President, Frank H. Norwood; Secretary, Karl Elliott; Treasurer, C. H. Wills; Attorney, W. H. Soale. Mr. Bonney and Mr. Soale are now in Chicago negotiating for the manufacture of the coupler.

The business of the Western Electric Co., Chicago, for March made a better showing than any of the preceding months of the fiscal year, which began December 1, 1908. March sales were at the rate of about $48,000,000 a year, and the rate for the four months ended with March was about $45,000,000 a year. The company is still increasing the number of its employees, having added to its force about 2,000 men since the beginning of the fiscal year. It now is employing in all about 17,000 persons. The additions to the Hawthorne plant are being pushed ahead and will be completed this summer. While foreign returns have been received for only December and January, they show a slight increase in comparison with December and January, 1907-1908. The company's business abroad did not suffer during the last two years as did the domestic business, and hence the ratio of improvement is considerably less.

A. M. Gilbert, formerly President of the Buda Foundry & Manufacturing Co., Chicago, and the Paige Iron Works, Chicago, died at his home at Santa Barbara, Cal., on April 14. He was born in New Jersey in 1847. He moved to Chicago just before the fire of 1871 as Representative of the Howe Scale Co., Rutland, Vt., and later became Manager of Fairbanks, Morse & Co., Chicago. In 1890 he was elected Vice-President and General Manager of the Crane Co., Chicago, and in 1895 returned to Fairbanks, Morse & Co. as Vice-President. In 1903 he was elected President of the Buda Foundry & Manufacturing Co. and the Paige Iron Works, which position he held until 1908, when his health weakened. From that time he made his home at Santa Barbara. Mr. Gilbert was an energetic, able business man and possessed great ability as a financier. He was a member of most of the country and city clubs of Chicago and had been a member of the Chicago Club since 1873.

Louis G. Henes, Monadnock block, San Francisco, Cal., has recently started a railway, industrial and contracting equipment business, and will cover the territory along the Pacific coast as far east as Salt Lake City, Utah, and the west coast of Mexico. Mr. Henes was formerly associated with the Niles-Bement-Pond Co. in its main office at New York. Immediately after the earthquake and fire in San Francisco he went there to manage the machine tool business of Harron, Rickard & McCone, who are the Pacific Coast agents of the Niles-Bement-Pond Co. On January 1 of this year he was appointed Pacific Coast Manager of the Commercial Acetylene Co., New York, manufacturer of a safety system of acetylene for use in locomotive headlights and car lighting. He has also been appointed Manager in that territory of M. Kirchberger & Co., New York manufacturers and distributors of the Von Schwarz and Crescent acetylene burners; also Manager of the Whiting Foundry Equipment Co., Harvey, Ill., manufacturer of cranes and foundry equipment, and Manager of Toch Brothers, of New York, manufacturers of technical railway and marine paints. Mr. Henes is also representative in the Pacific coast territory of the Railway Materials Co., Chicago, for its Ferguson oil furnaces; also of the Rostand Manufacturing Co., Milford, Conn., for the McCarthy baggage rack; also of Hubbard & Co., Pittsburgh, Pa., makers of picks, shovels and track tools; also of the Ward-Packer Supply Co., Chicago, manufacturer of Minnesota boiler compounds, metallic packing, Corning draft gear, Crosby bell ringer and Ames water glass shield; also of W. H. Foster & Co., New York, makers of the Lassiter special bolt machinery, and of the Frost Railway Supply Co., Detroit, Mich., manufacturer of Detroit metal weather strip.

TRADE PUBLICATIONS.

Dry Batteries.—The Western Electric Co., New York, is mailing a folder which tells of the merits of Blue Bell dry batteries for telephone service. This company will ship, free of charge, 10 of these cells for trial.

Great Northern.—A folder describing and illustrating the scenic northwest is being distributed. Different parts of Minnesota, North Dakota, Montana, Idaho, Washington, British Columbia, Oregon and Alaska are the subjects described in the folder.

Western Pacific.—"The Story of the Western Pacific" is told in a 24-page catalogue recently issued by the Denver & Rio Grande. The requirements of modern railway construction and the sources from which profits are secured are elaborately described. A number of illustrations show some of the scenery along the route.

Jacks.—The Duff Manufacturing Co., Pittsburgh, Pa., has just issued a catalogue which illustrates and describes Duff-Bethlehem forged steel hydraulic jacks in all styles and capacities for vertical or horizontal lift. These jacks are an entirely new line and of construction different from other jacks made by this company.

Paint.—The Detroit Graphite Co., Detroit, Mich., has just issued a booklet descriptive of the repainting of the Poughkeepsie bridge. This is one of the longest bridges in the world, and the magnitude of the work of designing the bridge, and especially of painting it, is concisely set forth. A copy of the booklet will be sent to anyone interested.

Chicago, Milwaukee & St. Paul.—The country on the North Pacific coast is attractively described in a 64-page catalogue that is now being distributed by the company. The grandeur of the country in the states of Oregon, Washington, Idaho, Montana, British Columbia and the territory of Alaska is described, and the illustrations show some of the agricultural and industrial possibilities and natural wonders of that territory.

Drills and Sockets.—The American Specialty Co., Chicago, has just issued a new catalogue on drills and sockets. The illustrations show both flat and twist drills for machine and ratchet work. The "Use-Em-Up" drill socket, made of one piece with a flat side forged within the socket, for using drills with broken tangs, is also made by this company. This socket was illustrated and described in the *Railroad Age Gazette* of September 18, 1908.

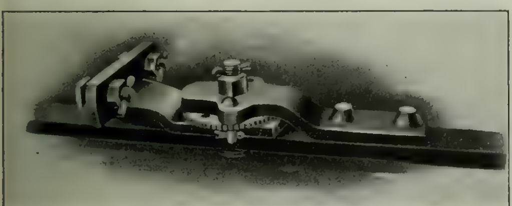
Northern Pacific.—"Eastward Through the Storied Northwest," by Olin D. Wheeler, is the title of a 62-page catalogue

that has been issued by this road. A good description is given of the climate and scenery of California, Washington, British Columbia, Montana and the Yellowstone Park, as well as of the educational and industrial opportunities in the northwest. Several tables give the altitudes of principal points, fares, accommodations and a partial list of the publications covering specific parts of the country.

Track Supplies and Railway Material.—Catalogue No. 127, just issued by the Buda Foundry & Manufacturing Co., Chicago, is one of the publications sent into the railway field that is worthy of a very careful perusal and should afterwards be indexed as a reference encyclopedia of track supplies and various railway materials. The publication contains 424 pages of descriptive matter and illustrations, each device being thoroughly explained. New features of Buda products will be found in the pages describing water softening plants, railway motor cars and velocipedes, hand and push cars, replacers, jacks, switch stands, drills, crossing gates, frogs, crossings and switches. Attention is also directed to the complete offerings in extra durable scales. Indicative of the thoroughness with which this catalogue is prepared is the fact that the part devoted to motor cars and other types of cars fills 70 pages, in which are 60 half-tone illustrations and describes 40 different types of cars, each designed to meet different requirements. The repair parts of the cars are also shown in detail and listed, giving sizes and prices. In addition to the materials already mentioned the catalogue describes wrecking frogs, track gages and levels, rail benders, bumping posts, battery chutes, cinder pit ties, Buda stoves for stations, roundhouses and cabooses, etc. An index in the back makes the contents of the book easily accessible.

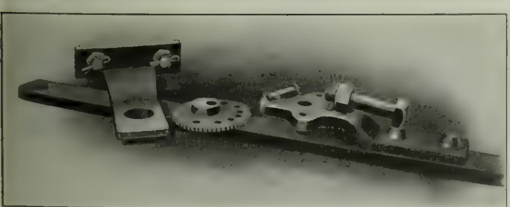
Buda Adjustable Switch Rod.

The "Buda" adjustable switch rod is shown in the accompanying illustrations. Simplicity of construction, substantialness and durability are the principal claims, together with the fact that it is unnecessary to remove the center, or main retaining bolt, to effect adjustment. Only the auxiliary pin at the side is withdrawn and the



Buda Adjustable Switch Rod.

eccentric moved in either direction as desired, after which the auxiliary pin is returned. Adjustments can be made as close as $\frac{1}{16}$ in. With the auxiliary pin in the position shown, the adjustment is within ⅛ in., but by putting the auxiliary pin on the opposite side and throwing over the eccentric wheel to correspond, the extremely close



Parts of Buda Switch Rod.

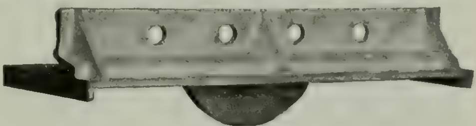
adjustment of $\frac{1}{16}$ in. is obtained. Removal of the main retaining bolt of an adjustable switch rod often necessitates cutting off the nut on account of rust. If the trackmen does not have another nut that will fit, the switch has to be spiked temporarily. But, of course, it is well to avoid removal of the main bolt at any time, if possible.

In the type here shown, the head, or No. 1 rod, is usually fitted with an adjustment at both connections with the switch point in order that with switch stands set approximately true each point may be adjusted to its stock rail without shifting the stand. The No. 2 rod has one adjustment, and the No. 3 rod is usually rigid. The Buda Foundry & Manufacturing Co., Chicago, is the maker.

Winans Rail Joint.

The rail joint illustrated herewith was invented by L. Winans, of Portland, Ore. It is made preferably of malleable iron or cast-steel, or can be rolled if desired. The lengths are 24 in. for a four-hole joint and 28 in. for a six-hole joint. The weights for four-hole joints in malleable iron range from 30 lbs. for a 60-lb. rail to 40 lbs. for an 85-lb. rail, and 50 lbs. for a 90-lb. rail. As the illustration shows, the base plate has a deep central rib for stiffening and has a downward flange at each end to prevent rail creeping. A plain angle bar is used on the inside of the rail.

Laboratory tests on a malleable joint for a 90-lb. rail having a base plate ⅜ in. thick and a rib ¾ in. thick showed a safe working



Winans Rail Joint.

load of 50 tons without deflection. At 75 tons there was a deflection of 0.04 in. without permanent set, and at 100 tons there was a permanent set of 0.06 in. The test was made by the Pittsburgh Testing Laboratory.

Joints of this design have been in experimental service on two steam roads and one interurban electric road for three years with gratifying results. They are now on trial on four prominent steam and one elevated railway, and orders have been given by several other steam roads for trial lots. The Winans Rail Joint Co., Portland, Ore., has been formed to put the joint on the market.

The Lifting Magnet in Railway Work.

Lifting magnets have been manufactured by the Electric Controller & Manufacturing Co., Cleveland, Ohio, for the past 10 years. Early in 1905 it put on the market a magnet suitable for handling all kinds of miscellaneous iron or steel. This type was first introduced into steel mills for handling scrap. The service in the steel mills is very severe, the magnets being worked 24 hours per day, and in some cases making as many as four lifts per minute. The magnet has been perfected till it meets this very severe service entirely satisfactorily and is considered more dependable than the crane from which it operates.

Since railways have great quantities of iron and steel to handle, the use of magnets would save them a great deal of money and make them independent of a very troublesome class of labor. The magnet handles not only all kinds of scrap and small castings, but almost any other iron and steel used by or handled by a railway, and railways are beginning to use magnets, especially in the stores departments. A magnet is most efficiently operated from an overhead electric traveling crane, but the stores or shop yards are usually so extensive as to call for a steam driven locomotive crane. In these cases the Electric Controller & Manufacturing Co. is prepared to furnish small steam-driven generator sets for supplying the magnet with current.

The photographs show the work that may be accomplished with one of these Type S-A Magnets. Fig 3 shows the magnet lifting rails of about 50-lb. section. This magnet will lift about all the rails it will cover, no matter what the weight of the section is, if they are piled evenly, and will lift five or six rails even if piled indiscriminately, as a section gang would load them in a car. Such a lift is shown in Fig. 2.

Fig. 6 shows a lift of nine car axles which weigh about 200 lbs. each and which were lifted from a single row on the flat car.

Fig. 1 shows the magnet lifting a cylinder casting which weighs about 2,000 lbs.

Fig. 4 shows a lift of track bolts in the keg, there being six to eight kegs per lift.

Fig. 5 shows a lift of four car wheels on their axles, the magnet being between the wheels and lifting from the axles.

Fig. 7 shows a typical lift from the scrap dock, which lift probably weighs in the neighborhood of 1,200 lbs. A good crane operator can with this magnet put scrap on the dock from cars at the rate of a ton a minute. The magnet can be attached to or detached from the crane in less than a minute, so that it does not interfere with the use of the crane for handling timbers and other non-magnetic material.

A magnet of this same size is used by the Chicago & North Western

Co. on the scrap dock at its Chicago shops. It is handling from: 1,000 to 1,300 lbs. per lift of nuts and spikes; 1,100 to 1,200 lbs. per lift of driver brake shoes; 800 to 1,000 lbs. per lift of cast car brake shoes: 800 to 1,000 lbs. of flue ends, averaging about 8 in. long.

It is handling all of the material received at this dock which is within the capacity of the crane in a satisfactory manner.

The Chicago, Rock Island & Pacific has one of these magnets in its store yard at Silvis, Ill., and reports the following results: 1½ in. round bar iron, 16 to 18 ft. long, 2,100 to 2,400 lbs. per lift; five 65-in. locomotive driving wheel tires, lifted from the tread, weight not ascertained; three locomotive smokestacks per lift, weight of each stack 650 lbs.; cylinder casting with half the saddle, weight 4,000 lbs., magnet lifting from the side of the cylinder so that only a line contact was obtained; seven ¼-in. plates, 60 in. wide by 72 in. long.

At other points these same magnets are handling such material as: Cast-iron pipe, 3 ft. in diameter, each weighing 2,000 lbs., one per lift: cast iron sections for the retaining wall of the East river tunnel under the Hudson river, these castings being concave on one side and convex on the other and of a radius to conform with the diameter of the tunnel, weight each 4,000 lbs., one per lift; paper filled car wheels, weight not known, two wheels per lift, handled either from the tread or from the hub: steel pipe 5 in. in diameter, 30 ft. long, seven per lift, weight 3,000 lbs.; ½-in. x 4-in. x 4-in. angles, 37 ft. long, 10 pieces per lift, weight per lift 4,580 lbs.

The above data is on the No. 3 Type S-A magnet, which is 36 in. in diameter and the No. 4 Type S-A magnet, which is 43 in. in diameter.

In practice it has been found that each magnet takes the place of from seven to 14 laborers, effecting a saving on this score alone of from $10 to $30 dollars per day. It has reduced the cost per ton handled from 10 or 25 cents to 2 cents per ton, or less. These savings will quickly pay not only for the magnet but for a locomotive crane from which to operate it.

The Electric Controller & Manufacturing Co. builds larger magnets, known as the No. 5 Type S-A, which is 52 in. in diameter, and the No. 6 Type S-A, which is 60 inches in diameter, of very much greater capacity than those mentioned above, but these magnets are not applicable to operation from locomotive cranes on account of their weight and the larger sizes of generating sets necessary to supply them with current. However, where an electric overhead crane is available one of these larger sizes might be more suitable to the work.

Fig. 1.

Fig. 2.

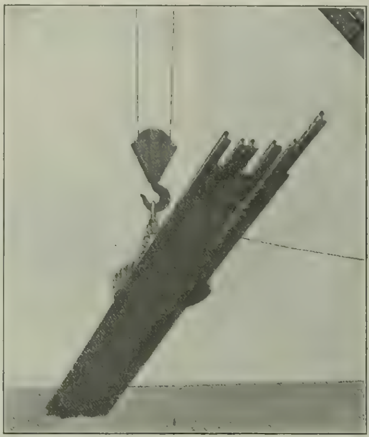


Fig. 3.

Fig. 4.

Fig. 5.

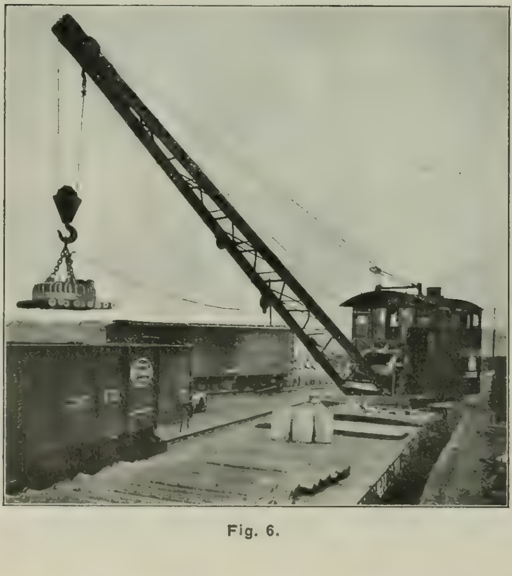


Fig. 6.

Fig. 7.

CLASSIFIED ADVERTISEMENTS AND PROPOSALS

Undisplayed advertisements are inserted at two cents a word for first insertion and one cent a word for each consecutive insertion of same advertisement. Minimum charge, 50 cents. Proposals are inserted at twenty cents a nonpareil line per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

POSITIONS WANTED.

WANTED—By A1 B. & B. road clerk, 28 years old, married, sober, honest and industrious, position with western road; now employed in Texas. Box 249, care *Railroad Age Gazette*, 81 Fulton St., New York City.

SALESMAN of supplies or machinery to contractors or railroad companies in or around New York City. Technically educated civil engineer, 10 years' experience. Correspondence solicited. Address Box 265, *Railroad Age Gazette*, 81 Fulton St., New York City.

TECHNICAL GRADUATE, four years' experience railway location and construction, wants position as transitman, resident engineer or better. References. Address "T. G.," care *Railroad Age Gazette*, 81 Fulton St., New York.

POSITION with short line as superintendent or assistant; have had 11 years' experience with trunk line, six years superintendent of short line; age 35, married; references no better. Address Box 254, *Railroad Age Gazette*, 81 Fulton St., New York.

FIRST CLASS maintenance engineer open to engagement; graduate C.E., M Am. Soc. C. E.; 20 years' experience on best roads; practical trackman; experienced in construction, maintenance, operation, organization and economy; best references. Address Box 255, care *Railroad Age Gazette*, 81 Fulton St., New York.

POSITIONS WANTED.

SALESMAN, well acquainted with the railroad supply trade and particularly with the manufacture and sale of car wheels, wants to change his position. Address Box 259, care *Railroad Age Gazette*, 81 Fulton St., N. Y.

SINGLE man, 34, experienced as salesman, buyer, office work, correspondence, chief clerk 12 years' experience in railway, mine, mill, contractors, boiler, structural, supplies and specialties machinery, pneumatic appliances. Best references. Address Box 266, *Railroad Age Gazette*, 81 Fulton St., New York City.

YOUNG man, 26; married; eight years' varied experience in operating department as chief clerk and expert stenographer, desires similar position or as confidential man with railroad, manufacturing concern or public service corporation; best references. Address Box 262, care *Railroad Age Gazette*, 83 Fulton St., New York City.

SIGNALMAN, with seven years' experience in charge of design, construction, maintenance and operation of mechanical and electrical interlocking and single track block signals, including six years' railroad experience; four years in charge of signal department. Thoroughly familiar with contracts, costs, specifications and details of best construction, a good handler of men, and know how to get the best results and economy in maintaining and operating signals. Now open for position in my line with the best of reasons for a change. Address Post Office Box 545, Houston, Texas.

PROPOSALS.

PHILADELPHIA & READING RAILWAY COMPANY. Construction of the work appurtenant to the abolishment of grade crossings on the P., G. & N. R. R. Sealed proposals for the work of construction under the following contracts will be received at the office of the Chief Engineer, 520 Reading Terminal, Philadelphia, Pa., until 12 o'clock noon, on Wednesday, May 26, 1909: Contract No. 19—Permanent Signals, Green Street to Broad Street. Contract No. 33—Signal Bridges, Norris Street to Broad Street. Contract No. 34—Two Signal Towers, one on east side of railroad between Cumberland Street and Thirteenth Street, and the other at the northeast corner of Railroad and Tenth Street. Plans, specifications and blank forms for bidding may be obtained at 520 Reading Terminal, by making a deposit to cover their return in good order, viz., Contract No. 19, $15.00, and Contracts Nos. 33 and 34, $10.00 each. Foreign corporations must furnish with their proposals a certificate from the State authorities, entitling them to do business within the State of Pennsylvania. The right is reserved by the company to reject any or all bids. W. Hunter, Chief Engineer.

MISCELLANEOUS WANTS.

I DESIRE to act as Chicago agent for responsible firm. Have a nicely equipped office, large acquaintance with railroad men and contractors, and 15 years' experience in railroad and supply business. Address Box 264, care *Railroad Age Gazette*, 160 Harrison St., Chicago.

PROPOSALS.

PROPOSALS FOR FURNISHING, during the fiscal year ending June 30, 1910, Miscellaneous Supplies as follows: Hand and Push Cars, Warehouse Trucks, Warehouse Scales, Wheelbarrows, Jacks, Anvils, Vises, Forges, Shovels, Picks, Tool Handles; Blacksmith's, Machinist's, Carpenter's and Track Tools; Machetes, Drills, Garden Tools, Pipe Tools, Saws, Differential, Snatch and Tackle Blocks; Pulleys, Wire-rope Attachments, Hose Clamps, Sister Hooks, Brooms, Brushes, Dusters, Squilgees, Mop Heads, Solder, Cotton and Wool Waste, Sash Cord, Manila Rope, Oakum, Marline, Vitrified Sewer Pipe, Draintile, Brick, Fire Clay, Asbestos, Cement, etc. Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D.C., until 10:30 a. m., May 17, 1909, at which time they will be opened in public, for furnishing the above-mentioned articles. Blanks and general information relating to this circular (No. 506) may be obtained from this office or the offices of the Assistant Purchasing Agents, No. 24 State Street, New York City; Custom House, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.; also from the United States Engineering Offices in the following cities: Seattle, Wash.; Los Angeles, Cal.; Baltimore, Md.; Philadelphia, Pa.; Pittsburg, Pa.; Boston, Mass.; Buffalo, N. Y.; Cleveland, Ohio; Cincinnati, Ohio; Chicago, Ill.; St. Louis, Mo.; Detroit, Mich.; Milwaukee, Wis.; St. Paul, Minn.; Chattanooga, Tenn.; Louisville, Ky.; Mobile, Ala., and Galveston, Texas; Commercial Club, Kansas City, Mo.; Chamber of Commerce, Quincy, Ill., and Chamber of Commerce and Board of Trade, Tacoma, Wash. F. C. Boggs, Captain, Corps of Engineers, U. S. A. General Purchasing Officer.

"WANTED" AND "FOR SALE" ADVERTISEMENTS

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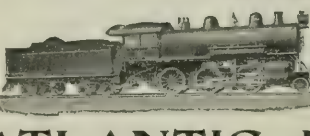

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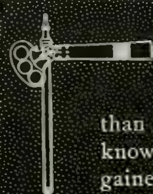

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DIRECTORY OF ADVERTISEMENTS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

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CONTENTS

The rail specifications adopted by the steel manufacturers of the United States and Canada for 1909, which are practically the same for the different companies, indicate the views of the rail makers as to the proper tests and chemical composition for securing good rails, and are comparable with the main features of the rail specifications of some of the principal railways, which were published in this paper March 19, page 535. The drop test of the manufacturers for 90-lb. and 100-lb. rails is reduced in height from 19 ft., in their previous specification, to 18 ft. in the present one, and the new clause relating to the temperature of the drop test piece makes the minimum limit 60 deg. F. and the maximum 120 deg. F. The anvil block must weigh at least 20,000 lbs., but nothing is said of the character of the foundation, which is of much importance in making drop tests which shall be in all respects comparable. If the first piece breaks two re-tests are allowed, and if either of these fail all rails of the blow which they represent will be rejected, and if both meet the requirements they are accepted. The A. S. C. E. sections are still officially regarded as standard practice. The chemical specification for Bessemer rails of 90 and 100-lb. section make the carbon limits 0.45 to 0.55; phosphorus not over 1.10 and manganese 0.84 to 1.14. No. 2 rails shall not be accepted if they have flaws in the head more than ¼ in. or in the flange more than ½ in. in depth. For open hearth rails the physical conditions, drop tests and inspection are the same as for Bessemer rails. The chemical requirements for 90-lb. and 100-lb. rails are carbon 0.62 to 0.75; phosphorus not over 0.04; manganese 0.60 to 0.90. The chemical requirements for Bessemer and open hearth rails are not very different from those recommended by the American Railway Association committee in its report of a year ago, except that the manufacturers do not include any limits for sulphur, and in the A. R. A. report this element is limited to 0.06 for open hearth and 0.075 for Bessemer. These limits are probably higher than they should be. Manganese sulphide, in certain forms, is a harmful constituent of steel.

THE RULES OF CAR INTERCHANGE.

The Master Car Builders' Rules for the Interchange of Cars have grown with annual accretions until they now fill 60 pages of the published Proceedings of the Association. The magnitude of the business of car inspection in prosperous years is such as to require large numbers of car inspectors; yet at such times the men often find more attractive employment at better wages. New and unschooled car inspectors are then employed and the quality of the work deteriorates. Even the older and more experienced men find increasing difficulty in interpreting the rules, and there is a demand for a simpler classification which shall divide the code, and arrange those rules which fix the responsibility of the delivering line under one heading, and those relating to defects chargeable against car owners under another. It has been suggested that rules pertaining to defects for which the delivering line is responsible should be placed first so that interchange inspectors could learn and understand them thoroughly; then they would not have to study and memorize all the rules in order to understand those affecting their particular part of the business. All that they would have to know would be the conditions which make a car safe to go over the line according to the instructions of superior foremen, and for what defects the delivering line is responsible. A simple and clear cut fixing of responsibility would save a great deal of time, many disputes and much delay to freight movement.

The spirit which governs the April meetings of the railway clubs often is that of making as few changes as possible, and the changes proposed usually affect only details. These recommendations are apt to be based on local experience, which may be comparatively narrow, and the larger interests affecting national and international interchange are sometimes overlooked. The broader view necessary for such a treatment can be obtained by a study of the more complete statistics now available; and a new influence is seen in the work of the Executive Committee of the Chief Joint Car Inspectors' and Car Foremen's Association.

When the interchange rules were first adopted there were comparatively few cars; the western country was not developed and freight cars did not go so far from home. The proper maintenance of cars was obtained by rules which put the burden of responsibility on the delivering line, and their operation continued to be satisfactory until the number of cars and the distances they went from home became too great. Frequent delays to traffic, disputes over bills and general confusion then compelled the radical revision of the rules. This was in 1896. Car owners were then made responsible for and chargeable with all those repairs made to their cars when away from home, which were necessitated by ordinary wear and tear in fair service, and cards were not required for any defects thus arising. Railways handling cars were made responsible for damage by unfair usage, derailment, accident or improper repairs, and they were required to make such repairs at their own expense or issue a defect card acknowledging responsibility for such damage.

This statement of the division of responsibility remains in

the last revision of the Code of Rules; but there is now a tendency to reduce the responsibility of the delivering line and to increase the list of defects chargeable against the car owner. It appears that in spite of all the discussion and revision of the past 15 years the division of this responsibility has not yet been so clearly defined as to prevent confusion and frequent dissatisfaction. The Chief Joint Car Inspectors, at their recent meeting in Cleveland, passed resolutions to the effect that there is no benefit gained by making the delivering line responsible for defects for which the owner is chargeable, if the car is in interchange. The maintenance of equipment is not thus best accomplished, while the practice makes a large amount of work in tracing and in giving cards for defects which are chargeable to the owner. At nearly every important interchange point the practice of issuing cards against delivering lines for owners' defects is being largely discontinued on the ground that it is more equitable to omit them. If such practice is fair at the larger cities it should be fair everywhere, and the rules should be modified so as to authorize it.

The Chief Joint Car Inspectors have made an important recommendation in regard to Rule 125, which deals with worn-out cars on foreign roads. Under the present rule a car unsafe to load on account of general worn-out condition due to age or decay, is returned to the owner on a home card which states the defects and shows the proper route. The rule answered a good purpose when cars did not get far from home; but at present worn-out wooden cars are found thousands of miles from home, and the return of such a car is an expensive and dangerous operation. It cannot be loaded and the long, empty haul is a useless expense. If mixed with strong steel cars in a long train it becomes an element of danger; and such cars cause wrecks. A railway is seldom able to get such a car over its line without having to stop it at different repair tracks, whereas, if it had been rebuilt or thoroughly repaired before it became unserviceable, it could have been put into revenue service instead of being started on the long and dangerous empty haul.

The joint car inspectors have recommended that Rules 125 and 126 be changed to read as follows:

Rule 125. "All wooden frame cars that a road has in its possession in an unserviceable condition, and it is desirous of procuring redress from the owners, may call in a disinterested person, such as car department head of a disinterested line, or his representative, or a chief joint car inspector, who is employed by four or more lines, who shall examine the car and, if he finds that the defects are such that the owners are responsible, he shall write to the owners, stating all defects, sending a copy to the road calling him in. The owners shall decide whether the car shall be repaired or dismantled at their expense; if the owner elects to have the car dismantled or destroyed, and the car is a 60,000 lbs. capacity car or over, the road destroying the car shall allow the owner second-hand price for wheels or axles, full price for air brakes, and scrap metal prices for all other metal. If the car is of less than 60,000 lbs. capacity, the road destroying it will allow the owners full price for air brakes, second-hand price for wheels, and scrap price for all other metal."

Rule 126. "A metal car that is safe to run, which on account of accident or serious damage by wreck or otherwise or from defects due from ordinary wear and tear, shall be reported to its owners, as provided by Rule 125; and the owner shall state whether the car shall be sent home or destroyed. In case he elects to have the car sent home, the road having the car in its possession shall make same safe for trainmen as provided for in Interstate Commerce Rules, and shall place an M. C. B. Defect Card on car for all defects for which the delivering road is responsible."

The wording of the proposed changes in these two rules could be improved, but rules giving effect to their spirit and purpose seem desirable. There are now over two million freight cars in interchange traffic. The records of the Car Efficiency Committee show that on an average 40 per cent. of these are on foreign roads; and the Rules of Interchange are applied over a large territory. As the number of heavy steel cars increases, the need of keeping crippled wooden cars out of long and heavy trains grows more acute. When a car has become practically scrap it should be made scrap, wherever it is, and settled for as such; and not dragged around the country, a source of delay to traffic and of danger to trains on every line over which it moves.

SAVINGS BANK INVESTMENTS IN RAILWAYS.

The returns of the 1,453 savings banks of the United States showed that they had in 1908 a total of $618,193,415 invested in railway stocks and bonds, chiefly bonds. Their railway investments formed more than 16 per cent. of their total resources of $3,809,533,000; and in two years the railway investments had increased from $346,561,192 to $618,193,415, or almost 80 per cent., while the leading form of savings bank investment, realty mortgages, increased only from $1,323,729,810 to $1,440,061,503, or less than 9 per cent., in the same time. To the savings banks investments in railways must also be added the vast but indefinite railway holdings of corporative and private trustees who, in not a few states, must invest under the savings bank statutes. There is now every indication that railway investment in the various trust forms—including the savings banks—is increasing swiftly in its ratios to other holdings. The great sales of railway bonds in the market is one of its indices; and the exceptional prominence and frequency on the advertising circular with which the "legal for savings banks" in various states is annexed to the offered bond is another and significant sign. In the category of investment forces which act as absorbent on the conservative group of railway securities the savings bank must be ranked not only as the first but as increasing its lead. And the savings banks not only buy railway securities but, as a rule, hold them to maturity.

At such a time and when a good many legislatures are in session with many savings bank bills before them the statutes of railway investment become a subject of special interest. It may be noted in passing that two eastern states—Rhode Island and Massachusetts—have recently revised and extended their savings bank investment laws. Rhode Island, strange to say, up to last year had practically no bars up against any railway investment whatsoever. An institution for savings in that state could invest "in such corporate stock or bonds" as the managers "may deem safe and secure," for which has been substituted under the new act the requirement of 4 per cent. dividends for five years preceding in the case of the railway note, and, in the case of the railway bond, the earning of not less than twice the interest charge on the bond after operation, maintenance, taxes and guaranteed interest and dividends have been paid. Rhode Island has thus leaped from ultra looseness to rigid conservatism—probably the sequel of her harsh experiences of a panic twelvemonth. Massachusetts, a state rather severe heretofore in such matters and pretty severe still, has, on other other hand, revised the savings bank investment law in the direction of liberality and expansion. One feature singular in its outworking she retains by which new bonds become illegal for investment if outstanding debt of a railway exceeds capital stock. The Massachusetts theory is obvious enough. The capital stock—assumed always to have been paid in—is classed as a protective equity over the bond. But the new bond may be the highest type of railway security. It may be a bond refunding a senior mortgage. It may be a gilt edged bond on a subsidiary line from which all the stock has been retired. It may be a senior bond in actual valuation far and away ahead of earlier issues yet illegal for savings banks of the state while the inferior but earlier bond—or note—is legal. In fact, $5,000,000 of one-year notes of the New Haven railway company have just been declared legal for the Massachusetts banks under a special exemption of the state law. Yet a Massachusetts savings bank cannot buy a new first mortgage bond on the New Haven's main stem, upon which, at present, there are no mortgage bonds outstanding.

This Massachusetts case shows the absurdity to which, now and then, a general investment statute relating to savings

banks may lead and points at the higher value of the "specific mention statute" which names the conservative and dividend paying railway lines whose securities—exclusive of stock—are open to the banks. But the "specific" idea also strikes its rocks. Its worst evil, perhaps, is its direct tendency to lobby the specified security upon the valid list. An actual and illustrative case can be cited. Some four years ago a new railway line of considerable length and fair promise was opened in the Central West. Financial interests seeking a market for its bonds—on commission—after considerable opposition succeeded in working the bonds on to the savings bank "specific" list of a highly capitalized eastern state. The bonds ere long defaulted and are in default still though likely in the end to make good. But under the general law of the state in question they would have been excluded and the case stands as a bad instance and worse precedent.

About two-thirds of the deposits of the regular savings banks of the country are in New England and New York state, and in that eastern region the tendencies of the statutes bearing upon investment in railways is of prime importance. One distinct tendency is shown by the fact that within the last three years four New England states have practically revised the investment law to meet changed and changing railway conditions. The drift of the statutes may be briefly expressed as follows: (1) Favor for the securities of the railways within the state or chartered by it and extending within the state. (2) Restriction to mortgage bonds—usually to the senior mortgage—but with allowance for refunding and "consolidated" bonds. (3) A minimum limitation of the ratio of outstanding stock to outstanding debt, usually not less than one-third. (4) A general restriction to roads that have paid dividends for a continuous series of years previous to the date of the savings banks railway investment. (5) A strong tendency to subdivide the roads and their securities into investment classes. (6) Extension of savings banks investment to street railway bonds with favor for those within the state in some cases subject to the approval of a state officer, and (7) a specific list named almost always of strong dividend paying roads and large systems. In their main features most of these provisions are old but nearly all of them have been within a very few years amended. Very noteworthy is the tendency to favor the domestic roads. Saying nothing of the influence of such lines on investment legislation such favor is based in human nature and has at least the vantage that the local railway credit and security can be more easily watched.

In seeking the ideal savings bank investment law for railway securities and a statute which will at the same time protect the depositor and be just to the railway companies the great obstacle is encountered of wide variants in the security which cannot be met by general law. The debenture of one company may be better than the first mortgage bond of another. In a panic year a railway corporation whose bonds are all gilt-edged or silver-edged may wisely drop a dividend or two, yet by that fact exclude itself for some years from the "continuous dividend" requirement that opens its bonds to the banks. It may thus be tempted to maintain its dividend unwisely so as to retain the savings bank investment privilege. A savings bank law for the railways should be rigid enough to supply the fundamental safeguards yet flexible enough to meet exceptions. Such flexibility could theoretically rest on the individual judgment of a state officer or body of officers. But there one finds that same danger of intrusion of politics "pull" and incompetency which has sapped the functions of so many railway commissions. The solution of the problem must be left to time and experience. Meantime there is in the foreground of the question the cheering facts that the splendid record of the savings banks attests the investing judgment of their fiscal managers; that under existing laws railway investment has been large, has increased and is still increasing; and that, spite of some anomalies, the drift of new statute-making is toward the investment conservatism that benefits alike the railway and the bank which "digests" the railway security. The effect of railway consolidation in strengthening subsidiary securities and opening them more and more to savings bank purchase is another feature to be marked and emphasized.

Finally there is what may be called a territorial suggestion not without its deep meanings in the future. New York and New England have pretty restrictive savings bank investment laws. They have about two-thirds of the regular savings bank deposits of the country and absorb their hundreds of millions of railway holdings. The rest of the states, some of them very rich and highly capitalized, have, with few exceptions, loose investment laws—or no laws at all—and only a third of the savings banks deposits. As financial conservatism reaches southward and westward, albeit slowly, are we not to see the savings bank system of the East duplicated there and corresponding expansion of the area and volume of the absorbed railway security?

PROPOSED ELECTRIFICATION OF PART OF THE GRAND TRUNK PACIFIC.

The resolutions that were introduced in the legislature of New Brunswick the week before last and carried unanimously, regarding the electrification of that portion of the Grand Trunk Pacific Railway lying between the St. Lawrence river and Moncton, are interesting as indicative of the growing confidence in the possibility of electric traction. As was stated in the preamble to the resolutions, the immediate reason for discussing the subject was a desire to protect from fire the forest areas through which the road passes. The conservation and preservation of the forests of Canada have become live topics in Canadian politics, and both parties are united in working toward that end. The resolutions suggest a conference in which the province of Quebec is invited to join, and, from the influence that is back of the movement, it seems fair to expect that such a conference will be held, and that the subject of electrification will be duly and carefully considered.

The proposal to electrify the Grand Trunk Pacific between the St. Lawrence river and Moncton is the most ambitious scheme that has yet been proposed, as far as mileage is concerned. The distance between the two points named is about 459 miles, and much of the line passes through dense forests of spruce and fir in lower Quebec and northern New Brunswick, as well as through a rich farming country along the upper St. John. Starting from the St. Lawrence, the location of the road lies through a rather heavy, rolling country with a ruling grade eastbound of 0.4 per cent. and one westbound of 0.6 per cent. At one point in each direction there are stretches of 7 and 10 miles, respectively, where the grade rises to 1.10 per cent. Under any system of operation, either electric or steam, economical work will demand the use of a pusher at these points. In steam operation this will require at least two locomotives with their complete equipment of crews, besides the establishment and maintenance of coal and water stations that would not otherwise be needed, or else a large extra mileage to procure these supplies. With electric haulage two locomotives will also be required, to be sure, but their operation on the multiple unit control will do away with the extra crews on the pusher grades as well as the coal and water stations.

It is not probable that even the most enthusiastic of legislative electricians would have considered such a recommendation had not a water power sufficient to develop a current for the whole road been available on the line. This water power is located at Grand Falls on the St. John river, 269 miles from the St. Lawrence and 160 miles from Moncton, not far from the central point. At this place the river has a natural fall of about 120 ft. and a flow that has been estimated to be sufficient to furnish from 100,000 to 125,000 h.p. continu-

ously, by the utilization of comparatively inexpensive means of storage and conservation in the lakes tributary to the St. John. These lakes have a large area, and this, with the comparatively short period of low water, it is claimed, will maintain the flow at the figure named. As the requirements of the road have been estimated at 40,000 h.p., it looks as if an ample supply would be available.

The movement to utilize this water power for the railway is backed up by another impulse in addition to that of forest protection; the further conservation of the somewhat scanty coal supply of the country. This section is dependent upon the Dominion coal of Nova Scotia or upon that imported from the United States. The area of the Nova Scotia coal fields is limited, and beyond this there is nothing available. The coal is of good quality and ranks with the Pittsburgh and eastern Ohio output, and it is, therefore, of the first importance that it should not be wasted.

Thus there are two reasons why the whole country is interested in the decision. It is looked upon as a national undertaking, and will certainly receive careful attention. The work of the electric locomotives of the New York Central, New York, New Haven & Hartford, Baltimore & Ohio, the Grand Trunk at the St. Clair tunnel, the Valtellina Railway, the Simplon tunnel and elsewhere, have shown conclusively that so far as the mechanical and electrical elements are concerned, heavy traffic can be handled by electric locomotives. The system used must undoubtedly be a high tension alternating current for the distances involved.

The real crux of the whole matter lies not in the mechanical but in the commercial possibility of the scheme. The outlay for the railway company will consist mainly of transmission lines and equipment, for it is proposed to purchase the power outright, at a fixed price, from a development company. It remains to be seen whether, with 64 per cent. of the number of steam locomotives required when commuted to electrical machines, plus the transmission lines, minus the saving effected in power, the cost will be more or less than that of steam operation. We guess it will be more, but under the conditions presented it looks as though the proposed installation would be well worth a most thorough and careful investigation.

In presenting the case to the Canadian public, the reasonable claim is made that electrification would materially expedite freight traffic, because it would eliminate stops for water and reduce engine charges, while during the periods of intense cold that characterize the New Brunswick and Quebec winters the efficiency of the steam locomotive is much reduced, but the efficiency of the electric locomotive would be increased.

The plan is a large one; larger than that suggested for immediate and initial electrification of any other proposed for this continent, and ranks with the reported contemplation of Sweden to electrify all the railways in the southern part of the country; with the proposals before the Swiss Federation, and with those applying to northern Italy. In each of these instances there is an ample water power available for the generation of the current, and in each the promotors turn squarely away from the Aspinall rule, and propose electrification to save money, instead of to make money.

PENNSYLVANIA RAILROAD.

So great and so diversified is the tonnage carried by the Pennsylvania Railroad, the operating company for the lines east of Pittsburgh, that local causes affecting only certain classes of business would hardly be reflected at all in the grand total of freight carried by the company. For instance, there might be a general shortage, even of crops, without a reduction in the total tonnage of the Pennsylvania by more than a very small per cent. On the other hand, as we pointed out in an article in last week's issue of the *Railroad Age Gazette*, the business of such an enormous concern as the Pennsylvania shows with the greatest accuracy the effect of the unprosperous year of 1908 on railway earnings and business. All lines directly operated carried a total tonnage of revenue freight of 182,000,000 tons in 1908, or 41,700,000 tons less than in 1907.

The Pennsylvania is the great Pittsburgh road, 65.5 per cent. of its tonnage last year was products of mines, and although the falling off in tonnage of such classes of freight may not for a short period of time be a true index of business conditions, yet over a period as long as a year they probably tell a truthful story. The tonnage of coke especially varies directly and quite closely with the activity in manufacturing centers. In 1908, 12,000,000 tons of coke were carried by the Pennsylvania as against 19,500,000 tons in 1907, and 75,600,000 tons of bituminous coal, the tonnage of which quite directly varies with business prosperity, was carried in 1908 as against 82,000,000 tons in 1907.

The Pennsylvania Railroad.

Under the head of manufactures the same heavy decreases in tonnage are noticed, and it is only in the tonnage of food stuffs, such as the products of agriculture and products of animals, that the decreases are comparatively small or in which there are increases.

The loss in tonnage and the consequent loss in revenue hit the Pennsylvania exceptionally hard, because there were no alleviating circumstances. For instance, the road was well managed and economically operated in 1907 so that it was not possible to make up in increased efficiency what was lost from smaller business; nor were there any recent improvements from which the road could benefit in 1908 enough to offset decreased gross earnings. It therefore had to cut down operat-

ing expenses where it could, chiefly in maintenance of way and maintenance of equipment, and for the rest, pay its stockholders a smaller dividend, 6 per cent. in 1908 as against 7 per cent. in 1907, and make smaller outlays for improvements and additions.

Gross earnings were $136,300,000 last year as against $164,-800,000 in the previous year, a decrease of $28,500,000, or 17 per cent. Most of this reduction naturally was in loss from freight revenue. In 1908 this revenue from freight amounted to $98,000,000, which is 21 per cent. less than the freight revenue in 1907.

Expenses as a whole were $97,400,000 as against $119,600,000 in 1907. Of the $22,000,000 saved in operating expenses, $10,-300,000 was saved in expenses of transportation, which expenses amounted to $51,500,000 last year, and $11,700,000 was saved in the cost of maintenance, maintenance of way and structures costing $15,200,000 last year and maintenance of equipment, $25.100,000 as against $20,000,000 and $32,000,000. The cost of maintenance of way and structures per mile of first, second, third, etc., track (switch tracks and sidings being counted half), was $1,980 in 1908 and $2,620 in 1907.

In speaking of the loss in revenue in 1908 President McCrea says: "This necessitated a drastic reduction in expenses in all departments and compelled the discharge of many thousands of (your) employees and a material decrease in the hours of labor of many of those retained in the service."

The Pennsylvania made only such extraordinary expenditures for additions and betterments as were necessary to complete work under way. The aggregate expenditures for construction, equipment and real estate on the main line between New York and Pittsburgh, including $7,500,000 on account of the principal of car trusts, was $15,300.000, of which $5,600,000 was charged to capital account, $7,300,000 to income, $300,000 to profit and loss and $2,100,000 to extraordinary expenditure fund. This, of course, does not include the expenditures on the tunnels and terminal station at New York, for which accounts are carried separately. The work on the tunnel extension was carried on throughout the year, and it is expected that the station and tunnels will be completed in the summer of 1910. The steel structure of the station is almost finished and over half of the exterior granite is in place, while the crosstown tunnels between the station and the East river and those under the East river, which as soon as the Pennsylvania gets into New York will connect with the Long Island, are ready for the laying of track.

The financing of this great work of the Pennsylvania has been done partly by charging cost of construction directly to capital account of the Pennsylvania Railroad, partly by expenditure from income of both the Pennsylvania Railroad and the Pennsylvania Company, and also by the contribution of $10,000,000 by the Pennsylvania Company, which sum was charged to its profit and loss account. The total amount carried on the balance sheet of the Pennsylvania Railroad Company on account of the New York tunnel system is $46.500,000. Of this amount, $15,000,000 is represented by capital stock of the Pennsylvania Tunnel & Terminal Railroad Co., at par, and the balance represents advances made on account of cost of construction up to December 31, 1908. This is after the deduction of the sums charged against income and profit and loss accounts of the Pennsylvania Railroad and the Pennsylvania Company. Possibly it is well here to recall the fact that the Pennsylvania Railroad owns almost all of the stock of the Pennsylvania Company and operates directly the lines east of Pittsburgh. The Pennsylvania Company owns a majority of the stock of the lines west of Pittsburgh and operates directly what is known as the Northwest system of the Pennsylvania Lines West.

A striking illustration of the strength of the Pennsylvania Railroad's credit was shown in 1908 when the company had decided to issue $40.000 000 40-year 4 per cent. consolidated mortgage bonds. It was found that the market for securities in this country was in such bad shape that to successfully float the issue it was necessary to market half of it abroad. An extremely strong combination of bankers underwrote the issue, and partly on account of the strength of the banking interests doing the financing and partly on account of the credit of the Pennsylvania itself, the sale of bonds was a notable success and marked the beginning of better times in the railway securities market.

Through the sale of these securities and through the general policy of the management, the cash position of the Pennsylvania is very strong. On December 31, 1908, current assets amounted to $83,900,000, and of these current assets $56.000,-000 was in cash. This is a gain in cash over the previous year of $18,600,000. At the same time current liabilities amounted to $28,700,000, of which $14,200,000 was payrolls and vouchers, a decrease of $6,000,000 from 1907. In 1910 there are $60,000,000 short term notes maturing in March and $20,-000,000 general mortgage bonds maturing in July, so that although the cash on hand would appear amply adequate for the needs of the company during the present year, the stockholders have authorized $80,000,000 bonds, which will be issued by the directors when necessary.

Interest from the investments of the Pennsylvania Railroad amounted to $11,300,000 as against $10,400,000 in 1907. The cost of securities held by the company was $232,000,000, so that the revenues received from them in 1908 was about 4.86 per cent. of their cost. The revenue in 1907 was $10,440,000, the increase in 1908 coming from dividends on additional New York, Philadelphia & Norfolk stock acquired during the year and interest on the securities from the Pennsylvania Company which were contributed toward the cost of construction of the New York tunnel extension.

Announcement has just been made that the Pennsylvania has repurchased between $15,000,000 and $16,000,000 stock of the Norfolk & Western, which it sold in September, 1906. At that time public sentiment was very much opposed to any apparent monopoly, and it was in deference to the expressed public opinion, that the Pennsylvania was attempting to control the shipments of bituminous coal to Tidewater, that it and its subsidiaries sold large blocks of stock in the Norfolk & Western. In December, 1908, the Pennsylvania Railroad itself owned $6,246,000 common and $3,246,000 adjustment preferred of the Norfolk & Western. It is understood that the present purchase of stock brings the holdings of the Pennsylvania and its subsidiaries up to about 37 per cent. of the outstanding stock of the Norfolk & Western. This announcement of the acquisition of a possible control coming so soon after the opening of the Virginian Railway, H. H. Rogers' new soft coal road, is of special interest not only to the stockholders of the Norfolk & Western but to Pennsylvania stockholders as well, since, as has already been pointed out, the Pennsylvania is a very large carrier of bituminous coal, and by more closely consolidating the Norfolk & Western business with its own it should be in a better position to meet the possibly severe competition which the Virginian Railway may undertake. It is also worth remembering that the Cheseapeake & Ohio has been acquired by strong financial interest not connected with the Pennsylvania.

The average train load on the four grand divisions of the Pennsylvania was 602 tons in 1908, an increase of 28 tons over 1907. This is exceptional in a year of smaller offering of freight, and very few roads have shown even as large train loads in 1908 as in the previous year. It is of course in freight density, that is, the number of tons carried one mile per mile of road, that the Pennsylvania makes it most astonishing showing when compared with almost any other road in this country. Even last year the freight density was 4,270,000 tons and in 1907 it was 5,502,000 tons. This compares with a freight density in 1908 of 2,024,000 tons on the New York Central Lines and of 2.370.000 tons on the New York Central & Hudson River. The earnings on the Pennsylvania per ton

per mile last year were 0.569 cents and on the New York Central Lines, 0.598. In 1907 the earnings on the Pennsylvania per ton per mile were 0.577 cents. Even on such a road as the Bessemer & Lake Erie, where huge train loads of coal and ore are dragged along over an almost level country, the freight density was 5,538,000 tons in 1907, while on such a road as the Northern Pacific the freight density was but 77,000 tons in 1907.

The total operating revenue from July 1 to February 28 of the present year amounted to but $91,000,000 as against $106,000,000, but the earnings for February were $10,000,000 as against $9,800,000 in 1908, notwithstanding the fact that February had one day less tnis year than in the previous year. Moreover, from July 1 to February 28 the expenses for transportation amounted to $32,400,000 as against $40,100,000 in 1908. This showing should indicate that the Pennsylvania will earn considerably more net in the present year than last year, even if business does not improve any more rapidly than has been the case in the last six or seven months.

The following table shows the results of operation for the years 1908 and 1907:

	1908.	1907.
Average miles operated	3,862	3,858
Freight revenue	$97,989,330	$123,826,165
Passenger revenue	30,312,883	32,623,889
Total operating revenue	136,296,871	164,812,826
Maint. way and structures.	15,177,314	20,009,756
Maint. of equipment	25,113,455	31,977,703
Traffic	1,811,574	2,034,705
Transportation	51,463,479	61,835,024
Total operating expenses.....	97,412,016	119,607,348
Taxes	3,988,977	3,979,164
*Net earnings	32,189,193	36,349,248
Gross income	46,577,895	50,143,354
Net income	28,207,661	33,575,056
Additional and betterments...	†4,538,981	‡3,260,651
Dividends	18,875,681	21,908,436

*After the deduction of rentals paid roads operated on basis of net earnings.

†Includes $1,000,000 applied toward construction of New York tunnel extension.

‡Does not include $2,500,000 transferred to extraordinary expenditure fund.

GENERAL ELECTRIC COMPANY.

The seventeenth annual report of the General Electric Co. shows receipts of $47,168,469 in 1908 as compared with $72,484,988 in 1907. The profits for the fiscal year ended January 31, 1909, (the 1908 year above referred to) amounted to $4,802,253. This is after charging off for depreciation of plants, $1,524,295. This compares with profits of $6,586,653 for the year ended January 31, 1908. The business depression prevented any large new installations by companies which buy supplies from the General Electric, and the business received by the General Electric was largely from renewals to existing plants. The orders received by the company during the year were 70 per cent. only of those received for each of the two previous years, and the shipments to customers were only 63 per cent. of the shipments for 1907; so that in January, 1909, the capacity of the General Electric factories was far in excess of the then existing demands.

The unfilled orders as of January 31, 1909, were about $13,000,000 as compared with $14,500,000 at the close of the previous year. While the total number of separate orders and contracts received increased by 11,520, bringing the total up to 248,384 for the 1908 year, the average value per order was 30 per cent. less. The terms of payment, however, for orders compare favorably with recent years: 16.6 per cent. of orders called for payment on shipment and 68 per cent. for payment after 30 days in 1908, and in 1907, 17.8 per cent. called for payment on shipment and 68.5 per cent. for payment after 30 days.

Among the important contracts received during the year may be mentioned the following: Complete electrical equipment for two power stations and electric transmission plant furnishing power and light for the construction of dams at Gatun and Miraflores on the isthmus of Panama, the order also including 12 electric locomotives and numerous motors and electrical equipment; additional car equipment for the Hudson Tunnels Co., New York; rotary convertible apparatus to be used in supplying current for Southern Pacific 1,200 volt d.c. car equipments at Oakland, Cal., and five 2,500 k.w. generators, with switchboard and complete transformer equipment stepping up to transmission potential of 66,000 volts.

The anuual report of the General Electric Co. is a model for completeness and frankness. The policy of the company has been conservative, and the financial operations undertaken by the management have been shown and quite fully explained in the reports from year to year. The company has a capital stock of $65,178,800, and has outstanding $14,963,000 debentures. In 1908, after charging off liberal sums for depreciation, for the purchase of patents and for losses and after paying fixed charges, the company paid dividends of $5,214,026, which, with the most commendable frankness, it states left a deficit for the year of $411,773, which was charged to surplus account. As the surplus account amounted to $16,513,836 on January 31, 1908, the deficit of last year reduced it only to a very slight extent, leaving a total surplus January 31, 1909, of $16,102,063.

In 1898 patents and franchises were carried at $8,000,000, and since then, by charging off to profit and loss, depreciation and sums spent for new patents and for patent litigation, the company has reduced its book value of patents, franchises and good will to $1.00. Patent expenses have been heavy in the past few years, but the company wisely declines to include them among its assets. For instance, in 1908 there was spent for sundry patents, licenses under patents and in patent litigation, $929,109, all of which was at once charged off.

On account of easy money, probably, the company found much less difficulty last year in collecting accounts from its customers than in the previous year, and from this cause, and from the fact that its gross business was so much smaller last year, it accumulated a large stock of cash, amounting to $22,233,671 on January 31, 1909, compared with $12,250,721 on the same date in 1908. Of course the working capital of such a concern as the General Electric is necessarily very large, but $22,000,000 is obviously ample for all requirements. The company does not invest its cash as does the American Sugar Refining Co., but keeps it on deposit.

The company has no floating debt, and accounts payable of but $2,836,835. Its factory plants are all free from mortgage or other lien, and the book value of them in 1908 was $13,900,000, a valuation of but $1.98 per square foot of floor space, including land, buildings, power houses, machinery, tools and other equipment; the floor space being 7,000,000 sq. ft. in 1908.

The company carries as a separate item on its balance sheet $3,174,581 as copper mining investment. The General Electric is one of the three or four largest buyers of copper in the United States, and has benefited to a certain extent both during 1908 and 1907 from the cheap price of copper. Should, however, the price of copper materially increase it will profit by its independent supply.

The following table shows the company's sales and orders for the last six years:

Years ending January 31:	Sales billed.	Orders received.
1904..................	$41,699,617	$39,060,038
1905..................	39,231,328	35,094,807
1906..................	43,146,902	50,044,272
1907..................	60,071,883	60,483,659
1908..................	70,977,168	59,301,040
1909..................	44,540,676	42,186,917

"Orders received" include only apparatus and materials manufactured by the General Electric Co. and do not include labor of installation, freight and transportation, or materials of outside manufacture. All these items are included in "Sales billed."

NEW PUBLICATIONS.

The Fare Question.—Published by the American Street & Interurban Railway Association, 29 West 39th street, New York, 1909. 150 pages; 6 in. x 9 in.; paper.

It is well-known to readers of the *Railroad Age Gazette* that

a great many street railways have been increasing their fares in the last three years because they had started out on a basis quite unremunerative, or else had so increased their length of haul and so extended their transfer privilege that the passenger was getting more for his nickel than the company could afford to give him. The pamphlet at hand tells in a clear and very interesting way the difficulties that some of the roads have encountered, especially in Massachusetts, and discusses the means of increasing the fares. The question is a live one, and we are inclined to think that the matter contained in this pamphlet would interest the traffic departments of a good many steam railways. No price is quoted for the pamphlet; we presume it can be obtained in limited quantities upon application.

Moody's Analyses of Railroad Investments. First Annual Number, 1909. By John Moody. Published by Analyses Publishing Co., 35 Nassau street, New York. 551 pages; 8 in. x 11 in.; cloth. Price, $12 net; expressage, 50 cents.

Mr. Moody, in the extremely important volume at hand, investigates railway values. He points out that the book is in no sense a manual, nor is it intended to supplant manuals, but it explains and applies in clear and simple form the proper methods of the analysis, from the standpoint of the banker and investor, of the various kinds of railway securities issued by railway corporations, from the highest grade bonds to the most speculative and cheapest stocks. The study includes most of the important railways of the United States, and complete analyses worked out on thoroughly sound and scientific lines are presented in uniform style for all.

The book contains three sections. The first one is an extended discussion of primary principles and their practical application in the analysis of railway reports, with copious examples and illustrations designed to clarify, for the ordinary investor, the complexity of the average railway report and to enable him to make quick and intelligent comparison. The second portion of the book presents, in simple form, but in complete detail, the Interstate Commerce Commission's system of accounting, which has been adopted as the reporting method for all American railways. The third section is devoted to analyses, based on a showing of averages, as reported by the railways for a period of ten years. In this section the physical factors, such as miles of line, equipment, traffic, density trainloads, passenger and freight rate, etc., are shown through the entire decade, indicating the trend of changes for the period, and also the position of the property in any year during the decade, as well as the average result for the ten years. This average is compared with the averages of other railways similarly situated, and comments are made on the showing.

The income factors are covered in a second statement, and these are all reduced to the average mileage basis of the system for each year and show, in addition to gross revenue and operating expenses, total net income, fixed charges, surplus, disposition of surplus and the margin of safety over fixed charges. A third statement covers capitalization, reduced in the same way to the average operating mileage basis of the system. Where rentals exist, they have been capitalized at 5 per cent., and reduced to a mileage basis with other capital items, and approximate net capital per mile is thus shown for each year, and a percentage of net income is worked out on this net capital, thus showing the trend of earnings in relation to capital invested. In the same table a dividend record is presented, which shows the margin of safety over the dividend requirements for each year and for the decade.

Each of the bond issues of each railway is given a rating based on its margin of safety. This margin of safety is calculated from the average earnings which protect it, and the work of calculation has been done in a careful and scholarly way.

This general description, much of which is taken from the author's own prospectus, is rather inadequate. It may be said in brief that the book tries to give for each railway and for each bond the statement which would be asked from the statistician of a good private banking house by the partners, when the railway or the bond was under consideration. With the exception of certain kinds of transitory and confidential information which the statistician would probably possess, the record in this book is as complete as need be, and the book is far better adapted for the use of the intelligent private investor than is any railway manual that has come to our attention. It is a mistake to suppose that the author's elaborate studies can be used without some thought, however. It took hard work to prepare them, and it will require reasonably hard work to make really efficient use of them. Like all other elaborate workings out of statistical systems on arbitrary bases, it is possible for this book to mislead the investor who tries to apply its conclusions without using independent thought. For the investor who does use independent thought, however, and who is accustomed to make more or less full and intelligent analyses of his own, this book will be of enormous assistance, and if the author carries out his intention of revising it annually, it is well worthy of a permanent place in every financial library.

Railroad Construction.—By Walter Loring Webb. New York: John Wiley & Sons. Fourth edition; 777 pages; 4 in. by 6 in.; 217 illustrations; flexible leather. Price, $5.00.

This book is a compound of a treatise on railway construction and a pocketbook on the same subject. Its form is that of the usual engineer's handbook, so that it can readily be carried in the pocket; it is printed on thin paper and it is provided with a copious index. At the same time, the subject matter partakes more of the character of a treatise on the subject, and a very interesting one at that. It is divided into chapters, and these treat of surveys, alinement, earthwork, trestles, tunnels, culverts, ballast, tires, rails and fastenings, switches, buildings, yards, signals, rolling stock, train resistance and cost. The second part deals with the economics of railway location and of operation as dependent thereon. Under each of these headings the subject in hand is briefly but comprehensively treated. For example, the chapter on earthwork opens with outlines of the usual cross-sections of cuts and fills and the methods to be employed in the calculation of quantities. In this there is no attempt to teach the mathematics of the subject, but the advisable methods to be pursued are outlined and it is taken for granted that the reader will have had the training to apply that method without detailed instruction. Of course the slopes must be left to the judgment of the engineer, but there are innumerable hints as to the method to be pursued in the work, such as the case of a compound section of rock and earth, where it is suggested that it will be well to remove the center portion of the section first until enough of the rock surface has been exposed so that the cut in it can be given the proper width and side slopes. This is cited merely to show the minuteness with which the text enters into some of the details. The same comprehensiveness in outline obtains throughout the book, and though it is, of course, impossible to produce a treatise on any one of the subjects that are handled, enough is presented in each case to indicate the lines along which a more thorough investigation should be conducted.

In the part of the book devoted to railway economics, the author starts with the promotion of railway projects, and discusses the various points to be considered, such as terminal facilities and traffic, and then takes up the matter of operating expenses as involved in maintenance of way and equipment and the cost of conducting transportation. Then come the effects of distance on traffic, expenses and receipts; the desirability of eliminating grades and curves and the amount of expense that will be justified in the relocation of old lines.

The book thus furnishes an outline guide for the general consideration of railway work, though it is hardly of a character that an engineer would care to carry as a pocket book, except for a few isolated formulas that could be easily copied

and for the mathematical tables of trigonometrical values and of quantities with which it ends.

The Engineering Index Annual, 1908.—Published by *The Engineering Magazine*, 140 Nassau street, New York. 438 pages; 6¼ in. x 9¼ in.; cloth. Price, $2.

This is the seventh consecutive volume of engineering indexes which *The Engineering Magazine* has published, and the entire series covers the technical press quite fully from 1884 to 1908. We have always had considerable admiration for the careful and scholarly way in which this work has been done, and we believe that this volume is an important addition to libraries which desire to be able to locate contributions in the current engineering press. Much matter of the highest value appears in this way from week to week, and much of it would be irretrievably lost for anything like ready reference, even a short time after its publication, were it not for this careful indexing which *The Engineering Magazine* does. As most of our readers know, the plan of this index is a generous one, and the brief abstract following each title supplies what is really an index on the card catalogue order.

The Earning Power of Railroads. Compiled and edited by Floyd W. Mundy, of James H. Oliphant & Co. Published by James H. Oliphant & Co., 20 Broad street, New York. 428 pages; 4¾ in. x 7¼ in.; cloth.

This extremely handy reference book has been appearing annually now for a number of years and is well-known to most railway investors. The plan of the book is to give the salient statistical records which affect the earning power and investment value of railways, comparisons being made for a series of years and on a system of unit basis which makes it tolerably easy to set one road off alongside another. Quite full notes are also given about the affairs of each road, and these notes greatly extend the information contained in the tables.

The Merged Roads of Mexico. A series of papers on the Mexican railway system, written by Charles F. Speare and reprinted from the *Evening Mail*, New York, in pamphlet form. Paper; 26 pages; 6 in. x 9 in. Price, 25 cents.

Mr. Speare's pamphlet gives an excellent idea of the Mexican railway situation; a situation which is none too clearly understood in this country. It is well worth reading.

Letters to the Editor.

REGULAR BILLING ACCOMPANYING OR IN ADVANCE OF TRAFFIC.

Birmingham, Ala., April 13, 1909.

To the Editor of the Railroad Age Gazette:

The article by W. H. Newman under above caption, published in your issue of January 29, again draws attention to a question of great importance, not only to the transportation department, but to the traffic department also, and even to the accounting department. Formerly it was customary to card-bill cars under any and all conditions, and mail revenue waybills whenever convenient to do so. This led to abuses and conditions, resulting in serious delays to traffic, congestion in terminal yards, and loss of *per diem*.

To correct these conditions it was the consensus of opinion that regular billing must "accompany or precede" traffic, and a reform having this for its object has swept over the country. As in all reforms, the pendulum has swung too far, for in our anxiety to have regular billing *accompany* traffic, we have overlooked the greater importance of having regular billing *precede* traffic.

On many roads there is rigidly enforced the arbitrary rule that regular billing must accompany traffic. When regular billing must accompany traffic, naturally it may not precede it. This rule is as serious a blow to prompt movement of cars at junction points, to prompt handling of less than carload freight at unloading points, to efficient and intelligent service to consignees in giving advice of expected shipments, especially perishable, as was the old discarded system of allowing revenue waybills to follow traffic. It should not be permitted that revenue billing may either accompany or precede traffic, but it should be required that revenue billing must precede traffic, if possible, but if not should accompany it.

I am firmly of the opinion that the following rules should govern the forwarding agent in determining whether waybills should precede or accompany the car:

1. No cars must be forwarded unless necessary data are in hand from which to furnish revenue billing.

2. If waybill can be mailed on passenger train which will reach destination (or junction on which car is billed) before arrival of car by freight train, then waybill must be mailed, and car card-billed, and card bill must bear notation of the number and date of the train on which revenue waybill has been or will be mailed.

3. If waybill can not be mailed on passenger train so as to reach destination or junction before arrival of car by freight train, then revenue waybill must accompany the car; but every effort must be made to have revenue waybills precede the cars.

Rule one would cover the receipt of cars from connecting lines and the checking of rates, etc.

If revenue waybills precede the cars, the cars on arrival will pass through junction yards into trains of connecting lines and out on their journey with the same precision and promptness as if no junction had been reached.

Take a case where a train arrives, the waybills covering having preceded by mail: Waybills have been revised, routed, expensed, and abstracted to connecting lines; and the yard has a "mark up" so that train is broken up into "cuts" for various connections, house tracks, etc., and is handled without further instructions or delay. Merchandise cars are placed at depot and unloading clerk has waybills in hand by the time cars are placed. The cashier's office has already made the freight bills for the same car, and freight can be delivered to consignees or transfer companies as fast as it is trucked from cars to warehouse.

Take another train with waybills accompanying the cars: The train arrives but the yard clerk is not sufficiently familiar with rates, routes and traffic arrangements to route more than fifty per cent. of the cars in train. The other fifty per cent. go to the yard cemetery, commonly known as the "hold" track, where they must stay at least until the revising clerk can receive waybills from the yard, check rates and routes and then instruct the yard as to delivery. The chances are that the "hold" track will claim such cars for twenty-four hours, more or less.

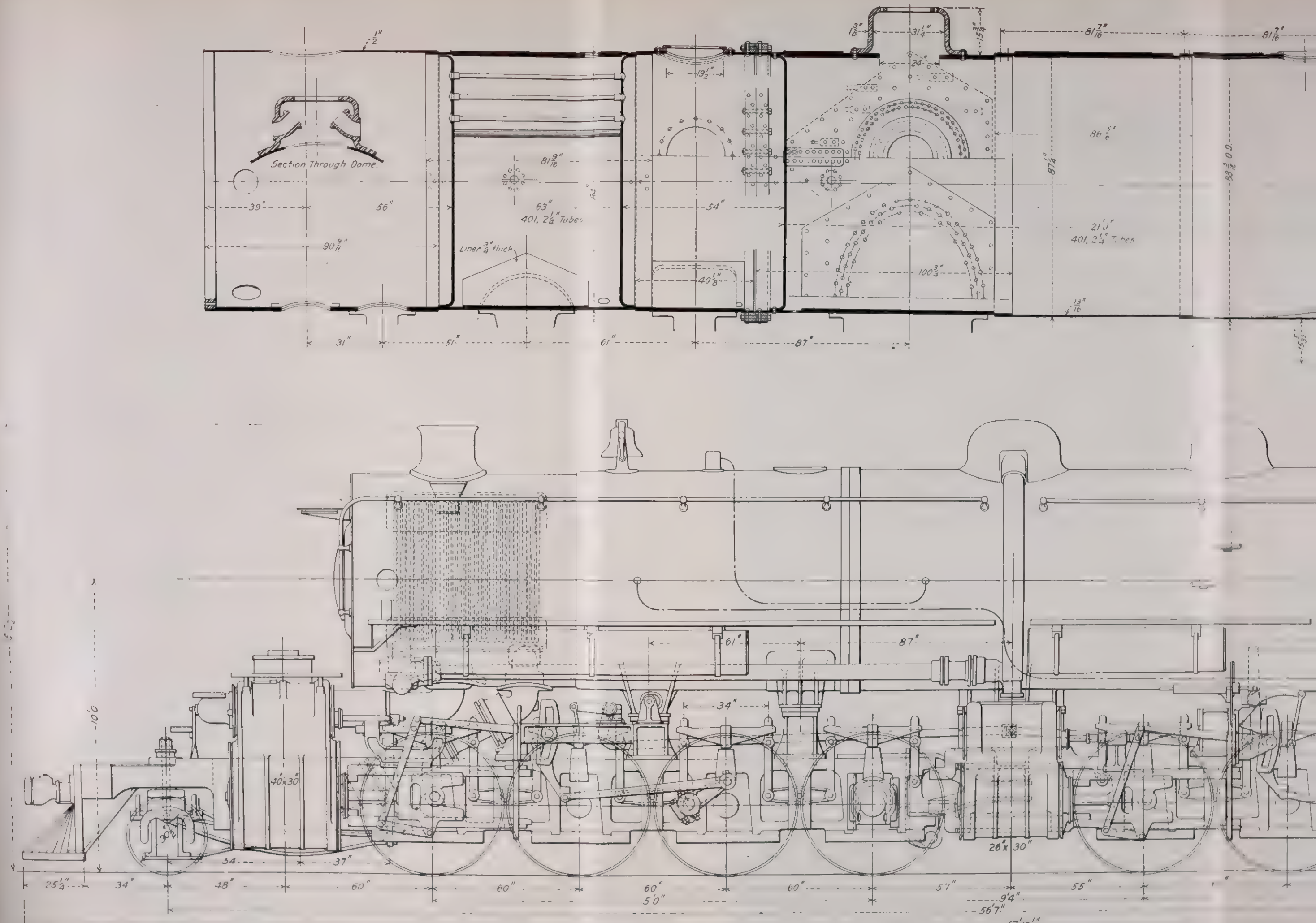
Even such cars as are delivered on arrival to connecting lines meet with delay and extra handling, as the freight office has not had time to furnish waybills to cover, and the receiving line does not know whether to accept such cars on faith, or reject them pending receipt of revenue waybills.

Take the time merchandise sent to the house for unloading; the time required for checking rates and making freight bills, added to the time for actual unloading, will usually prevent delivery before the following day and must, at best, delay delivery several hours.

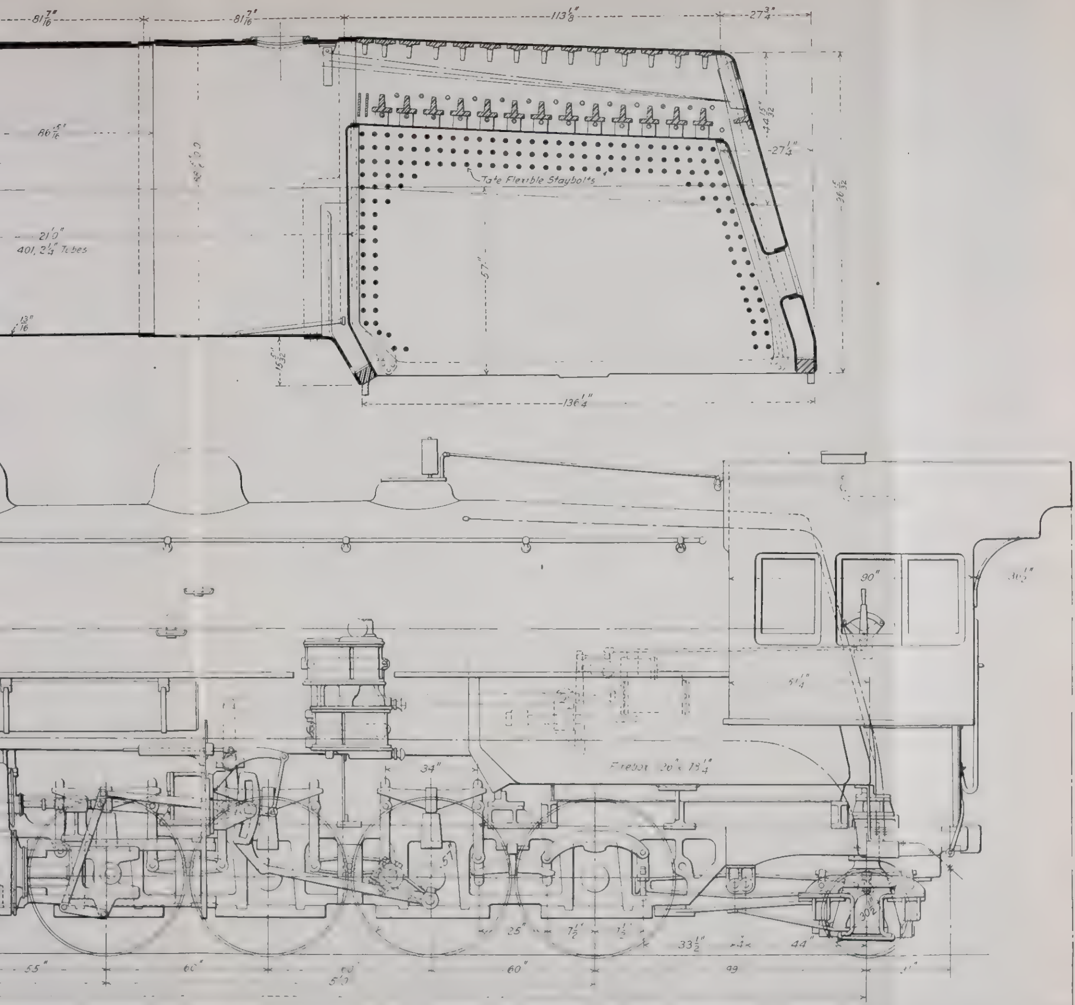
Another strong argument for the waybill to precede the car is that if the car is set out or delayed, the receiving agent can still take the waybill into account and can trace the car through his superintendent of car service, thereby having a double check against an indefinite delay.

The obvious conclusion is that waybills should precede cars whenever possible, but if impossible to precede, should accompany the traffic.

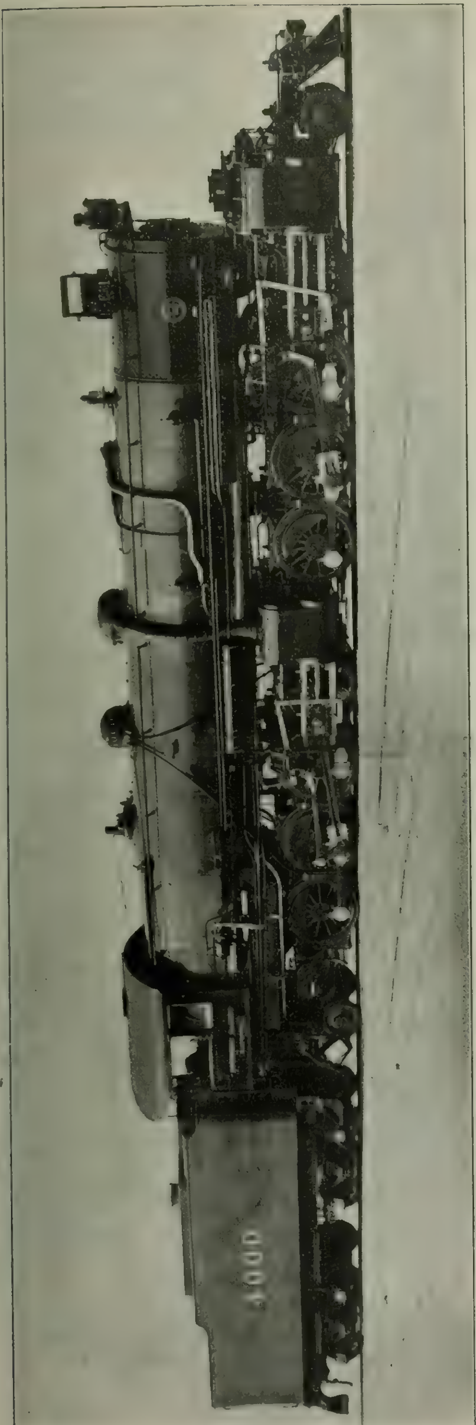
V. E. WHITAKER,
Agent Seaboard Air Line, Birmingham, Ala.



ELEVATION AND SECTION OF BOILER, 2-8-8-2 MALLET ARTICULATED COMPOUNDS, BUILT BY THE BALDWIN LOCOMOTIVE WORKS FOR THE SOUTH



DWIN LOCOMOTIVE WORKS FOR THE SOUTHERN PACIFIC RAILWAY. WEIGHT 430,000 LBS.



Mallet Articulated Compound Locomotive for the Southern Pacific. Built by the Baldwin Locomotive Works.

MALLET ARTICULATED COMPOUND LOCOMOTIVE FOR THE SOUTHERN PACIFIC.

[WITH AN INSET.]

The record for the maximum-weight locomotive has again been broken, this time by the Baldwin Locomotive Works, in two Mallet articulated compound locomotives built for the Southern Pacific Company. The engines are intended for operation on a grade of 116 ft. to the mile, and it is the expectation that they will haul 1,212 tons back of the tender. The general design follows that of the locomotives built by the same company for the Great Northern, which were illustrated in the *Railroad Gazette* Aug. 17 and Oct. 12, 1906, in that they have a two-wheel leading truck at the front and back. The weight, however, is considerably greater than that of the Great Northern engines. The latter weighed 355,000 lbs., of which 316,000 lbs. were on the driving wheels. There were three pairs of these in each truck. In the Southern Pacific locomotives there are four pair of driving wheels in each truck, and the total weight is 430,000 lbs., of which 390,000 lbs. are on the driving wheels. This total weight is, therefore, about 20,000 lbs. more than that of the Erie Mallet, which weighs 410,000 lbs.; but as the whole weight of this engine is on the driving wheels, the Southern Pacific falls about 20,000 lbs. short, with a corresponding reduction in tractive effort.

The engines are, however, modifications and are a development of the Great Northern machines. The locomotives are very long, having an engine wheel base of 56 ft. 7 in., while that of the engine and tender is 83 ft. 6 in., and the over-all dimensions are 39 ft. 10 in. A part of this length is due to the use of the trucks at the ends of main frames, and though ordinarily their use makes it possible to put in a larger boiler than would otherwise be possible, in this instance it has been necessary to make the length of the boiler very great, it being 50 ft. 4in. from the lower edge of the back head of the firebox to the front of the smokebox ring, which is far in excess of anything that has ever been built before for locomotive work. As it would be out of the question to utilize this whole distance with the ordinary firebox, tubes and smokebox, a radical innovation in design has been introduced.

The firebox is of the ordinary type with sloping back sheets and a shallow combustion chamber incline, makins its total length 126 in. The tubes are 21 ft. long over the tube sheets. This takes up 31 ft. of the length. It is at this point that the innovation appears.

Instead of making the whole length in one rigid piece it is built in two sections. The rear section terminates just in front of the front tube sheet where a heavy ring is riveted to the outside and mates with another riveted to the front section, the two joining in a V recess and projection and being held together by 42, 1¼-in. bolts.

The front section consists of a plain, cylindrical shell with a feedwater heater built into its central portion. When it is bolted in position there is a combustion chamber 54 in. long immediately in front of the fire tubes. The feedwater heater then comes, occupying 63 in., beyond which is the smokebox with a length of 95 in. The feedwater heater consists of a space enclosed by two circular tube sheets riveted in the shell and having the same number and size of tubes in it that are used in the main shell of the boiler; that is, to say 401 2¼-in. tubes, which are spaced and set to mate those back of it.

Two non-lifting Hancock inspirators are used, and these deliver into feed-water heater at about the center line of the boiler, as indicated on the engraving. The feed after circulating through the heater passes out at the top and, coming down and back around the outside of the boiler, enters it through a check on the center line of the shell, 21 in. back of the tube sheet.

The feedwater heater will be kept full of water at all times, and it will be the overflow from this that reaches the boiler. Under ordinary working conditions the temperature will be

below that corresponding to the boiler pressure, but if it should so happen by any chance that steam sould be generated and a pressure in excess of that existing in the boiler start to be developed, it would at once be equalized by escaping back into the main boiler.

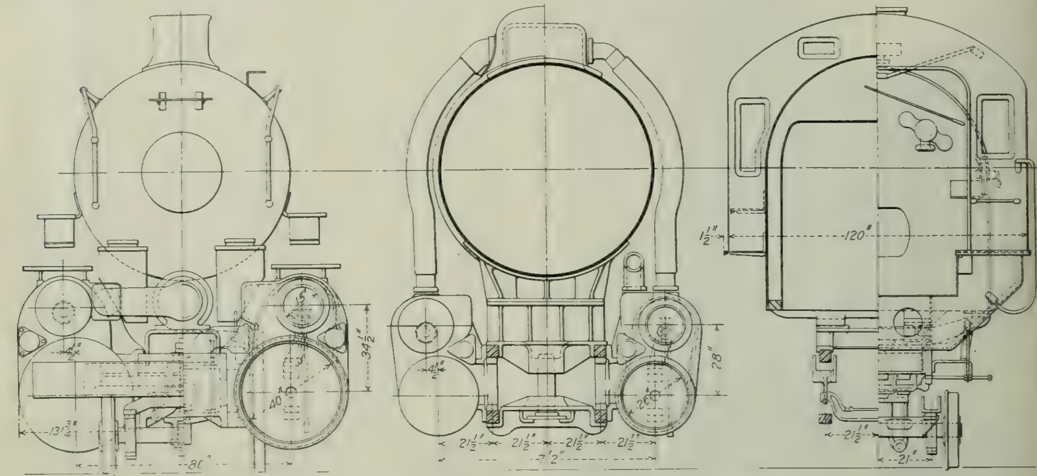
In the smokebox there is a Baldwin superheater. It is of the same type as that illustrated in the *Railroad Gazette*, for March 27, 1908, with the modification that, instead of taking steam at the top and discharging at the bottom, both inlet and outlet are at the bottom. There have also been a few minor modifications, such as a rearrangement of the bolts holding the headers in place, which while important as details, do not affect the general design or its efficiency.

The junction ring thus serves to make the handling of the boiler safer and more convenient than would otherwise be the case with the usual repair shop facilities.

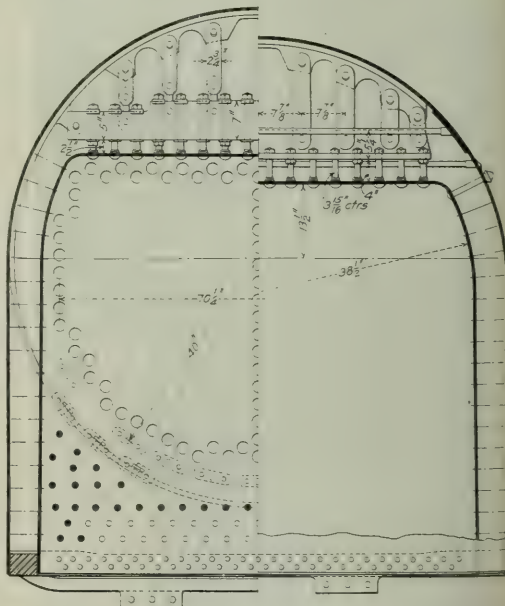
The steam dome is set well out to the front and in line with the center of the high-pressure cylinders. It is of cast steel, and the steam pipes lead down from it on the outside of the boiler to the steam chests of the high-pressure cylinders.

Such a boiler design as this must necessarily be regarded as more or less experimental. The tubes are almost up to the maximum of length that are used, and though they are 2¼ in. in diameter, it is certain that they will have a marked cooling effect on the gases, though probably not as much as though they were smaller. These gases then pass through the feed-water heater, and, as the tubes here are 5 ft. 3 in. long, it appears likely that a large amount of heat will be abstracted. So the chances are that, when the gases finally enter the smokebox, their temperature will be very low, and it remains to see whether they will be capable of adding anything in the way of superheat to the steam. The boiler, therefore, presents an exceptional opportunity for studying effects, and the determination of gas temperature and its performance should go far towards settling the discussion that has been on for so many years as to the value of feedwater heaters on locomotives. That some heat will be added to the water there can be no doubt, and if the temperature is raised above the precipitating point of the scale, it seems probable that, with the comparatively slow circulating velocities that must prevail there, the heater space will serve as a settling tank for the accumulation of precipitates, and thus serve as a protection to the tubes of the main boiler.

The arrangement of steam pipes in these Southern Pacific locomotives is quite different from that of the Great Northern. In the latter, it will be remembered that the high pressure exhaust from the two cylinders was discharged into a Y whose leg was connected by a slip joint with a receiver pipe lying beneath the boiler and between the frames. A ball joint at the front end connected the receiver with the low-pressure steam chests. The low-pressure exhaust reached the smokebox through a pipe fitted with a slip joint and two ball joints.



Cross Sections and Elevations; Mallet Articulated Compound for the Southern Pacific.



Sections of Firebox.

In the Southern Pacific locomotives, quite a different arrangement is used. As the high-pressure cylinder saddles are attached to the boiler, there is no movement between it and the rear frames.

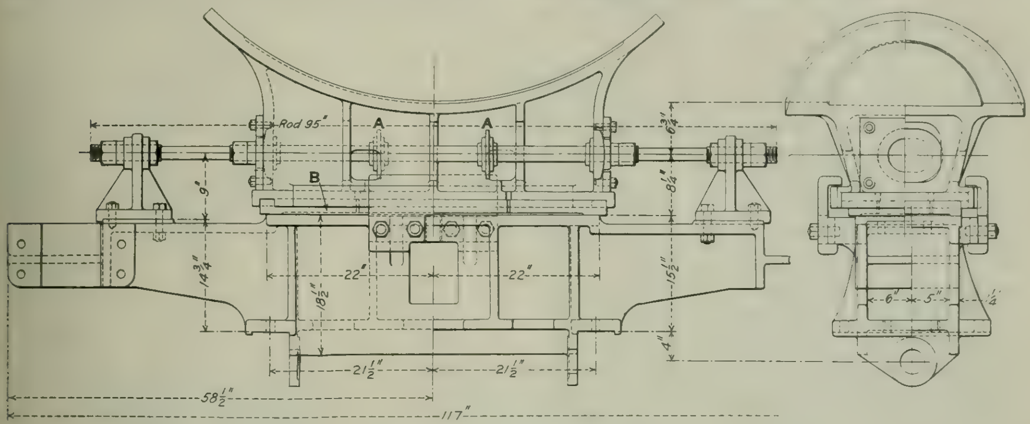
The high-pressure exhaust pipes are, therefore, brought out from the steam chests and carried along the side of the shell

beneath the running boards to the smokebox, where they turn in and enter the superheater at the bottom.

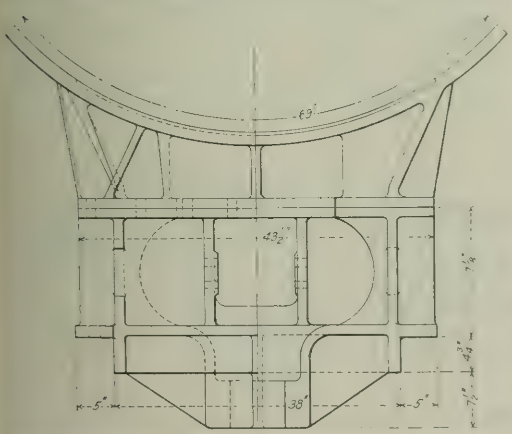
The steam, after passing through the superheater, or rather re-heater, as it really is, is let down on a sharp incline to the low-pressure steam chest. Flexibility is here obtained by means of the usual combination of two ball-and-socket joints and a slip joint. The distance between the rigid points of attachment, that is to say, between the centers of the ball joints, is about 5 ft. 3 in. As the wheel-base and flexibility of the engine has been designed to pass a curve of 16 degrees, the lateral movement of the front truck will be about 1 ft. This will involve considerable motion not only for these joints, but for those of the low-pressure exhaust; but it is considered that no trouble from excessive wear or leakage will be experienced.

The exhaust from the low-pressure cylinders is delivered into a double return bend of 9-in. inside diameter, and thence, after coming together, passes into a 11-in. exhaust pipe fitted first with a ball joint, then a slip joint and, at the smokebox beneath the exhaust nozzle, with a socket joint that has a sufficient rocking motion to compensate for the action of the springs and the swinging of the boiler.

In the case of the slip joint of the low-pressure steam pipe, the packing is effected by means of a gland and stuffing box, but with that of the exhaust pipe, tightness is secured by means of snap rings and leakage grooves. At the smokebox end the ball or socket joint is fitted with a coiled spring which holds the pipe against its seat. For the regular ball joints, tightness and contact is obtained by means of bearing pieces held in place by a gland with the usual bolts.



Self-Centering Waist Bearer.



Cast Steel Cylinder Saddle; Mallet Articulated Compound for the Southern Pacific.

The articulation of the locomotive is accomplished by connecting the two frames at their adjoining ends with a 7-in. pin put in from beneath. In the case of the Great Northern engines there were two radius bars, one entering an opening in the saddle and the other down below on an independent cross-tie bolted to the bottom rail of the frame.

In the Southern Pacific engines there is but one bar. This is bolted to the back end of the front frames and sets up against the bottom of the cylinder saddle. Then beneath it there is a cross-tie bolted to the lower rails of the front portion of the rear frames. A 7-in. pin passes through these three pieces and is held in place by a plate that is itself held by lips cast on the cross-tie. The pin thus serves to transmit the tractive effort of the front to the rear frames by way of the cross-tie and saddle.

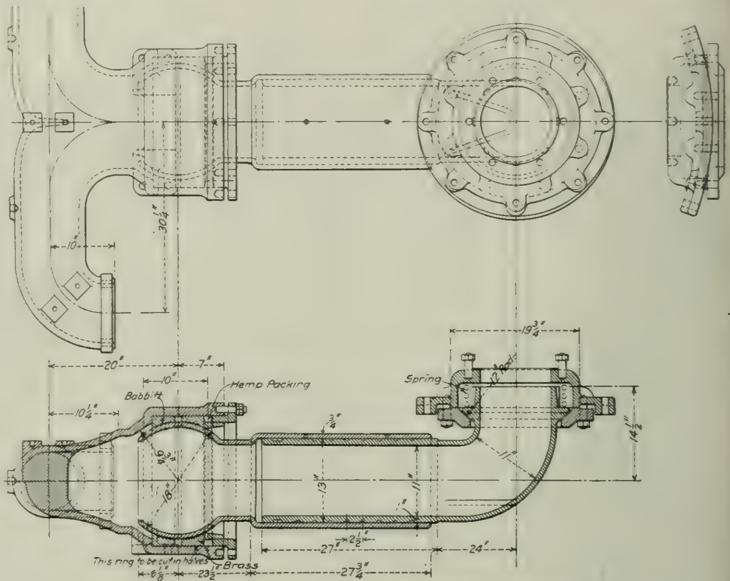
The connection between the frames and the boiler is made, for the rear frames, through the cylinder saddle, buckle plates and expansion plates in the usual manner. For the front frames there are two waist bearers and the cylinder saddle. One of the waist bearers consists of a simple bracket bolted to the shell which has a bearing on the top of a cross-tie brace bolted to the frames. Then when the engine is traversing a curve, and the boiler maintains its alinement with the rear frame, the bracket simply slides to and fro upon the cross-tie. The construction of this is identically the same as that used on the Great Northern, which was illustrated in the issue of the *Railroad Gazette*, Oct. 12, 1906. The change in the steam pipes and the connections has, however, necessitated a change in the details of the low-pressure saddle and bearing bracket, which has been made like that shown in the illustration. The saddle is a steel casting bolted to the frames and forming a cross-tie for them, and over it there is a simple bracket or carrier bolted to the bottom of the smokebox. The area in contact at the saddle measures 43½ in. by 45 in. In the Great Northern engines the waist bearer was of this character. In the Southern Pacific machines a modification has been introduced in the second waist bearer that is towards the front end of the forward frame by which centering springs are used that tend to bring the frame back to its central position after it has been swung out of line on a curve. The cross-tie used as a support for the bearer bracket is a steel

casting 9 ft. 9 in. long over all, that is bolted to the frames, and extends out far enough on either side to carry some of the valve rigging. The bearer bracket is riveted to the bottom of the boiler shell and has a passage cored in the side walls to admit the centering rod. This rod, which is 1⅝ in. in diameter and 7 ft. 11 in. long, carries two washers near its center that serve as seats for the centering springs. The outer seats for the springs are formed by caps that cover the openings in the bracket and are bolted to the same by studs and nuts. The rod is fastened at its outer ends, to brackets that are bolted to the upper face of the overhang of the crosstie, so that any lateral movement of the boiler relatively to the shell will compress one or the other of these springs, whose tension will thereupon tend to return it to the central position.

Both the bracket that is riveted to the boiler and the crosstie are of steel castings, and they are separated by a wearing shoe of cast iron, that is made with a lip, projecting into the bracket and so moves with it. The two surfaces in rubbing contact are, therefore, of cast iron and cast steel respectively; and the bottom of the cast iron shoe is grooved with oil passages so as to facilitate the lubrication.

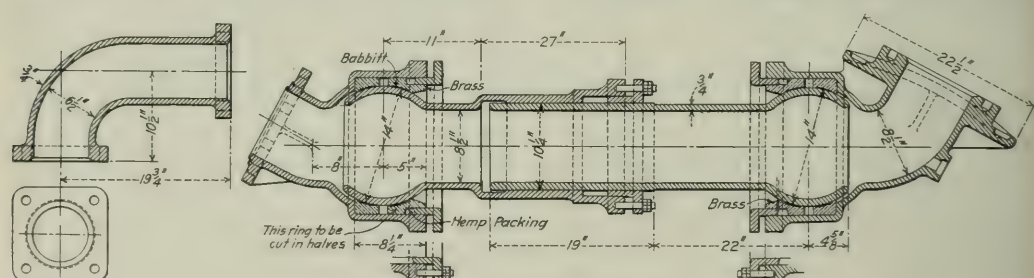
The boiler is thus supported at seven points: at the front and back of the firebox by expansion plates; at the waist by two buckle plates; at the high-pressure saddle, and by the two waist bearers on the front extension. These waist bearers are set; one 7 ft. 3 in. ahead of the center line of the high-pressure cylinders and the other 5 ft. 1 in. ahead of this. There is, therefore, left about 10 ft. of overhang of the feed water heater section and the smokebox beyond the center of the front waist bearer.

In the Great Northern locomotives, flat valves were used upon both the high and low-pressure cylinders. In these Southern Pacific locomotives, piston valves are used. The high-pressure cylinder is 26 in. inside diameter, with walls 1½ in. thick, and it has a valve chamber bored out to 16⅜ in. This is bushed down to 15 in. for the valve face with cast iron, as shown. Both cylinders are fitted with the Sheedy drifting valve, which is simply a by-pass that is opened by spring-actuated valves at the ends of the passage, whenever steam is shut off. These passages are 5 in. diameter for each cylinder. The valves are arranged for inside admission and are worked by the Walschaerts gear. As will be seen by a reference to the engraving, there is a difference in the method of fastening the cylinders to the frames. The rear frames are of the bar type for their whole length and the lugs on the cylinder casting are arranged to bear against the sides of both rails; the bottom of the top rail and the top of the bottom rail. In each place it is held by staggered 1½-in. bolts driven both horizontally and vertically.



Exhaust Steam Pipe from Low Pressure Cylinders.

The front frame differs from the rear, in that instead of being continuous and in one piece from end to end, the bar section stops at the cylinders and to it a front slab section is bolted. It is to this that the low-pressure cylinders are bolted. These cylinders are 40 in. in diameter and have 15-in. piston valves, which are also arranged for inside admission. The walls are 1⅝ in. thick, stiffened by two strengthening ribs between the flanges. The steam posts are very short and are 1½ in. wide through the valve bushings, and open into passages 1¾ in. wide cored in the cylinder casting.



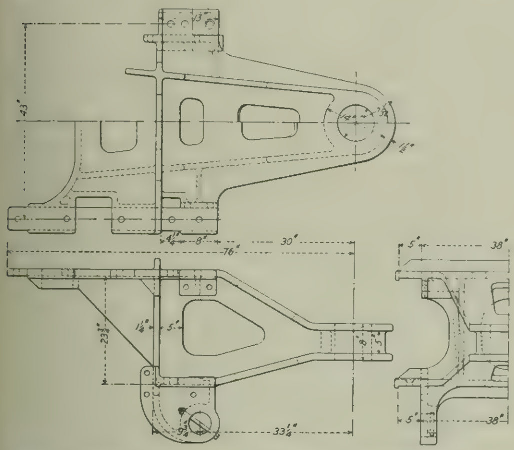
Steam Pipe to Low-Pressure Cylinders.

The valves are worked by the Walschaerts gear and these are so designed for the front and rear engines that they balance each other, the eccentric cranks being so arranged that one follows while the other leads the main crank, so that the back radius rod is raised while the forward one is lowered when being thrown into forward gear. The reversing is done with the McCarroll air reversing mechanism, and there are no

hand connections attached, so that it is necessary to have an air pressure upon the engine when the gear is to be moved.

Steel castings are used liberally, even lavishly, throughout the whole design. They are used for the cylinder saddles, cross-ties, frame radius rod, frame, guide yokes and a mass of miscellaneous castings.

Some of these details will be made the subject of another article on these engines.



Engine Radius Bar; Mallet Articulated Compound for the Southern Pacific.

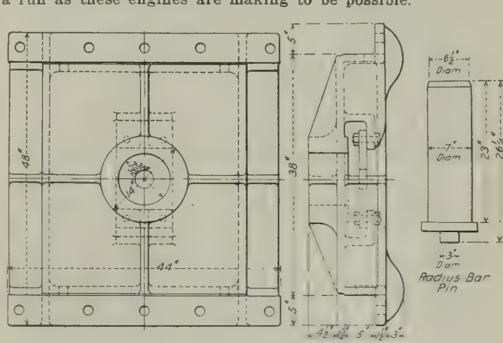
Standard solid steel wheels are used for the front and rear trucks and under the tender.

The fuel is to be oil, and this will be burned with the standard burners of the Southern Pacific Company. It will be preheated by a simple heater consisting of a 1¼-in. pipe leading from the oil tank and passing through a piece of 3½-in. pipe about 7 ft. long that is filled with steam, which is sufficient to raise the temperature of the oil to a point where it will flow freely at the burners.

These engines are sufficiently novel in design to attract a good deal of attention and a corresponding amount of interest will undoubtedly be manifested in their performance. The four-cylinder compound locomotive has been used for a sufficient length of time to have made it possible to estimate very closely as to what may be expected in that direction. With these, the mechanism is very simple, not even an intercepting valve being used, but a direct by-pass valve that must be opened and closed by the driver, for admitting steam to the low-pressure cylinder when starting, so that with the experience of the Great Northern, Baltimore & Ohio and Erie locomotives at hand, there can be no doubt about the efficiency of these new monsters as freight handlers. The points that will come up will be the general efficiency of the boiler as a steam producer when used in connection with the feed-water heater and superheater. The superheater will undoubtedly dry out the high-pressure exhaust and reheat it to some extent; to what extent remains to be seen.

In appearance the engine certainly looks a monster even to eyes accustomed to seeing the large modern locomotives, and only a faint impression of this can be obtained from the engravings and photograph. Probably this impression of size is driven home more emphatically when looking out of the front window of the cab along the running board than from any other point. The boiler occupies nearly the whole width of the cab, leaving a space so narrow that a small man would be rather tightly squeezed to get through, and beyond is the narrow stretch of the running board almost 50 ft. long, or about twice the distance of an ordinary large locomotive. The track ahead is entirely out of sight, and cannot be seen at all on a tangent from inside the cab. By leaning well out at the window it may be possible to see it. Curves to the right come within the range of the engineer's vision some time before they are reached, but he will never see anything of a curve to the left.

For convenience of manipulation, these engines are models, and the labor of operation is reduced to a minimum. The use of oil as fuel practically does away with the manual labor of the fireman, though demanding a high grade of intelligence and skill, while the use of the air reversing gear not only clears the cab of an obstruction, but cuts out the one element requiring exertion on the part of the driver. With the large reverse lever out of the way, it is possible to arrange all of the other levers and valves ready to the hand and in a way to leave a much larger clear space than that usually found in the ordinary locomotive. It is a bold piece of work and well worthy of all the attention that it will receive. It marks, too, the improvements that have been made in recent years in the clearances of the permanent way. It is only a few years ago that one of the arguments brought against the practicability of the development of the two-cylinder compound locomotive was that in order to be available for the heavy work demanded it would be necessary to make the low-pressure cylinder at least 36 in. in diameter, and that this would make the machine too wide to meet the clearance requirements of the ordinary railway. Indeed, as late as ten years ago, when the Richmond Locomotive Works were exploiting the Mellin two-cylinder machine by the "Tramp," that engine could not be run into New York, Boston, Albany or Montreal because of the clearances of the roads entering those places and yet the low-pressure cylinder was at first only 30 in. in diameter, but was afterward replaced by one of 32 in. diameter. Yet here is a locomotive with cylinders 8 in. larger in diameter than that built in Philadelphia and routed to cross the continent on its own wheels. Whether it would be possible to run the engine through the New England states is doubtful, though clearances there are much wider than they were. It may be added, too, that far less trouble was experienced in routing the "Tramp" through the west than in the east, though at times there was some trouble even there. But it shows that wide clearances must be comparatively common now for such a run as these engines are making to be possible.



Pivot Crosstie for Radius Bar.

The following are some of the principal dimensions of these engines:

Cylinder, diameter, h.-p.	26 in.
Cylinder, diameter, l. p.	40 "
Piston stroke	30 "
Boiler, diameter, shell	84 "
Boiler, thickness, sheets	$\frac{13}{16}$ and $\frac{27}{32}$ in.
Steam pressure	200 lbs.
Fuel	Oil
Staying	Crown bars
Firebox, length	10 ft. 6 in.
" width	6 " 6¼ "
" depth front	6 " 3½ "

Firebox, depth back	5 ft. $10\frac{1}{2}$ in.
" thickness, sides, back and crown	$\frac{3}{8}$ in.
" thickness, tubes sheet	$\frac{1}{2}$ in.
" water space	5 in.
Tubes, material	steel
" thickness	$\frac{1}{8}$ in.
" number	401
" diameter	$2\frac{1}{4}$ in.
" length	21 ft.
" feedwater, length	5 ft. 3 in.
" " number	401
" " diameter	$2\frac{1}{4}$ in.
Heating surface, firebox	232 sq. ft.
" " tubes	4,941 "
" " feed-water heater	1,220 "
" " total	6,393 "
" " superheater	655 "
Grate area	68.4 "
Wheels, diameter driving	57 in.
" " truck	$30\frac{1}{2}$ "
" " tender	33 "
Journals, main driving	11 in. x 12 in.
" trailing driving	10 " x 12 "
" truck	6 " x 10 "
" tender	6 " x 11 "
Wheel base, rigid	15 ft.
" " driving	39 ft. 4 in.
" " engine	56 " 7 "
" " engine and tender	83 " 6 "
Weight on driving wheels	390,000 lbs.
" " front truck	19,000 "
" " rear truck	21,000 "
" total	430,000 "
" engine and tender (about)	600,000 "
Tank capacity, water	9,000 gals.
Tank capacity, oil	2,850 gals.
Tractive effort	94,640 lbs.

Weight on drivers / Total weight	90.69*
Weight on drivers / Tractive effort	4.12
Total weight / Tractive effort	4.54
Tractive effort x diameter drivers / Heating surface	843.81
Heating surface / Grate area	93.46
Firebox heating surface / Total heating surface	3.63*
Weight on drivers / Total heating surface	61.00
Total weight / Total heating surface	67.32
Displacement 2 h. p. cylinders, cu. ft.	18.43
Total heating surface / Displacement 2 h.p. cylinders	346.88
Grate area / Displacement 2 h.p. cylinders	3.71

*Per cent.

THE CONNECTICUT RAILWAY CHARTER DECISION.

The case of Mackay and others *versus* the New York, New Haven & Hartford Railroad Company and others, recently decided by the Supreme Court of Connecticut, the highest tribunal in that state, is of exceptional importance in its bearing on the charter powers of a railway corporation holding charters in a number of states. In this case, the New Haven Company holding charters in Connecticut, Rhode Island and Massachusetts had contracted to place its guarantee on shares of the New England Investment & Security Company, a voluntary association organized to hold a large nummer of trolley properties in Massachusetts, of which the New Haven company had secured control. The defendant corporation acknowledged the contract but refused the guarantee on the ground that the Supreme Court of Massachusetts had on May 8, 1908, rendered a decision that such a guarantee was illegal under the Massachusetts law. The lower court of Connecticut had held the guarantee legal and the case went up on appeal to the Connecticut Supreme Court. The Connecticut case was in effect a friendly suit in which the Connecticut court was asked to determine the powers of the defendant corporation under its Connecticut charter as against the Massachusetts decision and the law of that state.

Annexed are extracts from the Connecticut decision written by Chief Justice Simeon E. Baldwin, the other four judges of the court concurring:

The only question presented for our determination is whether the Superior Court erred in enforcing the obligation, in view of the law of the State of Massachusetts affecting that defendant.

A private corporation may be defined as an association of persons to whom the sovereign has offered a franchise to become an artificial, judicial person, with a name of its own, under which they can act and contract, and sue and be sued; and who have either accepted the offer and effected an organization in substantial conformity with its terms (in which case a corporation *de jure* has been constituted), or have done acts indicating a purpose to accept such offer and effected an organization designed to be, but in fact not, in substantial conformity with its terms (in which case a corporation *de facto* has been constituted).

The merger of 1872 (under which the New Haven, Hartford & Springfield and the New York & New Haven companies were combined) was authorized by an act passed by Connecticut in 1871, and one passed by Massachusetts April 5, 1872. VII Private Laws of Conn., 252; Mass. Acts and Resolves, 1872, Chap. 171. These acts were quite similar in terms, except that that of Connecticut provided that "said consolidated corporation shall at all times be subject to the power, control and legislation of the General Assembly of the state," while the corresponding section of the Massachusetts act declared that "said consolidated corporation shall at all times be subject to the legislature of this state as to that portion of its road in this state, as heretofore, and shall be subject to the general laws of this state as to its whole road, so far as such laws may be applicable thereto."

Where several corporations, each of a different state, are so consolidated by the co-operating legislation of those states as to assume a new corporate form and name, the consolidated corporation is, in each of those states, in the eye of the law, as to acts there done or to be done, a corporation of that state. Neither of the states in question could confer upon it the franchise of maintaining a corporate existence in any other state, nor add to nor diminish the powers that it can exercise in any other. O. & M. R. R. *v.* Wheeler, 1 Black, 286, 297; Delaware R. R. Tax, 18 Wall, 206, 228.

The new form of corporate organization exists in each state by virtue of the laws of that state. If, acting within its powers there possessed, it incurs a liability to be there discharged, and upon which it is there sued, it cannot escape its enforcement on the ground that it is also a corporation in another state under the laws of which no such liability could have been legally assumed.

The ultimate loss from a judgment diminishing these rights of property, in whatever state it may be rendered, falls on the same men, and in the same proportions. But this situation is one which the shareholders have voluntarily assumed.

No shareholder in the New York, New Haven & Hartford Railroad Company who consented to its becoming, by consolidations and mergers, a corporation composed of several corporations of different states, can complain that each state regulates its conduct, so far as concerns franchises which it has granted.

Referring to the decision of the Massachusetts court enjoining the New Haven company from directly or indirectly guaranteeing securities of a Massachusetts street railway Judge Baldwin says:

If the injunction which was decreed could be fairly construed to apply to acts of the New York, New Haven & Hartford Railroad Co. that might be done by or for it as a Connecticut corporation agreeably to the laws of that state, or in Rhode Island as a Rhode Island corporation agreeably to the laws of that state, it seems obvious that questions of jurisdiction and of constitutional law might be raised, which could not arise if the decree applied only to acts by or for the company as a Massachusetts corporation, that might be done in or purport to affect rights or property having a *situs* in that state. (Wharton on Private International Law, I, Sec. 477.) In view of these considerations, the observation of the Supreme Judicial Court of Massachusetts that it was entirely immaterial whether the defendant should be described in the decree as a Massachusetts corporation, or as one existing under the laws of three states, apparently implies that it enjoined only action by or for it in the capacity of a corporation existing under the laws of Massachusetts. (See Davis *v.* N. Y. & N. E. R. R., 143 Mass., 301, 9 N. E. 815.)

But whether this be so or not, the courts of this state, in dealing with a Connecticut corporation, cannot accept as an excuse for a refusal to perform a contract, the obligation of which upon it, as such corporation, it expressly admits, the plea that to perform it might violate an obligation which its shareholders have assumed in accepting and acting as a corporation under a Massachusetts franchise.

There is no error.

HANDLING MATERIALS AND ITS RELATION TO COSTS.

BY H. B. WHIPPLE.

Various railways have gotten up figures from time to time to show the relation of material and labor to the total cost of locomotive repairs, with the object of determining a standard percentage basis. One railway claims that the labor should be but 40 per cent. of the total cost, and that the material should be 60 per cent. Another claims that these percentages should be reversed.

The systems of accounting and store department methods differ so widely that the two cases mentioned above might each represent good practice on these two railways. That is, the cost per mile for repairs might be equally good, even though the figures showing percentage of labor and material separately should be so greatly at variance. For instance, one road might manufacture material in large quantities and keep the finished product on hand to supply its shop needs, and the other road might not like to carry so much money tied up in material, prefering to manufacture the parts needed as requirements at the time demanded. In the first case, the finished product in stock carries with it a labor charge which is not considered as labor when the material is charged out, and this is one of the reasons that the material cost runs up higher than in the other case. On the other hand, if the material is manufactured for an individual engine at the time it is needed the raw material is the only material change made, and the labor of making and finishing is charged directly to the locomotive.

There is another feature of the material as affected by accounting methods which is not always thoroughly understood—it has to do with second-hand material, a question of great importance, with possibilities of benefit to the railway if handled properly, yet capable of becoming a farce if not given the constant attention the subject requires. There are railways which charge out the new material, such as for instance a pair of new cylinders, and when, in removing the old cylinders, one is found to be good for further service, instead of giving credit to the locomotive for the second-hand cylinder it is not taken into stock but is kept on hand until needed, when it is used without being charged out. This treatment is carried out with all kinds of material. In this case, the cost of the cylinders may be $800, and this charge is placed against the locomotive in question. The other method of handling the matter, when the credit is given for the second-hand cylinder, would be to charge out $800 to the locomotive and credit 75 per cent. of $400 or $300, which would leave a net charge of $500 against the locomotive. But when the second-hand cylinders were used after being thus credited, it would be necessary to charge them out, which would mean $300 against the locomotive receiving them. If the results for the railway are looked at yearly, the variation in the results of these two methods would be but slight; but, if, as is generally the case, the results are dealt with monthly, there is a possibility of considerable variation.

If the men handling such matters were expert accountants and experienced mechanics as well, either method would do, provided a certain period were decided on to inventory the accumulation of second-hand material and adjust the credits. It would be unreasonable to expect a railway not to inventory accumulated second-hand material, because it would be equivalent to saying the management was willing to carry a stock on hand greater than its book balance indicated.

In accumulating second-hand material, where store rooms are set apart for that purpose it is a difficult matter to avoid accumulating a lot of odds and ends which are of doubtful value for future use; and it is also difficult to get the average man to discriminate between new and second-hand material in charging it out when the system is to charge it out again. When there is a doubt as to the usefulness of a piece of second-hand material it should be turned into the scrap pile, where at least it can bring a known value in return. It is the writer's opinion, after experience in the details of the subjects mentioned, that the most satisfying arrangement would be one which would entirely eliminate second-hand material. When a pair of cylinders is applied and one cylinder is removed that is good for further service, we would charge the locomotive with $800, credit the one cylinder removed, and take it into stock as new material and at the value of new material, or $400. If a shop required one cylinder for a locomotive and it has this good second-hand cylinder, it would not order a new one but would use the old one and would charge it out, not as second-hand but as "one cylinder, $400." We would thus avoid possibilities of confusion due to not having experienced men handling the charges, we would avoid the accumulation of useless second-hand material, and we would insure our charges and book balances being correct. By using the old material in preference to the new the amount on hand would be kept at a minimum. As would be the case with the cylinder, it would generally facilitate repairs to use the old material in preference to the work of fitting up the new.

TECHNICAL JOURNALISM.*

BY RAY MORRIS,

Managing Editor of the *Railroad Age Gazette*.

To an onlooker who is at the same time a participant, two interesting journalistic tendencies stand out plainly in the records of the last fifteen years. The first is the growth of the irresponsible daily newspaper; the second, the development and astonishing prosperity of the highly responsible technical journal. It is probably no serious exaggeration to say that we were indebted to the irresponsible daily newspapers for the Spanish war; I believe we are also becoming indebted to them for a sort of progressive immunity from the sensationalism of great type. But along with the daily object lessons in loose thinking and careless statements that are being cried from every street corner, a radically different journalistic concept, the technical journal, has, from a publishing standpoint, far surpassed the expectations of its best friends in its material progress since 1894, and indeed since 1900.

A short time ago the writer dined with a small group of publishers of technical journals, and calculated that the combined annual advertising revenue of the papers represented at the table was not far from two millions dollars. It was noted by a statistical guest that technical advertising had increased by one-half since 1903, while in the ten years previous to 1903 it had increased only by one-third. These are rather impressive statements, especially in view of the fact that the ordinary, or average, citizen (if there be any such!) has never read a technical journal in his life, while the advertiser, who makes this prosperity possible, does not care if the general citizen never reads one!

What the work is which these papers do; how they do it; whether it is worth while, and who pays them for it—it seems to me that these questions have some general interest.

The word "journal," corruption of the Latin *diurnalis*, means a publication of daily things, and the great daily newspapers, representing general journalism in its most frequent and concrete form, must need catch the drift of a fearful number of these things, and make the best news they can of them, without a moment lost. To the man engaged in the production of a daily newspaper, time is fully as important a consideration as accuracy; usually much more important. Moreover, he must be at least reasonably impartial in his use of material; he must look upon his readers as an audience before his platform, and remember what a hopeless number of kinds of things they are interested in! Were there but one journal in the commonwealth; one London *Times* of the olden

*An address before the engineering students of the University of Michigan.

days, read and remembered by all, it would have to be a general journal, unless all the citizens of the commonwealth were cobblers. If they were, it may be presumed that notes and news of the shoe trade would predominate, yet room would certainly be found for graphic reports of the current scandal, since even a citizen of this highly specialized commonwealth must need be a human being, as well as a cobbler.

But the modern community is characteristically diverse in its interests, and the need for special information, as used by special trades and professions, cannot possibly be met by the general journal without grievous injustice to its readers. The growth of the 60-page Sunday paper, with its financial section offset by picture puzzles, and its real estate section balanced by the adventures of Little Nemo, is an attempt in this direction, somewhat marred by the constant efforts to induce one kind of reader to read some other kind of material. Indeed, the Sunday paper is as good an illustration as need be that the demand for special news and special kinds of information cannot possibly be made adequate by the general newspaper.

To fill this want, the special journal has come into being. For the purpose of this analysis, it is first necessary to divide the field of special journals into two broad groups; work papers and play papers. There are a surprisingly large number of play papers in existence; I suppose even the stale and dreary police court sensationalism to which certain of these papers loyally devote their pages must be classed among the pastimes!

The present discussion excludes this range of journalism entirely, and confines itself to work papers; to journals which are part of the primary or secondary equipment of a trade or a profession. The distinction between a trade journal and a technical journal is not always plain; there is much interweaving between the two, as will be shown. In broad terms, however, I suppose it is fair to say that the technical journal deals with the literature of a profession, or of an industry devoted to the applied use of materials, while a trade journal exists primarily to furnish statistics relative to the sale of raw products or manufactured articles. This will perhaps serve for a definition, although I do not recommend it.

The duty of a technical journal to its readers is to present a current record of the best standard practice, together with such help as may be really illuminating in making practice better. Its duty is to glean in an entirely accurate and trustworthy manner the best things of the East and carry them to the West, and return with an armload of the best things of the West. It must also broaden the specialist so as to make him a better specialist and also a more serviceable man to his employ—whatever that employ may be—through his general understanding of the whole run of questions presented. This work, in its last analysis, is nothing but highly capable news gathering, using the word news in the broader sense than is commonly employed. Comment on this news is also made in the editorial columns, and a technical paper occasionally has a chance to do magnificent original work that abides for all time, because of its high viewpoint and its ability to command the best ideas of the best experts and compare results through a wide territory.

The writer has very definite ideas about the functions of the editorial column of a technical paper, or, indeed of any other kind of paper. I had occasion some time ago to make a careful study of the files of the New York *Herald* and the New York *Evening Post* for the year 1837. At that time I suppose the news gathered by one of these papers would fill an average of three columns, and the editorial comment would fill just as much space, or a little more. The editorials were magnificent, great things, to be classed with the three-volume novel and the two-hour sermon, and people read them. In the *Evening Post* to-day there are leading editorials covering somewhat less space than was filled by those in the big columns of 1837, while the news departments have expanded to fill some seventy-five columns of the present paper. To-day's *Herald* makes the point emphatic; it has eighty three columns of news, and one leading article nine inches long.

In a word, people have come to realize that it is a great deal better for them to be supplied with news and to make their own comment, than it is for them to be supplied with comment and have to make their own news!

This state of affairs is true to a high degree in a technical journal. I do not believe it ever pays to preach sermons in the editorial column, although that is the first instinctive desire of every man we take on our staff. The editorial column, if properly conducted, will be the crowning glory of the paper, but it will be so because a host of important collateral facts and outside study are brought to bear on some important subject at hand; not because the editor passes endless judgments on matter at hand without having any new information whatever, a process which may be called robbing the news. Nowadays, why you think things, is more important than what you think!

Yet I have no doubt that trade news, ranging from frothy gossip to a dignified and highly condensed compilation of orders and contracts, or to case abstracts, as in a law journal, is the work which brings technical papers the greater part of their readers. Quotations, or prices-current, furnish an additional field of the highest importance in the case of a financial paper, or of the characteristic trade journal in an industry subject to constant price fluctuation, such as the sugar trade. Again and again I have seen technical journals, edited with great skill and responsibility, fall short of prestige, and incidentally of earnings, because they failed to give due regard to this work-a-day feature of expert and critical news gathering. From this fact arises the curious anomaly that a technical journal not infrequently makes its living, acquires a host of readers and firmly establishes itself in dignity, power and responsibility from its purely trade journal departments.

The situation may be summed up by saying that every modern profession, industry or business (however these three descriptive titles may be differentiated) has absolute and urgent need for accurate, highly specialized news, and knows well that it has. Every profession, business or industry under modern conditions also demands increasing education and fitness on the part of its representatives, but the number of those representatives who know that they need education and systematically set about acquiring it is one-tenth, or perhaps one-hundredth, of the number of those who are eager for the acquisition of special news. Consequently, it is quite idle for a paper to say that it wants to be a great lyceum of information and discussion and does not want to cumber itself with news; unless it devotes time and brains and dollars to its news departments, nobody will come to the lyceum. This fact is often overlooked in consideration of the work of a technical journal, perhaps because the divine carelessness of the daily papers in their news gathering has cast a shadow over the industry.

This is the theory that underlies the news department of the technical journal, and the journal cannot be great without it. Yet, with the finest news department in the world, and with only that, the technical journal would be no further along than the trade journal, and the great technical journals of the country go far beyond this for their high reputation and their broad dignity.

The theory of the scientific part of the paper, already briefly touched upon, may be summed up by saying that in the present stage of abounding human industry, text books cannot keep up. The surgeon prepares himself to practice by laborious study of a certain set of principles sufficiently well established so that they are available in bound books, and when he has mastered these principles and the supplementary comment given by the lecturers, and has acquired technique by hospital work, he is for the moment abreast of the current stage of his science, but in order to remain there he must depend on what he acquires from conversation and from the technical journals of his profession. The same thing is true of the lawyer. Text

books give him his fundamentals; cases, his present-day knowledge, and case reports constitute the principal tools with which he works.

The essentials of information in the transportation and engineering fields and the forms in which it is desirable that this information should be presented, bear, from an educational standpoint, a fairly close resemblance to those in the medical and legal fields. Once the principles have been mastered, the successful manager, or civil engineer, or locomotive designer, wants to know about every application of these principles which is in any important respect an advance on established practice. No books can give this information; like the printed catalogue of a great library, the additions and supplements which would become indispensable while the original work was in the printer's hands, would make it out of date before it left the presses. The card catalogue method has almost universally succeeded the printed book method of preparing records of this kind, because of its flexibility, and the technical journal, for the same reason, has succeeded the text book in supplying a very large part of the special, technical information that the world needs.

What has just been said applies primarily to the technical journal as a professional man's tool; to the part of its usefulness that enables a man to have all current facts at hand that possess important bearing on the specific task at which he is engaged. But there is another important aspect of the educational feature which works out in a different way. The highly specialized conditions under which modern industry is carried on do not all tend towards efficiency. The members of the leather workers' guild in an ancient German town considered themselves specialists, but they could see with their own eyes the accomplishment and fruition of their labor; they did not work at a branch of a branch, the way the man does to-day who operates the machine that stamps eyelets into counters that are stitched into shoes by other machines, further down the line. Consequently, although their fingers lacked some of the hopeless, heartless deftness that comes from performing piece work under conditions of incredible repetition, they were greatly interested in what they were doing, and if the final, finished product was not perfect, their concern was immediate.

The factory hand who spends all his days upon a minute detail has no concern whatever in the finished product, and so long as he cannot himself become a perfect machine, the finished product is going to suffer on that account. The same thing is shown even more clearly in the conduct of an industry involving a huge organization, the individuals of which have tasks which vary instead of tasks which are fixed.

This point can readily be illustrated in the management of a railway. If the line is twenty miles long, and the President is also General Manager, General Superintendent and Chief of Motive Power, he is going to know all that is done by every employee, and every employee is going to be interested in doing his work well and efficiently, because he comes in direct contact with the Old Man, and his share in the movement of the whole transportation machine is tangible and produces results. But this twenty-mile line now-a-days is apt to be part of a five-thousand-mile system, and specializataion brings in bad results for the individual, although it produces important economies. The Superintendent of the Great Valley division is a past master in turning out record trainloads, but he has long since forgotten that big trainloads are not the beginning and end of making a railway profitable. The statistics of his train and car loading go straight to the general offices and look good, but the harm done in the traffic department by these big loads—in this case assumed to be excessive—is not measured graphically. The master mechanic overlooks the fact that the percentage of time his locomotives spend in the shop is not the only criterion of his efficiency; the work they do on the road is also important, though not recorded on the same sheet, but it is not his specialty. The ticket agent ought to remember, though he usually does not, that his work has not been well done, no matter how quick he is and how free from error, if he has sent a passenger to a rival line by his personal discourtesy.

So, after the technical journal plays its part in making a specialist, its most valuable function is to unmake him again, at least to the extent that he shall view himself and his individual work as part of the general scheme of work for which his company exists. It does not accomplish this by preaching, but by showing in its own form and makeup the respective proportions of the specialist's branch and of the entire work of the railway. Where an operating officer has the chance to take his lunch every day with the traffic staff, and has time to do a little talking and a little listening afterwards, it makes him a better operating man; and his technical journal will likewise make him a better operating man, because the traffic man and the master mechanic and the car builder and the comptroller, as well as the owner and instigator of the competing trolley line, are gathered together between the covers, and have called on the editor of the paper to help them put their ideas into English that is not too hard to read.

It should be said, parenthetically and apologetically, that the editor of a technical journal has to change radically certain fundamental literary ideas, as, for example, that a contributor is entitled to just the statements that he signs, and that the editor's function is to accept or reject, but not to change, a signed statement. This is the theory; the practice is that the editor gets hold of a speech made by a master mechanic whose language has never really caught up with his ideas, and he works for a while with blue crayon, and then takes to using scissors and paste-pot, and then gives that up and dictates the master mechanic's remarks himself, not from the fullness of his wisdom, but from the fullness of his language, while the master mechanic, when he sees the address in print, is surprised and highly pleased to learn that he can write so well.

Reference has been made to the extraordinary growth of advertising in technical papers as one of the very interesting journalistic facts of the past few years. This increase in earning power has had the direct result of giving the subscribers to most papers a great deal more value than they pay for. The subscription price of the *Railroad Age Gazette* is $5 per year, but it costs us over $17 a year to supply each subscriber with his paper. The fact is plain, and without dispute, that the advertiser pays the bills, or most of them—a situation which is at once the strength and weakness of modern technical journalism.

What does the advertiser expect in return for this payment; or, more definitely, what does he get?

Upon the answer to this question depends the reputation of every newspaper and magazine, but temptation comes to the technical paper more constantly and more insidiously, I believe, than to any other paper in existence.

The A. & B. Railroad has issued some short-time notes on its heavily overcapitalized property, the object of the notes, in plain language, being to pay unearned dividends. Grogson & Co., bankers, have underwritten this issue on a basis very satisfactory to themselves, providing they can dispose of the notes, and have therefore published a full-page advertisement in the *Investors' Home Companion*, a young and hopeful financial paper which has only recently come into the field, already well filled with like papers. What comment is the *Investors' Home Companion* going to make on these notes in its editorial column? The case is one in which honesty and reputation seem to be engaged in deadly warfare with present prospects!

The lines on which this battle should be fought are clearly shown. Very well, then, consider the following case: A technical paper devoted to the interests of transportation believes fully and freely that it is part of its righteous work to show useful new devices which have recently been put on the market, so that those whom these devices might help in their work may know about them. This journal receives a large

advertisement from the manufacturer of a device which is on the border line between usefulness and foolishness, with the request that this device be shown (not praised) in the editorial columns. What is the editor going to do about it? Is he going to decide that the machine is useful if its owner advertises in his paper and foolish if its owner does not, and, if so, is he going to show the device in his reading pages? Will he show it with or without the little *advt.*, which the daily newspaper sometimes uses as a mark of designation?

There is an ancient and dishonorable word used to describe this kind of practice when shoved just a little more plainly into the light, and that word is blackmail. Yet it is perfectly astounding how many well-meaning technical journals are guilty of this special form of blackmail in greater or less degree, simply because the difference between right and wrong even in the abstract is very ill-defined. To cite an instance of this: A certain machine was designed some years ago, which is now in use on a number of railways and which saves untold hours in making statistical computations. The mechanical principle of this machine is based on the same idea as that of the machine which receives a pasteboard card stamped full of holes and shows in electrically illuminated figures a carriage number in front of the theatre.

The editors of the best technical journals were convinced that their people ought to know about this machine, and they did not hesitate to print illustrated descriptions that filled several pages, in entire disregard of the question whether or not the machine was advertised in another part of the paper. Here was a clear case on one side of the ethical line. A clear case on the other side would be a "write-up" of some article, such as a hand-saw, a laborious description of which could be of service to to one except the owner of the trade name under which this particular kind of saw was manufactured.

There are two ways of getting around this particular pitfall with honor. One way is to edit strictly all such material and make no distinction between devices from advertisers and those from non-advertisers. The principal objection to this method is that the kind of editing that this kind of copy needs is a sure road to real, durable unpopularity with the people whose devices are shown.

I believe we have found a better way. We have transferred this department bodily from the editorial staff to the advertising staff, and we print it next the advertising pages, in distinctive type, so that it shall not be confused with editorial matter. This method has two advantages; it is honest, and it is popular. Many people have supposed that honesty and popularity never met each other between the covers of a trade journal, but we have made them the best of friends!

It may be seen that undue stress is being laid on the problem of the manufacturer's "write-up." But the manufacturer's "write-up" is the great problem of high-class technical journalism—the rock on which many a journalistic reputation has struck. And between the ways of doing these things that are clearly right and the ways that are clearly wrong there lie any number of cases where ethics throws up her hands and leaves it to the editor!

But there is a redeeming feature of all this. I do not know of any kind of business where it is more unerringly true that from a purely commercial standpoint honesty is the best policy. A paper that is known to print blackmail advertising very soon reaches a stage where it cannot get any other kind, and this sort of thing very quickly becomes common knowledge; consequently the host of papers making their living to a greater or less degree upon unfairness and advertising blackmail eke along a wretched existence, respected by none and sympathized with by none, and in the long run of years they are never serious competitors of the papers with clean hands.

The necessary weaving of the trade journal into the technical journal is another direct result of the support given by the advertiser, and a very desirable one. Every profession has a supply of trade attached to it—even a minister of the gospel has to have Bibles and white bands—and it would indeed be a curious anomaly if the excellent advertiser did not occasionally clamor for the special news of his own trade in the magazine which deals with someone else's profession but which he himself supports. Hence it is that flourishing departments of notes arise, such as:

"Mr. Jacob Kruse, of the Kruse Bird Cage Wire Company, sailed for the Mediterranean Saturday on the 'Princess Irene.' He is accompanied by Mrs. Kruse, Miss Violet Kruse and little Jakey, and will go from Naples to Rome, Florence and Venice, returning on the 'Cretic' early in the fall."

Without discourtesy to the excellent Kruse family, it will probably be conceded that the value of this news as *technical* information is not far-reaching, yet Mr. Kruse likes it better than any other item in the *Brass Herald*, and carries a kindly feeling in his heart toward that paper on account of it. Its worthy competitor, the *Brass Manufacturer*, takes a lofty stand; it has no space for personal gossip, and tells Mr. Kruse so, more or less frankly. It explains to him its readers are interested in only three things—brass manufacture, orders and prices current—and that the people he sells goods to are more concerned with his wire than with his family, even including little Jakey. But when the fall advertising campaign begins the Kruse Bird Cage Wire Company forgets that the *Manufacturer* has the most readers and a higher class of subscribers; it remembers the personal notice and gives the *Herald* a page of advertising and the *Manufacturer* a quarter-page!

From an advertising standpoint, Mr. Kruse is in error. He is making his principal announcement in the paper which *he* reads instead of in the paper which his customers read. But the error is a very common one. The supply men are keenly interested in each other; they read with the most pleasure that paper which best satisfies their personal interest and overlook the fact that the customer whom they wish to reach may have only a moderate interest in their affairs. So the serious-minded technical paper has this always to contend with, and it is fortunate indeed if it is able to dispense with the Personal Vanity department entire.

My own theory in this matter is that if a news department can be made really good, with real trade news, it will interest and awe the Jacob Kruses and, in turn, will escape the daughter violets and the little Jakeys. And so far it has worked. Our paper used to be conspicuously weak in its news department. We used to believe, and I think with justice, that we were covering in a fully adequate manner the professional part of our work. We believed that the news department was secondary, and by carrying out that belief faithfully for a number of years we succeeded in making ourselves quite unpopular with a large number of advertisers and subscribers as well. Our solution of the problem was to admit that the technical journal of the present day, supported almost entirely by a certain trade, has got to give that trade the news which it wants. Now, therefore, a copy of any one of our issues is really two entirely separate and distinct papers living together under one roof. In the front, a critical review of railway operation; in the back, the best railway supply trade newspaper that we know how to make.

Josh Billings once observed that he had had a great deal of trouble in his life, most of which never happened. Much of the news in the very best daily newspapers never happened, either, and the amount of chaff which a critical news gatherer has to separate from this journalistic wheat is one of the surprises of technical editing.

Yet it is equally true that the horde of news gatherers who swarm over this land like locusts do get substantially all the news there is every day. The difficulty is that they get so much news which there is not! Nobody seems to hold a general newspaper responsible for this kind of thing, but a technical journal must tell the truth and nothing but the truth. If we report that the National Lines of Mexico are in the

market for equipment it is going to cost the equipment companies a great deal of money to follow up that order, because Mexico is far away. Follow it up they surely will, however, and if the National Lines of Mexico turn out not to be in the market after all, does anybody doubt that we are going to hear about it from the equipment firms? If those firms are going to use a technical news service instead of going to the very great expense of providing a news service of their own—and an enormous number of them are coming to do so—the news has got to be right—a situation which the daily newspaper is spared, because nobody takes its findings too seriously.

Without going into the details of the way in which a technical news department analyzes the material brought into it it may be noted, briefly, that it relies on correspondents all over the country, on the work of its own staff and upon the daily press, supplemented by a follow-up system, by means of which every doubtful item can at once be tested. The men in charge of various columns have learned by long experience which of the newspapers are most accurate and which are the stuff that dreams are made of. There is one daily newspaper in New York City, and none west of New York City, from which the *Railroad Age Gazette* takes important railway news without confirming it. There are two others in New York, one in Chicago, one in Boston and one in Springfield, Mass., which are careful about their news, in the sense that they will lose a sensation rather than take a chance. As for the rest of them, it is perfectly astounding to see the total lack of responsibility which crops up again and again in the news paragraphs of the day.

May it not well be true that the doctrine of responsible statement and weighed utterance, which is the life of a technical journal, can be spread by that means? There is a good deal of helter-skelter in the American temperament, and the principle of the short cut, to which much of American invention is owed, is not always happy in its outworkings. Has not the great nucleus of responsibility in the technical journals possibilities of public service?

We have often described our own paper as being a normal school for country newspapers. Even during the years of strongest opposition to corporations in general, and the railways in particular, we have been astonished at the number of newspapers, east and west, north and south, that have quoted from our editorial comment, or appropriated it entire, with or without credit. The amount of this rather expert comment on transportation affairs which would appear in those papers would not be a sufficient proportion of the total contents of the paper to have any very lasting effect on the minds of its readers, but the significant thing was that the people supplying news to those readers and making comment on the news had gotten in the habit of looking to the technical papers for certain kinds of facts and certain kinds of discussion. I believe it would not take a very wide extension of this principle to be of incalculable benefit to the general range of American journalism, and I believe this extension will come. I believe that the growing production of careful, scientific literature, especially in a form like that of the technical journal, where it can be gotten at, is going to have its effect in making careful newspapers all over the country scrutinize their news, and that the effect will be important.

Life in the office of a technical journal is not all as solemn and joyless as these paragraphs might suggest. The scrutiny of incoming news is sometimes applied for other purposes than those of copy-making. It is inspiring, for example, to read a paper devoted to the fur trade, and to learn that good quality electric rabbits will be in great demand, or to encounter in a textile journal a paper on the twister motions of self-actor mules! We noted recently in the *Shoe and Leather Reporter* a paper on the best way of barring the throats of gypsy bals, and from a paper devoted to the grocery trade we are always glad to learn that spot prunes are dull or active, as the case may be; that tomatoes are stagnant, cabbages firm and potatoes quiet. We have felt from personal experience that potatoes were quiet, and have cherished in secret the belief that prunes were dull, but it is a satisfaction to receive scientific confirmation of these impressions. A mere glance at these headings gives ready demonstration that if people must know about these things they have grave need for the special journal!

What worldly opportunity does a technical journal give to the people who are working on it as compared with the opportunity in other lines of endeavor? The answer to this, as to a similar question applied to almost any business or profession, is that the opportunity is largely what the worker makes it. It is possible and easy for the man working on the editorial end of a technical paper to get into a rut. The work at the outset seems to him extraordinarily difficult because of its intense technicality, but, this mastered, the routine path becomes easy. The question before the young technical editor is, How far can he break away from the routine that so easily entangles him and do something worth while with the means at hand?

There are two ways in which the career of a technical editor can be considered, as an end or as a means. As an end in itself the actual income possibilities of the position are pretty good, and have been improving very rapidly during the last ten years. The editor of a strong technical journal will get somewhat higher pay than a rear-admiral, and although this in itself is not large, as measured by the compensation which goes to the successful merchant, lawyer or engineer, the best technical journals offer very promising opportunities for investment in their own businesses, of which the man important to his company will probably be able to avail himself at considerable profit.

Editorial salaries on the best technical papers are neither higher nor lower than those on the standard monthly magazines, and the chance for the editor to acquire a holding is rather better than in the case of the old and well-established monthlies, because it must be remembered that the great growth in prosperity of the technical journals is a very recent thing. The *Railroad Age Gazette* is over fifty years old, but its growth can be divided into three geologic epochs, which are of considerable interest, from a commercial, as well as from a literary, standpoint. The first period was that of the broadside sheet for circulation in hotel lobbies, eking out a precarious existence and of no account whatever so far as serious editorial work was concerned. This was a comparatively short period, for clear-sighted people saw a chance to make a paper which was worth while. The next period was one of some twenty-five years, in which the solid, substantial editorial work done by the paper was far and away beyond the substantial commercial recognition. The most recent period, less than ten years old, is that of a great accession of prosperity, due to the fact that advertisers have realized that they need have fewer salesmen on the road, particularly to do the important preliminaries toward getting contracts, if they will make free use of the technical journals that go to the very people they most want to reach, and go to them in their leisure hours. Nobody knows how far this period is going to extend, because it is making rapid advances year by year and quarter by quarter.

In short, the editorial opportunities of the technical papers are fairly good and the commercial opportunities are better.

The indirect opportunity which an editorial position on a strong technical journal offers is in some ways greater than the direct opportunities. If a technical editor does not qualify as a first-rate expert in his own line of endeavor it is his own fault. It is no exaggeration to say that he has in many respects a better chance than the men who are directly engaged in the work which he is watching and reviewing. He gets a little better perspective of the work at hand from the very fact that he is not so close to it. In the case of my own

paper there have been two recognized lines of activity into which men developed from the editorial staff. Manufacturers learned a good many years ago that the extremely wide acquaintance which a technical editor develops, combined with the real knowledge which he requires for the conditions of his technical field, were an asset to them if they wanted to sell goods to that industry. Consequently, a number of our editorial people have left our employ to take important positions in the selling end of manufacturing houses which made railway supplies.

The other line of work for which our editorial opportunities qualify specially well is private banking. The editor has an opportunity almost unequaled to observe properties, to learn how they are really conducted and to acquire practical tests which he can apply to determine whether or not they are properly maintained and whether the operating force is efficient or not very efficient. This first-hand knowledge of properties is of great value to a banking house which deals in the securities of those properties, and when this knowledge is possessed by a man with the right sort of mental equipment it makes him a candidate for high-priced positions in the business that is perhaps the most lucrative of all businesses.

To sum up, I believe it is rather easier for a man to get lazy in the editorial office of a technical journal than in most other businesses, for the reason that it is possible for him to produce a vast amount of work which is not quite bad, but which certainly is not good, yet which is not particularly subject to criticism—it simply is not read at all by anybody! The young technical journalist has to fight sternly against this danger. If he conquers it and qualifies himself to write things which have to be read, because people cannot afford to pass them by, he will have no occasion to worry about his opportunities; they will come at him from every corner!

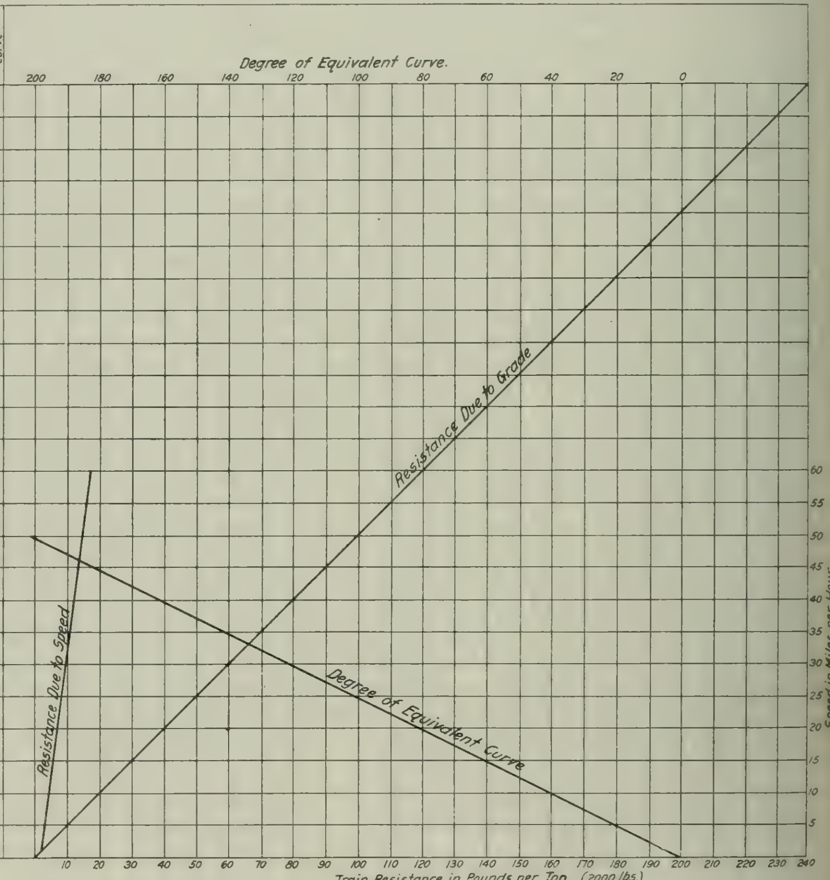
GRAPHIC PRESENTATION OF TRAIN RESISTANCE FORMULAS.

BY SIDNEY C. CARPENTER.

The table and diagram bring together, in compact form for reference, a number of formulas for train resistance, grades and curves. At the left of the table is given the grade per cent., which equals the rise in 100 ft., the number of feet of track for 1-ft. rise, the rise in feet per mile, the radius of the equivalent curve and the degree of curvature. The values are calculated for every ½ per cent. up to 12 per cent., and are arranged so that they can be readily compared.

In the body of the diagram is given the train resistance due to grade and speed and also the degree of the equivalent curve. In the table of formulas each quantity is given in terms of

Grade Percent	Rise of grade in feet per mile	Distance for one foot rise	Radius of equivalent curve	Degree of equivalent curve
12	633.6	8	11.91	
	607.2	8 2/3	12.43	
11	580.8	9	12.99	
	554.4	9 1/2	13.61	
10	528.0	10	14.29	
	501.6	10	15.05	
9	475.2	11	15.88	
	448.8	12	16.82	
8	422.4	12 1/2	17.87	
	396.0	13	19.06	
7	369.6	14	20.42	
	343.2	15	21.99	
6	316.8	16 2/3	23.82	
	290.4	18	25.99	
5	264.0	20	28.59	
	237.6	22	31.76	181
4	211.2	25	35.74	161
	184.8	28	40.84	141
3	158.4	33 1/3	47.65	120
	132.0	40	57.18	100
2	105.6	50	71.47	80
	79.2	66	95.29	60
1	52.8	100	142.94	40
	26.4	200	285.88	20



A Graphic Representation of Train Resistance.

each of the other quantities, so that if one is known any of the others may be found directly.

If it is required to find the radius of curve equivalent to a certain per cent. grade it may be found at the left of the diagram, where the radius is given in feet for every ½ per cent., or, from the table, the radius is found to be equal to about 143.2 P. If the degree of curvature is required, the table gives it as equal to 40.16 P, or it may be found at the left of the diagram. In the body of the diagram it may be found by reading horizontally from the required grade per cent. to the diagonal line marked "Degree of Equivalent Curve," and then vertically to the scale at the top of the diagram.

If the train resistance is required, read horizontally from the required grade to the diagonal marked "Resistance Due to Grade," and thence down to the scale at the bottom. The resistance can also be found from the formulas given in the table.

If resistance due to speed is required, read horizontally from "Speed in Miles Per Hour" at the right to the diagonal showing resistance due to speed, and then down to the scale at the bottom. This speed resistance curve is from the formula $R = S/4 + 2$, where S equals speed in miles per hour.

Comparison of Grade and Curve Formulas.

	M.	P.	D.	R_c.	C.
M Rise of grade in ft. per mile.	....	52.8 P.	$\frac{5,280}{D}$	$\frac{7,563}{R_c}$	1.32 C.
P Grade percent = rise in 100 ft.	0.0189 M.	....	$\frac{100}{D}$	$\frac{143.2}{R_c}$	0.0249 C.
D Distance for 1 foot rise.	$\frac{5,280}{M}$	$\frac{100}{P}$	....	$0.698 R_c$	$\frac{4,000}{C}$
R_c Radius of equivalent curve.	$\frac{7,563}{M}$	$\frac{143.2}{P}$	1.432 D	....	$\frac{5,730}{C}$
C Degree of equivalent curve.	$\frac{M}{1.32}$	40.16 P	$\frac{4,000}{D}$	$\frac{5,730}{R_c}$	....
R_m Resistance due to grade or curve	.3788 M.	20 P	$\frac{2,000}{D}$	$\frac{2,864.86}{R_c}$	.5 C

RAILWAY REGULATION IN HOLLAND.

By reason of the unsatisfactory results of operation of the railways of Holland, the government has appointed a committee to inquire into the whole situation and report upon what should be done to improve conditions.

The government of Holland finds itself seriously embarrassed by the conflicting policies with which it has forced the railways to contend. While compelling competition between the railways, the government has nevertheless interfered to force expenditures and prevent economies. All the time, the state has avoided any guarantee of dividends to stockholders, and now seeks to avoid the logical result of its policy—taking the railways over to complete government ownership.

The essential features of the railway situation of Holland are these:

1. The government owns the 1,107 miles of line. Two private companies supply the rolling stock and operate the two systems into which the lines are separated, paying the government a fixed rental per mile, as well as a share of the profits in excess of 4 per cent. The gross investment of the state in its lines of railways amounts to about $150,000,000, upon which the revenues of the state from the companies amounts to less than $1,750,000—or little more than one per cent.

2. The two operating companies are forced to compete, both as to export and domestic traffic. Each company has running rights over the tracks of the other, thus making routes to leading inland towns or frontier stations available to both companies. The result of this policy has been a duplicated and excessive train service, which has seriously burdened the finance of both companies. Had the companies been free to do so, they would, it is understood, have sought to effect economies by checking the redundancy in service. But, in projecting any change in their time-tables, they had to reckon with a possible veto from the Railway Minister, himself bound by the state principle of enforced competition. The companies realize that to increase rates and charges is not practicable, but they are insisting that greater latitude should be allowed to them in effecting economies, more particularly in suppressing unnecessary trains, in running trains at reduced speed, and in simplifying time-tables generally.

3. The government has exceptional regulatory powers over operations. All tariffs and all train schedules must be approved by the Railway Minister; no important improvements and no purchases of new rolling stock can be made without the same authority.

4. The government also has the right of intervention in labor disputes between the companies and their employes. All questions of wages and conditions of labor must be approved by the state. The immediate result of this policy was that the men got higher pay and reduced hours of work, and that the expenses of the companies were increased between $200,000 and $250,000 a year. While this increase was virtually forced by the state, the companies have voluntarily incurred large expenditures in new freight stations, docks, sidings, heavier locomotives and finer passenger cars, as well as in the building of several splendid passenger stations. An involuntary addition to expenses has also been due to the increasing cost of materials, the price of coal alone having increased $1.25 per ton in twenty years.

5. If the government desires, it may take over the companies upon twelve months' notice at any time up to 1915, by paying an agreed price. On the other hand, if the railways become so unremunerative that for two years in succession they can pay dividends of no more than 3½ per cent., the companies can force the state to take them over upon an agreed valuation.

The companies paid only 3½ per cent. in 1907, and the results for 1908 were almost equally bad. The companies may soon be in a position, therefore, to compel the state to take them over. The government of Holland, however, is extremely reluctant to take this responsibility upon itself. Apart from the financial considerations involved, the government does not welcome the idea of having to deal with 30,000 railway men as state employes.

The Royal Commission, which has been appointed accordingly, is to deal with the question of the entire railway policy of Holland, advising particularly as to how far it is desirable that the state policy should be revised, with a view, first, to improving the financial position of the companies, and, secondly, of rendering unnecessary a resort to complete government ownership.

In a review of the railway situation in Holland, Edwin A. Pratt, the English economist, writing in the London *Times* of March 19, says:

"In well-informed circles in Holland, it is asserted that leading members of the government are prepared to admit that state control over the railways and the enforcement upon them of mutual competition have been carried too far. It is also believed that the appointment of the Royal Commission is favored both as an excuse for reconsidering past policy and as a possible means of avoiding revolutionary changes in ownership, by allowing the companies an opportunity alike to effect their desired economies and to operate, in future, more in accordance with economic laws and ordinary commercial principles."

On the 26th of September last on the Berlin Elevated Railroad, an accident occurred, resulting in the fall of a car from the structure and the killing of 18 and wounding of as many persons. The "conductor" was prosecuted in a criminal court, and the court held, that the accident was due to his negligence

in over-running a signal; and sentenced him to 18 months' imprisonment. Among the victims of this accident was a daughter of Dr. Alfred von der Leyen a high official in the railway ministry, and known here by his work on American railways.

THE CHAMONIX-MARTIGNY ELECTRIC RAILWAY.

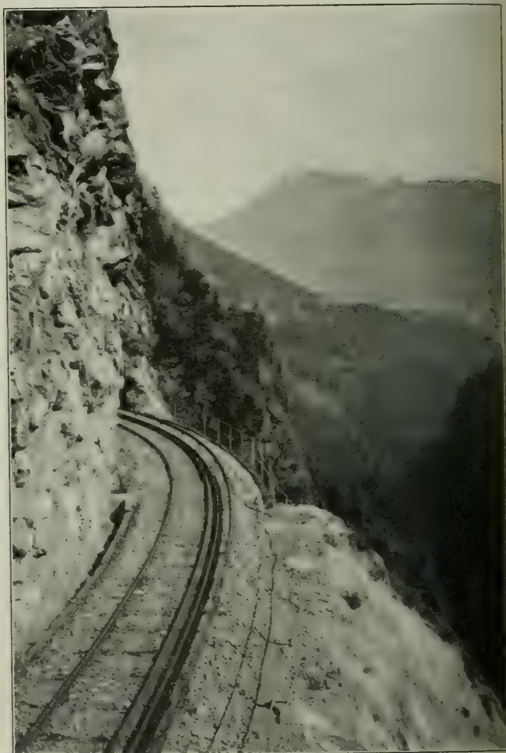
BY C. VAN LANGENDONCK.

The Chamonix-Martigny-Chatelard Electric Railway enables a tourist to make a three-hour trip through the Alps from France into Switzerland. Former routes required about nine hours to make this same trip. The line is narrow gage. Continuous current at 600 volts is fed to an elevated third rail from power stations along the route. The current conductors are carried on poles spaced nearer together than usual on account of the weight of the wires. That part of the line which is in Switzerland is provided with a rack and third rail electric power is used through France.

The first section of the line from Chamonix to Argentiere is five miles long and has intermediate stations at La Praz and Les Tines at the foot of the Mer de Glace. The mountainous character of the line begins about three and a half miles west of the latter place. Argentiere is a fair sized village and the huge glacier of the same name descends into the valley of the Arve between the Aiguille Verte and Aiguille du Chardornet. The line between this point and the Franco-Swiss frontier is five miles long, the route mainly following that of the new Tete Noire. After leaving the station at Argentiere, the line passes near the glacier then ascends the gentle slope of a cold morain and then curves eastward towards the col de Balme. Opposite the village of Frasserands, the line doubles back to the west, and after crossing the Arve river for the last time over a masonry viaduct, enters a tunnel under the col des Montets about three-quarters of a mile long. Owing to the

Train at Martigny Station.

hardness of the rock, the piercing of this tunnel proved to be a difficult undertaking. On leaving the tunnel the line enters the valley of the Eau Noire and continues over a fairly level country until it arrives at the scattered village of Vallorcine, where an international station is located. Vallorcine is shut in on all sides by mountain peaks and here the tourist has a last view of the summit of Mt. Blanc. From Vallorcine to Chatelard, the line runs close to the river and the valley grows steadily wilder, deeper and narrower, and the line crosses the stream near the junction of the Eau Noire and Barbernie rivers. Beyond this point, the line runs through a narrow valley and for a distance of about one and one-quarter miles it runs on a rock-fill which terminates in a tunnel 334 ft. long, through a rocky spur. A short distance beyond the tunnel the railway crosses the wagon road and the river over a steel bridge and connects, with the Swiss end of the line from Martigny, at Chatelard, on the boundary line between France



Section of Chamonix-Martigny Line on Side of Mt. Lachat.

and Switzerland. There are several switchbacks between Argentiere and Chatelard. The respective altitudes above sea level of these two places are 3,963 ft. and 3,484 ft., the fall of nearly 300 ft. being towards the north. At Chatelard, the two wagon roads to the Rhone valley separate; one going southeast, crossing Tete Noire to Martigny, and the other almost due north to Vernäyaz, via Finhaut and Salvan. The railway keeps fairly close to the latter road. This road, which is very narrow and practicable only for light vehicles, is much more picturesque than the other one. After leaving Chatelard, the railway borders the base of the mountain, running through dense pine forests and over rough and rocky open ground. Along this section, the grade becomes greater, and after threading three short tunnels and passing over one large viaduct, the station of Finhaut, which is the summit of the line, 4,060 ft. above sea level, is reached. Finhaut is beautifully situated and commands a superb view of the Trient glacier and is a very popular resort of English and American tourists. Beyond Finhaut, the line approaches, in some cases very closely, the remarkable series of chasms known as the Gorges du Trient. These form a ravine seven and one-half miles long through which the Trient glacier passes. After passing through three more short tunnels, two of which are built

for protection against avalanches, the hamlet of Triquent is passed. A short distance beyond Triquent, the line crosses an enormous fissure called the Gorges du Triège, through which a torrent from the Trient glacier runs. The railway is carried over this fissure on a single span masonry bridge, 114 ft. long. The level of the track is 196 ft. above the river. Continuing past the village of Les Marécottes, the line describes a sharp curve and then descends 3,035 ft. to the little town of Salvan. This place is a favorite summer resort. From Salvan to Vernäyaz, the line descends 1,500 ft. in two miles where a rack rail is used. The line makes a spiral curve, the upper portion of which is hollowed out of the walled rock overhanging the valley. The railway reaches the Rhone valley near the entrance of the celebrated Gorges du Trient, where the rocks 420 ft. high approach each other so closely that the view at the mouth of the ravine resembles a cavern. From Vernäyaz, about 1 535 ft. above the sea, the line runs parallel for four miles with the Jura Simplon Railway to Martigny, its termination. The distance between Chatelard

Sainte Marie Bridge; Chamonix-Martigny Electric Railway.

and Martigny is 11.9 miles, the total length of the line from Chamonix being 22 miles. The maximum grade on those sections of the line using a rack is about 20 per cent., while it is about 7 per cent. where the third rail is used. Electric power for the line between Chamonix and Chatelard is generated at Servoz by three 20,000-h.p. dynamos driven by water turbines, using power from the River Arve. The river is diverted into a tunnel in the side of the hill near Port St. Marie, and this tunnel divides into three immense tubes near Servoz. The generating station for the Swiss line is situated near Salvan, the power being gotten from the Salanfe falls of the Cascade du Dalley. Both electric locomotives and auto-cars are used over this line. The locomotives weigh about 20 tons and the auto-cars about 35 tons. The latter are 55 ft. long and designed to accommodate 100 passengers. The trip from Martigny to Chatelard takes one hour and fifty-five minutes and between Chamonix and Argentiere about thirty minutes.

THE RAILWAY, THE MAN, AND THE ACCIDENT.*

BY J. O. FAGAN.

We find ourselves face to face with a very peculiar situation. On the railway we have good men,, good managers and unsatisfactory results. * * * You cannot localize accidents; it makes no difference, according to our statistics, whether the man who disobeys the rule is a greenhorn or a veteran, on duty for six hours or sixteen; whether he happens to be running fast or slow, crawling through the yards as a switcher or across the prairie as a flyer, we have illustrations to suit every condition and circumstance.

Naturally this state of affairs calls into being a great number of specialists who go to work and diagnose the symptoms. Nostrums by the score are volleyed at every tissue of the railway man's anatomy that is open to moral, medicinal or surgical treatment. In all the history of man's sojourn on this planet, it is doubtful if any section of our fellow creatures has ever before been subjected to such comprehensive and analytical scrutiny. Examine his eyes, his ears, his diet, his liver, his alcholic affinity, his domestic troubles, his mentality and psychological subdivisions, his capacity for prolonged attention under the circumstances, not to mention the discipline he is subjected to and all the different theories and methods of management. I must not be misunderstood—there is more or less importance to be attached to every one of these considerations. They are all spokes of a wheel with the man himself and his complete personality as the hub and heart of it all. I recognize the fact that external authority, that is, the absolute dictum of a railway manager has its places and uses. Nevertheless, it is manifest to me that in the nature and increasing complication of a railway man's duties, for the most part beyond the reach of supervision, this external authority is daily becoming less comprehensive and adequate as an absolute and sufficient means of securing efficiency of service. Both the external authority of the manager and the external relief and assistance of the railway man's well wishers in their humane and scientific efforts to find out what's the matter with him, are sadly handicapped and at times altogether inoperative from lack of co-operation along internal lines of the railway man himself.

With all sincerity then, I wish to call your attention to the fact that the whole field of physical, moral and psychological inquiry as to why that signal is unobserved and that rule is disobeyed, calls for a preliminary investigation that cannot be evaded. In a word, we must first connect the railway man with these preventable accidents *in his own mind*.

For the past ten years, every signal that has been erected, almost every piece of legislation, almost every article that has been written on the subject have had the effect of minimizing the employee's responsibility and taking away his moral attention. I am not criticizing this state of affairs—to the best of my ability I am describing conditions. I think the spirit of laws, safety devices, schedules and newspaper articles, in the main has had the tendency to ease up on the personality of the employees and to favor the idea that if possible, the impersonal management should be called upon to shoulder the lion's share of the blame. Let us look still deeper into this matter.

For the year 1907, and for many years previous we have certain statistics relating to preventable accidents. As a matter

*From a paper read before the American Anti-Accident Association.

of fact, we are not immediately concerned with the proportion of the fatalities and expense that can be definitely laid at the door of the employee. Indeed, if we could be convinced, and I think we can, that the employee is actually doing his best, according to his light and education, the fact would be comparatively insignificant. What we desire to bring out is that the trainmen and enginemen are actually and soulfully impressed with the deplorable loss of life and suffering and that they publicly and privately make known their desire and make manifest their intention, if possible, to improve the records. We desire this public spirit of the employee made so unmistakable that it will become the strongest factor conceivable in the good work of decreasing the number of those who disobey rules and disregard signals. I, for one, ask nothing more and nothing less.

But up to date the railway man has not given to you or the public any intimation that he is in need of immediate treatment. The statistics that appal you have not yet aroused him, as a class, to definite action that you can place your finger on and say, here is a public declaration, here is a private circular from a labor leader, or here is an account of a grand convention of railway men. So far as I am aware we feel no special call for consultation or agitation of any kind. We seem to think that all matters relating to preventable accidents can properly be left to take care of themselves without our personal assistance, or that of our organization. That is to say, the signal and the rule have not been brought under the influence of the employee's attention from the highest and most effective point of view.

I may be mistaken, but it does seem to me that the American people are going to look more and more every year to the individual employee instead of to the railway companies, in placing the blame for disastrous wrecks. There are many men who are conversant with the numerical strength of railway brotherhoods who are saying to themselves and to others, "You brotherhood men, with your vast aggregations of organized members, covering territory stretching from the Bay of Fundy to the Golden Gate and from Alaska to Panama, what are you doing? What have you done in the past to prevent accidents or to assure us that the safety of the loved ones we entrust to you has had and will have the vigilant care and attention that the unity of brotherhoods can give, if it will?"

We railway brotherhood men owe the people the payment of the moral obligation of doing everything in our power to lessen the dangers incident to travel, and I would suggest as one way to assist in achieving better results that brotherhood men request their representatives to take up before the executive meetings of their organizations the desirability of embodying in the procedure of business of the subordinate lodges an allotment of time for a discussion on the question of safety. By this means members would grow to realize that their organizations, in addition to trying to promote their welfare, would assist in using all means in their power to safeguard their lives and limbs.

The "abuse" of the power of the railway brotherhoods in their relation to safety, or rather their interference with the disciplinary measures of railway managements, has a very direct bearing on the question of the safe and expeditious handling of traffic. This abuse owes its origin to a deep sympathy for a brotherhood man in trouble; also to an inconsistent view as to what constitutes justice between officials and employees, and last, but not least, to the feeling among brotherhood men that it is their duty as such to secure a reversal of the decision given a brother, even though there be but the remotest possibility of securing it on account of the knowledge they may have that the original sentence was a just one.

The result is that certain classes of employees are careless in their observance of the rules and regulations, in accordance with the attitude of their organization in fighting for disciplined members, and this necessarily touches cogently upon safety. Officers are well aware, and brotherhood men well know, that these conditions exist, and that they vary, too, according to the conservative methods employed by the different organizations—but we all know that they do exist to a greater or lesser extent in all of them. And yet brotherhood men, through a mistaken sense of loyalty or fealty to their order, refuse to admit, except to other members, that such things are done. I believe that it is a very serious abuse of power and one that does not advance the interests of organized labor on railways, and which also has the grave tendency of blocking the proper enforcement of disciplinary measures, which, after all is said and done, means a certain measure of protection for these self same brotherhood men.

Most of us look with astonishment and envy at the accident records of European railways. From various quarters come statistics and information in regard to peculiarities in roadbed, to density of traffic and to the general conditions under which trains are moved, from all which we are called upon to bunch together and frame our excuses for accidents as best we can. It is all to no purpose. If people will only take the the trouble to study the actual accidents and the way they take place, they will quickly discover that very few accidents are common to both American and European railways. The American accident is a characteristic of personal behavior which, as an actual fact, has no counterpart in any other country. The compass and trend of American progress points to these accidents as the natural outcome of individual freedom of thought and action running riot. This is no ill considered statement. For a number of years there has been a wild scramble in almost every line of industrial behavior to kick over the traces. In many directions the results have been surprisingly beneficial, but on the railways it has been a dangerous experiment. "Taking chances" is distinctly an American characteristic. You will search in vain on European railways for accidents of a similar nature. The European railway man is too stolid, too stupid, if you prefer the term, at any rate, he is too methodical to get caught in that way. He has been too long accustomed to the rut of obedience. And I think it is an easy matter to demonstrate that the difference between American and European records is to be found in these accidents that are distressingly typical of the American temperament. It is then, the personal equation that is responsible for the avoidable accident, consequently you must look to the personal equation for your remedy. On the railway to-day, the Kicker is King. We kick against discipline, we kick against merit and ability as factors in promotion, we kick against what is, what is not and what is likely to be. Meanwhile the manager is in a whirl, dodging the sparks.

But there is one feature of our occupation and duties that has escaped our attention. We don't kick against the accident record!

The railway toll alone for twenty years has been more than 1,000,000 American fathers, wives and children. What are we, the railway men, going to do about it? First and foremost it is our problem. Far be it from me to criticize the American railway man so far as his intentions and honesty of purpose are concerned, but we must agree that certain deplorable accidents have happened and are happening only too frequently. A certain minority of railway men are accountable in some way or other for the fatalities that have occurred. Now the only power in the United States to-day that is able peacefully, radically and permanently to reach and influence this minority responsible for these preventible accidents is the railway man's labor organization. To saddle the management with the problem of anything but the arithmetic of railroading is, under present conditions, out of the question. The center of influence upon the personality of the men has passed into the hands of the union. Now let them go to work and use this influence in the public interest.

General News Section.

The Cleveland, Cincinnati, Chicago & St. Louis is preparing to introduce telephones for train despatching on its line between Cincinnati and Indianapolis.

The preparations for using electric locomotives through the Cascade tunnel of the Great Northern are now so far advanced that it is expected to begin electric operation May 20.

The Interborough Rapid Transit ran a test train of side-door cars of its own design in the subway, New York, on April 20. The doors are in the centers of the cars. Cars with side doors near each end, designed by Bion J. Arnold, were recently tried.

A press despatch from the City of Mexico says that the Wells-Fargo Express Co., instead of having a monopoly of the express business on the National Lines of Mexico, will become a minority stockholder in a new company which is to be organized, the Mexican government holding the majority of the stock. Wells-Fargo officers will manage the new company.

The State Railroad Commission of Indiana has recommended to all the steam and electric railways of the state that bulletins be put up at suitable points, warning trespassers to keep off the tracks and property of the railway. The roads are also advised to secure the co-operation of prosecuting attorneys, with a view to punishing all violations of the statutes forbidding trespassing on railways.

Several railways in Nebraska have notified the State Railroad Commission that they will discontinue the use of public drinking cups on trains. The Nebraska state board of health held that the drinking cup on trains was a menace to the public health, and the State Railroad Commission indicated that unless the roads voluntarily abolished it the Commission would issue an order requiring it.

The railway men in Seattle have pledged $10,000 for the celebration of Railway Men's Day at the Alaska-Yukon-Pacific Exposition at Seattle. A parade will be given which will be headed by such primitive means of transportation as camels, elephants and dogs, and will include an ox team and a stage coach, followed by a construction gang building a railway, and finally by a huge papier mache standard railway train.

The Pueblo Joint Inspection Association has been enlarged so that hereafter the Chief Joint Inspector and his assistant inspectors will not only inspect cars under the M. C. B. rules but will also make interchange reports to the transportation departments of the various roads. The inspectors will be paid $5 a month more than in the past, and the yard clerks who have been engaged in reporting cars interchanged will be transferred to other work.

Reports filed with the Texas state tax board show that in 1907 there were operating in that state 68 railways with a mileage of 12,053 miles, and that they paid in state, county, municipal, school district, franchise and other taxes, an aggregate of $2,707,700, or an average of $225 per mile; and that in 1908 seventy-one railways operating in the state with a total mileage of 12,968 miles, paid in state, county, municipal, school district, franchise and other taxes, an aggregate of $2,524,811, or an average of $195 per mile.

The State Railroad Commission of Indiana has issued to the railways of the state a circular calling attention to the use of inadequate and objectionable signal lamps and switch lamps, complaint having been made to the commission to this effect. The companies are called upon to detect promptly and correct failures of lamps; also to see if there are any white lights in or around the stations which interfere with enginemen's views of the signal lights. Attention is called also to the necessity of having switchstands, when situated near together, made of different heights, so as to avoid confusion at night.

The Missouri Southern Railroad will inaugurate train service on its extension from Reynolds, Mo., to Bunker on May 2. This extension opens a territory rich in timber and mineral resources and with great agricultural possibilities. A modern sawmill and woodworking plant with a capacity of 100,000 ft. of lumber daily has just been finished at Bunker, Mo., the western terminus of the extension, and the total capacity of the mills now operating on the Missouri Southern is 650,000 ft. of forest products daily. More mills are being located. The extension from Reynolds to Bunker is 10 miles long, making the entire length of the road 54 miles.

The Wabash, the Cleveland, Cincinnati, Chicago & St. Louis, the New York, Chicago & St. Louis, the Illinois Central, the Indianapolis Union Railway and other roads in Indiana are seeking to get the state board of tax commissioners to reduce the assessments of their properties below what they were made last year. Joseph Moses, who appeared for the Big Four, stated that on the night of April 19 its car accountant reported that 5,103 cars were standing idle on the sidings of that road. F. B. Carpenter, who appeared for the Nickel Plate, stated that on March 31 it had 3,600 idle cars. Similar facts were presented on behalf of other roads, and it was contended that owing to the fact that they were handling so much less business than in previous years they should not be taxed as heavily.

The New York Legislature has passed the Travis-Lee resolution providing for a constitutional amendment eliminating self-sustaining subway and dock bonds of first class cities and water bonds of third class cities from the computation of the debt limit. This constitutional amendment, which has now been approved by the Legislature for two successive years, will come before the people of the state for a vote next fall, and if adopted will permit New York City to expend a large sum for new subways; such expenditures being at present impossible because by limitation in the state constitution the city has already borrowed nearly all the money that it can. Should the constitutional amendment be adopted the amount of dock bonds which would be eliminated from the sum total of the city's debt, as stated in making computations in connection with the debt-limit, would be $95,870,000 and of rapid transit bonds $54,863,325, making a total of $150,733,325.

Interborough's Traffic.

In connection with the wide publicity New York City's transit needs are obtaining these days through advertisements in New York papers a statement of the number of passengers being carried by the Interborough is of pertinent interest.

In the month of March last the Interborough carried a total of 43,994,740 passengers, which is 4,133,161 more than it had in March, 1908. Travel was divided as below:

	March 1909.	March 1908.	Increase
Elevated lines	24,073,561	23,335,694	737,867
Subway	19,921,179	16,525,885	3,395,294
Total	43,995,740	39,861,579	4,133,161

It will be seen that while the elevated lines are still carrying more than half of the daily passengers on the system, the increasing popularity of the subway is causing that branch to overhaul the elevated. Where a year ago 59 per cent. of the travel was over the latter named lines, and 41 per cent. in the subway, the figures in March were 54 per cent. and 46 per cent. respectively. On a daily average, Sundays included, the elevated carried about 777,000 passengers in March of this year to 643,000 carried by the subway. The number carried Sundays is but little more than half the week day average.

April 12, 1909, was the biggest day in the subway's history, when in connection with the crowds which attended the Petrosino funeral there were carried 893,000 passengers in that single day.—*Wall Street Journal.*

Austrian Roads.

Austria has completed an electrical survey of the streams of the Alps with a view to their utilization for railway motive power and for general industry.

Steel Corporation Earnings.

The statement of earnings of the United States Steel Corporation and subsidiary companies for the quarter ending March 31, 1909, is as follows:

January, 1909		$7,262,605	
February, 1909		7,669,336	
March, 1909		7,989,327	
Total earnings after deducting all expenses incident to operation.*			$22,921,268
Less, charges and appropriations for:			
Sinking funds on bonds of subsidiary companies		$272,533	
Depreciation and reserve funds		3,463,666	
			3,736,199
Net earnings			$19,185,069
Interest for quarter on U. S. Steel Corporation bonds outstanding		$5,939,208	
Sinking funds for the quarter on U. S. Steel Corporation bonds, viz.:			
Installments	$1,012,500		
Interest, bonds in sinking funds	360,255		
		$1,372,755	
			7,311,963
Balance			$11,873,106
Dividends for quarter, stocks U. S. Steel Corporation, viz.:			
Preferred, 1¾ per cent.		$6,304,919	
Common, ½ per cent		2,541,513	
			8,846,432
Surplus for the quarter			$3,026,674

*Including those for ordinary repairs and maintenance of plants and interest on bonds and fixed charges of the subsidiary companies.

In the preceding quarter the total earnings were $26,225,485 and the surplus was $5,142,451. The unfilled orders on hand on March 31, 1909, amounted to 3,542,595 tons, which compares with 3,603,527 tons on December 31, 1908, and 3,765,743 tons on March 31, 1908.

Burlington Association of Operating Officers.

The forty-first meeting of the Burlington Association of Operating Officers was held at the Auditorium Hotel, Chicago, on April 20, 21 and 22. On the evening of April 21 a dinner was given, at which Daniel Willard, Second Vice-President, was toastmaster. The speakers and their subjects were: "Passenger Service," John Francis, General Passenger Agent; "Claims," C. I. Sturgis, General Auditor; "Co-operation," A. D. Parker, Vice-President of the Colorado & Southern. O. M. Spencer, General Solicitor of the Missouri district of the Burlington, closed the speaking with reminiscences of the early building of the Burlington. James J. Hill was to have been the guest of honor but was unable to attend.

Oppose Further Railway Legislation in Illinois.

A large delegation, composed of representatives of the manufacturers of railway supplies having plants in Illinois, appeared at Springfield on April 29, before the various committees of the Illinois legislature to which railway bills have been referred, to oppose any further railway legislation at the present session of that body. The delegation was headed by George A. Post, President of the Railway Business Association, and A. H. Mulliken, one of the Vice-Presidents of the association. Mr. Mulliken made a short address introducing Mr. Post, who made the principal argument.

A special train was run from Chicago to Springfield Wednesday night and from Springfield to Chicago on Thursday night as a second section of the Chicago & Alton's Midnight Flyer, carrying the members of the association who went to Springfield from Chicago. A large number of supply manufacturers from East St. Louis and other points in the state joined the party from Chicago at Springfield.

Pants Pressed for Plebeians.

The New York Central announces that henceforth there will be "valets" not only on the limited trains whose passengers are supposed to set a high value on their time—and their appearance as well—but also on trains Nos. 29 and 30, the Buffalo Special, running nightly between New York and Buffalo.

Thus what were but yesterday luxuries for the rich are rapidly becoming the necessities of ordinary people, and, by a very slight stretch of the imagination, one can see all the legislature's next year members presenting "full-crew law bills," applying to all trains, suburban, branch line, mixed trains, and everything, requiring every train crew to consist of

Conductor.	Porters.
Engineman.	Barber.
Monitor.	Valet.
Brakemen (in number according to the feelings of "labor" at the time).	Maid.
	Manicure.
	Stenographer.
Flagman.	Typewriting operator.
Fireman.	Dining car conductor.
Assistant fireman.	Custodian of the wine cellar.
Baggagemaster.	Cook.
Electrician	Assistant cook.
Parlor car conductor.	Dish washers.
Sleeping car conductor.	Waiters.

South Manchurian Railway.

According to a consular report, the South Manchurian Railway, which last year could bring down only about 2,000 tons a day to Newchwang and Dalny, can now deliver daily at the two ports 3,500 tons. Last year also there were repeated washouts during the summer, which completely interrupted traffic for weeks at a time. This year, though there was some trouble, no such obstruction was caused. There is now arriving at Dalny by train an average of 3,000 tons of freight every day, as compared with about 1,500 last year.

Antung-Mukden Railway.

The reconstruction of the Antung-Mukden Railway is to be started in earnest early this spring. Permanent survey work was begun in January from the Antung end of line and three of the most important tunnels have already been located and all preliminary drafting completed. The route adopted by the engineers will not vary much from the present line, except that the terminus will be moved southward across the Hun river to Suchiatun, on the main line of the South Manchurian Railway, some 10 miles from Mukden. By thus changing the terminus from Mukden to Suchiatun the necessity for bridging the Hun river will be obviated and the line shortened a few miles. Suchiatun is already the junction of the branch line to the Fushun collieries, having the necessary yards and transshipping facilities. There will, therefore, be a considerable saving to the company by adopting Suchiatun as the terminus of the Antung line. It is said that the new route, i.e., from Antung to Suchiatun, will be 20 miles shorter than the present Antung-Mukden line. It is estimated by the Japanese that it will require three years to complete the work of reconstruction and that the average cost per mile will be about $50,000.

International Railway General Foremen's Association.

As previously announced in the *Railroad Age Gazette*, the annual meeting of the International Railway General Foremen's Association will be held at the Lexington Hotel, Chicago, June 1 to 5, inclusive. There will be two sessions daily, beginning at 9 a.m. and at 2 p.m. Topical discussions will be made the special order of business the last 45 minutes of the morning session each day. The meeting will adjourn at 2.30 p.m. on June 2 to give the members a chance to visit the railway appliances exhibit on the parlor rotunda floor of the Lexington Hotel.

Committees will report on the following subjects: "Air-Brake Equipment, All Classes of Service"; "Coaling of Engines with Mechanical Devices"; "How to Obtain the Greatest Despatch in Handling Engines Through Terminals"; "Installation of Hot Water Washout and Filling System"; "Best Method of Getting Work Through Shop with Economy and Despatch"; "Most Approved Type of Ash Pan Conforming with Requirements of Interstate Commerce Commission."

There will be the following topical discussions:

"Best Method of Arriving at Cost of Repairs," introduced by W. S. Cozad (Erie), followed by H. D. Kelly (C. & N. W.).

"What Class of Repairs Should be Made at Outside Points Where Facilities Are Limited," introduced by F. W. Rhuark (B. & O.), followed by S. B. Clay (St. L. & S. F.).

"The Use of Commercial Gas for Heating Purposes in Modern Shop Plants in Place of Gasolene or Crude Oil," introduced by J. N. Davis (C. & S.), followed by T. L. Drew (B. & O.).

"The Use of Oxy-Acetylene Process for Welding Fireboxes, Boiler Sheets, Frames and Other Locomotive Work."

"What Advantage from the Use of the Wide Firebox? Should the Wide Firebox Have a Wide or Narrow Water Leg?" introduced by Lee R. Laizure (Erie), followed by P. F. Flavin, Vice-President, International Railway Boilermakers' Association.

"The Location of the Point of Water Delivery in the Boiler; Why Not at a Point Six to Eight Inches Above the Mud Ring Just in the Rear of the Throat Sheet?" introduced by H. W. Kidneigh (Santa Fe), followed by H. J. Carrier (Erie).

The headquarters and general arrangements for the convention will be in charge of the executive committee of the Railway Supply Men, which is composed of Frank Raymond Spear (Chairman), Frank Baskerfield, Charles P. Storrs, Clifford A. Nathan and J. Will Johnson, Secretary and Treasurer. James C. Younglove is Chairman of the committee on entertainment. The hotel rates will be as follows: Rooms without bath, $1 to $2 per day single; $2 to $3 per day double. Outside rooms with bath, $2 to $3 per day single; $3 to $4 per day double. Table d'hote luncheon, 50 cents.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York, May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.

American Railway Industrial Association.—R. E. Wilson, Ry. Exchange, Chicago; May 11; Cincinnati, Ohio.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug., and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June July, and Aug.; St. Louis.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R, East Buffalo, N. Y.; September, 1909; Denver.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

The Union Pacific and allied lines have made formal applications to the Interstate Commerce Commission at Washington for a suspension of the commission's order in the Spokane rate case. The order as issued was to take effect May 1.

It is reported that the Canadian Pacific Despatch has decided to raise westbound freight rates. This is interpreted as a move toward the establishment of peace with the trunk lines which have been combating the Canadian Pacific and the New Haven on the matter of their differential out of New York.

The Union Stock Yards at St. Paul during the first three months of the current year received 6,207 cars of live stock, compared with 7,229 cars last year, or a decrease of 1,002 cars. In March alone 2,161 cars arrived, against 2,419 cars in March, 1908. Three months of shipment give gains from 2,125 cars in 1908 to 2,378 cars this year.

The Delaware, Lackawanna & Western announced last week its intention to reduce by two cents per 100 lbs. the freight rates on sugar in carloads from New York City to western points. The Pennsylvania, the Philadelphia & Reading and the Baltimore & Ohio at once followed with announcements that they would make a similar reduction from Philadelphia, thus maintaining the differential in favor of that city. With these reductions, the rate to Chicago will be from New York 26 and from Philadelphia 24 cents.

Wells, Fargo & Co. announce that on May 1 they will extend their express service over about 10.000 additional miles of railway line and will open about 1,200 more offices. They will then operate over 70,000 miles of railway. The roads on which this company's service will be installed on May 1 include all lines of the St. Louis & San Francisco, all lines of the Chicago, Milwaukee & St. Paul, and the following new electric lines: The Chicago, Lake Shore & South Bend, the Rock Island Southern, the People's Traction Company and the Tama & Toledo. Wells, Fargo & Co. also established their service on the Chicago, Peoria & St. Louis on April 1.

The two Utah members of the United States Senate have presented to President Taft a petition for redress against the Union Pacific and also, in a lesser degree, against the Denver & Rio Grande and other roads, in the matter of freight rates to and from Ogden, Salt Lake and Provo, which it is declared are grossly discriminative and oppressive. It is alleged that the roads have unlawfully conspired together to exact much higher charges from the East than from the East to California, and that similar discrimination is in vogue in rates to and from other points. By unlawful conspiracy the roads have steadily increased the rates on freight, and have made oppressive regulations.

Both the railways and the coal operators in Missouri are filing protests with the State Railroad Commission against the mileage rates on coal which it proposes to put into effect on May 1. It is contended that the proposed rates would enable coal producers in Illinois to ship coal to points in Missouri for less than it could be hauled to those points from Missouri mines. The Commission about a year ago proposed to apply a mileage tariff on coal, but then also the railways and the coal operators united in opposing the enforcement of the order and it was withdrawn. The Commission has postponed until May 15 the date on which the proposed rates shall be put into effect.

Testimony was taken by a Special Master in Chicago last week in the case brought in the Federal court at St. Paul by the transcontinental lines to restrain the Interstate Commerce Commission from enforcing its order requiring the railways to reduce the rates on lumber from the Northwest which they put into effect on November 1, 1907. J. A. Munroe, Freight Traffic Manager of the Union Pacific, said that the increase in 1907 was made because of increases in the cost of transportation. It was believed that higher rates would not hinder the movement of lumber and that this commodity should contribute in larger proportion to paying the expenses of operation. He admitted the advances were made after conferences between the traffic officers of the interested lines.

He thought that the rates had long been too low in proportion to what was charged on other traffic. Asked if he believed that the railways should share in the increased profits received by lumbermen owing to the advances in the price of lumber, Mr. Munroe replied that he believed the roads were entitled to share in the increased prosperity of the country. He did not think it was fair that when lumber prices were constantly going up the railways should be held rigidly to the old rates. If lumber prices were going down he thought that the railways should correspondingly reduce their rates. J. G. Woodworth, Traffic Manager of the Northern Pacific, gave testimony similar to that of Mr. Munroe. He reviewed the history of lumber rates in the Northwest, and contended that they had been too low in proportion to the rates on other traffic. He conceded that the gross earnings, traffic density and ton-mile revenue of the Northern Pacific had increased largely during the past ten years, and that it has been getting a fair return on its investment, but contended that, nevertheless, it has not been getting a fair return from its lumber traffic.

On Saturday last the Cincinnati, New Orleans & Texas Pacific entertained the members of the National Association of Freight and Traffic Agents on an excursion from Cincinnati to Chattanooga, showing them the scenery and industries at the different points along the line of the road, and giving the party excursions from Chattanooga to Lookout mountain and Chicamauga park. About 150 guests enjoyed the excursion. The party consisted mostly of city, local and traveling agents and their wives, sons and daughters. The members of this association are mostly northern men, and the Queen & Crescent gave the entertainment with a view to making them more familiar with the business world of the South, where new industries are constantly springing up.

INTERSTATE COMMERCE COMMISSION.

Commissioner Prouty on April 21 at Chicago directed the express companies doing business in the Middle West to comply with the petition of the Fairmount Creamery Co. and other large creamery concerns for reductions in the rates on creamery products. The Commission in its decision in the case of Beatrice Creamery Co. et al. v. Illinois Central et al. and other proceedings brought by the so-called creamery trust to restrain the railways from collecting advances that they had made in rates to Chicago and other concentrating points, held that the advances made by the railways were unreasonable and fixed certain schedules of rates to be charged. Mr. Prouty suggested that the express companies put into effect through rates over connecting roads similar to those the Commission had ordered the railways to make. He indicated that unless the express companies acted upon this suggestion the Commission would issue a formal order in the case.

Loading Charges and Carload Rates.

John N. Voorhees v. Atlantic Coast Line et al. Opinion by Commissioner Clements.

Complainant shipped 6 carloads of cabbages from St. Andrews, S. C., to New York, N. Y., for the transportation of which defendants charged their less than carload rate, because the initial carrier performed the loading service. These shipments having been offered in carload quantities were entitled to the published carload rate, and in the absence of specific tariff provision no additional charge could be lawfully collected from complainant to cover loading service performed by the railway company. Reparation awarded.

Routing by the Shipper.

Duluth Log Company v. Minnesota & International et al. Opinion by Commissioner Lane.

Complainant alleges that its shipment of poles over lines of defendants from La Porte, Minn., to Poplar Bluff, Mo., should not have moved through Kansas City, but it appeared that a representative of complainant directed that it be carried by the Frisco line, which necessitated its going through Kansas City. It was the duty of the initial carrier to obey the specific routing instructions furnished by complainant. When a shipper names the carriers that are to transport his shipment, it must be assumed that he is relying on his own investigations, and that for some reason he considers it expedient that the shipment move over the route indicated by him.

However, the record shows that while defendants transported the shipment over the lines named by complainant, they did not route or carry it via the cheapest reasonable route available over the lines of the carriers specified in the shipping bill. If the shipment had moved from Kansas City to Poplar Bluff through Springfield, Mo., rather than through St. Louis a lower rate than the one collected would have been available. It is therefore held that complainant was entitled to the lowest rate available via the Frisco Line and that damages should be awarded against the defendant for such misrouting.

Published Rate Not Necessarily Legal.

Arkansas Fuel Company v. Chicago, Milwaukee & St. Paul. Opinion by Commissioner Harlan.

The act to regulate commerce as amended not only gives a remedy against excessive and unreasonable rates as applied to shipments to be made in the future, but also affords the shipper a means of recovering excessive charges on shipments made by him in the past under rates that were unjust and unreasonable. In dealing with shippers the carrier is required to conform the freight charges actually collected to the amount fixed in its published tariffs, and in that sense the published rate in effect at the time of the movement is the legal rate; but the law declares that every charge for services rendered by a carrier in the transportation of passengers or property shall be reasonable and just, and if a carrier promulgates a rate in violation of this injunction it is not a lawful rate when its reasonableness is subsequently questioned upon complaint filed. While the published rate is the legal rate, the mere publication cannot make a rate lawful that is unreasonable and excessive. No rate can be lawful, in the sense of being immune from attack, either with respect to past or future shipments, if it be excessive and unreasonable in amount.

Complainant shipped from Kansas City, Mo., to Seymour, Iowa, via defendant's road, a carload of hay on which it was compelled to pay a class rate of 13½ cents per 100 lbs. This was 1 cent higher than a proportional commodity rate which had been in effect between the points in question until a short time prior to the date of the shipment and was restored within about 60 days thereafter by an amendment to defendant's tariffs. Under the admission of the defendant, and on the Commission's knowledge of hay rates in the same territory, the class rate was excessive and unreasonable, and should not have exceeded the commodity rate. Reparation awarded on that basis.

Track Storage Charges at Pittsburgh.

Wilson Produce Co. et al. v. the Pennsylvania. F. Wilbert Bros. et al. v. same. H. W. Joynes v. same. Opinion by Commissioner Lane.

Defendant's track-storage tariff, applying to carload shipments of fruit and produce received at the Pennsylvania lines produce yards at Pittsburgh, Pa., provides that after the expiration of 48 hours' free time, track-storage charges will be assessed as follows: For the first two days, $1 per car per day or fraction thereof; for the next succeeding two days, $3 per car per day or fraction thereof, and for each succeeding day $4 per car per day or fraction thereof. On rehearing of complaint challenging legality of these charges, it is held that the law does not require a carrier to give its cars and tracks under any terms for use as warehouses or places of business.

After allowing a reasonable time for unloading cars, a carrier may impose such charges for further detention as will lead to the speedy release of its equipment. A carrier has a right to impose such charges at its produce terminal as will render that terminal available for the purpose for which it was intended. The imposition of higher track-storage charges at the Pennsylvania lines produce yards in Pittsburgh than at other points does not constitute undue discrimination in view of the substantial dissimilarity of conditions. Complaint dismissed.

Discrimination Against Indianapolis.

Indianapolis Freight Bureau v. Cleveland, Cincinnati, Chicago & St. Louis et al. Opinion by Commissioner Clark.

Complainant alleges the exaction by defendants of unjust and unreasonable class rates from Indianapolis, Ind., to Missouri river points in and of themselves and as compared with rates on similar traffic from Chicago; also challenges defendants' rates on chairs and furniture from Indianapolis to Missouri river points. The present class rates on through traffic from Indianapolis to Missouri river points are unreasonable and subject Indianapolis to unreasonable prejudice and give to Chicago undue preference. A relative adjustment as between Indianapolis and Chicago is prescribed; also reasonable maximum rates to be applied in the future to the transportation of class-rate traffic and chairs and furniture from Indianapolis to Missouri river points. Order relative to class rates and relative adjustment thereof withheld pending court decision on *Burnham, Hanna, Munger case*, 14 I. C. C. Rep., 209.

While it may not be doubted that competitive conditions are responsible for the present rates applying from Chicago, yet, giving full weight to such considerations, it is the province of the Commission to determine whether the disparities between the total charges from Chicago and Indianapolis, respectively, are greater than are justified by the recognized dissimilarity of conditions.

Whatever may be the general effect of an order changing the rate structure for a typical point in a group, the Commission cannot, under the law, deny relief to such point for the sole reason that other points in like situation may be able to show that they are entitled to a similar order. Any order which the Commission may have authority to enter must be predicated on the complaint which is before it, after examination into the facts, circumstances, and conditions appertaining thereto, and such order is limited in its scope by the petition filed in the particular case to which it is addressed. If other points in the same territory are properly entitled to relief by order of the Commission, proceedings specifically directed to that end must be prosecuted in the manner prescribed by law to vest the Commission with authority. Whether or not such other points are entitled to similar relief depends upon the facts, circumstances, and conditions appearing upon investigation, and those questions cannot be determined in this case.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has rescinded the reciprocal demurrage rule which it made in an order issued on March 19, 1907, because it has found that it has not power to enforce it.

The Montana Railroad Commission has held that the rates on hay and straw in that state are excessive where the distances are more than 45 miles, and has fixed a new maximum distance tariff ranging from 3 cents to 34 cents per 100 lbs. for distances from 10 to 690 miles.

The Colorado Railroad Commission has ordered the Colorado & Southern to reduce its rate on coal from Denver to Central City from $3.20 a ton to $1.75 a ton. The order was made as a result of a petition filed by the Jenkins-McKay Hardware Company, which alleged that a rate of $3.20 a ton, the distance being 38 miles, was excessive. The road did not oppose the reduction.

The Railroad Commission of Louisiana has issued a new rule governing the receiving and delivering of baggage at stations in Louisiana where there are agents. This requires railways to deliver baggage during the hours in which agents are on duty except during 30 minutes before the arrival of trains. When trains arrive at night baggage must be delivered immediately after their arrival and for 15 minutes thereafter. Baggage to be forwarded must be received at any hour during the day that passengers are taking trains when the agent is on duty. When trains leave before 8 a.m. baggage to be forwarded must be received on the afternoon of the day previous.

The New York Public Service Commission, First district, has issued orders to all the street railways in New York to equip all their cars, except those operated by animal power, with wheel guards or fenders of a type to be approved by the commission. In every case drawings and specifications for the equipment are to be submitted to the commission for approval. In the year ended December 31, 1908, the total number of injuries on the lines under consideration was 35,050, which included 2,137 seriously injured and 434 killed outright. It is calculated that it will cost between $200,000 and $250,000 to equip the 6,000 cars in use in the five boroughs. The total cost of law suits and legal expenses arising from injuries has been $3,500,000.

COURT NEWS.

In the United States Circuit Court of Appeals at Richmond, Va., April 20, on petition of the Cabin Creek Consolidated Coal Co. of West Virginia, Judge Goff issued an order restraining the Chesapeake & Ohio from increasing the rate on coal from the New River and Kanawha districts of West Virginia to Lake Erie ports. It is charged in the bill that the coal operators in eastern Ohio and western Pennsylvania are attempting by forcing the rates from the Kanawha and New River districts to lake ports beyond the hope of competition to establish a monopoly in lake coal traffic.

Judge John F. Philips of the federal court at Kansas City issued a temporary injunction on April 24, restraining the Attorney General of Missouri, the members of the Railroad Commission, the Circuit Attorney at St. Louis and other state officers, from interfering with the railways of that state in any action that they may make to restore passenger rates to a basis of 3 cents a mile. The injunction is returnable on May 6. Judge Philips specifically forbade the state officials to prosecute in the state circuit court at St. Louis the suit brought by Circuit Attorney Jones to restrain the railways from raising their rates to 3 cents a mile. Governor Hadley of Missouri subsequently issued a statement saying that the state's suit in the state court at St. Louis would be dismissed so far as it affects roads that adopted a 2½-cent fare. He indicated that the state would appeal to the supreme court of the United States against any road that sought to charge a 3-cent fare.

Judge De Haven of the federal court at San Francisco on April 22, rendered an opinion holding that ocean carriers operating between the United States and foreign countries are not subject to the provisions of the Interstate Commerce Commission against rebating, but that a railway which is a party to a through rate between a point in a foreign country and a point in the United States which does not conform to the law may be punished. The Pacific Mail Steamship Company and the Southern Pacific accepted a shipment of matting on a joint through rate from Kobe, Japan, to Springfield, Ohio. A competing Japanese steamship line offered a reduced rate on the matting just before the Pacific Mail steamship sailed for Japan, and the P. M. S. met the reduced rate, the result being that the shipment was transported at a rate less than the legal quotation. Judge De Haven said that the steamship company could do as it saw fit in charging rates, but that when a joint legal rate to which a railway was a party was departed from, the railway became liable for violation of the law.

The United States Circuit Court of Appeals for the Seventh Judicial Circuit, Judges Grosscup, Baker and Kohlsaat, has dismissed the petition of the Chicago, Milwaukee & St. Paul for an injunction to restrain the Interstate Commerce Commission from keeping in effect its order requiring this road to apply for two years a rate that it had voluntarily reduced. The Flint & Walling Manufacturing Company complained to the Interstate Commerce Commission that the Lake Shore and other roads, including the Chicago, Milwaukee & St. Paul, charged a joint through rate of 28 cents per 100 lbs. on water tanks and substructures from Kendallville, Ind., to Beaver Dam, Wis., via Milwaukee, when the sum of the local rates was only 21½ cents. After the petition was filed with the Commission the defendant roads voluntarily reduced the through rate to the sum of the locals. The Commission awarded reparation and, as already stated, ordered the car-

riers to keep the reduced rate in force for two years. The St. Paul in its petition challenged the right of the Commission to require it to keep a new rate in effect two years, which rate had been made voluntarily. The court in dismissing the railway's bill held that the Commission had authority to make such an order, inasmuch as the rate attacked was in effect at the time of the filing of the shipper's petition; that the jurisdiction of the Commission to determine the reasonableness of the rate took effect when the shipper's petition was filed; and that no subsequent act of the defendant could oust its jurisdiction until it had passed upon the question involved.

Decision Under Hours of Labor Law.

Judge Landis, of the Federal court at Chicago, rendered an opinion on April 21 that the Atchison, Topeka & Santa Fe had violated the federal hours of labor law, and under his instructions the jury in the case returned a verdict of guilty. A fine of $100 was imposed. The case was tried on an agreed state of facts. The testimony showed that at Corwith, Ill., two telegraph operators were employed, one a day man and one a night man, the day man's time being from 6.30 a.m. to 6.30 p.m., but that he was off duty three consecutive hours of this time; and that the night man's time was from 6.30 p.m. to 6.30 a.m., but that he was off duty three consecutive hours of this time. Judge Landis admitted that Congress had not made clear the meaning of the law, but said its title indicated that it was an act to protect railway employees and passengers. Having in mind the purpose of the law as indicated by its title, he was of the opinion that it meant that an operator cannot be on duty for more than one unbroken period of nine hours, and that the period starts when he begins work and ends when he is finally dismissed for the day. He therefore instructed the jury to bring in a verdict of guilty.

Protection via the Freight Office.

The Mexican government railways have issued a tariff, which has been approved by President Diaz, in which Mexican coal is granted rates of $1 a ton less than those on imported coal. This reduction also applies to native coke. It is regarded as a prohibitive discrimination against foreign coal and coke.

Summary of Revenues and Expenses of Railways for February.

Rail operations.	Amount. 1909.	Amount. 1908.	Per mile of line 1909.	Per mile of line 1908.	Ratio, per cent. 1909.	Ratio, per cent. 1908.
Freight revenue	$93,752,124	$85,275,181	$564	$525	69.65	68.77
Passenger revenue ..	29,853,619	28,028,989	179	172	22.18	22.60
Other transp. rev....	9,734,374	9,467,563	58	58	7.23	7.64
Nontransp. revenue..	1,261,404	1,234,328	7	7	.94	.99
Total operating rev..	134,601,522	124,006,062	811	763	100.00	100.00
Maint. way & struc..	14,972,201	13,658,179	90	84	11.12	11.02
Maint. of equipment.	23,283,390	21,360,187	140	131	17.30	17.22
Traffic expenses	3,058,472	2,913,594	18	17	2.27	2.35
Transp. expenses....	50,906,432	52,918,119	306	325	37.82	42.67
General expenses	3,846,189	3,759,893	23	23	2.86	3.03
Total operating exp..	96,066,687	94,609,974	578	582	71.37	76.29
Net operating rev....	38,534,835	29,396,088	232	181	28.63	23.71
Outside operations.						
Total revenues	2,636,825	1,847,729	15	11	.....	.....
Total expenses	2,771,885	1,884,520	16	11	.....	.....
Net revenue	135,060*	36,790*	..	..	.....	.....
Total net revenue ...	38,399,774	29,359,297	231	180	.....	.....
1/12 annual taxes.....	5,506,509	5,158,074	33	31	.....	.....
Operating income ...	32,893,265	24,201,222	198	149	.....	.....
No. of reports	208	204	..	..	.....	.....
Mileage operated ...	165,946.02	162,340.25	..	..	.....	.....

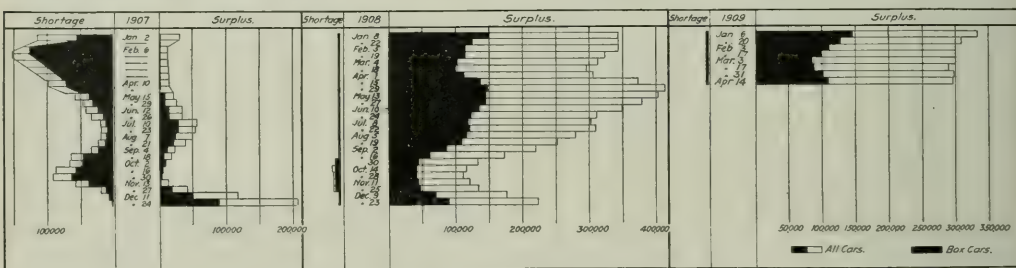
*Deficit.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 45, giving a summary of car surpluses and shortages by groups from February 19, 1908, to April 14, 1909, says:

"There is practically no change in the surplus car situation since our last bulletin, the total for the date of this report being 296,663, an increase of 63 cars. There is an increase of 6,947 in box, with a decrease of 5,564 in coal and gondola. There is also considerable decrease in flats, due to drafts made on this class of equipment for construction purposes and in quarry trade. The results by groups differ very little from the grand total."

The accompanying table gives the surpluses and shortages for the period covered by the report and the chart shows the surpluses and shortages in 1907, 1908 and 1909.



Car Surpluses and Shortages in 1907, 1908 and 1909.

Car Surpluses and Shortages, February 19, 1908, to April 14, 1909, Inclusive.

	Number of roads.	Surpluses. Box.	Surpluses. Flat.	Surpluses. Coal, gondola and hopper.	Surpluses. Other kinds.	Surpluses. Total.	Shortages. Box.	Shortages. Flat.	Shortages. Coal, gondola and hopper.	Shortages. Other kinds.	Shortages. Total.
April 14, 1909	163	108,291	17,692	122,982	47,698	296,663	80	135	109	19	343
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
March 17, 1909	161	88,459	20,328	139,997	42,634	291,418	310	74	27	139	550
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 7908.	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1909.
(See also issues of April 9, 16 and 23.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Trans-portation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$78,292	$28,061	$117,552	$22,307	$26,750	$3,681	$40,984	$5,048	$98,770	$18,782	.....	$4,450	$14,332	$7,414
Bessemer & Lake Erie	201	170,970	16,653	192,438	37,157	85,880	6,184	86,840	6,832	222,893	30,455*	.....	6,000	36,455†	6,854
Buffalo & Susquehanna	373	164,589	12,938	183,133	27,511	56,171	2,268	88,232	6,715	180,897	2,236	$63*	4,000	1,827†	8,501
Central Branch	388	99,382	21,933	130,510	13,206	19,413	3,568	52,099	3,823	92,109	38,401	.....	9,500	28,901	10,871
Central New England	294	157,786	19,989	187,624	18,188	16,918	1,236	64,971	2,554	103,867	83,757	.....	5,600	78,157	58,939
Chicago, Cincinnati & Louisville	285	87,874	16,215	109,225	12,351	22,965	8,746	53,043	5,798	102,903	6,322	.....	3,885	2,437	30,114
Chicago, Peoria & St. Louis	255	96,339	19,661	121,646	16,177	29,306	6,220	63,091	4,326	119,120	2,526	.....	4,300	1,774†	10,271
Cleveland, Akron & Columbus	210	101,665	28,511	143,020	18,429	25,608	1,930	48,078	3,019	97,064	45,956	.....	5,000	40,956	9,245
Cleveland, Lorain & Wheeling	194	141,209	15,721	162,532	30,359	34,323	6,266	73,725	6,018	150,691	11,841	.....	9,406	2,435	‡44,402
Cumberland Valley	162	139,195	36,806	187,771	18,401	18,949	3,370	60,327	4,693	105,740	82,031	101	3,713	78,419	22,074
Detroit & Mackinac	348	66,729	16,910	89,003	13,191	18,823	1,580	31,095	2,364	67,053	21,950	140*	6,850	14,960	9,667
Duluth & Iron Range	168	65,469	15,156	85,233	32,227	24,650	357	50,233	8,042	115,509	30,276*	2,414*	4,624	37,314†	16,711
Duluth, Missabe & Northern	282	71,841	26,741	101,906	40,618	55,837	1,308	58,741	10,013	166,517	64,611*	3,850*	4,646	73,107†	567
Elgin, Joliet & Eastern	239	196,130	7	200,663	18,659	35,386	2,612	70,740	6,633	134,030	66,633	.....	9,500	57,133	29,635
Evansville & Terre Haute	310	88,830	43,988	149,255	14,363	21,639	3,374	55,756	6,370	101,502	47,753	399*	9,035	38,319	‡7,206
Grand Trunk Western	336	269,937	100,725	401,203	28,538	65,623	19,503	182,720	10,323	306,707	94,495	1,438*	32,000	61,057	27,465
Kanawha & Michigan	177	103,859	20,729	128,261	23,436	38,432	2,277	52,581	2,561	119,287	8,974	31*	6,490	2,453	4,697
Louisiana Ry. & Nav. Co.	343	80,034	10,323	96,215	21,166	11,580	3,740	44,325	5,415	89,226	6,989	.....	3,750	3,239	3,014
Midland Valley	324	31,342	19,836	55,444	15,042	16,269	1,759	22,289	4,131	59,490	4,046*	.....	8,000	12,046†	‡20,509
Missouri Pacific	3,492	1,137,869	247,601	1,553,178	266,365	271,112	47,681	759,848	53,944	1,398,950	154,228	98*	77,105	77,025	‡121,198
Nevada & California	379	54,590	17,301	79,557	6,002	9,410	723	59,616	1,825	77,576	1,981	458*	6,200	4,677†	‡13,867
New Orleans & Northeastern	196	176,910	53,716	251,816	25,137	44,699	7,778	94,082	10,260	181,956	69,860	.....	8,000	61,860	38,886
New York, Susquehanna & Western	151	139,111	41,700	207,212	10,488	18,011	1,504	80,388	3,481	113,872	93,340	1,054	15,089	79,305	63,162
New York, Philadelphia & Norfolk	112	169,299	30,178	213,731	25,570	41,414	2,922	83,853	8,528	162,287	51,444	.....	6,250	45,194	11,677
Northwestern Pacific	373	58,800	84,382	162,008	37,572	31,891	2,241	74,890	9,296	155,890	6,118	.....	8,955	2,837†	30,639
Pittsburgh & Lake Erie	191	675,853	80,290	783,783	80,125	91,805	12,461	216,210	19,108	419,709	364,074	421*	17,000	346,653	82,313
Quincy, Omaha & Kansas City	262	42,468	14,864	62,485	11,062	13,765	1,400	29,528	3,120	58,875	3,610	.....	2,450	1,160	4,231
St. Joseph & Grand Island	319	88,188	26,017	122,929	14,712	14,411	4,730	45,922	3,753	83,528	39,401	424	5,143	34,682	2,064
St. Louis, Iron Mountain & Southern	2,608	1,402,300	316,138	1,876,196	289,431	274,936	46,481	657,165	61,754	1,329,767	546,429	167*	63,161	483,101	183,045
Santa Fe, Prescott & Phoenix	257	72,462	26,582	104,691	16,731	6,949	6,140	24,351	4,586	58,757	45,934	.....	.....	45,934	8,351
Southern Indiana	237	69,989	10,202	82,118	8,203	10,625	1,789	26,432	5,544	52,593	29,525	.....	6,929	22,596	‡9,148
Stephenville, North & South Texas	43	4,327	1,123	5,858	616	1,455	170	2,701	573	5,515	343	.....	91	252	.....
Texas Central	268	60,608	24,316	92,057	18,062	14,671	1,153	31,296	4,767	69,949	22,108	.....	3,058	19,050	10,514
Trinity & Brazos Valley	455	138,433	11,298	152,996	38,093	21,680	4,212	77,797	12,512	154,294	1,298*	.....	3,300	4,598†	23,130
Vicksburg, Shreveport & Pacific	171	68,536	29,948	108,705	21,326	18,024	3,414	38,605	4,316	85,685	23,020	.....	6,000	17,020	5,335
Western Maryland	543	356,947	45,873	422,234	40,302	70,289	6,876	152,702	13,206	283,375	138,859	.....	16,500	122,359	44,591

EIGHT MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Trans-portation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$671,435	$304,839	$1,053,440	$170,725	$218,848	$26,626	$344,805	$39,792	$800,796	$252,644	.....	$33,170	$219,474	$5,940
Bessemer & Lake Erie	201	3,810,259	210,112	4,063,097	393,483	771,946	47,457	1,099,480	73,355	2,385,721	1,677,376	.....	67,000	1,610,376	‡51,870
Buffalo & Susquehanna	373	1,356,285	137,587	1,542,796	261,791	359,706	19,827	590,083	55,153	1,286,560	256,236	$842*	32,000	223,394	104,103
Central Branch	388	857,588	228,596	1,168,728	184,324	148,868	26,433	400,640	30,663	790,928	377,800	.....	76,000	301,800	41,369
Central New England	294	1,314,026	225,312	1,632,680	264,643	164,425	12,935	566,360	23,411	1,031,774	600,906	.....	44,800	556,106	334,006
Chicago, Cincinnati & Louisville	285	676,637	190,912	911,797	204,897	199,641*	62,698	402,430	47,524	917,190	5,393*	.....	26,635	32,028†	26,254
Chicago, Peoria & St. Louis	255	805,761	223,301	1,080,858	151,552	242,659	48,808	455,152	37,846	938,071	144,841	.....	36,200	108,641	36,693
Cleveland, Akron & Columbus	210	896,954	300,416	1,306,128	153,154	230,782	18,415	427,707	24,210	854,268	451,860	.....	50,222	401,638	49,350
Cleveland, Lorain & Wheeling	194	2,202,820	153,538	2,507,148	253,300	458,325	48,326	854,917	48,092	1,662,960	844,188	.....	75,251	768,936	‡155,906
Cumberland Valley	162	1,200,467	384,146	1,667,524	158,725	153,475	30,310	520,480	43,544	906,534	760,990	4,333	29,703	735,620	‡2,264
Detroit & Mackinac	348	498,400	195,068	737,181	123,000	121,259	14,846	250,498	21,936	531,539	205,642	2,573*	57,918	145,151	‡36,978
Duluth & Iron Range	168	4,631,951	150,245	4,837,975	556,912	362,129	3,227	816,257	79,988	1,818,513	3,019,462	4,692	196,043	2,828,111	‡234,992
Duluth, Missabe & Northern	282	6,593,323	235,916	6,867,182	565,493	610,987	10,079	916,674	98,694	2,201,927	4,665,255	34,396	279,710	4,419,942	‡528,903
Elgin, Joliet & Eastern	239	1,569,982	307	1,622,708	171,470	261,755	20,543	535,299	61,904	1,050,971	571,737	.....	76,000	495,737	‡54,565
Evansville & Terre Haute	310	899,195	399,423	1,443,016	197,805	197,085	28,777	453,236	50,121	927,024	515,992	2,550*	72,280	441,162	‡4,148
Grand Trunk Western	336	2,324,574	1,156,923	3,702,630	307,822	511,467	162,055	1,429,578	90,690	2,501,612	1,201,018	7,449*	256,000	937,569	402,828
Kanawha & Michigan	177	1,224,141	216,842	1,476,164	283,953	382,371	18,935	454,127	22,565	1,161,951	314,213	161*	53,024	261,027	202,971
Louisiana Ry. & Nav. Co.	343	570,937	87,379	708,962	187,624	94,217	25,653	317,419	42,004	666,917	42,045	.....	27,000	15,045	55,881
Midland Valley	324	437,113	176,471	650,999	156,285	148,108	13,791	218,597	34,716	571,497	79,502	.....	60,083	19,419	‡129,376
Missouri Pacific	3,492	10,373,128	2,707,180	14,483,676	2,005,629	2,165,873	380,547	6,034,484	476,053	11,062,586	3,421,090	11,843*	616,840	2,792,407	196,953
Nevada & California	379	473,023	171,681	704,993	93,198	91,431	6,524	281,823	15,715	488,691	216,302	2,743*	52,267	161,292	‡369,722
New Orleans & Northeastern	196	1,527,224	378,830	2,043,589	197,432	374,343	59,078	689,845	83,958	1,404,656	638,933	.....	60,000	578,933	93,583
New York, Susquehanna & Western	151	1,061,010	398,826	1,652,927	173,393	171,563	11,830	595,708	31,726	984,220	668,707	13,852*	89,660	565,195	80,678
New York, Philadelphia & Norfolk	112	1,462,277	260,013	1,849,317	162,983	334,419	24,821	682,842	85,049	1,290,114	559,203	.....	49,790	509,413	‡62,686
Northwestern Pacific	373	799,971	1,061,108	2,021,653	423,424	285,574	18,082	724,913	74,958	1,526,951	494,702	.....	72,740	421,962	49,539
Pittsburgh & Lake Erie	191	6,858,303	810,562	7,915,918	946,871	727,762	103,582	1,876,170	168,283	3,822,669	4,093,249	2,561*	131,526	3,959,163	‡670,983
Quincy, Omaha & Kansas City	262	365,277	144,280	552,109	134,519	94,328	12,412	253,174	24,043	518,476	33,633	.....	20,110	13,523	22,624
St. Joseph & Grand Island	319	755,513	263,652	1,104,782	161,177	115,939	41,319	364,306	29,612	712,353	392,429	699	31,362	361,766	‡42,500
St. Louis, Iron Mountain & Southern	2,608	11,270,649	3,047,739	15,641,840	2,170,686	2,080,266	349,314	5,215,786	469,615	10,285,667	5,356,173	19,430*	507,796	4,828,947	720,151
Santa Fe, Prescott & Phoenix	257	610,320	212,586	875,324	146,942	71,340	22,601	207,041	37,530	485,454	389,870	.....	......	389,870	‡41,278
Southern Indiana	237	655,035	108,464	781,951	106,034	138,154	13,367	228,118	51,170	536,843	245,108	.....	55,428	189,680	‡207,541
Stephenville, North & South Texas	43	66,286	12,170	81,189	5,770	6,541	1,298	19,303	4,544	37,456	43,734	.....	734	43,000	.....
Texas Central	268	520,273	282,197	854,817	114,259	111,506	8,255	288,549	34,939	557,508	297,309	.....	18,069	279,240	29,010
Trinity & Brazos Valley	455	1,330,743	112,988	1,466,619	274,691	207,981	34,919	683,349	92,827	1,293,767	172,852	.....	25,399	147,453	445,380
Vicksburg, Shreveport & Pacific	171	547,151	324,610	942,755	162,779	186,790	26,900	291,505	33,714	701,688	241,067	.....	48,452	192,615	55,701
Western Maryland	543	3,247,508	558,670	3,987,800	422,606	592,995	56,108	1,281,366	96,175	2,449,250	1,538,550	.....	132,000	1,406,550	77,164

*Deficit. †Loss. ‡Decrease.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. T. Haggart has been appointed Auditor of the Enid, Ochiltree & Western.

W. F. Every, whose appointment as General Claim Agent of the Northern Pacific, with headquarters at St. Paul, Minn., was previously announced in these columns, was born at Leroy, Minn., April 11, 1872. He finished his high school education at Leroy, Minn., in 1888, and from that year until 1892 attended the Cedar Valley Seminary at Osage, Iowa. He began railway work on January 1, 1895, as a stenographer in the General Claim department of the Northern Pacific, and filled in turn each position in the department, becoming chief clerk in July, 1897, which position he held until his appointment as General Claim Agent.

W. F. Every.

C. J. Dowd has been appointed the Chief Claim Clerk of the Buffalo & Susquehanna, succeeding J. A. Armstrong, resigned.

C. R. Stovel, Right of Way and Claim Agent of the Canadian Northern, has been appointed also Claims Agent of the Duluth, Rainy Lake & Winnipeg.

Wallace Hays Gephart, recently elected President and General Manager of the Central Railroad of Pennsylvania, was born October 18, 1880, at Bellefonte, Pa. He is a graduate of Princeton University of the class of 1902, and during three of his summer vacations worked as locomotive fireman. In June, 1902, he became a clerk in the office of the General Superintendent of the Central of Pennsylvania, and by October had been made chief clerk and assistant to the General Superintendent. On November 1, 1904, he was appointed Assistant General Superintendent, and in February of the next year was made General Superintendent, which position he held until April 12, when he was elected President. The accompanying photograph of Mr. Gephart wac taken in 1902 when he left college.

W. H. Gephart.

The Minneapolis, St. Paul & Sault Ste. Marie, having leased the Wisconsin Central, will hereafter operate that road as a part of its system, to be known as the Chicago division. The following is a list of officers: President, Edward Pennington; Second Vice-President and Traffic Manager, W. L. Martin; Secretary and Treasurer, C. F. Clement; Auditor, C. W. Gardner; Auditor, Chicago division, Robert Toombs, heretofore Comptroller and Auditor of the Wisconsin Central; General Counsel, A. H. Bright; General Solicitor, H. B. Dike; General Attorney, J. L. Erdall; Freight Claim Agent, A. E. Hodson.

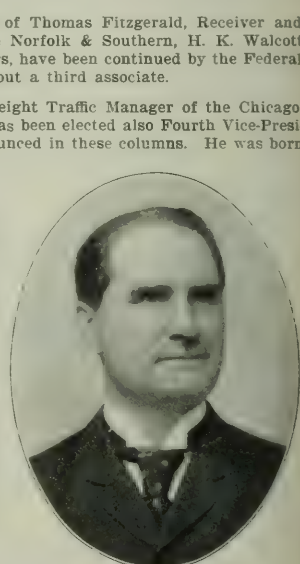
W. D. Williams, Mayor of Ft. Worth, Tex., has been nominated by Governor Campbell to succeed the late L. J. Storey as a member of the Texas Railroad Commission.

T. G. Winnett has resigned as President and General Manager of the Erie & Michigan Railway & Navigation Co. C. G. Root has been appointed Vice-President and General Manager.

W. H. Seaman has been elected the President of the Tremont & Gulf, succeeding William T. Joyce, deceased. James Stanley Joyce has been elected the Secretary, succeeding J. M. Jenks, resigned.

In view of the death of Thomas Fitzgerald, Receiver and General Manager of the Norfolk & Southern, H. K. Walcott and H. M. Kerr, Receivers, have been continued by the Federal court as Receivers without a third associate.

Edward S. Keeley, Freight Traffic Manager of the Chicago, Milwaukee & St. Paul, has been elected also Fourth Vice-President, as previously announced in these columns. He was born in 1861 at Peru, Ill. After an education in the public schools he began railway work about 1879 in the Freight Traffic department of the Rock Island & Peoria, now a part of the Chicago, Rock Island & Pacific, at Rock Island, Ill. In 1881 he was associated with the Traffic department of the St. Louis & Southeastern, now a part of the Louisville & Nashville, with office at St. Louis, Mo. In 1883 he was appointed chief clerk to the Division Freight Agent of the Chicago, Milwaukee & St. Paul, and in 1887 was made Division Freight Agent. In 1891 he was appointed Assistant General Freight Agent, and in 1900 was made the General Freight Agent. In 1907 he was appointed the Freight Traffic Manager, which position he now retains in addition to that of the Fourth Vice-President.



E. S. Keeley

Operating Officers.

J. B. Stewart has been appointed Special Assistant to the General Manager of the Erie, with office at New York.

F. H. Thomas, Superintendent of the Bellefonte Central, has been elected the Vice-President and General Manager, and his former office has been abolished.

Robert King has been appointed the Superintendent of District No. 2 of the Atlantic division of the Canadian Pacific, succeeding D. W. Newcomb, assigned to other duties.

J. R. Cameron, General Superintendent of the Canadian Northern, has been appointed also General Superintendent of the Duluth, Rainy Lake & Winnipeg, with office at Winnipeg, Man.

W. B. Cronk, Superintendent of the Smiths Falls section of District No. 2 of the Canadian Pacific, has been elected also the Superintendent of District No. 1, with office at Farnham, Que., succeeding T. Williams, assigned to other duties.

J. P. Connolly has been appointed the Supervisor of Mails of the Philadelphia & Reading, with office at Philadelphia. He will have direct supervision over all matters pertaining

to the railway mail service and will report to Theodore Voorhees, Vice-President.

E. C. Blanchard, Superintendent of the Lake Superior division of the Northern Pacific, with office at Duluth, Minn., has been appointed the General Superintendent of Lines East of Mandan, N. Dak., with office at St. Paul, Minn., succeeding F. W. Gilbert, deceased. George T. Ross succeeds Mr. Blanchard.

M. A. Murphy, General Manager of the Duluth, Rainy Lake & Winnipeg, has been appointed Superintendent. The following officers of the Canadian Northern have been appointed also to similar positions on the Duluth, Rainy Lake & Winnipeg: J. P. Driscoll, Superintendent Car Service; W. Pratt, Jr., Superintendent Sleeping and Dining Cars.

The Minneapolis, St. Paul & Sault Ste. Marie, having leased the Wisconsin Central, will hereafter operate that road as a part of its system, to be known as the Chicago division. The following is a list of the operating officers: General Superintendent, G. R. Huntington; General Superintendent Chicago division, E. F. Potter, formerly General Superintendent of the Wisconsin Central.

William Walliser, whose appointment as Superintendent of the Minnesota division of the Chicago & North Western has been announced in these columns, was born on July 27, 1866, at Chicago. After receiving an education in the Chicago public schools he began railway work on May 20, 1883, as an engine care taker on the Chicago & North Western at West Chicago. On November 10, 1883, he was made a locomotive fireman on the Galena division of the same road. On September 5, 1885, he was made a freight brakeman on the Galena division, and on June 22, 1892, a freight conductor. On November 1, 1901, he was appointed a Trainmaster of the Peoria division, which was under construction at that time. On June 1, 1902, after the Peoria line was completed, he was again made a freight conductor, and on November 7 of the same year was appointed Trainmaster of the Galena division. On November 9, 1903, he was appointed Assistant Superintendent of the Galena division, and on March 17, 1909, was promoted to his present position.

G. T. Neubert, Master Mechanic of the Chicago Great Western at Oelwein, Iowa, has been appointed Master Mechanic of the Northwestern division, with office at St. Paul, Minn. His former office has been abolished and the duties assumed by W. P. Chrysler, Superintendent of Motive Power. Mr. Neubert was born at Fort Wayne, Ind., in 1860, and began railway work as machinist in the Union Pacific shops at Armstrong, Kan., in 1874. In 1880 he went to the Atchison, Topeka & Santa Fe as machinist at Topeka, Kan. In 1892, after working for the Union Pacific, he returned to the Santa Fe as foreman at Dodge City, Kan. In 1892 he was made general foreman at Nickerson, Kan., and by 1897 had become Master Mechanic of the Oklahoma division, with office at Arkansas City, Kan. In 1900, when the Oklahoma and Middle divisions were consolidated, he was placed in charge of the new division, with office at Newton, Kan., and the next year was promoted to Master Mechanic at Topeka, Kan. Later in the same year he was made Master Mechanic of the Kansas City Belt Railway, and in 1908 became Master Mechanic of the Chicago Great Western, which position he has since held.

Traffic Officers.

H. R. Charlton has been appointed the General Advertising Agent of the Grand Trunk Pacific, with office at Montreal.

Charles P. Sumner, Agent of the Cunard Steamship Co. at Boston, Mass., has been appointed Agent at New York, succeeding Vernon H. Brown, retired.

T. V. Murray, Jr., Traveling Freight Agent of the International & Great Northern, with office at Dallas, Tex., has resigned to engage in other business.

B. F. Bayha has been appointed the Chief of the Tariff Bureau of the Chicago, Milwaukee & St. Paul, with office at Chicago, succeeding F. D. Burroughs, transferred.

George W. Housley has been appointed the General Freight Agent of the Little Rock & Hot Springs Western and the Pine Bluff & Western, with office at Hot Springs, Ark.

Frank J. Wolf, Assistant General Passenger Agent of the New York Central & Hudson River, has resigned to go into business with De Val, Greer & Co., bankers, New York.

E. C. Frew has been appointed General Freight and Passenger Agent of the Beaumont & Great Northern, with office at Onalaska, Tex., succeeding G. R. Wansborough, resigned.

R. H. Stansell, District Passenger Agent of the Seaboard Air Line, has been appointed an Assistant General Passenger Agent, with office at Savannah, Ga., succeeding C. F. Stewart, resigned.

F. S. Holbrook, one of the Official Classification representatives on the Uniform Classification Committee, has been chosen Chairman of the Official Classification Committee, succeeding D. O. Ives, resigned.

Charles F. Stewart, Assistant General Passenger Agent of the Seaboard Air Line at Savannah, Ga., has been appointed the Superintendent of the Tariff Bureau of the Southeastern Passenger Association, with office at Atlanta, Ga.

F. S. Brooks, Assistant General Freight Agent of the Gulf, Colorado & Santa Fe, at Galveston, Tex., has been appointed General Live Stock Agent of the Atchison, Topeka & Santa Fe, with office at Kansas City, Mo., succeeding J. I. Conway, deceased.

G. W. Vaux, Assistant General Passenger and Ticket Agent of the Grand Trunk at Chicago, has been appointed General Passenger Agent, with headquarters at Montreal, Que. Mr. Vaux was born at Montreal March 21, 1866, and received his education in the common schools and at Montreal Business College. He began railway work July 13, 1881, as office boy in the Passenger department of the Grand Trunk. In 1885 he was made clerk in the same office, and in 1897 was made chief clerk. In August, 1899, he was appointed Assistant General Passenger and Ticket Agent at Montreal, and in May, 1900, was transferred to Chicago, with the same title. He held this latter position continuously until his recent appointment.

G. W. Vaux.

G. T. Bell, General Passenger and Ticket Agent of the Grand Trunk Pacific and of the Grand Trunk, has been appointed Assistant Passenger Traffic Manager of both these companies. This is a new office, and the office of General Passenger and Ticket Agent of the Grand Trunk has been abolished. H. G. Elliott, Assistant General Passenger and Ticket Agent of the Grand Trunk, has been appointed the First Assistant General Passenger Agent, with office at Montreal, Que.

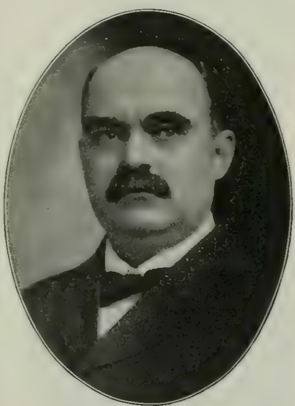
J. B. Dunlap has been appointed a Freight Solicitor of the Southern Railway, with office at Birmingham, Ala. B. Z. Ruff, Traveling Freight Agent at Spartanburg, S. C., has been appointed a Commercial Agent, with office at Spartanburg, and his former office has been abolished. Alexander McBee, Soliciting Agent at Greenville, S. C., has been appointed a Commercial Agent, with office at Greenville, and his former office has been abolished. C. D. Brown has been appointed a Traveling Freight Agent, with office at Abbeville, S. C.

Harold N. Drummond has been appointed a Traveling

Freight Agent of the Chicago, St. Paul, Minneapolis & Omaha, with office at St. Paul, Minn., succeeding E. A. Donnelly, promoted. His territory will be in the states of Minnesota and North Dakota on and north of the line of the Chicago, Milwaukee & St. Paul from St. Paul to the Missouri river and south of the line of the Northern Pacific from Brainerd, Minn., to Mandan, N. Dak., inclusive, including the Bismarck and Underwood branch of the Minneapolis, St. Paul & Sault Ste. Marie; also including the line of the Great Northern and the Northern Pacific south of Saunders and Carlton, Minn.

The Minneapolis, St. Paul & Sault Ste. Marie, having leased the Wisconsin Central, will hereafter operate that road as a part of its system, to be known as the Chicago division. The following is a list of the traffic officers: Second Vice-President and Traffic Manager, W. L. Martin; General Freight Agent, T. E. Sands, heretofore Assistant General Freight Agent of the Soo Line. Mr. Sands succeeds George C. Conn, who has been appointed Freight Traffic Manager of the Pere Marquette, as previously announced in these columns; General Freight Agent, Chicago division, F. E. Singer, heretofore General Freight Agent of the Wisconsin Central; General Passenger Agent, W. R. Callaway.

W. S. Cookson, chief clerk in the Passenger department of the Grand Trunk at Chicago, has been appointed Assistant General Passenger Agent, with headquarters at Chicago, succeeding G. W. Vaux, promoted. Mr. Cookson was born June 12, 1871, at Port Jervis, N. Y., and was educated in the Brooklyn public schools. He began railway work July 15, 1886, in the car record office of the Erie at Jersey City, N. J. On November 1, 1890, he entered the service of the Chicago & Western Indiana in the General Roadmaster's office and a month later was transferred to the ticket office of the Grand Trunk in Chicago. On October 1, 1899, he was made chief clerk in the Passenger department, which position he held until his recent appointment.



W. S. Cookson.

H. P. Hinton, Assistant General Passenger and Ticket Agent of the Grand Trunk, has been appointed the General Passenger Agent of the Grand Trunk Pacific, with office at Montreal, succeeding G. T. Bell, promoted. Mr. Hinton was born at Ottawa, Can., in 1871. He began railway work in 1887 on the Canada Atlantic in the auditing department at Ottawa. In 1891 he was appointed chief rate clerk in the traffic department, and by March, 1898, had become Assistant General Freight Agent. On July 1, 1901, he was appointed General Freight Agent of the Canada Atlantic Railway and also General Freight Agent of the Canada Atlantic Transit Co. In 1903 he was made General Freight and Passenger Agent of both companies. In 1905, when the Grand Trunk took over the Canada Atlantic, his title was changed to General Agent, Passenger department, with office at Ottawa, and he was put in charge of transatlantic business and was given other special duties. In 1906 he was appointed Assistant General Passenger Agent and continued his duties in charge of transatlantic passenger traffic, which position he held until his present appointment.

Engineering and Rolling Stock Officers.

The office of W. H. Elliott, Signal Engineer of the New York Central & Hudson River, has been moved from New York to Albany, N. Y.

A. Shields, Master Mechanic of the Canadian Northern, has been appointed also Master Mechanic of the Duluth, Rainy Lake & Winnipeg.

H. McConkey, Superintendent of Telegraph Maintenance of the Canadian Northern, has been appointed also the Superintendent of Telegraph Maintenance of the Duluth, Rainy Lake & Winnipeg.

J. G. Hopkins has been appointed the Assistant Supervisor of Division 10½ of the Western Pennsylvania division of the Pittsburgh division of the Pennsylvania, succeeding H. R. Catlin, promoted.

J. M. Meade, Engineer of the Eastern Grand division of the Atchison, Topeka & Santa Fe, has been appointed the Engineer Eastern Lines, with office at Topeka, Kan. F. M. Bisbee, Engineer of the Western Grand division, has been appointed the Engineer Western Lines, with office at La Junta, Colo. The office of Engineer of the Central Grand division at Newton, Kan., held by W. H. Earl, has been abolished. These changes are made on account of the recent division of the Santa Fe into two territories.

The Minneapolis, St. Paul & Sault Ste. Marie, having leased the Wisconsin Central, will hereafter operate that road as a part of its system, to be known as the Chicago division. The following is a list of the engineering officers: General Mechanical Superintendent, Theodore A. Foque, formerly Mechanical Superintendent of the Soo Line; Mechanical Superintendent, Chicago division, with office at Fond du Lac, Wis., A. R. Kipp, formerly Superintendent of Motive Power and Cars of the Wisconsin Central; Chief Engineer, Thomas Greene.

T. H. Croswell, whose appointment as Chief Engineer of the Spokane, Portland & Seattle has been announced in these columns, was born January 29, 1867, at Anoka, Minn. He graduated from the University of Minnesota with the class of 1887. He began railway work in June, 1884, as draftsman of the Minnesota & Northwestern, now a part of the Chicago Great Western. In 1885 he was made a rodman and in 1887 transitman. In 1890 he was appointed Resident Engineer of the Duluth & Winnipeg, now a part of the Great Northern, and the Great Northern. From 1890 to 1899 he was engaged in private work and government surveying. In 1899 he was appointed Locating and Assistant Engineer of the Northern Pacific, and in 1903 Division Engineer, with offices at Tacoma and Spokane, Wash. In 1906 he was appointed Principal Assistant Engineer of the Spokane, Portland & Seattle, in charge of the lines east of Pasco, Wash., which position he held until his recent promotion.

Purchasing Officers.

The Minneapolis, St. Paul & Sault Ste. Marie, having leased the Wisconsin Central, will hereafter operate that road as a part of its system, to be known as the Chicago division. The following is a list of purchasing officers: Purchasing Agent, E. T. Stone; General Storekeeper, T. W. Flanagan, formerly Storekeeper of the Soo Line.

J. B. Finley has been appointed the General Storekeeper of the Cananea, Yaqui River & Pacific, the Sonora Railway, the Southern Pacific Lines in Mexico, the Arizona & Colorado, the Arizona Eastern, the Phoenix & Eastern, the Maricopa & Phoenix and the Gila Valley, Globe & Northern, with office at Empalme, Sonora, Mex., succeeding G. V. Green, resigned.

Special Officers.

The Minneapolis, St. Paul & Sault Ste. Marie, having leased the Wisconsin Central, will hereafter operate that road as a part of its system, to be known as the Chicago division. The following is a list of special officers: Land and Industrial Commission, Chicago division, W. H. Killen; Town Site and Industrial Agent, C. A. Campbell.

OBITUARY.

John T. Denniston, Auditor of the Star Union Line of the Pennsylvania, died at Pittsburgh on March 21.

Mace Moulton, Consulting Engineer, died at his home in New York on April 27.

Edward Wiles, Manager of the Commercial Express fast freight line, died on April 22 at his home in Buffalo.

J. S. Oliver, formerly Superintendent of the Dakota division of the Chicago & North Western, died at Los Angeles on April 23.

J. C. Meredith, Engineer in charge of construction on the extension of the Florida East Coast Railway, died at Miami, Fla., on April 20.

Robert G. Curtis, formerly a Superintendent of the New York, New Haven & Hartford, died at his home in Northampton, Mass., on April 20.

Frederic P. Olcott, a member of the board of directors of the New York, Chicago & St. Louis, the Sixth Avenue Street Railway, the Delaware, Lackawanna & Western and various banking institutions, died April 15 at his home in Bernardsville, N. J. He was prominent in the financing of many railway enterprises and was at one time closely connected with the financial problems of the Philadelphia & Reading.

Judge Hosea L. Roberts, at one time General Superintendent of the Anniston & Atlantic, now part of the Louisville & Nashville, died at Mount Clemens, Mich., on April 20. He was formerly a clerk in the New York Central & Hudson River offices and later chief clerk and paymaster on the Pennsylvania. He was Superintendent of Construction of the Anniston & Atlantic, and later became its General Superintendent. In 1890 he left railway work.

General William J. Palmer, railway builder and officer, and founder of Colorado Springs, Colo., died on March 13. He was born near Leipsic, Del., on September 18, 1836, and was educated in the private and public schools of Philadelphia, Pa. He began railway work in 1853 as a rodman of an engineering corps of the Hempfield Road, now a part of the Baltimore & Ohio. In 1856 he went to England, where he spent a year in travel and study. On his return he was elected Secretary and Treasurer of the Westmoreland Coal Co. A year later he was appointed the private secretary to J. Edgar Thomson, President of the Pennsylvania Railroad. Andrew Carnegie was at that time secretary to the Vice-President of the Pennsylvania. In 1861, at the outbreak of the Civil War, Palmer entered the Union army as a captain of volunteers and four years later, when only 29 years old, was mustered out as a brigadier-general. He then became Treasurer, Director of Surveys and Manager of Construction of the Kansas Pacific, now the Kansas division of the Union Pacific. To him was largely due the credit of organizing and securing financial backing for the Denver & Rio Grande, and in 1870 he was elected its President. A few years later he was one of the organizers of the Colorado Fuel & Iron Co. and was elected its first President. In 1882 and 1883 he built the Rio Grande Western and became President of that road. In August, 1883, he resigned the Presidency of the Denver & Rio Grande in order to complete the Mexican National, of which he was President for the seven following years. In 1901 he sold his interests in the Rio Grande Western to the Denver & Rio Grande. He was for several years also Vice-President of the Mexican Northern and President of the Mexican National Construction Co. This was after General Palmer was 65 years old, although he still retained offices at New York and Colorado Springs.

W. J. Palmer.

As a soldier in the Civil War he won much distinction. General George H. Thomas wrote of him: "There is no officer in the regular or volunteer service who has performed the duties which have devolved upon him with more intelligence, zeal or energy than General Palmer, whose uniformly distinguished success throughout the war places his reputation beyond controversy." On his retirement from business in 1901, on the sale of his interest in the Rio Grande Western, he and a few other large stockholders distributed among the 104 officers and several hundred employees of the road the sum of $1,000,000. This incident was characteristic of General Palmer's generosity both before and after his retirement. He was the founder of Colorado College and one of its first trustees. In the fall of 1906 he was thrown from a horse and received injuries that brought on partial paralysis, rendering him a cripple, and this accident was mainly the cause of his death.

The following well deserved tribute is from a letter, by Rev. Samuel H. Bishop, published in the New York *Evening Post*:

* * * General Palmer won my reverent regard and admiration, as well as friendship. He was one of the most splendidly virile moral personalities I ever knew, a man with a master conscience. In some respects he was unique. His integrity was imposing, but without pedantry or officiousness; his moral perceptions acute and finely discriminating, yet never tinged with anything like Pharisaism; his standards lofty, but his judgments of others both gentle and generous; his intellect keen and severe, but his sympathies broadly inclusive.

Love of justice was in him a divine passion, and generosity was both an instinct and a principle. He could afford to be, as he was, an aristocrat, because he was so fundamentally a democrat. I have never known a man whose moral judgments were surer and more penetrating than his, whose insight into the moral issues of politics was deeper and clearer, or whose leadership, where I did not know the way, I could more confidently follow. If Lecky, or Morley, or the Ethical Culture Society had wished to personify the incorruptible integrity, the intrepid conscience, the clean and high thinking, and the noble living for which they give us the rules, I think they could have found no better exponent than was General Palmer. He was reserved in utterance, modest as to his estimate of his own personal ability; but I think there has been no man in this generation whose influence upon those who knew him counted more positively for the great and final issues of personal conduct and of public policy than did his. General Palmer was the finest unconscious Christian I have ever known, and belongs in the category of such men as Socrates, Plato, John Stuart Mill, Lecky and Morley.

Frederick W. Gilbert, General Superintendent of the Northern Pacific, died after a brief illness of two weeks at St. Paul, Minn., on Saturday, April 17. The Northern Pacific has lost a reliable and efficient railway officer, a strict disciplinarian, but a man who never asked any one under him to do what he was not capable of doing and willing to do himself, and one who never allowed himself to be a figure-head in his department. Mr. Gilbert's father, William Bradford Gilbert, was an engineer of note and was well-known for his work on the Erie. After graduating from Cornell, Mr. Gilbert became, in 1870, an Assistant Engineer on the New York & Oswego Midland, now the New York, Ontario & Western. In 1873 he was made Assistant Engineer on the New York, Lake Erie & Western, now the Erie, and in 1881 he became Engineer in charge of shop construction on the Northern Pacific at Brainerd, Minn. By 1885 he had become Superintendent of the Rocky Mountain division, and in 1888 was made Superintendent of the Coeur d'Alene division. In April, 1903, he was made General Superintendent, the duties of which position he has since performed with a loyalty and straightforward frankness and with an unassuming responsibility in carrying out important work that has won him the respect and confidence of those with whom he had to do. Mr. Gilbert leaves a widow and a cousin, Bradford Lee Gilbert, an accomplished architect, who has designed many notable railway stations and structures in different parts of the country.

Railroad Construction.

New Incorporations, Surveys, Etc.

ACME, RED RIVER & NORTHERN.—According to press reports, track laying has been started on the extension from Acme, Tex., west into Cottle county. (March 19, p. 651.)

ARNPRIOR & PONTIAC.—A charter has been granted by the Canadian Parliament to build from a point on the Canadian Pacific, between Quyon, Que., and Campbell's Bay, south across the Ottawa river to Fitzroy Harbor, Ont., thence westerly via Arnprior to a point on the Kingston & Pembroke near High Falls, in Renfrew county, about 40 miles; also to build from Fitzroy Harbor easterly via Britannia to a point on the Grand Trunk, near South March, in Carleton county, 25 miles, and to build a bridge over the Ottawa river. The incorporators include: A. H. N. Bruce, R. Bruce and J. G. Gibson, of Ottawa; J. Bell, of Arnprior, and H. Kedey, of Fitzroy Harbor.

BUFFALO, ROCHESTER & PITTSBURGH.—Bids are being asked for line revision work on two miles of the Clearfield & Mahoning division near Rockton, Pa.

CAIRO & NORFOLK.—Work is under way on the first 60 miles east from Fort Jefferson, near Wickliffe, in Ballard county, Ky., east. The Atlantic & Cairo Construction Co., New York, has the general contract. Projected from Cairo, Ill., east to tidewater at Norfolk, Va. On the first three sections, from Cairo to Hopkinsville, Ky., 115 miles, the work will be light, with maximum grades of 6 per cent. and maximum curves of 3 deg. The work will include two concrete bridges, one over the Tennessee river, 1,800 ft. long, and one over the Cumberland river, 1,100 ft. long. L. W. Goode, Pres., 111 Broadway, New York, and C. H. Delano, Gen. Mgr. and Ch. Engr., Mayfield, Ky.

CANADIAN NORTHERN.—Work is said to have been started on a branch from Vegreville, Alb., southwest to Calgary, about 200 miles.

CANADIAN PACIFIC.—Contract is said to have been given to Stewart & Hewitson, of Port Arthur, Ont., for the construction of all the concrete culverts and bridges to be built between Port Arthur, Ont., and White River during the next five years.

CHICAGO & NORTH WESTERN.—An officer writes that the Board of Public Works has approved the plans for track elevation work on the south side of Milwaukee, Wis., and work has been started. The improvements include raising the tracks over Chicago avenue, Lincoln avenue, Becker street and Kinnickinnic avenue with the necessary approaches; also putting in a new double-track bridge over the Kinnickinnic river. It is expected to have all the work finished by October of this year. (April 23, p. 918.)

CHICAGO, INDIANAPOLIS & LOUISVILLE.—Plans are said to have been made for building new yards at Bloomington, Ind., to have a capacity of about 600 cars. A new concrete, brick and stone roundhouse, with a glass dome and stalls for 17 engines, is to be built soon.

About 1,500 ft. of new side track has recently been laid at Monon, Ind. The company is planning to lengthen many of its side tracks to accommodate its freight service.

CINCINNATI, LOUISVILLE, LEXINGTON & MAYSVILLE TRACTION.—Incorporated in Kentucky, with $10,000,000 capital, to build from Cincinnati, Ohio, south to Lexington, Ky., and from Maysville west to Louisville, with connection at Dry Ridge, in Grant county, in all about 250 miles. W. T. S. Blackburn, Pres., Dry Ridge; J. Glascock, V.-Pres., Williamstown, and J. McCoy, Sec., Dry Ridge.

CLEAR LAKE NORTHERN.—Incorporated in California to build from Pieta, Cal., on the Northwestern Pacific, east to Highland Springs, and thence northwest via Kelseyville to Lakeport, 31 miles. C. M. Chase, Pres.; W. L. Gerstle, Secy. and Treas.

COPPER RIVER RAILWAY.—According to press reports, a large force of men are shortly to be put at work on this line, building from Cordova, Alaska, or Valdez north to Bonanza, about 195 miles. M. J. Heney, 514 Coleman building, Seattle, Wash., is building the line. (Sept. 25, p. 1022.)

CRYSTAL CITY & UVALDE.—Incorporated in Texas with $50,000 capital and headquarters at Crystal City, to build from Uvalde, Tex., on the Southern Pacific, south to Crystal City, in Zavalla county, 44 miles. A. R. Ponder, Pres., San Antonio; J. A. Weir, Sec., Uvalde. I. T. Pryor and H. L. Howard, of San Antonio, are incorporators.

CUBA RAILROAD.—It is understood that this company will build 200 miles of extensions during the coming summer.

ESTACADO & GULF.—Press reports indicate that additional grading contracts are to be let soon. (March 19, p. 656.)

FLORIDA & EAST COAST.—See this company under Iron and Steel.

FORT SMITH & WESTERN.—Surveys said to have been made for an extension from El Reno, Okla., southwest to Lone Wolf, about 85 miles. (Dec. 11, p. 1559.)

FORT WAYNE & TOLEDO (ELECTRIC).—Organized in Indiana, with $100,000 capital. An officer writes that the proposed route is from Ft. Wayne, Ind., northeast via Maysville to Hicksville, Ohio, thence via Farmer to Bryan, 45 miles, with a northern extension to Montpelier, 10 miles. Work, it is expected, will be started soon. R. T. Bastress, Gen. Mgr., Harlan, Ind.

GRAND TRUNK PACIFIC.—Work is said to have been started on a branch from Wainwright, Alb., to Calgary.

Work, it is said, will be started this summer from Melville, Sask., on a line south to the United States boundary; also north from Melville to Hudson Bay.

An officer says that about $10,000,000 will be spent for construction work in western Canada during this year.

GREAT NORTHERN.—An officer writes regarding the reports that construction will be started at once on a line from Winnipeg, Man., south to Noyes, Minn., that no instructions have yet been given to start the work. (April 23, p. 918.)

GREAT SOUTHERN.—This road is now in operation from The Dalles, Oregon, for 30 miles south to Dufur. We are told that if an extension is built it will be from the southern terminus at Dufur south to Tygh, about 20 miles. Regarding the reports that negotiations are pending for the sale of this road nothing definite has taken place, although a number of offers to buy have been made.

GULF & NORTHWESTERN.—Incorporated in Kansas, with headquarters at Goodland, Kan., to build from a point in northwestern Kansas southwest to Pueblo, Colo.; also from a point on the above mentioned line in Cheyenne county, Kan., southeast to Englewood, in all about 450 miles. The incorporators include: J. F. Kimmel and B. Dyatt, of Goodland; J. W. Tibbles, Dresden; C. C. Evans, of Colby, and R. B. Ketchum, of Canyon City, Colo.

KANSAS NORTHWESTERN.—Incorporated in Kansas to build from Benkelman, Neb., on the Chicago, Burlington & Quincy, southeast to Wichita, Kan., about 325 miles. E. W. Moses, Pres., and Geo. Brinkman, Treas., Great Bend, Kan.

MEXICAN ROADS.—Consul Thomas W. Voetter, of Saltillo, Mex., writes to the Bureau of Manufactures that the development of the Mexican project for building a railway between Monclova, Coahuila, and Chihuahua, in Chihuahua, is progressing, as the following indicates: "I have been informed that contracts have been signed by the state governments of Coahuila and Chihuahua by the terms of which a subsidy of about $4,000 United States currency per mile will be granted the enterprise. This is estimated by an engineer well acquainted with the route of the proposed road to be sufficient for grading and bridges. Arrangements have been made with French banking interests for the sale of the bonds necessary to complete the road." (Oct. 16, p. 1176.)

According to reports from Torreon, Mex., surveys are now being made by W. F. Lineberger, of Bermejillo, Dur., to build a line from Bermejillo to the San Juan mine in the Mapimi district, about 14 miles, to haul ore from the San Juan and adjoining mines to the main line of the Mexican Central. It is expected that grading work will be started early in May.

Mississippi Roads.—C. H. Pond, of Moorehead, Miss., is said to be organizing a company to build from Watervalley, Miss., on the Illinois Central, southeast to Calhoun City, on the Mobile & Ohio, about 40 miles.

Missouri, Oklahoma & Gulf.—According to press reports, contracts have been let for about 20 miles from Allen, Okla., south to Tupelo, and contracts for 35 miles additional are soon to be let. (April 16, p. 871.)

Oklahoma Union Traction.—Incorporated in Oklahoma, with $100,000 capital, to build from Sapulpa, Okla., northeast to Tulsa, 20 miles. The estimated cost of the line is $300,000. The incorporators include: A. Small, E. Tucker, G. C. Stebbins, C. L. Holland and S. A. Orcutt, all of Tulsa.

Pensacola, Mobile & New Orleans.—Work has begun on an extension to Mobile, Ala., about 50 miles.

St. Louis & Chester.—Incorporated in Illinois with $100,000 capital and headquarters at East St. Louis to build from East St. Louis, Ill., south through St. Clair, Monroe and Randolph counties to Chester, about 55 miles. The incorporators include: R. Stecher, Murphysboro, Ill.; E. W. Ziegenhein and R. A. Slack, of East St. Louis; W. F. Bentzen and E. Schiwitz, of St. Louis, Mo.

San Diego & Arizona.—According to press reports, bids are to be asked about May 1 to build the first section from National City, Cal., south to Tijuana, in lower California, about 15 miles. The projected route from Tijuana is east parallel to the international boundary to the Jacumba valley, thence north into California and east through Carisso canyon and the Imperial country to the Colorado river. John D. Spreckles, San Francisco, is interested.

South Dakota Roads (Electric).—Capital is said to have been secured and the necessary right-of-way arranged for, to build from Sioux City, Iowa, northwest to Centerville, S. Dak., about 60 miles. F. Heglin and J. Norran, of Daylesburg, S. Dak., and A. S. Anderson, of Alsen, S. Dak., are interested.

Southern Pacific (Mexico).—According to press reports from Mazatlan, Mex., a section of the Guadalajara extension was recently opened for traffic from Culiacan, Sin., south to Mazatlan, about 150 miles. (March 19, p. 661.)

Spokane, Portland & Seattle.—An officer of the Northern Pacific writes regarding the construction of the new joint line of the Northern Pacific and the Great Northern, from Portland, Ore., along the north bank of the Columbia river to Pasco, Wash., thence to Spokane, that it is said to be on a larger scale and probably more perfect than any other work which has been undertaken in the West for some years. The line from Portland to Pasco has a .2 per cent. grade, with maximum curves of 3 deg. The grade from Pasco to Spokane is .4 per cent., with maximum curves of 3 deg.

Sumpter Valley.—Press reports indicate that this company will build an extension from its present western terminus at Austin, in Grant county, Ore., southwest via Prairie City to Canyon City, about 30 miles, and eventually south to a point in the Harney valley. (Sept. 4, p. 890.)

Toledo, St. Louis & New Orleans.—An officer writes that contracts will probably be let in July or August for building this line. The projected route is from Carmi, Ill., south via Newhaven, Ridgway, Lawler, Karber's Ridge and Golconda to Brookport, with a branch from Golconda southwesterly to Thebes, in all about 145 miles. Work will include four steel bridges and a 2,100-ft. tunnel. N. M. Burns, Pres., 1622 Peirce building, St. Louis, Mo. (April 16, p. 872.)

Timpson & Northwestern.—Contracts may be let in June for building an extension. W. G. Ragley, Pres., Timpson, Tex.

Terre Haute, Indianapolis & Eastern (Electric).—According to press reports, surveys have been finished for an extension of the branch which now has its western terminus at Danville, Ind., southwest via Amo to Sullivan. Most of the right-of-way has been secured. Part of the work is completed between Danville and Amo, seven miles, where connection is made with the main line. The extension is being built to reach the coal fields owned by the company in Clay and Owen counties. The Danville line and the new section to Amo when finished will be used as the main line for traffic between Indianapolis and Terre Haute.

Railroad Financial News.

Boston & Albany.—The Massachusetts Railroad Commission has been asked to approve an issue of $4,500,000 4 per cent. 25-year bonds, the proceeds to be used for extensions and improvements at the East Boston terminals and to reimburse the New York Central & Hudson River for construction work already financed by the Central.

Chesapeake & Ohio.—See Virginian Railway.

Chicago, Burlington & Quincy.—The holders of the following bonds are offered the privilege of exchanging them for general mortgage 4 per cent. bonds of 1908-1958:

	Outstanding.*	Maturing.	Premium offered.
Iowa Div. mortgage sinking fund 4s....	....	1919	None.
Southwestern Div. sinking fund 4s.....	$3,200,000	1921	"
Denver Exten. sinking fund 4s.........	7,968,000	1922	"
Debentures, 5 per cent	9,000,000	1913	$20
Nebraska Ext. sinking fund 4s.........	24,214,000	1927	None.
Burl. & Mo. R. R.R. in Neb., 6s........	8,751,000	1918	$20
Republican Valley R.R. sinking fund 6s,	1,078,000	1919	20
Hannibal & St. Joseph R.R. 6s........	8,000,000	1911	30

*Excluding bonds canceled under sinking fund provisions, but including bonds held in sinking funds.

Most of these divisional bonds are subject to compulsory retirement at par through the operation of sinking funds.

Denver, Northwestern & Pacific.—The Colorado-Utah Construction Co. collateral trust notes dated February 6, 1909, have been called for payment at 101 on May 1. D. H. Moffat, who guarantees the notes, is President of both the Denver, Northwestern & Pacific and the Construction company, and is quoted as saying: "I have perfected my plans for financing the road from Steamboat Springs (Colo.) to Salt Lake (Utah), 364 miles." The road is now in operation from Denver, Colo., to Steamboat Springs, 214 miles.

Gulf, Colorado & Santa Fe.—See St. Louis & San Francisco.

Hocking Valley.—The Circuit Court of Franklin county, Ohio, on April 24, handed down a decree ousting this company from control, through a syndicate, of the Zanesville & Western, the Toledo & Ohio Central, the Kanawha & Michigan, the Sunday Creek Coal Company, the Sunday Creek Company, the Continental Company and the Buckeye Coal & Railway Company. The decision was rendered under the Ohio anti-trust law.

Intercolonial Railway.—A board consisting of M. J. Butler, Deputy Minister of Railways and Canals; D. Pottinger, General Manager, Canadian Government Railways; E. Tiffin, Traffic Manager, Intercolonial Railway, and F. P. Brady, formerly General Superintendent of the Lake Superior division of the Canadian Pacific, has been placed at the head of the management of the Intercolonial.

Kanawha & Michigan.—See Hocking Valley.

Michigan Central.—J. P. Morgan & Co., New York, who together with the National City Bank and the First National Bank offered $10,000,000 4 per cent. debenture bonds of the Michigan Central of 1909-1929 at 95, announce that the price of the unsold remainder will be 96½.

Mississippi Central.—See Natchez & Eastern.

Municipal Traction (Cleveland).—The receivers have been authorized by the Federal court to make payments aggregating $556,000 out of the $740,000 cash on hand. The majority of the payments are to be made to or on account of the Cleveland Railway.

Natchez & Eastern.—The entire outstanding $1,540,000 first mortgage 6 per cent. bonds of 1907 have been called for redemption at par on June 1. It is understood that this is preparatory to the merger of the Natchez & Eastern and the Mississippi Central controlled by the same interests. The line of the two companies in operation runs from Natchez, Miss., to Hattiesburg.

New York Central & Hudson River.—See Boston & Albany.

Norfolk & Western.—See Pennsylvania.

Pennsylvania.—This company and its subsidiaries have repurchased from Kuhn, Loeb & Co., New York, between $15,-

000,000 and $16,000,000 stock of the Norfolk & Western. See reference to this purchase in the review of the annual report of the Pennsylvania in another column.

PITTSBURGH, SHAWMUT & NORTHERN.—The New York Public Service Commission, Second District, has authorized the receiver to issue $1,600,000 receiver's certificates, the proceeds of the sale of these certificates to be used to refund receiver's certificates maturing in September, 1910, and March, 1911, but payable at the option of the receiver in 1909, and also for additions and improvements.

PONTIAC, OXFORD & NORTHERN.—The sale of this road at an upset price of $400,000 has been adjourned from April 8 to June 17.

ST. LOUIS & SAN FRANCISCO.—Press despatches from Dallas Tex., say that the St. Louis & San Francisco has bought the Dallas & Paris line of the Gulf, Colorado & Santa Fe, and will run trains after June 1 from St. Louis, Mo., to Dallas, Tex., and Fort Worth, via Paris.

SOUTHERN PACIFIC.—The *Commercial and Financial Chronicle* says that "it is understood that the stockholders subscribed for practically the entire $44,000,000 convertible 4 per cent. bonds offered recently to stockholders and underwritten by Kuhn, Loeb & Co., New York."

SOUTHERN RAILWAY.—The company has sold about $1,500,000 4½ per cent. equipment trust bonds. They were sold at this time, it is said, because of the present good demand for this class of security rather than because of any present need of money by the company.

TOLEDO & OHIO CENTRAL.—See Hocking Valley.

VIRGINIAN RAILWAY.—Arrangements have been made by which the Virginian is to have trackage rights over the Chesapeake & Ohio tracks from Deepwater, W. Va., to St. Albans, 44 miles. St. Albans is about 12 miles west of Charleston.

WESTERN PACIFIC.—The syndicate headed by Blair & Co., Wm. A. Read & Co. and William Salomon & Co., all of New York, which bought the $50,000,000 Western Pacific first mortgage 5 per cent. bonds of 1903-1933, has been dissolved, all the bonds having been sold. Procter & Borden, New York, are offering $2,000,000 of these bonds at a price to yield about 5 per cent.

ZANESVILLE & WESTERN.—See Hocking Valley.

FOREIGN RAILWAY NOTES.

The Dominican government is pushing the project of building a railway between the capital and the town of La Vega. This, with the construction of a short line between La Vega and Mocha, will give railway connection between Puerto Plata, the most important seaport of the northern coast, and Santo Domingo, the capital and most important city of the Republic, and will open up a rich agricultural section. The road will also be of great importance from a military standpoint.

The Chinese company which owns the Hanyang steel plant, Tah Yeh iron mines and the Ping Siang coal mines is about to open a large coal station in Hankow. It intends to build 100 cargo boats of 200 tons capacity each and 100 of 100 tons capacity, together with powerful shallow-draft tugboats to handle the cargo boats in fleets. It now has one freight steamer and is about to build two more. The various steamers plying the Yangtze are testing the company's coal, and so far the reports have been very satisfactory.

The Nicaraguan government has made a contract with private parties for the construction of a railway from San Juan del Sur, on the Pacific coast, about 16 miles to the port of San Jorge or other ports on Lake Nicaragua. This contract was entered into in January, 1908, but was not officially published until February 20, 1909. While the proposed road would open up rich agricultural country and greatly facilitate transportation in southeastern Nicaragua, the parties holding the contract have so far been unsuccessful in securing the necessary capital. The territory to be served is along the old proposed Nicaragua canal route.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Kansas City, Mexico & Orient is in the market for 20 locomotives.

The Chicago, Indianapolis & Louisville has ordered three locomotives from the American Locomotive Co.

The Boston & Maine has ordered 20 eight-wheel passenger, 20 Mogul freight and 10 six-wheel switching locomotives from the American Locomotive Co.

The Chesapeake & Ohio, reported in the *Railroad Age Gazette* of February 5 as having ordered 15 locomotives from the American Locomotive Co., with an option on 15 more, has ordered 20 locomotives from the American Locomotive Co. It is understood that the entire order of 35 locomotives is for delivery by November.

A. V. Kaiser & Co., Philadelphia, Pa., are in the market for two or three second-hand 60-ton Mogul locomotives with cylinders 18 in. x 24 in. Detailed specifications and photographs are required, and prices, if possible, should be quoted on equipment in export shipping shape, f.o.b. alongside steamer in New York for foreign shipment.

The Cuba Railroad has ordered 10 consolidation freight and 3 ten-wheel passenger locomotives from the American Locomotive Co. These locomotives will be equipped with fire-tube superheaters.

General Dimensions.

	Consolidation.	Ten-wheel.
Weight on drivers	154,000 lbs.	98,000 lbs.
Weight, total	176,000 "	141,000 "
Cylinders	24 in. x 26 in.	21½ x 26 in.
Diameter of drivers	54 in.	68 in.
Boiler, diameter	71¼ in.	68 "
Boiler, work'g st'm press.	160 lbs.	160 lbs.

The Quebec Contracting Co. has ordered two four-wheel locomotives from the Montreal Locomotive Works, Ltd. These locomotives will be for use on the National Transcontinental Railway and are now building.

General Dimensions.

Weight of engine	36,000 lbs.
Cylinders	10 in. x 16 in.
Diameter of drivers	30 in.
Boiler, type	Straight top
" working steam pressure	150 lbs.
Firebox, length	42 in.
" width	24 "
Tubes, number	98
" outside diameter	1¾ in.
" length	8 ft. 2 in.
Water capacity	600 imp. gals.
Coal capacity	600 lbs.

The Temiscouata Railway has ordered two 10-wheel locomotives from the Montreal Locomotive Works, Ltd.

General Dimensions.

Weight on drivers	83,000 lbs.
" of engine	108,500 "
" of engine and tender	197,500 "
Cylinders	18 in. x 24 in.
Diameter of drivers	51 in.
Boiler, type	extended wagon top
" working steam pressure	160 lbs.
Firebox, length	90 in.
" width	33¾ "
Tubes, number	198
" outside diameter	2 in.
" length	12 ft. 3 "
Wheel base, rigid	10 " 6 "
" " engine	20 " 8 "
" " engine and tender	49 "
Water capacity	3,500 imp. gals.
Coal capacity	8 tons

The International Railway of New Brunswick has ordered one 10-wheel locomotive from the Montreal Locomotive Works, Ltd.

General Dimensions.

Weight on drivers	83,000 lbs.
" engine	108,000 "
" total, engine and tender	197,000 "
Cylinders	18 in. x 24 in.
Diameter drivers	51 in.
Boiler, type	extended wagon top
" working steam pressure	160 lbs.
Firebox, length	90 in.
" width	33¾ "
Tubes, number	198
" diameter	2 in.
" length	12 ft. 3 "
Wheel base, rigid	10 " 6 "
" " engine	20 " 8 "
" " engine and tender	49 "
Water capacity	3,500 imp. gals.
Coal capacity	8 tons

CAR BUILDING.

The Lehigh Valley is asking prices on 16 passenger cars.

The Pennsylvania is to build 15 all-steel dining cars at its Altoona shops.

The Central of New England is asking prices on six passenger coaches.

The Northern Ohio Traction & Light Co., Akron, Ohio, is in the market for one 52-ft. private car.

The Buffalo, Rochester & Pittsburgh is in the market for three combination baggage and smoking cars.

The Coal & Coke Railway is said to have ordered two coaches and one combination car from the Barney & Smith Car Co. This item has not been confirmed.

The Cuba Railroad, reported in the *Railroad Age Gazette* of April 9 as being in the market for 100 box and 100 flat cars, has ordered this equipment from the American Car & Foundry Co.

The Western Pacific, as reported in the *Railroad Age Gazette* of April 16, has ordered 1,500 freight cars from the Pressed Steel Car Co. These will be all-steel, 50-ton side dump gondola cars.

The Norfolk & Western, reported in the *Railroad Age Gazette* of April 16 as being in the market for 300 freight cars, is reported to have decided upon building 300 all-steel freight cars in its Roanoke shops. This latter item is not confirmed.

The Boston & Maine, unofficially reported in the *Railroad Age Gazette* of April 23 as being in the market for 900 thirty-ton steel underframe box cars, is said to have ordered this equipment from the Laconia Car Co. This item is not confirmed.

The Salt Lake & Ogden (Electric), Salt Lake City, Utah, reported in the *Railroad Age Gazette* of April 2 as being in the market for twelve 56-ft. cars, six of which will be coaches and six combination passenger and baggage cars, has ordered this equipment from the Jewett Car Co.

A. V. Kaiser & Co., Philadelphia, Pa., are in the market for from 200 to 300 second-hand 30-ton flat cars equipped with air-brakes and automatic couplers. Detailed specifications and photographs are required, and prices, if possible, should be quoted on equipment in export shipping shape, f.o.b. alongside steamer in New York for foreign shipment.

The Southern, reported in the *Railroad Age Gazette* of March 19 and March 26 as asking prices on 114 passenger cars, has ordered 85 passenger coaches from the Pullman Co.; 6 baggage-express, 6 mail-baggage, 6 passenger-baggage and 6 postal cars from the American Car & Foundry Co.; 2 dining and 3 chair cars from the Barney & Smith Car Co.

IRON AND STEEL.

The Marlum Co., Kansas City, Mo., is in the market for 7,700 tons of rails.

The Ann Arbor has ordered 6,000 tons of rails from the Lackawanna Steel Co.

The Chicago & Alton has ordered 1,500 tons of bridge steel from the American Bridge Co.

The Guaymas & Yaqui River has ordered 13,000 tons of rails from the Steel Products Export Co.

The Cuba Railroad is said to have ordered 5,000 tons of bridge steel from the Pennsylvania Steel Co.

The Chicago, Milwaukee & St. Paul has placed an order for 65,000 tons of 90-lb. rails with the Illinois Steel Co.

The Wisconsin Central has ordered 600 tons of structural steel for bridge construction from the Wisconsin Bridge & Iron Co.

The Indianapolis Union Railroad has ordered 400 tons of structural steel for bridge construction from the McClintic-Marshall Construction Co.

The Buffalo, Rochester & Pittsburgh, reported in the *Railroad Age Gazette* of April 16 as asking bids on about 3,500 tons of bridge steel, has ordered about 3,000 tons from the Pennsylvania Steel Co.

The Florida & East Coast, reported in the *Railroad Age Gazette* of March 26 as being in the market for 100 bridge spans and a quantity of rails, has ordered about 11,000 tons of bridge steel from the American Bridge Co. for use on the extension from Knight's Key, Fla., to Key West. There will be 182 plate girder spans, 79 ft. 6 in. long; 12 riveted spans, 125 ft. long, and 12 pin-connected spans, 182 ft. long. The order also includes the steel for two small bridges on the main line.

The Seaboard Air Line will soon place orders for about 1,800 tons of bridge steel to be used in the following structures: Savannah River, Scherzer type lift bridge, weighing about 270 tons, and 12 deck plate girder approach spans; Meherrin Slough, 24 deck plate girder spans and one through plate girder span; Crabes Creek, deck plate girder span; Cedar Creek, plate girder viaduct; Upper Hunter Terminal, through plate girder span. All of these spans are single-track, excepting the one at Upper Hunter Terminal, which is double-track.

General Conditions in Steel.—The financial statement of the United States Steel Corporation shows total earnings, after deducting all operating expenses, of $22,921,268, a decrease of $3,304,217 from the quarter ended December 31, 1908, and an increase of $4,692,253 over the quarter ended March 31, 1908. The surplus after payment of all charges and dividends was $3,026,674 as compared with $5,142,451 for the December 31 quarter, and $7,865 for the corresponding period of 1908. The unfilled orders on hand March 31 last amounted to 3,542,595 tons, a decrease of 60,932 tons from December 31, 1908, and of 222,748 tons from March 31, 1908. This is said to be the poorest showing since September last, when the total was 3,421,977 tons. These figures would seem to reflect past rather than present conditions, as business during the current month is thought to have shown a heavy increase.

RAILROAD STRUCTURES.

ANN ARBOR, MICH.—The Ann Arbor has given the contract for building five bridges to the Toledo-Massillon Bridge Co.

BLOOMINGTON, IND.—See Chicago, Indianapolis & Louisville under Railroad Construction.

CARMI, ILL.—See Toledo, St. Louis & New Orleans under Railroad Construction.

EVANSTON, ILL.—The Chicago & Northwestern will build four new passenger stations at a total cost of about $173,000.

MILWAUKEE, WIS.—See Chicago & Northwestern under Railroad Construction.

OAKLAND, CAL.—Plans and specifications have been made by the Southern Pacific for a new depot. Work on the building will begin immediately after official specifications have been accepted.

PEORIA, ILL.—The Peoria & Pekin Union is preparing plans for a new double-track bridge over the Illinois river. It will cost about $250,000.

PERU, IND.—The Ft. Wayne & Wabash Valley Traction Co. has been granted a franchise by the City Council for a freight and passenger station to be built on the property now used by the company. The structure is to cost $40,000. The company is to take action on the franchise within 30 days.

PORT ARTHUR, ONT.—See Canadian Pacific under Railroad Construction.

TAMPA, FLA.—The new Scherzer type lift bridge which is now being built by the Seaboard Air Line has a clear span of 165 ft. See Seaboard Air Line under Iron & Steel.

WINNIPEG, MAN.—A contract is said to have been given to Haney, Quinland & Robertson, of Toronto, Ont., at $495,000, by the National Transcontinental Railroad Commission (Grand Trunk Pacific) for putting up a combined railway and highway bridge, of steel construction, over the Red river at Winnipeg. (March 26, p. 729.)

Supply Trade News.

The W. K. Kenly Co., Chicago, has been appointed district sales agent for the Ernst Wiener Co., New York, builders of industrial cars.

The Erie & Union, the Titusville Northern and connecting lines are in the market for railway supplies. Address, Jesse L. Straus, Weston, N. J.

The Johnston-Adams Switch Devices Co., Columbus, Ohio, has recently been incorporated by S. A. Johnston, C. B. Adams, G. B. Butten, J. A. Kidwell and J. T. Moore. Capital stock, $100,000.

The Climax Railway Supply Co., Canton, Ohio, has been incorporated with $25,000 capital. The incorporators are: H. B. Stewart, F. W. Stewart, William Simpson, Jay Taylor and Allan R. Simpson.

The Morgan Engineering Co., Cleveland, Ohio, has been given a contract by the Bettendorf Axle Co., Davenport, Iowa, for the cranes for its new steel foundry. The total value of the award is about $90,000.

The Grip Nut Co., Chicago, manufacturer of the Grip-nut and Universal window fixtures, is building a large addition to its works at South Whitley, Ind. The structure will be 50 ft. x 270 ft. and two stories high.

A firm in France which sells many kinds of machinery to steel works and dockyards wants the agency for some concern making pneumatic tools. (Inquiry No. 3342, Bureau of Manufactures, Washington, D. C.)

The National Railway Devices Co., Chicago, has been incorporated to manufacture railway devices, machinery, etc. The incorporators are Frank E. Hinckley, Harry J. Berman and William L. Carlin. Capital stock, $200,000.

Edward C. Sawyer, who was formerly representative of the H. W. Johns-Manville Co., New York, is now associated with H. G. Hammett, Troy, N. Y., manufacturer of Trojan metallic packing, locomotive specialties and machinery.

The Magnetic Locomotive Co., Marquette building, Chicago, has been incorporated to manufacture electrical devices and machinery. The incorporators are Frank B. Tinker, Ward S. Perry and J. R. Merkle. Capital stock, $100,000.

Charles F. McCullough, for 15 years Treasurer of the Kewanee Tube Co., died suddenly from apoplexy at Kewanee, Ill., on April 24, at the conclusion of a bowling game. The Kewanee Tube Co. was acquired about a year ago by the National Tube Co., Pittsburgh, Pa.

James Bennie & Sons, proprietors of the Clyde Engine Works at Cardonald, near Glascow, Great Britain, makers of heavy machine tools for ship yards, structural iron works, boiler shop, etc., have been given a license by the Hanna Engineering Works, Chicago, to manufacture the Hanna pneumatic riveter in Great Britain.

The plans for the transportation exhibtion to be held at Buenos Ayres next year were published in the *Railroad Age Gazette* of April 16, page 863. Casco, Odell Bros. & Co., Buenos Ayres, importers and agents, wish to prepare and take care of exhibits for American manufacturers. The firm will also attend to the selling of the exhibits during or after the exhibition and take orders for other products of its clients.

An American consul in Latin America reports that a railway company in his district intends to build a branch line as soon as the right of way can be secured from the local government officials. He suggests that American contractors and exporters of railway materials, cement, agricultural implements, machinery of various kinds, etc., correspond with the president of the company. (Inquiry No. 3333, Bureau of Manufactures, Washington, D. C.)

George F. Hichborn, General Traffic Manager of the United States Rubber Co., has been appointed also General Traffic Manager of the following companies: The General Rubber Company, New York; the Rubber Goods Manufacturing Co., New York; the Peerless Rubber Manufacturing Co., New Durham, N. J.; the New York Belting & Packing Co., Passaic, N. J.; the Fabric Fire Hose Co., Sandy Hook, Conn.; the Hartford Rubber Works Co., Hartford, Conn.; Morgan & Wright, Detroit, Mich.; the Indianapolis Rubber Co., Indianapolis, Ind.; the India Rubber Co., New Brunswick, N. Y.; the Sawyer Belting Co., Cleveland, Ohio; the Mechanical Rubber Co., Cleveland, Ohio; the Mechanical Fabric Co., Providence, R. I.; the Stoughton Rubber Co., Stoughton, Mass.; the Mechanical Rubber Co., Chicago; the G. & J. Tire Company, Indianapolis, Ind., and the Sandy Hook Reclaiming Works, Sandy Hook, Conn.

Since the first of April a number of orders for steam turbines, steam engines and gas engines have been booked by the Westinghouse Machine Co., Pittsburgh, Pa., and the record for the first two weeks of this month shows a considerable increase over the same period of March. With the anticipated closing of a number of contracts for which negotiations are now pending, the indications are that the April business will make an excellent showing. Among the contracts recently received is an order from the City Electric Co., San Francisco, Cal., for a 15,000 h.p. turbine. This will be the most powerful turbine installed west of the Mississippi. This company has already installed three Westinghouse turbines of a smaller size. The East Pittsburgh shops are also turning out at present for the city of Detroit a 5,000-h.p. turbine, and another of the same size is going to the Nichols Copper Co., Laurel Hill, Long Island, while the Saginaw & Flint Railway, Michigan, has contracted for an 1,150-h.p. turbine and the Alaska Treadwell Gold Mining Co., San Francisco, has ordered two 1,000-h.p. machines of the same type.

TRADE PUBLICATIONS.

Northern Pacific.—An illustrated circular describing Yellowstone Park and giving information regarding railway fares from points on the Northern Pacific system, stop-overs and hotel accommodations, has been issued.

Headlight Legislation.—The Commercial Acetylene Co., New York, is mailing a reprint of an editorial, "Headlight Legislation," by Dr. J. W. Chamberlain, Ophthalmic Surgeon, St. Paul, Minn., which editorial appeared in the *Signal Engineer* of March, 1909.

Beam and Column Data.—The Northwestern Expanded Metal Co., Chicago, has just issued a vest-pocket size pamphlet which contains a large amount of data on concrete beams and columns. This information was compiled by Ernest McCullough, M. W. S. E., Chief Engineer for this company.

Woodworking Machinery.—The S. A. Woods Machine Co., Boston, Mass., has just issued a catalogue which is a very complete description of the uses and design of its No. 59 surfacer. The catalogue is printed on heavy paper and contains a large number of excellent half-tone and line illustrations.

Roofing.—The Standard Paint Co., New York, has just issued a catalogue which contains the results of some 25 years' experience with Ruberoid roofing. The pamphlet contains a large number of illustrations of buildings on which this roofing is used; also a number of re-prints from letters of those who have used the roofing.

Idaho & Washington Northern.—A recent folder issued by the traffic department describes trips that may be made in the Pend Oreille country. Hunting and fishing are the particular attractions, and the folder gives details and advice regarding these, including a summary of fish and game regulations in Washington and Idaho.

Steel Sheet Piling.—The Carnegie Steel Co., Pittsburgh, Pa., has just issued a new pictorial album on the subject of steel sheet piling showing types of construction and examples of installations. The album is printed on heavy paper and it contains a number of full-page line drawings of the details of this piling and a number of full-page half-tone illustrations, showing a number of installations.

CLASSIFIED ADVERTISEMENTS AND PROPOSALS

Undisplayed advertisements are inserted at two cents a word for first insertion and one cent a word for each consecutive insertion of same advertisement. Minimum charge, 50 cents. Proposals are inserted at twenty cents a nonpareil line per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

POSITIONS WANTED.

WANTED—By A1 B. & B. road clerk, 28 years old, married, sober, honest and industrious, position with western road; now employed in Texas. Box 249, care *Railroad Age Gazette*, 81 Fulton St., New York City.

SALESMAN of supplies or machinery to contractors or railroad companies in or around New York City. Technically educated civil engineer, 10 years' experience. Correspondence solicited. Address Box 265, *Railroad Age Gazette*, 81 Fulton St., New York City.

TECHNICAL GRADUATE, four years' experience railway location and construction, wants position as transitman, resident engineer or better. References. Address "T. G.," care *Railroad Age Gazette*, 81 Fulton St., New York.

MECHANICAL draftsman, seven years' experience in motive power and mechanical departments, now in charge of mechanical department, would like similar position or as locomotive draftsman; references. Address Box 269, care *Railroad Age Gazette*, 83 Fulton St., New York.

FIRST CLASS maintenance engineer open to engagement; graduate C.E., M Am. Soc. C. E.; 20 years' experience on best roads; practical trackman; experienced in construction, maintenance, operation, organization and economy; best references. Address Box 255, care *Railroad Age Gazette*, 81 Fulton St., New York.

POSITIONS WANTED.

SALESMAN, well acquainted with the railroad supply trade and particularly with the manufacture and sale of car wheels, wants to change his position. Address Box 259, care *Railroad Age Gazette*, 81 Fulton St., N. Y.

SINGLE man, 34, experienced as salesman, buyer, office work, correspondence, chief clerk 12 years' experience in railway, mine, mill, contractors, boiler, structural, supplies and specialties machinery, pneumatic appliances. Best references. Address Box 266, *Railroad Age Gazette*, 81 Fulton St., New York City.

YOUNG man, 26; married; eight years' varied experience in operating department as chief clerk and expert stenographer, desires similar position or as confidential man with railroad, manufacturing concern or public service corporation; best references. Address Box 262, care *Railroad Age Gazette*, 83 Fulton St., New York City.

SIGNALMAN, with seven years' experience in charge of design, construction, maintenance and operation of mechanical and electrical interlocking and single track block signals, including six years' railroad experience; four years in charge of signal department. Thoroughly familiar with contracts, costs, specifications and details of best construction, a good handler of men, and know how to get the best results and economy in maintaining and operating signals. Now open for position in my line with the best of reasons for a change. Address Post Office Box 545, Houston, Texas.

POSITIONS OPEN.

YOUNG man, 25 to 30, wanted by established railway supply company. Must have mechanical training, preferably with railroad. Good chances for advancement. State all particulars, whether married or single, and salary expected. Address Box 267, *Railroad Age Gazette*, 83 Fulton St., New York City.

MISCELLANEOUS WANTS.

I DESIRE to act as Chicago agent for responsible firm. Have a nicely equipped office, large acquaintance with railroad men and contractors, and 15 years' experience in railroad and supply business. Address Box 264, care *Railroad Age Gazette*, 160 Harrison St., Chicago.

BOOKS AND PUBLICATIONS.

SIGNAL DICTIONARY. New edition now ready. This important work of reference was edited by the authority and under the supervision of a committee of the Railway Signal Association. The definition of all terms and name of every detail part used in signaling refer in each case to the drawings. These drawings, many thousand in number, include under Block signals the Manual or Telegraph block, the Controlled Manual, the Train Staff, the Automatic block and signals for electric roads, together with detailed drawings of track circuits and all parts used. All details of Mechanical and Power Interlocking are fully illustrated and treated. Full morocco binding. Sent prepaid upon receipt of price, $6.00. Send for descriptive circular. *Railroad Age Gazette*, 83 Fulton St., New York City.

PROPOSALS.

PHILADELPHIA & READING RAILWAY COMPANY. Construction of the work appurtenant to the abolishment of grade crossings on the P., G. & N. R. R. Sealed proposals for the work of construction under the following contracts will be received at the office of the Chief Engineer, 520 Reading Terminal, Philadelphia, Pa., until 12 o'clock noon, on Wednesday, May 26, 1909: Contract No. 19—Permanent Signals, Green Street to Broad Street. Contract No. 33—Signal Bridges, Norris Street to Broad Street. Contract No. 34—Two Signal Towers, one on east side of railroad between Cumberland Street and Thirteenth Street, and the other at the northeast corner of Railroad and Tenth Street. Plans, specifications and blank forms for bidding may be obtained at 520 Reading Terminal, by making a deposit to cover their return in good order, viz., Contract No. 19, $15.00, and Contracts Nos. 33 and 34, $10.00 each. Foreign corporations must furnish with their proposals a certificate from the State authorities, entitling them to do business within the State of Pennsylvania. The right is reserved by the company to reject any or all bids. W. Hunter, Chief Engineer.

ALL railroad contractors read *Railroad Age Gazette* to keep posted on railroad development. That is why all proposals for railroad and similar work should be published here. Rates are low—only 20 cents per line each insertion. Send orders to *Railroad Age Gazette*, 83 Fulton St., New York City.

"WANTED" AND "FOR SALE" ADVERTISEMENTS

Displayed advertisements are inserted under this heading at the uniform rate of $1.50 an inch (1 inch deep by 1⅝ inches wide) per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

FOR SALE CHEAP!
68 good second-hand bridges
Specifications and Blue Prints on application
One 19x24, 10-wheel locomotive.
Five 18x24 Mogul locomotives.
One 17x24 eight-wheel locomotive.
One 19x24 six-wheel switcher.
Fifteen splendid flat cars.
F. A. JOHANN
1624 Pierce Bldg., St. Louis. Mo.

Locomotives, Cars, Steam Shovels, Relaying Rails, New Industrial Track and Equipment.
C. A. RALSTON
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FOR SALE!
40,000 Cypress and Oak Ties
F. P. BLANCHARD, COMO, MO.

A 25-Word Classified Ad Three Times for a Dollar.
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Railroad Age Gazette
83 Fulton St., NEW YORK CITY

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Bought and Sold.
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100 60,000 and 80,000-Cap. Hopper Bottom Gondolas
Box, Refrigerator Cars, Etc. 1 95-ton. Bucyrus; 2 Model 60 Marions.
Eastern Office: Philadelphia, Pa. 916-17 Penna. Bldg. P. B. Warner, Sec.-Treas.
The Cincinnati Equipment Co.
Cincinnati, O.
Chicago Office: 1301-2 Gt. No. Bldg. F. A. Peckham Sales Manager

RAILS
Locomotives Cars Etc.
Bought & Sold
ZELNICKER Supply Co
ST. LOUIS

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THOROUGHLY REPAIRED

SEVEN 80-TON MOGULS
SEVEN 50-TON SWITCHERS
FIVE 55-TON TEN WHEELERS
200 30-TON FLAT CARS

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Railway Exchange, Chicago — 30 Church Street, New York

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Central Inspection Bureau
Inspection, Tests and Consultation. Steel, Lumber, Ties, Cars and Locomotives.
GENERAL OFFICE
17 State Street, New York
Chicago Office, WILLIS C. SQUIRE, District Manager, 209 Western Union Building.

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Member Am. Soc. C. E.
116 Nassau St., NEW YORK
Design and Construction of Bridge and Structural Work
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Railroads and Street Railways
Inspection and Valuation of Existing Structures.
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ENGINEERS, CONTRACTORS
43-49 Exchange Pl., 41-45 Wall St., N. Y.
London Correspondent, J. G. White & Co., Ltd., 9 Cloak Lane Cannon St., London, E. C. Canadian Correspondents, Canadian White Co., Montreal. Principal Philippine office, Manila, P. I.

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ENGINEERS — CONSTRUCTORS
ELECTRICAL-CIVIL-MECHANICAL
181 La Salle Street
CHICAGO

DODGE & DAY
Engineers and Constructors
Layout, Construction and Equipment of Railroads, Repair Shops and Isolated Power Plants.
PHILADELPHIA

ALBERT LUCIUS
Civil and Mechanical Engineer
All kinds of Engineering Structures, Plans, Specifications, Estimates, Superintendence, Bridge Inspection and Reports.
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Railroad Age Gazette
83 Fulton St., New York City

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Railroad examinations, reports, appraisements, location and construction, improvements of old lines. Tunnels, terminals, docks and wharves, bridges. Plans and specifications, general supervision of works.
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Civil and Consulting Engineers
Railroad location, construction, betterments and appraisements.
1467 Hudson Terminal
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Mechanical Expert
Consultations, Inspection, Expert Testimony, Perfection of Inventions, Tests
Specialty—Railroad Equipment
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ENGINEERING
CONSTRUCTION
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Special attention given to Shop Designing and to the Designing, Testing and Constructing of Railroad Machinery and Rolling Stock. Self-feeding Track Drills.
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WILLIAM R. WEBSTER
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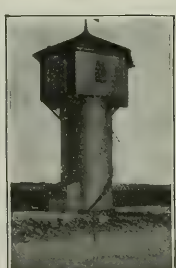
K  K

Soft water in ample volume at low cost, with vast economies in fuel, repairs, engine service and equipment—these possibilities are realized to their utmost in the "Kennicott."

When You THINK Soft Water—THINK Kennicott

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which describes and illustrates the greatest achievement of Kennicott in Water Softening Apparatus.

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INSPECTION of Materials, Processes, Structures, Locomotives, Cars, Rails.
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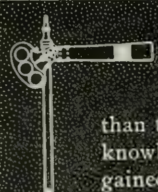

Success Lies In Superiority and means knowing and doing a thing better than the other fellow. A complete knowledge of signaling may be gained by taking a course in our School.
Send for Catalogue D.
The School of Railway Signaling.
UTICA, N. Y.

Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

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E. A. SIMMONS, *Vice-President*. RAY MORRIS, *Sec'y and Man'g Editor*.
R. S. CHISOLM, *Treasurer*.

The address of the company is the address of the officers.

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CONTENTS

We print this week the first instalment of a rather comprehensive paper on the physical aspects of the British railway system. Much of what the author writes will be familiar to most of our readers, but we believe a general round-up of present-day British practice by a trained observer will be found interesting, even by people who have seen the British railways at work and have had an opportunity to note some of the curious differences of practice, as compared with that to which they are accustomed.

The New York State Public Service Commission, Second District, has granted the petition of the New Jersey & New York Railroad to discontinue its station at Union, Rockland County, but the grant has a number of strings attached to it. The company is required to deliver carload freight at Union without extra charge; also L. C. L. freight where it is of such a character that it will not be likely to be stolen or suffer injury; to keep the station open, clean, lighted and heated during the time that passenger trains arrive and depart, and to stop all passenger trains at said station that are scheduled to stop there at this time. In other words the agent may be dismissed provided the company can arrange to have his most essential duties performed by someone else. The station will have to be unlocked immediately prior to the arrival of each train, and it ought to be locked after the train has passed. This can be accomplished easily by the signal department, by means of an electric lock, controlled by the operator at the nearest signal cabin. To keep the building warmed will be a little more expensive, but a three-inch pipe from the nearest station, with an all-electric automatic temperature regulator ought to do the trick. If electro-pneumatic block signals are in use on that line, no special pipe would be necessary, as the signal pipe would answer. What could be neater than a waiting room warmed by heated compressed air? The mental agitation of the signal maintainer might furnish all necessary heat not already developed by the compressor. At night, when trains are infrequent, the air pipe could be exhausted, the compressor reversed, and the pipe used as a vacuum cleaner to comply with the commission's order to keep the waiting-room floor in tidy condition.

Like Sherlock Holmes' friend, Dr. Watson, one is inclined to exclaim, "How simple! How is it that it did not occur to me!" when one reads the abstract of the opinion of the Supreme Court in the Commodities Clause case, printed on another page of this issue. By defining the meaning of the words "interest in" the Supreme Court cuts the ground from beneath the feet of the government attorneys and the attorneys for the railways as well. Apparently no railway company is prohibited by the Commodities Clause, as interpreted by the Supreme Court, from carrying coal belonging to a corporation the capital stock of which is owned by the railway company; that is, the words "interest, direct or indirect" are simply interpreted in the same sense that courts have interpreted them over and over again in the past. The court holds, it seems, that when the railway company has parted with all right to say what the disposition of the coal shall be, it no longer has any interest direct or indirect in the product. The two chief reasons that underlay the agitation for the Commodities Clause were, first, that the railway company made an extra profit by carrying its own coal to tidewater at a rate which did not have to be made public; second, and this reason chiefly urged by the Interstate Commerce Commission, that railways discriminated against others shippers so as to favor the movement of their own coal. The Commodities Clause as now interpreted will prevent both of these abuses as far as any law could do, and yet it does not irreparably injure the legitimate business of the railway company, as an enforcement of the interpretation put on the clause by the government attorneys might have done.

PREMIUMS TO TRAINMASTERS.

The *Railroad Age Gazette* will pay seventy-five dollars, under the conditions named below, for the best article on how to be a first-class trainmaster; fifty dollars for the second best article, and at its regular rates for any other articles accepted. The trainmaster—by which we mean the superintendent's chief assistant or assistants in dealing with station men and trainmen—is or should be the wheel horse of the operating team. He occupies a critical position, for he must take up varied responsibilities for which usually he has had little training, and for the first year must grow rapidly. We hope by this offer to give wide circulation to the best ideas of the men who have most thoroughly studied the duties of the position.

CONDITIONS.

1. The author must have had at least one year's experience in the position of trainmaster (or an equivalent position, whatever its name); must have had this within three years past, and must send with his paper a brief account of his experience and schooling; also say in what state or states he has lived.

2. The author's name and address should be sent in a separate sealed envelope.

3. The paper must not be less than 1,000 words long, nor more than 4,000 words. It must be typewritten.

4. All papers must be in our hands by July 15.

SUGGESTIONS.

Give facts, and be sparing of generalities; the generalities are pretty well known. But your theories will be interesting, provided you can illustrate them cogently from experience.

Do not be afraid to illustrate with accounts of actual occurrences on your own road; you can disguise names and dates if compelled to.

EFFECTIVE WORK BY THE BUSINESS ASSOCIATION.

Perhaps it would not be exaggerating to say that the appearance of the railway supply manufacturers of Illinois before a joint session of the two houses of the legislature of that state on April 29, that was convened expressly to give them a hearing, marked an epoch both in railway regulation and in the relations between the supply manufacturers of the country and the railways. The supply men did not go before the legislature as a tail to the railway kite. They hired a special train, paid the same for it as any other party would have to pay, and went to Springfield to ask the postponement of further legislation affecting railways to a time when business shall be less unsettled. Their spokesmen, Mr. Mulliken and Col. Post, did not oppose all regulation of railways, but conceded that reasonable regulation is necessary. They did not speak for the railways but for those who are making supplies for the railways, and their employees, who have been hurt worse by anti-railway agitation and legislation than even the roads themselves.

Probably the lawmakers of Illinois never before had brought forcibly to their attention the fact that there is a great branch of industry that is entirely independent of the roads in ownership and management, and yet is absolutely dependent on their prosperity for its prosperity. They had been used to hearing about railway matters only from shippers, representatives of railway labor, and representatives of the railways. Few of them knew before that the railway supply manufacturing business in Illinois is larger than in any other state, and represents many millions of invested capital and gives employment to probably 200,000 men. The statement to them of facts such as these made an obvious impression.

The plans for the demonstration, which were made by A. H. Mulliken, were perfect and perfectly carried out in every detail. Mr. Mulliken's brief talk to the legislature was that of a broad, sane, big business man, actuated not merely by private interest but by both private and public interest. Col. Post's speech was a model of eloquence, tact, and sound logic and good sense. The effect should be good, not only in Illinois but in other states.

After the delegation appeared before the legislature, it called on Governor Deneen. In a brief talk the governor made some statements about regulation of railways that were only too true and that indicated why so much railway regulation has been unwise and harmful. He said that at every session of the legislature shippers and railway employees come asking for legislation. The railways are represented at the capital by legislative agents who have nothing to do with shaping the policy of the roads, and can therefore only oppose measures that others suggest. Their attitude necessarily is always negative, never positive. He thought that if the executive officers of the roads and men of affairs, such as those composing the supply men's delegation, would take the time and trouble more frequently to come to the capital themselves, to present fully facts showing why proposed measures were unfair or dangerous and should be defeated, or how they could be modified so as to make them fair and beneficial, much fewer positively bad laws would be passed and the laws that were passed would be much better and fairer. Gov. Deneen's remarks gives the point of view of the public man—of the politician, if you please—and are well worth heeding. The responsibility for vicious regulation affecting large corporate interests, like all other bad government, lies not only on those who seek to get vicious laws passed, but also on those who do not do what they can to prevent their passage. It is all very well to denounce politicians, but before business men indulge in this popular pastime they should be sure they are doing their own duty more intelligently and more courageously than the politicians are doing theirs.

A more important work than enlightening legislatures that needs to be done is that of educating public sentiment. This is clearly recognized by those who have organized and are directing the energies of the Railway Business Association; and there can be no doubt that its educational work will tend not only to prevent much action hostile to railways during the present sessions of the legislatures, but to cause fewer legislatures to be elected in the future that will be disposed to attack the roads to make a politicians', shippers' and labor agitators' holiday.

EMERGENCY TELEGRAPH LINES FOR RAILWAY SERVICE.

The interruption to traffic between Philadelphia and Washington on the fourth of March last, keeping hundreds of eastern people away from the presidential inauguration, was one of the most notable incidents of the kind on record. Snow and sleet have many times destroyed more poles and wires, no doubt; but not often are there so many people to whom a short delay means so much disappointment and loss as was the case on this occasion. As railway managers usually seem ready to go to any expense necessary, no matter how large, to prevent delays, however small, on busy trunk lines, everybody wonders why, after lessons like this, every railway company north of Mason and Dixon's line does not at once lay underground wires the whole length of its lines; and as they do not seem inclined to do so, numerous editors and other persons arise to print good advice. The fact seems to be that the losses and inconvenience which result from a day's interruption of telegraphic communication do not count up so seriously when one sits down afterward and coolly considers them. After a brief isolation of the city of Philadelphia a few years ago the officers of the Pennsylvania Railroad considered carefully the project of laying an underground telegraph from that city to New York, but they decided not to do it. Judging by the general policy of that company, it is fair to assume that this decision was not due to mere stinginess, but rather to a deliberate judgment that the large sum of money necessary to lay 90 miles of underground telegraph could be made to do more good for the public if used in other ways. In such a situation an underground line would lie unused until the next disaster to the pole line, for messages can be sent so much faster on lines which are strung on poles that no one would think of using the underground when not compelled to do so.

There is one important feature, however, in which the Pennsylvania lines can be and probably now will be improved. Poles should be set far enough from the track so that if they fall they will not obstruct the path of trains. The proper place for poles is at the edge of the right of way. Where the right of way is too narrow for this, extraordinary precautions should be taken. Railway lines where the poles are thus set back present a much improved appearance.

Another precaution which might often prevent or greatly reduce delays would be to have means constantly at hand for quickly establishing emergency telegraph lines; and in this connection the reader will be interested in a letter which we have received from Major C. McK. Saltzman, of the signal corps of the army, as follows:

"The violent storm which occurred in the eastern states

early last month (*Railroad Age Gazette*, March 12, page 515), blowing down miles of poles and wires and seriously hampering railway travel, suggests the usefulness of the Signal Corps telegraph system on railways.

"When troops of the army engage in field service under modern conditions, it is no longer possible to send orders and messages by means of messengers or orderlies. The modern game of war is played fast. The Signal Corps of our army therefore has devised plans for rapidly laying field wires on the ground which can be operated either by telephone or telegraph. The Signal Corps uses two types of wire for this purpose. Its best type, known as "field wire" consists of ten small steel and one copper wire twisted together and covered by a tough insulation. The steel wires are each about .012 in. diameter, while the copper wire is No. 21, B. & S. The twisted wires are held together by a light serving of cotton, outside of which is a seamless compound of rubber having a thickness of .024 in. The rubber insulation is protected by an outer serving of closely woven braid of cotton. The completed wires are only about ⅛ in. in diameter. This wire is very pliable and weighs but 75 lbs. to the mile. It is carried on automatic carts drawn by two horses or mules, and the wire can be laid on the ground at a trot or gallop. The carts are so built that the wire can also be reeled up at a rapid gait. The insulation on the wire is tough and is not rendered unserviceable by troops and wagons passing over it. Communication is maintained over these wires by means of a valuable little instrument known as the "buzzer," which combines both the telegraph and telephone. This instrument can maintain communication over lines of very high resistance and has been used in sending telegrams over stretches of good barbed wire fence* and over short distances where railway track was used instead of wire.

"In addition to this "field wire" the Signal Corps has a lighter type of wire known as "buzzer wire" for emergency use. This consists of two steel wires and one copper wire, each having a diameter of .012 in. twisted together and covered with a double wrap of cotton and impregnated with an insulating compound. The wire is put up on spools containing one-half mile. These spools can be carried by a man mounted on a horse, and by means of a hand reel the wire can be paid out at a trot or gallop. This wire is only used in emergency when field wire is not available or for use on short distances of ground over which the large wire carts cannot be taken.

"Excellent results have been secured by the army in maintaining communication over these field lines and the great speed with which they can be laid, suggests that the scheme would be of benefit to railways for emergency use. Suppose several miles of telegraph line were suddenly destroyed; if a large reel of this army field wire were mounted on a hand car, or a flat car, or even on an engine tender, a wire could be laid along the right of way at a rate of about twelve miles an hour. Any number of wires could be so laid simultaneously from a number of reels. Upon the reconstruction of the permanent telegraph lines, the field wire lines could be taken up at a rapid rate. By the use of this type of field wire, the army has practically dispensed with the need for poles."

There would be numerous obstacles to the use of such a method on a railway line having many side tracks, junctions, and highway crossings, and it seems likely that the satisfactory experience of the army could not wholly be repeated; but the scheme is well worth consideration, even if not universally applicable. When a railway's telegraphs are in such a bad condition as to require the services of all its linemen for two or three days to re-establish only the most essential lines, an insulated line that would work while lying on the ground would be greatly appreciated, even if it could be laid over only a part of the disturbed territory.

*A railway in the southwest, in building recently some long stretches of wire fence, soldered the joints in the top wire, so as to make it a continuous electrical conductor; this with a view to its possible usefulness as an emergency wire for communication.—Editor.

NEBULOSITIES OF THE SHERMAN ACT.

Attorney-General Bonaparte, on surrendering office at the close of the last federal administration, gave out to the press a mock will and testament in which he recited the anti-trust suits bequeathed to his successor. That successor, Mr. Wickersham, has lately and officially refused full acceptance of the Bonaparte legacies. He does not, to be sure, reject them *en bloc*. But he admits, in the words of the press report, that "Some suits were instituted and some prosecutions commenced without sufficient consideration and without adequate cause," which suits the new administration will not hesitate to dismiss while "it will not abandon the splendid work of the last administration." But what is more relevant to the present situation is Mr. Wickersham's admission of "uncertainty as to the precise scope and meaning of the Sherman Anti-Trust law," his adverse reflection on its drastic quality and drastic legal interpretation and his hint of future amendment by Congress in the direction of moderation. Evidently the old "big stick" is reduced already in size and energy of swing. And such an utterance from the legal arsenal at Washington directs timely attention to some of the nebulosities of the Sherman Act as they are already disclosed by litigation.

For the most conspicuous example let us glance back at the Northern Securities case, now more than five years old, impressive, not to say startling, when the decision was rendered, but now well-nigh forgotten outside the courts. The decision on its face was sweeping. It held the stock control of the Great Northern and Northern Pacific railways by the Northern Securities Company a combination in restraint of trade and illegal; that the Anti-Trust Act applied to restraints of trade whether unreasonable or reasonable, actual or potential, to private as well as corporate combination, and it gave almost unlimited rein to the authority of Congress expressed by statute. The theory of high public values of free competition the court declared in the most explicit terms. But what may be called the judicial margin in the decision was thin. Four judges, Harlan, Brown, McKenna and Day, gave the radical opinion; Brewer gave them the majority of one, but only because he held the railway combination illegal, and he at the same time declared that the Sherman Act did not apply to minor and reasonable contracts in partial restraint of trade while freedom of investment remained the "inalienable" right of every citizen; and four judges, Chief Justice Fuller, White, Peckham and Holmes, dissented radically on the ground that the Anti-Trust Act does not apply to "ownership" of shares and they further criticise an interpretation of the Act which "would disintegrate society, so far as it could, into individual atoms" and "an attempt to reconsruct society." Such is the dissenting peroration of Justice Holmes, concurred in by three other judges, in a case which runs through 204 pages of the United States reports.

The narrow numerical majority in the decision is scarcely less noteworthy than the wide diverging in the legal view of fundamental principles as applied to the Anti-Trust Act; and since the decision was rendered five years ago a new judge has taken his seat upon the Supreme bench. In the later decision (November 7, 1908) of the United States Circuit judges, Lacombe, Coxe, Ward and Noyes, in the American Tobacco case one finds the same divergency in less degree. Three of the judges substantially follow the extreme opinion in the Northern Securities case. The American Tobacco Corporation is held radically to be a combination in restraint of trade and of benign competition and is doing an interstate business. But Judge Ward, dissenting, held that the tobacco company was, essentially, a state manufacturing corporation not an interstate trader, and had not, in fact, restrained trade, but the reverse. The earlier Knight sugar refining decision of the Supreme Court which bears upon the tobacco case is divergently interpreted by the Circuit Court justices; and, intermediately, there is only the Danbury Hat decision holding the boycott in restraint of trade. No wonder Attorney-General

Wickersham pronounces the Anti-Trust Act "uncertain" in scope and meaning.

The Act, in fact, is in its legal aspects vague nebulous and in a period of judicial transition. If unchanged and interpreted strictly by courts that hold to its letter and apply it sharply it can be made a weapon of severity, even of cruelty, and particularly so to the railway corporations whose interstate character is unquestioned. On the other hand, if developed conservatively it can be made in the end an agency of sane regulation with publicity as one of its incidental benefits. But this far the cases to which it has been applied have been limited in number and leave many phases of combination yet to be tried out. There is, for example, the "gentlemen's agreement" which has so often superseded the formal and incorporated trust or holding company. There is the holding company, itself, in manifold shapes. Finally there is the control based on an individual or group of individuals with a sympathetic relation to the original and underlying interest—as in the case of the Billard holding of the Boston & Maine. Can the courts in such a case go behind Judge Brewer's "inalienable" right of ownership? Can a state or the United States in such a holding of shares sue an emotion or issue an injunction against a sympathy? And, beyond all these, lie the uncertainties of future amendments of the Act by Congress—at which Attorney-General Wickersham points—which may modify or shift entirely by the tenor of earlier courts. The outlook, therefore, is hardly encouraging for that fixity and clarity which great vested interests crave in a national statute of such scope as the Anti-Trust Act. But it is only an extreme example of the judicial nebulosity sure to follow when a national statute falls upon interests at once variea and vast.

BALTIMORE & OHIO AND CINCINNATI, HAMILTON AND DAYTON.

For some time the directors of the Baltimore & Ohio have been considering the acquisition of control of the Cincinnati, Hamilton & Dayton, which is in the hands of Judson Harmon, as receiver. J. P. Morgan & Co. bought a controlling interest in the common stock of the Cincinnati, Hamilton & Dayton in 1905 for $160 a share and were to sell this controlling interest to the Erie, but when it was found necessary to put the road in the hands of a receiver, Morgan & Co. did not compel the Erie to take the stock, and still retain it.

While there has been no official announcement that the Baltimore & Ohio directors, the security holders' committees and J. P. Morgan & Co. have made any definite arrangements about the Cincinnati, Hamilton & Dayton, it seems pretty certain that some arrangement is about to be made by which the Baltimore & Ohio will guarantee interest on certain securities of the C., H. & D., and in return will receive an option on the $8,000,000 common stock held by J. P. Morgan & Co.

The advantages of such an arrangement to the Baltimore & Ohio are considerable. The B. & O. has its heaviest traffic district in the middle and is weak at the extremities. It has been likened to a balancing pole, heavy in the middle and light at both ends, and for this reason would find a collecting and distributing line west of Columbus, Ohio, of great value. It at one time tried to get the Hocking Valley, but was obliged to share that road with a number of partners. Similarly, the Philadelphia & Reading would have been of value to it, but the Vanderbilt lines were able to prevent this, and in 1882 a contract was entered into between the New York Central & Hudson River, the Fall Brook Coal Co. and the Philadelphia & Reading by which they were to favor each other in exchange of traffic and a through line was to be formed between Buffalo, N. Y., and Philadelphia, Pa. The contract was for 900 years.

The Cincinnati, Hamilton & Dayton does an excellent originating and distributing traffic in the Central West in connection with the Queen & Crescent and the Pere Marquette. The C., H. & D. owns joint control with the Alabama Great Southern of the Southwestern Construction Co., which in turn controls the Cincinnati, New Orleans & Texas Pacific, leased from the city of Cincinnati. A through working combination between the Pere Marquette, the C., H. & D. and the Queen & Crescent, of which latter the Cincinnati, New Orleans & Texas Pacific is part, is of the greatest importance as an offset to the close relations existing between the Pennsylvania and the Louisville & Nashville. At present the C. H. & D. gives about one-fifth of its traffic to the Baltimore & Ohio, one-fifth to the Vanderbilt lines, about one-fifth to the Erie and the other two-fifths scattering. By control of this line the Baltimore & Ohio hopes to get the lion's share of this traffic.

The advantages of control by such a strong company as the Baltimore & Ohio to the C. H. & D. are rather a question of what terms the Baltimore & Ohio is going to demand for the use of its credit than one of absolute merit or demerit. The 4½ per cent. noteholders' committee have been the chief objectors to the plan proposed by the Baltimore & Ohio, but if, as seems highly probable, they have now secured terms that are satisfactory, the benefit to other security holders is apparently a very real one.

NEW PUBLICATIONS.

Railway Freight Rates, in relation to the industries and commerce of the United States. By Logan G. McPherson, lecturer on transportation, Johns Hopkins University, author of "The Working of Railroads." 441 pages; 5½ x 8½ in.; cloth. Henry Holt & Co.; New York, 1909. Price, $2.25.

Mr. McPherson has produced an exceedingly important book. It is not only the best existing account of the railway freight rate structure of the United States, but it is easily the best book on American railway traffic that has been written. There has been a singular lack of useful books on railway traffic in this country. The general nature and location of the freight moving industry in the United States was outlined 25 years

Cincinnati, Hamilton & Dayton and the Baltimore & Ohio Lines.

The Staten Island Rapid Transit shown by a broken line.

ago in Hadley's Railroad Transportation, and Charles Francis Adams, M. M. Kirkman and other of the older authors and economists have discussed some of the principal traffic problems out of which the rate wars of the seventies arose. But Mr. McPherson makes the freight traffic structure of the country his primary object; not a secondary one, and he has done an admirable piece of work.

The book discusses the principal kinds of traffic which move in this country as commodities, telling where they are produced, how they are made ready for market and where the market is. Then, broadening out into the transportation charge on these commodities, the regional rate structures are first discussed, from the historical point of view that is necessary to explain some of their apparent vagaries. For example, New England retains its manufacturing supremacy under certain very serious difficulties. Boston in particular is far removed from the sources of the raw materials which it works up, but it has an abundance of highly skilled labor. Consequently, the railways must so adjust freight rates into New England that the raw materials can move there in competition with other manufacturing points, and the manufactured articles can move out again and be distributed all over the country in spite of the obstacle created by the distance from Boston to western points. Freight rates in the trunk line and central traffic territory derive their present structure from the way in which the main stems of travel were pushed out towards the west in parallel lines and then branched out into a maze of complications. The trunk line percentage system was created in 1876 and the rate between Chicago and New York, whatever the distance might be, was designated as 100 per cent. Then the rate to or from certain principal intermediate points that were common to two or more railways was made a fixed percentage of the rate to or from Chicago. Thus the rate from New York to Pittsburgh became 60 per cent., to Cleveland 71 per cent., to Peoria, 110 per cent. of the New York-Chicago rate.

After the Interstate Commerce law was passed, however, in 1887, the changes in the rate fabric in this territory to avoid conflict with the long-and-short-haul clause worked havoc, so that a further revision of the percentage system was begun in 1892 and resulted in 1896 in the adjustment which, with a few changes, is in effect at present. Rates for east and west traffic are applied to groups of stations, each focused more or less directly upon a central basing point; but the rates as a whole bear only an indirect relation to distance, although the long-and-short-haul principle is rigidly observed on interstate traffic. In the trans-Mississippi and trans-Missouri territory, however, no device similar to the trunk line percentage system was applicable because of the absence of a definite basing line, like that resting upon a populous New York at one end and a populous Chicago at the other; hence the system of adjustment by fixed differences instead of percentage arose.

In the territory south of the Ohio and east of the Mississippi the rate structure has always been profoundly affected by the water competition of the Atlantic ocean and the gulf of Mexico. A large proportion of the manufactured articles used in this section comes from New York and the New England district, and when manufacturers in the central west want to compete for this business they have to get a rate to the east which can make a showing against the rates from the north fixed by the coastwise steamers.

The traffic conditions in Texas require a long and careful discussion by themselves and they are greatly complicated by the fact that the Texas Railroad Commission, ever since the days of Judge Reagan, has used the local freight rate system of that great empire, which is entirely under its control, as a protective tariff against all manufacturers outside of Texas. The Texas Railroad Commission is interested only in Texas industries and does not include the railways among these industries. Consequently, when the through lines coming down from the north have endeavored to reduce their interstate rates so as to make it possible for manufacturers in the central part of the country to get into Texas jobbing territory and compete with the manufacturers who ship by water to Galveston, the Texas commission has promptly reduced the local interstate rates to match, thus throwing the competitive situation just where it was before the first change, and making the only net result a general lower basis of local rates within the state. In consequence of this policy and of the policy of fostering a large number of small jobbing points in preference to a few strong ones, jobbing centers have arisen every 40 or 50 miles, but no one jobbing point has been enabled to attain the size and importance which it would otherwise have done.

After continuing the discussion of the regional rate structures throughout the country, the author takes up the commodity rate structures on which grain and grain products, live stock and dressed meats, cotton, lumber, etc., move. Then, having given the reader a clear idea of the outline of his work, he begins again with history and runs through the early tariffs and classifications; early rivalries and the beginning of through service and rate wars and tariff agreements. Mr. McPherson then discusses secondary freight services and developments of the freight service, such as the bill of lading, the theory and practice of demurrage, reconsignment, etc.

After a long and thorough discussion of the transportation charge in its relation to public policy, and of public sentiment as expressed in legislation, the author has a fascinating chapter, of quite unique importance, on the commerce of the cities, taking up under different general titles the freight traffic created by commercial districts, such as the north Atlantic seaboard, Buffalo, Pittsburgh, Cleveland, the Southeast, Cincinnati, Louisville, Chicago, Kansas City, St. Paul and Minneapolis, Denver, the Pacific coast, etc. This chapter alone is important enough to justify the book.

The book closes with a comparison of the railways with the agricultural and manufacturing industries—a chapter which reads more or less like a campaign document, but is nevertheless interesting. Not the least important thing which the author has done is the preparation of an excellent index, covering 35 pages of the book and enormously increasing its practical use.

We have little hesitation in expressing the opinion that Mr. McPherson's book will stand as the standard reference work on freight traffic and freight rates in the United States for a good many years, and from the standpoint of public policy we are exceedingly glad the book has been written. The country would be better governed and much less governed, if every legislator, state and national, had to pass an examination upon it before taking his oath of office!

Letters to the Editor.

THE USE OF MODERATELY SUPERHEATED STEAM.

Montreal, April 12, 1909.

To the Editor of the Railroad Age Gazette:

Referring to my letter in your issue of April 9, page 789, I find that one page was omitted by the man who copied the letter in my office. The last paragraph but one in the letter as printed should read as follows:

"Mr. Fry has quoted a steam economy on the saturated steam engine of 12.5 per cent. for the low superheat, and 30 per cent. for the high superheat engine, these figures based on pounds of steam per inch-horse-power. Taking British terminal units the consumption is 27,900, 24,800 and 22,000 per horse-power-hour, respectively, or as 100 is to 89 and 79. In other words, 40 deg. of superheat shows a thermal economy of 11 per cent. and 290 deg. of 21 per cent. Mr. Fry accounts for this extraordinary economy obtained with 40 deg. super-

heat by what is, so far as I am aware, a radically new theory of cylinder condensation, viz., that it is caused by the water carried into the cylinders by the steam. I am aware that the importance of cylinder condensation has within the last few years been questioned, but I have understood that there is little doubt of its really accounting for about the quantity of loss stated by Mr. Fry and that the usual explanation of it is correct. This explanation depends largely on the action of the cylinder walls, and while no doubt the wetness of the steam is a factor, considerable condensation certainly occurs with dry steam, and in fact it would appear inconceivable for one or two per cent. of moisture in the steam to condense 37½ per cent of it in the cylinders, while it has been carried along with the steam in the various passages without producing any such effect. The experiments with steam of varying degrees of superheat have shown a decrease in the cylinder condensation with each increase in the amount of superheat, and I do not know of any experiments with low superheat that have shown anything like the saving estimated. In those given in Ripper, the saving with 100 deg., 150 deg. and 250 deg. superheat was almost exactly in proportion to the amount of superheat, and according to this the thermal efficiencies of the engines under discussion would be as 100 to 97 and 79, or about a 3 per cent. saving for the engine with low superheat as against 21 per cent. for that with high, and these are, I believe, much more closely the figures that will be obtained in service.

H. H. VAUGHAN.

Contributed Papers.

BRITISH LOCOMOTIVE BUILDING.*

Trade has been quite satisfactory until about a year since, when it began to fall off. That is not chiefly due to foreign competition, although the Germans have taken orders for India which would otherwise have come here. The chief cause is bad trade—the absence of demand. The fluctuations in our trade are largely due to the changes in the locality of the demand. In the Atlas works, of which I was managing director before the amalgamation took place, 90 per cent. of the engines turned out in 1902 were for the home lines. In the following year 10 per cent. only were for the home lines. From the beginning of 1895 to the end of 1902 there was a very considerable increase in the volume of our trade. The demand for locomotives for the home lines and for the Colonies and India was very large during the whole of those years, with the result that the whole of our three works, which at that time were separate works, increased their output to meet the demand, but since the beginning of 1903 there has been and is a considerable falling off in the demand for locomotives. We have had some foreign competition in the United Kingdom, but only in exceptional times. In 1898 or 1899 orders were given to the United States in four or five cases, and one small order went to Belgium for engines for this country. This was shortly after the engineers' strike in 1897, when some of the locomotive shops were closed for five to seven months, during the whole of which time orders were being carried out very slowly and the railways were getting short of engines. British railways build nearly all their own engines now. They only buy from us when there is a sudden demand which they cannot fill themselves, and as they are not likely to alter that policy there is no chance of the home trade increasing. Railway companies attach great importance to possible improvements in locomotives. Some of them, particularly the London & North-Western and the North-Eastern, have spent very large sums in improving locomotives, successfully to some extent. In other cases we find that a certain engine, which has been thought a great deal of at the time it was produced, is gradually being superseded. On the North-Western the Webb compound engine, introduced about 1881, was considered to be a great advance on anything done before. These compound engines have been developed from time to time and increased in size, weight, etc., and now they are being superseded by simple engines of very ordinary construction. The great French engines, imported here for use on the Great Western, are very good engines for the class of work they have to do. They would not be much more costly to make in France as compared with a similar engine made at our works. The labor is not as efficient in France as it is here, but they work longer hours and get lower wages.

EXPORT.

With regard to the colonies and foreign countries trade varies enormously. Many years ago we did a large trade with all Continental countries, but as they gradually began to manufacture their own locomotives we lost the trade. We still trade with Spain to some extent, and a little with Portugal, but the principal Continental countries we do not supply now. France and Germany make their own locomotives, and Italy also to some extent. In Italy the German competition is very severe for any engines wanted.

Germany has not imported an engine from this country for many years. The duty there is over 30 per cent. Some years ago we sent some engines to Germany under special circumstances, but Germany is now a closed country to us altogether. If the Germans had to compete with us on all fours they would be squeezed out, but they get very good prices indeed for their own products in their own country owing to the ring or "kartell," and if they have not enough home orders to fill up their works to their complete capacity they compete with us abroad and take orders at prices which cannot pay. They dump in India, Egypt, Italy and the Argentine Republic. The position of the Germans is immensely strengthened by the fact that the railways belong to the state. The state by way of assisting the manufacturers does not encourage the railways to build their own engines, but prefers to keep the manufacturers going. Even if they had free trade the Germans would probably not allow engines to be bought outside.

With Japan we do a trade which varies considerably, depending largely on the severity of the competition by Germany—our great rival there. If they happen to be full of work we get the orders.

In the United States we have no opportunity at all. If the American makers had to make to our specifications they certainly could not compete with us, but if they may supply their own article, which is much cheaper than ours, and we have to work to a proper specification, of course we cannot compete with them. If we work on American lines and build a cheap article, in all probability they could beat us still, but if they work on our lines they cannot compete with us. The British locomotive is a much more complicated, much better designed and better built engine than the American. The American engine is a cheap article as regards materials, designs and workmanship. Our men, trained to a high point of excellence of work, cannot compete with men trained to do cheap work and do it quickly. Americans do not believe in our system of repairing by which we have engines running for 30 to 40 years.

In South America, British makers supply practically all the engines for the British companies, such as the Rosario, the Great Southern, etc. They use a good many engines, but it is a very fluctuating business.

British makers supply most of the engines in India, although a few are built in the railway shops in India. Recently they have given an order to Germany, which is quite a new departure. The Indian railways had been keeping their orders back, and came into the market with a rush and could not get their wants supplied here; they therefore gave orders first to the United States and afterwards to Germany. Germany got the orders for India because of the price and time

*From evidence of J. F. Robinson (a director of the North British Locomotive Co., Ltd.), before the British Tariff Commission.

of delivery. At that time the locomotive shops in this country could not undertake delivery except over a very long period, and the result was that prices were high. The Germans had not much to do, they wanted work badly and were able to give early delivery and take orders at a lower price—at the same price we should get the orders in future, India would favor us to a certain extent. The government lines have never given any orders to Germany, it was only the guaranteed railway companies that did so. The first 40 engines ought to have been delivered in 1902, but were carried forward to the next year. They got some larger orders afterward. The first 40 engines were built in Hanover, and they had a great deal of trouble due to their being called on to produce a class of article and style of workmanship they were not accustomed to. When they submitted it to the inspector who had been inspecting our work he said theirs did not comply with the specification, and a large number of parts had to be scrapped. The later engines built by Germany for India were considerably improved because the builders found that otherwise they would not get the engines accepted. If they adopt a higher class of workmanship and pay larger wages they will find it more expensive to build the engines, but as long as the "kartell" goes on they will continue to compete with us in neutral markets, and successfull yin certain cases.

Railway companies in Canada have manufactured engines for themselves for many years past, and it is only when they are building for capital account that they buy outside; ordinary replacements are built in their own shops, but the Canadian Pacific and the Grand Trunk having very fine shops. In Canada they had works at Kingston, which led a precarious existence for many years and are now sold. They had some works in Montreal which were completed a few months ago, and have since been sold to the American Locomotice Company, so that the Americans have got a footing there and look forward to being able to supply the Canadian market from Montreal. Notwithstanding this, if the duty were taken off or reduced we might compete against the manufacturers there. Montreal is not an ideal place in which to build locomotives; it has a very severe climate in winter and a very hot climate in the summer, which is much against the output of the men. They must have a much larger area covered up than we have. Unless it is very wet indeed, a lot of our men work all the year in the open on certain jobs. If the duty in Canada against us disappeared altogether the Canadians would not compete. The labor party is not quite so strong in Canada as in Australia, but it is getting stronger every day. In February, 1903, we had two considerable orders in hand for the Canadian Pacific Railway, and they asked us about building 20 compound mixed engines (for heavy passenger or fast goods traffic), which had to be delivered out there in October, 1903. We were nearly full up with orders for the same company, the engine was a new engine to us, and we had no patterns and no drawings. They went to Germany, got an offer from the Saxony Company and placed the order for 20 engines with them. They came to us three months later, and asked us again to quote for 20 of the same engines to be delivered later on. We accepted the order, and our first engine was steamed on the day the first German engine was delivered in Montreal. Our last engine was delivered three months before their last engine. The order went to Germany on account of time, not price. They undertook a delivery they were not able to fulfill. The penalties in that contract are not settled yet. Experience in Canada will not encourage German trade there. Canada discriminates against Germany, and their manufactures pay over 33 per cent. more duty than ours.*

We supply engines to New South Wales and Western Australia. Victoria and South Australia build their own engines. In Queensland and New South Wales they sometimes build their engines. They pay a great deal more for what they make themselves. If the figures which are published in the Australian papers are correct, Australia is hopelessly out of competition with us in the locomotive building trade. It is not a question of scores, but hundreds of pounds.

There was a large demand in South Africa after the war and a great proportion of the orders came to our works. That is, of course, now decreasing, but as the country develops they will require many more engines. Cape Colony has bought a few engines from the United States, but since the conclusion of the war nearly all the Cape engines and all those for Natal, Orange Colony and Transvaal have been bought in this country. They have built no engines in South Africa.

RAW MATERIALS.

Our principal materials are steel, iron, copper and copper alloys. The copper and iron ores come from abroad, but we buy our supplies manufactured here. The iron and steel are cheaper in Germany, and probably also in the United States. In steel axles and tires, etc., the quality usually required here by locomotive engineers is very good and, therefore, expensive, and probably we pay far more for such articles here than if made in the United States or Germany. The class of steel imported from Germany is not used in our manufacture, but it has the effect of keeping the general price of steel down. A quality of plates similar to those manufactured by the people who make our boiler plates in this country comes from Germany. If they cannot get sufficient orders for cheap stuff because of such German competition they must compete for what orders they can get among themselves, and the result is that the price of steel plates, including boiler plates, is kept down by the competition in this country, which is accentuated by the German dumping. Dumping has not been of any other advantage to us.

TRANSPORTATION.

On much of our work, if being done for export, as we are close to the Clyde we do not pay heavy railway rates, but the rates for materials coming from Yorkshire where we get a large quantity of our steel and steel are high as compared with what they would be for a similar distance in other countries. In sending to Canada we have the sea passage to pay. That is a considerable amount. In the United States the locomotive firms are a considerable distance from the Canadian frontier, and get a long land carriage, which however is fairly cheap. The United States railways do not allow the engine to steam over the line, they haul it. When we deliver to English railways the engines are never allowed to be taken away in steam from the works. The companies refuse on the ground that an engine must not steam over their road unless they have inspected it. On Continental lines also such an engine is hauled by another engine as part of the train.

TECHNICAL EDUCATION.

Our fitters, turners and boiler-makers would not be improved by having technical or scientific training. The work in our places is so divided that the same man does the same job the whole year round, and by specializing in that way we get a better result than by having a good all-round man. There is not much new to learn about a locomotive. It has been going on since the days of George Stephenson. It has advanced in size and other respects, but it has got to about the end of its tether as regards improvement, and in our work as contractors there is not much scope for men of an inventive turn of mind. From my point of view as a locomotive contractor it would not help us very much to start such a thing as an engineering tripos at Cambridge or some similar 'nstitution in London; what you might do on railways is different. The design is usually supplied to us. If we get an order for a locomotive without any specfiications we should probably make use of some engineer's specification improved by ourselves according to our experience. If the engine were a new engine and had not been built before, we should take the

*At the time this evidence was given the British manufacturers of locomotives were receiving a preference from the Canadian Government of 33 per cent. of the duty charged on locomotives imported from other countries.

nearest thing we had to it, and work the parts in as far as we could, only making new parts where necessary. The United States railway engineers have become better educated in the line they have developed, as their engineers have certain ideas of their own which they insist on having carried out. As long as they were men of no education they were very much in the hands of the makers. Now the position has been to some extent altered.

TRUSTS.

In Germany in our business they have a combination which is recognized by the state railways, which tolerate this ring so long as they do not put their prices up abnormally. In the United States there was a large amalgamation in the locomotive trade, which included almost all the makers but Baldwins, the largest firm in the trade. The only amalgamation of any importance in the home locomotive trade was that of our own three companies, which took place in 1903, because it appeared to us that we could economize in production and expenses generally.

PROPORTIONS OF COST.

The proportions of the different elements of cost in our business vary very much according to the class of engines we are building and the specification we are working to. For productive wages we require 25 to 30 per cent. of the cost, materials 55 to 60 per cent., and fixed charges 15 to 20 per cent.

STANDARDIZATION.

British engineers have not made any advance in the direction of standardization. Each railway is a world of its own as far as making component parts of a similar pattern is concerned. It is practically impossible to make parts for stock, we never know what the next orders are going to be. We have tried standards for India to some extent, but the system will not have a very long life, the tendency being to improve the locomotives by making them more powerful and heavier. I am a member of the locomotive sub-committee of the Standards Committee, and at the time we started on this particular job we had certain regulations with regard to the weight, and especially the weight per axle admissible on the broad-gage and metre-gage lines. Before we got through with our standards these figures had been altered on certain lines and our standardization was thrown into the basket again to a large extent. Even when the Standard Committee engine was adopted on certain lines in India there were certain excrescences that had to be added to it to please the various locomotive superintendents. We tender for engines frequently according to the specification of the engineer. The Baldwin Locomotive Works used only to make engines to their own specification, but they have been forced into abandoning that to some extent. The Indian specifications to which we work are extremely rigid, but some orders were given to American builders without specifications being particularly insisted on as regards design or material. The conditions were unusual, but they wanted engines in a tremendous hurry and they had to get what they could. British manufacturers suffer in having to follow specifications of the various engineers if the other makers competing with them are not obliged to comply with those conditions. The engineers employed by the American railway companies have been generally inferior to those here, because the manufacture of locomotive engines for a great number of years was not undertaken by the railway companies. Their engines were bought to the maker's specifications and to the maker's drawings, so that they did not require trained men for designing engines . A certain number of men who got into the position of locomotive superintendents developed ideas of their own, and as railways grew in importance and wealth they would not any longer be content with buying the engines as made by Baldwin or Schenectady or other makers. The first railway company to make the change was the Pennsylvania, who have works of their own at Altoona, and therefore they were able not only to design their engines but build them, and if they ordered engines, unless they were in a great hurry, they used to insist on having their own specifications and drawings complied with by other makers. Other railways have since followed the Pennsylvania.

DUTIES.

The adoption of an Empire tariff here might assist us in our production generally, but a tariff applying exclusively to Great Britain would not alter the condition of things very much. An Imperial tariff would block out to some extent the bounty-fed competitions of Germany and the United States. The obstructive effect of foreign tariffs is that we are excluded practically from all Continental countries where engines are built, and from the United States. We are excluded from Germany, Russia and France except under special circumstances. Whether this country had a protective tariff or not the tariff policy of other countries would have tended to the success of our competitors. If the Germans had not this country and its colonies and dependencies in which to dump their surplus products they would have thought twice about developing their industries to the extent they have done. Securing the home markets at a high price enables our competitors to compete at or below cost in a neutral market, and so keep the works going and make their profits out of the home orders. The tariffs of Germany and the United States enable them to get orders in their own countries at high prices. It is better to dispose of 75 per cent. of your output at high prices and the remaining 25 per cent. at any price that gives you more than the cost of materials and wages, than have your works going three-quarter time.

PREFERENCE.

Through the preferential tariff in Canada we got some orders in 1902-3 for the Canadian Pacific. All the orders previous to that for many years had been given to the United States. The duty is 35 per cent. generally, and we get a preference of one-third. The price of our locomotive in Canada is £3,000, including the duty, which would be £1,000 to a United States maker, giving an advantage of over £300 in favor of the British manufacturer against the foreigner, or about 12½ per cent. on the price of the locomotive without the duty. A preferential tariff given to the British manufacturers of locomotives throughout the whole of the empire would be an advantage to the British manufacturer of locomotives. A preferential tariff sufficient to give us an effective preference in the colonies, *i. e.*, enough to compete with their own manufacturers as well as outsiders, would help us a good deal. In New South Wales there is a strong, well-organized labor party, who practically hold the control of the policy of the government. They have got wages up to very high rates, and they are determined to develop all the manufactures they can in their own country irrespective of whether the thing can be produced outside and sold to them cheaper than they can make it. A preference to the colonies for the supply of whatever they produce is of no use to us as long as they take our preference but refuse to buy our locomotives. Presuming an imperial preference could be arranged suitable to all the countries concerned, the natural tendency would be to develop trade in the British Isles by taking the trade that at present goes to Germany and the United States. The more we produce the cheaper we can produce it, and the more we enlarge the area of our markets the more regular the supply of orders tends to become. If we could enlarge the area to include Canada and the whole of Australia as well as India we should have a much better chance of having a regular flow of trade. It would also very much benefit the workman, for he suffers like ourselves. In certain years he has more work than is good for him; he works overtime nearly every night, and the next few years he cannot get full employment. This tends to drive up wages and increase the cost of production, whereas if we had a regular flow by having this market to ourselves, wages would become regular and the workmen would be better off.

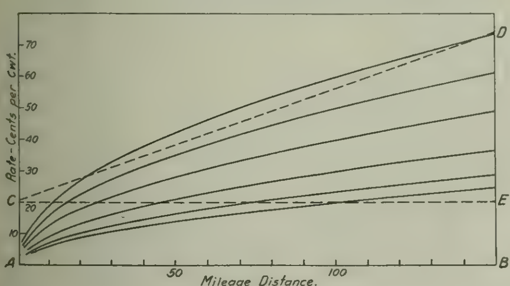
RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY,
Professor of Economics, Harvard University.

I.

THE EVOLUTION OF A RATE SHEET.

The task of constructing a freight or passenger tariff is an eminently practical one. The process must be tentative and experimental. Little can be calculated in advance. Tariffs are not made out of hand; they grow. Not until a rate has been put into effect, can its results be known. The lower limit of charges, however, is more or less fixed. Obviously the rate must not be less than that portion of the variable expenses, incident to each particular item of business. This variable expense is divisible into two parts, one for loading and unloading and the other for actual movement. The first step in constructing a tariff, therefore, is to separate these two portions of the variable outgo. General experience fixes the terminal outlay for loading and unloading at an average figure of about twenty or twenty-five cents per ton at each end of the line; that is to say at an average of about two and one-half cents per hundred pounds as the total terminal cost.* Just where, above or below this average, the figure for any particular tariff will lie, depends upon a multitude of details. This terminal expense is obviously quite independent of the length of the haul. It costs no more to load for a carriage of 3,000 miles than for one between two adjoining stations. It is the second portion of the specific costs, namely the movement expense, which varies with the distance. This movement cost is more difficult of determination, as affected by a multitude of variable factors, such as the grades, curvature, number of stops, the size of train load, and above all the volume of the traffic. Assuming the simplest physical conditions, one would expect the movement expense, aside from the initial cost of getting up steam in order to move at all, to rise proportionately to the distance traversed. Graphically represented the tariff would appear somewhat as follows:



Relation of Cost of Carriage to Distance.

In this diagram the distances of carriage are represented along the horizontal line, A B; while the rate charged is laid off vertically. The lines A C and E B represent the constant terminal cost; while the steadily rising rates with increasing distance, due to movement expenses, are shown by the sloping dotted line C D. This chart at once demonstrates why under the very simplest physical conditions a straight mileage tariff is unscientific and unreasonable. For the constant terminal expense spread evenly over the mileage traversed, as the movement expenses grow, becomes progressively less and less in proportion to the total of the two, which constitutes the real rate. The longer the haul, the lower the ton-mile cost as a matter of necessity. As Chanute calculated on the New York Central a generation ago,† while the average cost per mile of hauling a ton ten miles was 4.062 cents, it descended progressively to less than one cent per mile for distances over five hundred miles. A common rule is that the rate rises as the square root of the distance, rather than in proportion to it. A hundred-mile haul represents a cost approximately only twice as great as one of twenty-five miles, instead of being four times as much. For thrice a given cost the haul may be increased nine times. The course of such a tariff with increasing distance would be represented by the parabolic curved lines on the preceeding diagram.* The particular curve would depend upon the commodity and local physical conditions. In territory where movement expenses were heavy or operation difficult the curve would obviously rise more rapidly. Such a mathematical tariff does not depart widely from the one traced by the heavy dotted line C D first described. The progressive decline of the per mile rate with increasing distance may be illustrated by the rough estimate of allowing two and one-half cents per hundred weight or fifty cents per ton for terminal cost, with one-half cent additional per mile for movement expenses. For a ten-mile haul this would cost fifty-five cents, or an average of 5.5 cents per mile. Were the distance 500 miles the average cost would be only $\frac{50+250}{500}$ cents or 0.6 cents per ton mile.

Thus far the problem has been seemingly simple. The next step introduces new complications. Our hypothetical railway line at a point one hundred miles out, may cross a navigable river or canal, or may intersect another railway. Engineering considerations of absolute cost of operation now no longer predominate. Relative costs by rival lines enter into the case. Water lines or more direct railways compete for the traffic. One cannot even fall back upon the cost of carriage by any of these lines, either the weaker or the stronger. An entirely new principle comes into play. The alternative is presented of taking the business at a rate lower than, and out of line with rates on general traffic, rather than to lose it to another line. At first sight it would appear that it were better to abandon the traffic than to take it for less than a fair average return or profit. This is a serious matter. The tonnage offered is large. The existence of active competition for it, is proof of its importance. Railways meet at large towns, and large towns become larger because the roads meet there. The main reason for not abandoning the traffic, however, arises from that primary fact, to which one constantly recurs, that all expenses are not alike in their nature. A concrete example will make this plain.

Suppose, for instance, the normal rate to yield a fair average return, all expenses considered, be thirty cents per hundredweight. Two-thirds of the cost of this, or twenty cents, would not cease as outgo, were this business abandoned. The rails would rust, the ties would rot, the trains would move, but with

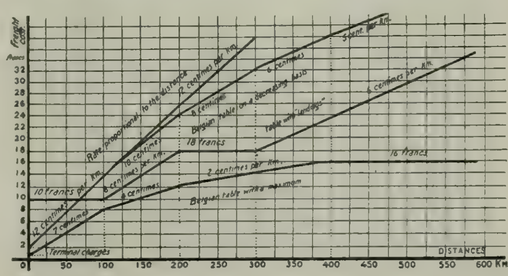


Diagram of Belgian Tariff Sheets.

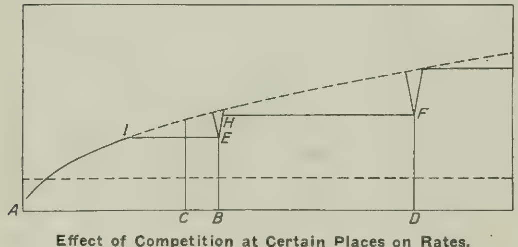
*Testimony before the Hepburn Committee, in 1879, p. 2921, is interesting on this point.

†U. S. Reports on Internal Commerce, 1876, p. 25.

*U. S. Industrial Commission, 1900, IX, p. 631. *cf.* also diagram of European tariffs in Elkins Committee, U. S. Senate, hearings etc., V, Appendix, p. 271.

lighter loads, and the fixed charges would still go on inexorably night and day. Ten cents per hundredweight will meet the variable and extra cost incident to this particular business. A fifteen-cent rate would at least recoup these outlays. It would do more. It would contribute five cents per hundred pounds to the twenty cents outgo per hundredweight, which, without the traffic, would have to be borne *in toto*. Even a rate of eleven cents would contribute something to this end. For it would leave a surplus of one cent per hundredweight to lighten the other burden. Adopting Hadley's phraseology, if you take at eleven cents, freight that costs you thirty cents to handle, you lose nineteen cents on every hundredweight. If you refuse to take it at that rate, you lose twenty cents on every hundredweight you do *not* carry. For your constant expenses go on, while the other road gets the business. There is only one course open. The rate at the competitive point must be cut, if not to make a profit, at least to stop a greater loss. And one comfort may be uncovered in so doing. The lowered rate may so stimulate new business and enlarge the volume of traffic, that it may be handled at much lower cost. In fact this consideration alone in absence of all competition, may induce a lowering of rates at certain points out of line with the general schedule. This incentive conditioned by the fact of increasing returns, is always in the background. The destiny of many places is manifested in terms beyond the control of the carrier. Soil may be poor, climate or population adverse to progress. But some particular places enjoy peculiar advantages for growth. Not to stimulate new business at these points where traffic might be cultivated, even without rivals in the field, is little better than allowing it to escape over a competitor's line of rails, were they present.

Cutting the normal rate at competitive points or at important points in order to stimulate traffic, in conformity with the principle above stated, transforms our tariff diagram as shown herewith. The rate rises steadily with the increasing



Effect of Competition at Certain Places on Rates.

distance from A, except at E and F. At these points it is fixed at a lower point, determined not primarily by the cost of service at all, but by the available demand for it. Traffic at these points is charged what it will bear; not as much but as little as it will bear: which being translated means that the charge is set as high as possible, still holding the volume of business constant, or even increasing it if that can be accomplished. The total profit is constituted of the profit per unit of freight multiplied into its volume. The center of interest is here shifted from the average profit per unit considered alone, to the total profit thus obtained. At this point another difficulty presents itself. Although as set forth elsewhere, local discrimination,—charging a lower rate for a more distant point,—may sometimes not only be not injurious but actually beneficial to all parties concerned, it is the exception, not the rule.* Ordinarily to accord a remote point a lower rate without patent cause, is an economic anomaly, and, moreover, a political blunder. It violates the democratic principle of cost of service as underlying rate schedules. Most legislative bodies have prohibited it by law. The United States and most of the American commonwealths do not permit it, other than in exceptional cases. The result is that on our hypothetical tariff, the rates from A to points intermediate between A and B and B and D must be cut to the level prescribed for those latter named places. Such was the action taken by the trunk lines in 1887 in conformity with the requirements of the long and short haul clause of the federal Act to Regulate Commerce. An original progressively rising tariff is thus at once transformed to a series of level grades or platforms, the shifts of level corresponding to the location of large towns or competitive centers; and the grade of each platform being fixed by the rate determined under competition at those points.* This ascending series of grades may be most irregular, as conditioned by local circumstances. The general steepness of the gradation is low on eastern roads like the New York Central, with a large volume of traffic and easy operating conditions. On western lines like the Denver and Rio Grande, in rugged territory, with a sparce population and light tonnage, the per mile rate rises rapidly and the gradation of the general tariff is steep. But always it will be found that the changes in rates occur at competitive points, with transition in a new level of rates determined by the conditions at the next competitive point beyond.

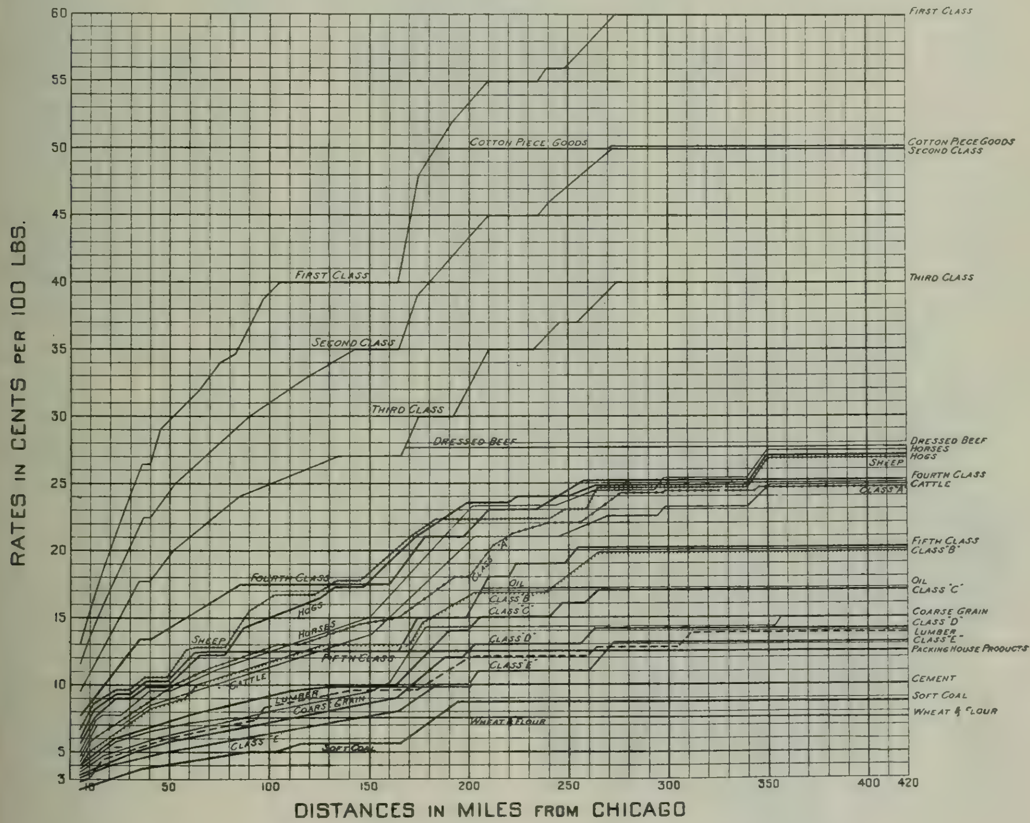
One important fact concerning this tariff thus far developed, is that of course the height of the upper level at the most remote point must never exceed what the particular traffic will bear. In other words, supposing that the traffic consist of grain or coal, not more than a certain amount could ever be charged, no matter how great the distance, without so far diminishing the profit in the transaction as to render the business impossible. This is shown by the diagram on the opposite page, whereon it appears that each commodity, coal, wheat, cement, lumber or oil, having attained a certain level of rates, never rises thereafter, no matter what the distance. Each attains the maximum of what it will bear. That level it can never exceed. This immediately leads to another consideration. No single tariff is applicable to any large number of commodities. Each one must be regarded as a law unto itself. Not only does the ultimate amount which each is able to bear depend upon the value of that commodity, but also the conditions determining competition with respect to it must be different all along the line.

Thus it appears that the height of the extreme upper level in our diagramatic series of rates is fixed by the highest charge which that particular traffic will bear. Beyond a certain point, no matter how great the distance, the rate cannot be increased above this level. This maximum varies, of course, with each commodity. On cotton it may be 55 cents per 100 lbs.; on grain or coal it will be much lower, and on sand or cement lower still. The problem of the traffic manager is to attain this highest rate as speedily as possible with increasing distance, and to grade his rates with distance up to this level as quickly as possible, consistent, of course, with maintenance of a full volume of business. But not only may the final limit of what the traffic will bear be different for each commodity; the steps or stages by which the rate progresses up to this maximum are quite independently determined. The actual tariffs of local class rates in general are much simpler than the commercial conditions of rate making often warrant. Probably the major portion of tonnage on American railways moves under special or commodity rates. Even in Prussia over three-fifths of the traffic is of this exceptional sort. These special rates are made with a view to particular circumstances prevalent at the time. Bids from a quarryman in Vermont on stone for a public building in Chicago, may be dependent upon the grant of a low rate on his marble in competition with a quarry in North Carolina also able to supply the particular stone required. The various ascending series of rates are thus rendered bewilderingly complex. This is shown by the accom-

*This topic of local discrimination is exhaustively treated by the author in the *Quarterly Journal of Economics*, May, 1909.

*Such a tariff on the Illinois Central is charted in Reports, U. S. Industrial Commission, IX, p. 295.

panying diagram of rates between St. Paul and Chicago.* The rate on a cheap, heavy commodity like coal probably rises rapidly at first, and soon attains a maximum beyond which it can never go. On this diagram, for instance, the freight rate on soft coal for points up to 180 miles out is higher than that on flour. Beyond that point the flour rate in turn exceeds that on coal. Cement is higher than lumber for the first 150 miles; but after that point the relatively greater value of lumber holds it steadily above cement. On heavy cheap commodities the relatively high cost of cartage in competition enables the railway to reap the full measure of its advantage and to charge well up to the maximum of what the traffic will bear, within a comfortably short distance. Moreover, the ment of some particular industry, wherever it crosses our hypothetical line, effectively holds down the rate on the product of that business. Junction points with other railways having no such interest may have no influence upon that rate, but may cause modifications in other directions. Another railway being in need of back loads, as a result of a predominant movement, let us say, of beef cattle at certain seasons of the year over its line, may introduce competition in all the tonnage capable of being carried on cattle cars. Such a road holds down the rates on this traffic wherever it happens to cross, but has no effect upon any other rate. Thus it comes about in practice, as the last diagram well illustrates, that the tariff lines cross and recross one another, generally rising with



Class and Commodity Rates Between St. Paul and Chicago.

variable costs for terminal charges have to be considered. Wherever they are high the rate must rise at once sufficiently to cover these, no matter how short the distance; but thereafter the rate may not need to be increased greatly for some time. On light higher-grade goods the wagon is an effective competitor for longer distances. Moreover, the competitive points at which rates rise from stage to stage are seldom the same for all classes of goods. A river crossing brings competition for coal, lime or cement, but does not affect the rates chargeable on high-class freight which seldom goes by water in any event. A railway specially interested in the develop- increasing distance, but at all sorts of different times and places.

Few generalizations are possible in this connection. Rate making must in a growing country ever be a matter of infinite detail. It is generally true, however, that beyond a certain point the tariff on different grades of commodities will separate more and more widely with increasing distance. For obviously after the low-grade goods have reached the maximum which they can bear—and this they tend to do speedily—they must remain practically constant; while those of higher grade continue progressively rising. And for very short distances the rate on the low-grade goods may even exceed that imposed upon higher-class tonnage. The coal rate for a ten-mile haul may exceed that upon some commodity worth twice as much;

*From Stickney's Railroad Problems, p. 69.

but for a 200-mile haul the coal rate may be only one-eighth of the rate on the other goods. Long experience on the part of the carriers has, however, enabled them to arrange their tonnage in classes; for each of which the conditions are more or less uniform. By reserving the exceptional traffic for special treatment under commodity rates, a fairly consistent scheme of rates rising by stages with increasing distance may be evolved.

Few standard railway tariffs in the United States develop beyond the point covered by the preceding paragraph. Many of them are unable even to reach this stage of logical growth. Conditions here, in general, are most favorable by comparison with the West and South. Both population and traffic are dense, and the state legislatures are conservative in making grants for the construction of new lines. The companies are historically mature. The good fruits of co-operation had already appeared in the evolution of a scientific and logical scheme, long before such co-operative action had been frowned upon by the law and the courts. All the railways in Trunk Line territory have worked in harmony, so far as general classified local tariffs are concerned—however much they may have fought one another over differentials to seaboard cities,

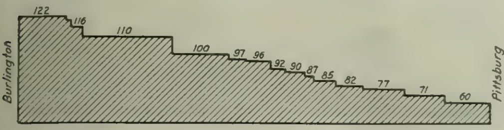
Percentages of New York-Chicago Rates. East Bound.

In the South, for instance, they have never got beyond the stage of progressively rising local rates, with independent and often radically reduced charges at all large towns or competitive points. Each traffic manager, particularly since the effective prohibition of working agreements between competing lines by the Trans-Missouri Freight Association decision of the Supreme Court in 1896, has been left to work out his own salvation, not aided by, but in spite of, the efforts of his rivals. There is, however, one example of such further development in the so-called Trunk Line territory, lying east of the Mississippi and north of the Ohio and Potomac rivers. or export and import rates. Their system is comparatively simple in principle, although it has required the experience of many years to work out in detail. Fully described elsewhere,* it will suffice for present purposes to say that all rates from intermediate points between Chicago and New York, are fixed at a definite proportion of the Chicago-New York rate both for east and westbound shipments. Thus, for instance, as shown by the appended map of trunk line rate distribution, the rate from Detroit to New York is 72 per cent. of the Chicago-New York rate. The percentages from the

*Ripley, Railway Problems, pp. 309-332.

following points are as indicated, namely: Cincinnati, 87 per cent; Indianapolis, 93 per cent.; Grand Rapids, 96 per cent.; Peoria, Ill., 110 per cent.; Louisville, Ky., 100 per cent.; Milwaukee, 100 per cent.; and even points in Canada, such as Toronto, 78 per cent., etc. Every place, no matter how small, has a special percentage of the New York-Chicago rate assigned to it. This rate varies with any variation of the Chicago-New York rate. Thus when the Chicago-New York rate, first-class, is 75 cents, the rate from Indianapolis is 93 per cent. of that figure. Any change of Chicago-New York first-class rates changes every intermediate rate in exactly the same proportion. This was well exemplified in the rate wars of 1893. These percentages have been fixed after a long process of compromise among conflicting interests. Another point of special interest is that these rates are adjusted on the basis strictly of the long-and-short-haul principle, namely, that all intermediate points enjoy a somewhat lower rate than the terminal points, although the percentage may not be exactly upon a mileage basis. Consideration of the distribution of these percentages points to many apparent inequalities in the adjustment; but as a matter of fact it will be found that the existence of competing routes, of water transportation, or of other factors, offers a partial explanation in most instances.

Such being the general character of this comprehensive Trunk Line system, the relation of it to the tariffs described heretofore is not difficult to demonstrate. Each separate railway having developed a well-ordered rate schedule, they have all met and agreed upon a unified scheme; which as far as possible harmonizes all conflicting interests. The gradation of rates rising with increasing distance from New York on each separate road, is adjusted to the corresponding grada-



Cross-Section from Burlington, Iowa, to Pittsburg.
Figures show percentages of the New York-Chicago rate.

tion of rates of its neighbors on either side. The result is a series of rate zones,* lying more or less concentrically about the terminal point. These zones are highly irregular in width and area, but possess one feature in common. Each remoter zone is one stage higher in rates than its predecessor. This relationship is indicated by the cross section diagram herewith. This cross section, of course, differs from the diagrams heretofore shown. It is purely geographical, being taken, not along one single railway, but as the crow flies —straight across the whole Trunk Line territory. But one should, in order to appreciate the significance of this elaborate scheme, imagine a whole series of such progressively rising rates, radiating out along the line of each railway. Connecting the corresponding levels or stages upon each one with those of its neighbors, the concentric zones are immediately outlined. The advantage of such a broad scheme is that it generalizes the single line tariff; taking into view every place, no matter how small, and irrespective of its location whether upon a thorough line or merely a local transverse one. Every town, no matter how insignificant, is assigned a place in a logically evolved plan. Such would seem to be the ideal of rate construction, toward which all traffic managers should strive.

(To be continued.)

The Spanish railways had considerably larger earnings in 1908 than in 1907, thus forming an exception to the general rule.

*Ripley, Railway Problems, p. 318.

TRAFFIC STUDIES.

BY RAY MORRIS,

Managing Editor of the *Railroad Age Gazette.*

I.

OREGON RAILROAD & NAVIGATION COMPANY.

The rail operations of the Harriman roads in the Pacific states extend from Seattle and Spokane, Wash., on the north, to the Mexican border, on the south, and then, bending through Arizona, the lines continue down the east shore of the gulf of California far into Mexico. For purposes of traffic consideration, operations in this enormous territory may be classified under three main heads: local operations on the Pacific coast; operations, both through and local, over the northern part of the system and the Union Pacific, and operations over the central and southern part of the system and the Southern Pacific.

Operations over the northern lines must again be divided into four parts, of which one embraces the movement between Portland, Ore., and San Francisco; another the movement between San Francisco and Ogden, Utah; another the Oregon Short Line, and another the Oregon Railroad & Navigation Company. All four of these main classifications in the northern part of the Harriman territory west of the continental divide have certain common characteristics. They have extremely heavy westbound traffic moving towards the coast cities, and extremely heavy eastbound traffic which is routed over the Union Pacific east from Ogden, Utah, and Granger, Wyo., so far as it is possible to do so.

This group of lines does not quite form a square, but it comes somewhere near it, with the Oregon Railroad & Navigation Company forming the north side, the Oregon Short Line the east side, the Central Pacific and its extensions the south side, and the Shasta route of the Southern Pacific the west side. The territory inside this route square consists of most of Oregon, most of Idaho, the northern part of Nevada and the northern part of California, with a corner of Utah, a corner of Washington, a corner of Montana and a corner of Wyoming. Its most marked characteristic from the standpoint of railway traffic is that it contains vast quantities of raw materials which move both ways, and that it is served by comparatively little other railway mileage than that of the Harriman lines.

The northern boundary of this enclosed area is supplied by the Oregon Railroad & Navigation Company, which extends from Portland, Ore., east along the south bank of the Columbia river and along the Lewis fork of the Columbia river to Riparia, Wash., where it leaves the river and branches off for Spokane, Wash., Wallace, Idaho, and Grangeville, Idaho, reaching Grangeville by way of Lewiston over certain jointly owned properties. From Umatilla, Ore., not far west of the point where the Columbia river makes its great bend from the north, a branch runs off southwest to Huntington, Ore., on the Snake river, where junction is made with the Oregon Short Line. Besides these main features of geographic location, the Oregon Railroad & Navigation Company also sends numerous feeders out into timber and into agricultural, grazing and mining districts. Until the building of the railway down the north bank of the Columbia river from Pasco to Portland as a joint enterprise of the Great Northern and the Northern Pacific, the Oregon Railroad & Navigation Company was the only direct route from the Portland gateway to the Spokane gateway; it is still the only direct line from the Portland and Spokane districts to points on the Union Pacific main line, via the Oregon Short Line. The Oregon Railroad & Navigation Company also operates 258 miles of steamer lines, of which 78 miles are on the Snake river between Riparia, Wash., and Lewiston, Idaho; 45 miles are between Portland and Dayton, Ore., on the Willamette; 20 miles are on the Columbia river, extending from Astoria, Ore., to the sea, and 115

miles are on the Columbia river and the Pacific ocean, extending between Portland, Ore., and Ilwaco, Wash.

HISTORY.

The Oregon Railroad & Navigation Company was chartered July 16, 1896, under the laws of Oregon, as successor to the Oregon Railway & Navigation Company, which became insolvent in 1893. The Oregon Railway & Navigation Company was chartered in 1879 as a consolidation of the Oregon Steamship Company, the Oregon Steam Navigation Company and the companies owning the railways around the rapids of the Columbia river. It was leased for 99 years from January 1, 1887, to the Oregon Short Line, and the lease was transferred to its successor, the Oregon Short Line & Utah Northern Railway, in 1889. The rental of the company prior to 1893 was guaranteed by the Union Pacific; at the present time the Oregon Railroad & Navigation Company is controlled by the Union Pacific through ownership of almost all its capital stock. The Oregon Railroad & Navigation Company now operates 1,340 miles of line, of which 678 miles is known as the Oregon division and 662 miles as the Washington division.

TRAFFIC.

Of the total freight tonnage of the Oregon Railroad & Navigation Company about 26 per cent. consists of products of mines, and some 20 per cent. of this is ores from the Coeur d'Alene district, in the northwest corner of Idaho. These ores move over the Oregon Railroad & Navigation lines west into Washington through Riparia and Walla Walla, Wash., and Pendleton, Ore., and then southwest to Huntington, Ore., for haul over the Oregon Short Line. They have also a good movement over the entire Oregon Railroad & Navigation upper main line from the Coeur d'Alene district to the Vallejo smelter at Portland, and part of them move north to Spokane for transit to Tacoma and Everett over the Northern Pacific. The Northern Pacific will also have its own through routing for this ore over its new cut-off from St. Regis to Paradise, Mont., but the haul via the O. R. & N. line is 150 miles shorter for points on Puget sound. These Coeur d'Alene ores are silver and lead only, and the principal tonnage goes to Colorado to be smelted at Denver, Pueblo, Leadville and Salida. About 80 per cent. of all the Oregon Railroad & Navigation ore tonnage moves through Huntington.

Timber is the second largest haul on the O. R. & N., and amounts to about 25 per cent. of the total traffic. A large part of this originates on connecting lines, particularly the Southern Pacific lines in Oregon, running south, west and northwest from Portland.

The next largest tonnage movement is grain, aggregating about 19 per cent. of the total. This is largely wheat, with a good movement of barley and of oats, and with practically no corn. The normal grain movement is west to the coast, and almost all the Oregon Railroad & Navigation lines share in this traffic, except those in the mountains. The barley all comes from Garfield and Columbia counties in Washington.

This grain is largely exported from Portland. Within the last three or four years export of whole grain to China from Portland has become quite a factor. The grain that does not go to China moves to California and to Europe. California used to export a hundred ship loads or two of grain every year, but now does not raise enough for its own needs. Shipments to California of wheat from Washington and Oregon amounted last year to 3,750,000 bushels; about 450,000 barrels of flour also went to California by boat from Puget sound and Portland. The greater part of this is milled in transit at interior points, the principal milling points being Spokane, Walla Walla, Waitsburg, Dayton and Prescott, Wash., and The Dalles, Pendleton, Athena, Milton, LaGrande, Union, Imbler, Alicel and Portland, Ore. Portland is very much the most important milling point, and turns out some 4,000 barrels per day from the Portland flouring mills, which are the pioneers of the export flour trade to China and Japan.

Of the wheat exported to China and Japan last year from the Columbia river, Hongkong took 730,000 bushels, Yokohama 370,000 and Kobe 80,000. The total wheat shipments from Portland amounted to 16,481,548 bushels in 1908, of which more than 90 per cent. was moved by the Oregon Railroad & Navigation. The wheat exports from the Columbia river were 13,039,956 bushels, of which the United Kingdom took about 7,155,000.

The flour shipments from the Columbia river are also very heavy, amounting to well over 1½ million barrels in 1907, and to not quite a million in 1908. Almost all this flour is brought to tidewater by the Oregon Railroad & Navigation Company.

The average flour haul of the O. R. & N. is probably around 200 miles; the average wheat haul, 300 miles, and the average ore haul, 325 miles, excluding in this computation crude ore, which is hauled from the mines to the concentrators at Wallace, Idaho. The haul on this crude ore averages less than ten miles, but the O. R. & N. gets it later for further carriage. The ore is concentrated in a ratio of about eight to one.

The rate to Denver and Pueblo is $8 per ton for concentrates which do not exceed $60 in value, and this is the rate on which the bulk of the silver and lead ore moves. The distance is from 1,500 to 1,600 miles. The ore that goes to New England only pays $12 per ton, which reduces the average rate to below half a cent per ton per mile.

On the O. R. & N. timber movement is east through Huntington, and the great bulk of this timber is hauled fairly long distances, some of it going to New England. There is very little log movement on the line, most of the timber being handled sawn. The rate varies from 30 cents into Idaho to 75 cents to the Atlantic seaboard, and the average lumber earnings to the O. R. & N. are perhaps $50 a car.

Wheat is the most profitable traffic on the line. It takes a local rate because it moves west, whereas if it moved east it would be no more profitable than lumber. When grain is high in the East there is occasionally a considerable movement to eastern points, and at a rate only a trifle higher than the lumber rate. The grain rate to Chicago is 57½ cents, or $11.50 per ton for a haul of some 2,150 miles, basing from interior points east of The Dalles.

After consideration of mine products, timber and grain, the next heaviest traffic movement on the O. R. & N. is that of manufactured articles, which aggregate some 9 per cent. of the total movement. Much of the general merchandise comes into Portland and is distributed back again. There is also a good movement of wool, aggregating about 8 500 tons per year, which goes entirely to the Atlantic seaboard (Boston). The total Oregon clip of wool is about 10,000 tons a year. Oregon also has a hop crop which ranges from 100,000 to 150,000 bales of 200 lbs., one of these 200-lb. bales of hops being as large as a bale of cotton. Hops are a very uncertain commodity from the standpoint of the man that raises them, the prices going through extreme variations from year to year.

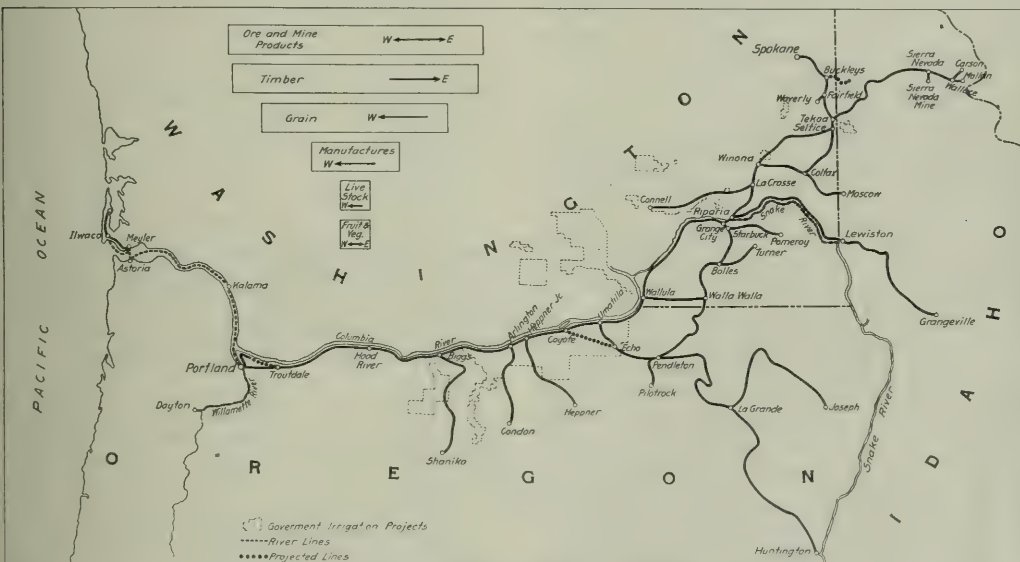
The passenger traffic of the Oregon Railroad & Navigation Company, with that of the other Harriman lines in the West, has its greatest importance in its effect in building up freight traffic. The West is under-populated, and probably will remain under-populated for a great many years. The need for oriental labor for the farmer and the fruit grower is paramount, yet the political obstacles are such that hope in this quarter is remote. Briefly, the aim of all railway passenger departments in the Far West is to take the agricultural population of Illinois, Michigan and Iowa and move it bodily out to Washington, Oregon and California, by persuading it that the western soil is better, the western sun is warmer, and the western season is longer. These facts must always be kept in mind in viewing the passenger work of the western lines. The Harriman people have perhaps the best system of all for bringing this about, through their "community" plan.

The Harriman passenger departments in the West go to

enterprising communities where there is fine opportunity for raising apples, or oranges, or wheat, or alfalfa, and stimulate the local board of trade or commercial club or similar organization to co-operate with them in their plan for drawing attention to the community. Then an elaborate and beautifully illustrated pamphlet is gotten out, printed on heavy paper, and showing in natural colors and in full size pictures of the apples or oranges or other fruits that characterize the locality. A special feature of these pamphlets is a map of the entire railway system together with connections from Chicago and New Orleans to the coast, on which the specific community in question is starred, and its name is printed in large, full-faced type, so that all the rest of the United States is made subordinate to Hood River, or Grant's Pass, or whatever the specific locality may be.

The community supplies the information and pays costs of publication; the railway has its expert photographer and pamphlet maker do the work (without charge for his services), and distributes the pamphlet at its own expense, except in so far as the pamphlets may be distributed by the community. The community plan has been going on for about a year, and in the first two weeks of the colonist period this year the O. R. & N. had 1,000 colonists more than it did in the same two weeks last year, while the communities have contributed well above $50,000 to the pamphlet campaign. In March and April the O. R. & N. moved about 10,000 colonists, and in September and October, 1908, about 8,500.

Three or four points of considerable interest stand out prominently in an endeavor to survey the future prospects of traffic on the Oregon Railroad & Navigation Company. It is probable that grain from Manchuria will before long compete with Columbia river grain in the Orient, and that the heavy shipments across the Pacific from Portland and other Columbia river points will be reduced. This will not necessarily affect the coast railways, however, because it is certain that the home demand for this grain will increase rapidly year by year. The difference will be that the grain will move to San Francisco and various local distributing points, instead of going to Europe, Asia and Africa. The chances are that it will take a higher rate rather than a lower one.



Oregon Railroad & Navigation Company.

The enclosed areas show the proportionate commodity tonnage movements, and the arrows show the direction of principal movement.

The result is that each western town is enabled to make the best possible presentation of its own case; a far better one than it could make without the able experience and systematized help of the railway company.

The Harriman lines have been extremely wise in concentrating attention on this aspect of the case, and have succeeded not only in increasing greatly the emigration to western points by their community system, but have altered enormously the former attitude of hostility which was directed at the railway. It is hard to feel unkindly towards persons with whom you are working shoulder to shoulder for mutual helpfulness.

The heaviest passenger movement on the Oregon Railroad & Navigation Company is on the line from Portland, Ore., to Huntington. Local passenger business slightly exceeds through interline business, and there has been a steady increase of suburban business around Portland. This business was nearly 50 per cent. greater in 1908 than in 1907.

Colonist travel moves in March, April, September and October.

The growth of the lumber tonnage in future years is also an interesting matter for speculation. There are some 300 billion feet of standing timber in Oregon; more than in any other state in the Union. Great areas of this are now far remote from the nearest railway, and the tendency of the future will probably be to build, slowly and gradually, a network of short feeder lines out into the timber, much as has been done in the southern states. This movement must come slowly, however, for timber shortage exists more in the future than in the present, and it would now be a comparatively simple matter to overstock the market. Manufacturing industries are still in their infancy on the Pacific coast, and all the established lines have a most hopeful future in the gradual growth of these industries, and in the haulage of coal and raw materials to them, and manufactured goods out again. The freight traffic of the coast, as has been said, is a raw material traffic, and a raw material traffic in which coal figures very little. Both coal and oil, however, can be found reasonably near at hand when the demand for them arises, and the day

when this demand comes will be a day of large, new earnings for the Oregon Railroad & Navigation Company and all the other lines serving the coast states. In the meantime, the road is very prosperous with its existing business, and is increasing in prosperity. Gross earnings in 1908 were $14,149,704, or well over $10,000 a mile.

TRAIN RESISTANCE.

BY A. STUCKI.

Instead of giving new formulas and new values in this already very perplexing question, the author intends to deal with the information already at hand and collected during the last 75 years, and an attempt will be made to show the different elements entering into train resistance, and especially to point out the different conditions under which each of these elements will appear. In this way, there is no doubt, a much better understanding can be obtained of the greatly varying and apparently contradicting information procured up to this time than by adding results of other tests, which again would differ from anything obtained so far.

For simplicity sake let us consider a 40-ft. gondola car, loaded with lumber to the clearance line, car and lading, 76 tons, load on all the journals, 143,500 lbs., passing a curve at 30 miles per hour.

GRADE RESISTANCE.

The grade resistance is simply 20 lbs. per ton for 1 per cent. of grade, regardless whether the car is loaded or empty, on a curve or tangent—hence this item will not be further discussed.

JOURNAL FRICTION.

The journal friction consists of the load on the journals, times the coefficient of journal friction, times the diameter of the journal, divided by the diameter of the car wheel. With our car we get: 143,500 x 0.01 x 5.5/33 or 239 lbs. per car or 239/76 = 3.1 lbs. per ton.

The coefficient of journal friction in this case was taken as 0.01, which represents average conditions with a good lubricating oil. It may seem strange that the quality of the oil and the method of applying it has really more to do with it than the composition of the bearing metal. If the journal would run in oil, the coefficient would decrease to about one-sixth or one-eighth of the figure used, and if the oil is unevenly and improperly applied, this same coefficient of friction may increase to many times the value used above.

The oil in itself has to be of such a character so as even under a maximum load to be able to keep the two bearing surfaces apart. This being the case, the maximum load on the journals will cause a minimum of resistance, with other words proportionate.

Decreasing the load will not decrease the frictional resistance in the same proportion; indeed, it decreases only very slightly. This is one reason why a locomotive cannot pull so much tonnage if the train consists of small or empty cars as it can if the tonnage is formed of high capacity cars, loaded to their full capacity.

As the speed increases from 0 to possibly 30 miles per hour, the coefficient of friction gets smaller, but from there on it has been found to increase again. The temperature has a similar effect. As it increases, this coefficient gets less, until about 100 degrees F. are reached. Beyond this conditions change, and it is only natural that temperatures that are high enough to destroy the desired consistency of the oil will produce bad results.

We have also some journal end friction between the collars of the axle and the brasses, owing to the lateral pressure, produced by the car passing a curve. This lateral pressure on a 400-ft. radius and with a velocity of 30 miles per hour is 11,560 lbs. per truck. This gives us an additional resistance of 11,560 x .01 x 3 ÷ 16½ = 21 lbs. per truck or 21/32 = .66 lbs. per ton (.01 being coefficient of friction, 3 in. being distance from center of axle to midway of collar and 16½ in. designating the diameter of car wheel).

WIND RESISTANCE.

The wind resistance for the car in question would be C V^2 A, C being a constant — 0.001 for the first car, 0.0001 for any intermediate car and 0.00026 for the last car of a train; V being velocity in miles per hour, and A being the cross-sectional area of the car. We then have: $0.0001 \times 30^2 \times 70 = 6.3$ per car or $6.3/72 = 0.09$ lbs. per ton.

The above constants have been used by Prof. Goss. The wind friction along the side of the car has not been considered, being very small in calm weather, and it is plain that even the face wind resistance, as given above, is very small for such a moderate speed and adds very little to the total train resistance. Of course, box cars, when running light, are very much at a disadvantage, but flat and gondola cars, especially when loaded with steel or other heavy material, will almost eliminate any resistance of this sort. A solid box car train suffers less in this respect than one where flat, gondola and house cars alternate.

ROLLING FRICTION.

Mr. Fowler in his experiment (See Proc. Pittsburgh Railway Club, Nov. '07) has found that by increasing the load on a wheel the area of the flat spot between the rail and the tread bears the following relation.

Load per wheel.	Area of spot.	Diameter.
6,000 lbs.	0.11 sq. in.	0.38 in.
10,000 "	.12 "	.39 "
11,500 "	.13 "	.41 "
14,500 "	.15 "	.44 "
16,500 "	.17 "	.47 "
17,500 "	.18 "	.48 "
19,000 "	.19 "	.49 "
25,000 "	.20 "	.51 "

The last column was added by the author and was obtained by considering these spots as being practically circular and figuring the diameter the same. This shows that although the loads have more than quadrupled, the diameters have increased but slightly, indicating that the rolling friction on heavy cars is considerably less in proportion than on light and empty ones.

All the above figures are based on similar conditions of rail and tread, while in actual service often great differences exist as to roughness of the surface, irregularity of the contacting parts and character of the materials. All these three items affect the rolling friction, and it is possibly due to this fact that the data in this respect is very incomplete and varies greatly. However, taking Thurston's middle value (0.002) as coefficient of rolling friction, the radius of the wheel, of course, being about 1⅓ ft. and the weight on the rail of the car in question being 152,000 lbs. we get:

$$\frac{152,000 \times 0.002}{4} \times 3 = \text{ lbs. per car or } 228/76 = 3 \text{ lbs. per ton.}$$

FLANGE RESISTANCE.

When a car approaches a curve the front truck will keep on in a straight line until the flange of the outside wheel strikes the rail, unless the truck is very flexible, so that the cone of the tread will sufficiently accelerate the wheel to keep up with its mate on the inner and consequently shorter rail. This latter condition exists on an arch-bar truck.

But in order to be able to adjust itself, as indicated, the truck bolster must swing relatively to the body bolster. If they were locked the truck could not swivel and the wheel would have to climb the rail. If they are partly locked, for instance, by the friction of the side bearings, the wheel will not any longer have to jump the rail, as the pressure between the flange and rail will simply increase until it is sufficient to overcome the friction of said side bearings. That this pressure at times is very great the following figures in connection with the accompanying sketch in the next column will show.

We have about 68,000 lbs. on each truck center plate, and

assuming that the centrifugal force in passing the curve is .2 of the load (the maximum is .4), and further assuming that the center of the plate forms the inner support of this load, we get on the outer side bearing 29,600 lbs., and the balance—or 38,400 lbs.—on the center plate. With ordinary side bearings and a coefficient of friction of .2, the truck in swinging around would have to overcome 29,600 x .2 lbs. in friction, working on a lever arm of 25 in., making 148,000 inch-pounds.

The load on the two outer wheels will be found to be 58,300 lbs., and naturally the balance, or 17,700 lbs., rests on the inner wheels. When the outer wheels are coming toward the flanges, trying to get ahead, they are prevented from doing so by the side-bearing friction. It is true the hold on the outer rail is greater than that of the side bearing, but the hold on the inside rail is small and the wheels are bound to slip. But before they do so they help to overcome the grip of the side bearings to the extent of 17,700 x .2 x 30, or 106,200 inch-pounds, leaving the balance of the grip, or 148,000 — 106,200, or 41,800 inch-pounds for the wheel flanges of the outer wheels to take care of. The lever arm, in this case, being 33 in., gives a lateral pressure on the flange of the front wheel equal

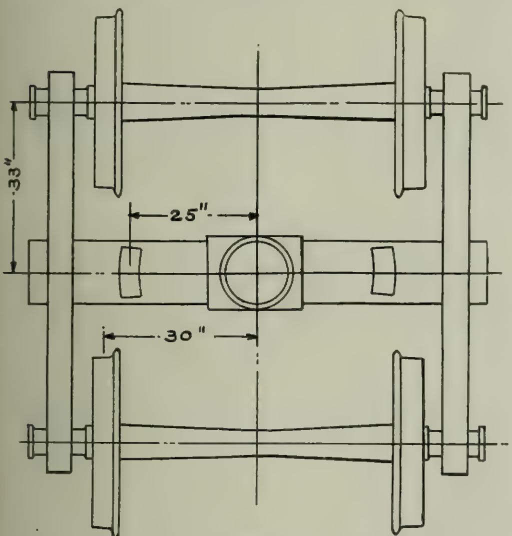


Fig. 1.

to 41,800 ÷ 33, or 1,270 lbs. Taking the coefficient of friction between the flange and the rail again as .2, and their contact with each other 3 in. ahead of the whel center, we have a flange resistance of 1,270 x .2 x 3 divided by the wheel radius, or 16½ or 46.2 lbs. for each outer front wheel, i. e., per truck, and 46.2/39 or 1.2 lbs. per ton.

Often the pressure on the outer side bearing far exceeds the figures above taken, even at moderate speeds. This is especially the case with superimposed loads, large side bearings and faulty roadbeds. Even the flexibility of the truck springs will, to some extent, augment such undesirable conditions. This, however, cannot be avoided. But the clearance between the side bearings should be kept as small as possible.

On wooden equipment, that is to say, with wooden bolsters, this very question caused the railways a good deal of trouble on account of being flexible. For this reason, the side bearing clearances had to be made very large, often ¾ in. and more, so as to avoid the risk of both sides becoming solid which, of course, would prevent the truck from swivelling. As a result of this, such cars often swayed from side to side even on a straight track, delivering a blow to truck, car and lading at each reversal.

With the introduction of steel bolsters, a decided advantage has been gained, inasmuch as they are much stiffer, and the M. C. B. Association has now decided that ¼ in. per side as a minimum would be safe enough.

With a true anti-friction side bearing, one which does away with all friction, this question is at once solved, in view of the fact that we can adjust them just as close as we wish to, and if they should even touch that much better, as we simply would have a steadier riding car and yet a fine swivelling truck.

Another important advantage of a closely adjusted side bearing is the reduced wear of the center plate. As is well-known, a large area to carry such a tremendous load continually is absolutely imperative. This was demonstrated beyond doubt when some five or six years ago the railways went back to a 12-in. center plate. But as long as a large side bearing clearance is allowed, the center plate will not get the benefit of its full area; on the contrary, it will be allowed to sway from edge to edge.

Following the example of flange resistance and adding the corresponding figures for greater centrifugal forces we get:

Centrifugal force.	Load on side bearing.	Load on outer whls.	Load on inner whls.	Resistance per ton.
0.2 of load..........	29,600 lbs.	58,300 lbs.	17,700 lbs.	1.2 lbs.
.3 " "	41,400 "	67,100 "	8,900 "	15.5 "
.4 " "	53,200 "	73,700 "	2,300 "	80.0 "

These figures do not include the impact due to the heavy mass of the truck being suddenly deflected from its straight course when striking a curve. However, they show how futile it would be to deduct a theoretical formula to take care of all the possible conditions existing in the daily service, and the best we may hope for is an average empirical value for average conditions. One-half pound of resistance is often considered a fair value per ton for each degree of the curve.

Is it any wonder that there is a strong desire to do away with these resistances, as shown in the last column, especially since it can be done by simply using frictionless side bearings? As long ago as 1902 the many opinions of railway officials, as given by the Committee on Side Bearings and Center Plates in their report, indicated that good results had been obtained wherever they were tried, and one road, after having used them extensively for over seven years, found that the power to haul a train around a curve was 10 per cent. less by using anti-friction side bearings.

It is true on a straight track there is no such reduction and if a railway company would be fortunate enough to have practically all straight tracks or if their limiting point in rating the engines would be, for instance, an inclined track without a curve, then the rating would remain the same, but the coal pile "would still suffer in passing a curve."

Besides that, the abrasion of the rails and wheel flanges is undoubtedly the most serious feature of this whole question. In 1902 in the committee report just mentioned, Mr. Bryan, Master Mechanic of the Duluth & Iron Range, reported that on his road the flange wear was very much reduced by the use of anti-friction side bearings. He equipped 300 cars with such a device and another 300 cars in the ordinary way, and he found that after a certain period 16 wheels of the first lot only, but 101 wheels of the second lot, were removed from service on account of having worn flanges. Such a tremendous saving sounds almost miraculous but it has been fully corroborated by the experience on other roads. For instance, the Pittsburgh & Lake Erie during a period of three years found that the percentage of wheels removed for worn flanges was 39.2 per cent. on cars with ordinary side bearings and 2.1 per cent. for cars with anti-friction side bearings.

Grinding off all these chilled wheel flanges on rolled steel rails must mean a tremendous amount of power used up unnecessarily, wheels and rails destroyed and time lost in restoring the injured equipment.

In pulling a long train slowly around a curve, the elevation of the outer rail in this case will cause the car to tilt inward

and to ride on the inside bearings, resulting in similar conditions, just shown by the preceding table. But aside from this we will meet a new resistance which so far has not been considered, and which is caused on account of the whole train, like a rope on a drum, pressing inward towards the center of the curve. Naturally this inward pressure increases with the length of the train and inversely as the radius of the curve, the pull of the locomotive being the same in all cases.

Let us assume 50 empty cars, 20 tons each, on a 4 deg. curve. The train in round figures is 2,000 ft. long and covers a little less than one-fourth of the circle of the above curve, figuring 80 deg. The lateral pressure on the rail, 10,000 lbs., being approximately the drawbar pull, is $\frac{10,000}{2} \times \pi \times \frac{80}{180}$ or 7,000 lbs.

This lateral pressure between wheel flange and rail, 3½ in. ahead of the wheel center, will, with a coefficient of friction of .2, amount to $\frac{7,000 \times .2 \times 3}{16\frac{1}{2}}$, or 254 lbs. resistance per train, or .254 lbs. per ton.

If the train would consist of loaded cars, naturally the train would be much shorter and cover a smaller portion of the curve. The initial force necessary to haul such a train is also much smaller, hence the resistance from this source will be reduced very much. This is undoubtedly what Prof. Goss had in mind when he said (*Railroad Gazette*, June 20, 1902) that in a 20-car train the flange friction increases faster than in a 5-car train.

The elevation of the outer rail will also have a tendency to shift the wheels and axles towards the inside rail, but as the friction between wheel tread and rail is greater than said tendency no sliding can take place. On the contrary, this friction will even minimize the resistance due to a slow haul around a curve.

Coming to a close, we will for convenience sake repeat some of the figures dwelt upon above in order to show how the train resistance of the car mentioned in the beginning of this article is made up:

	Per ton.
Journal friction	3.1 lbs.
Journal face friction	.66 "
Wind resistance	0.09 "
Rolling friction	3.00 "
Flange resistance	1.20 "
Total	8.05 lbs.

If an anti-friction side bearing is used, the last figure will fall away, making a total of 6.85 lbs. per ton, or a saving of 15 per cent., while the car is passing a curve.

These figures are representing only average values. In fact, they were principally given to show how the different items of the train resistance are made up. It would be, of course, a much simpler matter to measure the pull on the car itself. This, however, would not sub-divide these different items entering, neither would the various conditions necessary to determine each detail resistance ever be disclosed.

Naturally there exist conditions in a train which cause additional resistances which cannot be calculated; for instance, cut journals, poor workmanship, details being out of line, or insufficient clearance for couplers sideways. For this last mentioned cause alone the writer has seen cars forced to leave the tracks on reversed curves, and it is not hard to imagine what tremendous forces are set up between car body, truck and track in such a case. Neither will it be disputed that, although the cars may stay on the track, great internal binding takes place just the same and the natural result is additional resistance in moving the train.

According to a consular report, a German-Chinese export firm has received a large order for rails, bridges, locomotives and building materials for the Tientsin-Pukow Railway, this being in accordance with the agreement that German industries be given special privileges because of the placing in Germany of part of the last Chinese loan.

ACCIDENTS ON THE HARRIMAN LINES.

The charts shown herewith were made in the office of Julius Kruttschnitt, Director of Maintenance and Operation of the Union and Southern Pacific, to show in graphic form the number of serious accidents that took place on these roads during the calendar years 1906, 1907 and 1908. By a "serious" accident is here meant one that caused loss of life or considerable destruction of property.

It will be recalled that on these roads the causes of accidents are made public (*Railroad Age Gazette*, October 2, 1908, page 1031). This publicity plan was adopted on the Union Pacific early in 1907, and on the Southern Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Company in February, 1908; and the officers take satisfaction in observing that since these dates there has been a substantial decline in the number of accidents on all the lines, both absolutely and in proportion to the locomotive mileage. The absolute decline in the number of accidents in 1908, as compared with preceding years, is, of course, largely due to the fact that the movement of traffic in the latter year was smaller; but the charts show that there were other causes operating to increase the safety of trains. The fact that in dull times the men work under more favorable conditions has its effect; but the influence of the public hearings is believed to have been effective also.

The dots which mark "unavoidable accidents" refer to such accidents as those caused by the breakage of a wheel having a latent defect that no inspection would discover; by a fire, the cause of which could not be ascertained, etc. Where there was doubt as to whether an accident was unavoidable or due to negligence, it was always construed against the road, and put in the class of "accidents due to negligence."

It has long been a common saying among railway men that accidents come in bunches of three. These charts do not show that this saying is universally true, but an examination will show some apparent foundation for it. Repeatedly, on each line, there will be found a series of from two to as many as 15 accidents on the same or consecutive days, followed by a number of days on which there were no accidents at all. A plausible explanation of this is that when no accident occurs for a number of days there will be a natural tendency for the vigilance and care of officers and men to relax. This relaxation is apt to cause accidents. When the news of them goes out over the line, everybody is apt to brace up and become once more vigilant and careful, and then there will be a period free from trouble. In so far as this is true, it affords a good argument for giving immediate and general publicity to the facts about every accident, because of the effect that this will have in putting men throughout the operating department on their guard.

While crediting publicity with having helped to reduce the number of accidents, the officers of the Harriman lines also call attention to the influence that has been exerted in the same direction by the large mileage of automatic block signals that has been installed on these roads during the last few years, and by the systematic surprise tests that are constantly being made all over the lines.

General Superintendent W. L. Park, of the Union Pacific, read an interesting paper on this subject at the March meeting of the Western Railway Club, exhibiting one of these charts. Among other things, Mr. Park said:

"Not a few railway accidents are whitewashed in the investigation to the extent that the officials deceive themselves. The evidence is often made to substantiate a preconceived conclusion as to how the incident occurred. The dominant influence of one in authority frequently asserts itself to the extent that the interrogating or giving of testimony is shaped to meet the well-known views of a superior. This influence may be unconsciously exerted. * * * It has been said that 'the science of railroading is the art of shifting responsibility.' * * * The cure of disease is dependent upon an intelligent diagnosis of

the trouble. So the prevention of accidents lies in a thorough, intelligent and unbiased investigation as to the cause—applying the remedy is not so difficult. * * * Unless railway men are willing to let the politicians take from their hands the reins and govern the railways with inexperience and theory, they must analyze the present conditions and shape the future policy in this respect in accord with the growing sentiment that accidents are of too frequent occurrence. Unless prevented to a greater degree than at present, the strong arm of the Government must intervene, be the consequences what they may.

"There are railway officials who do not know, and not knowing, fear detection. There are others who are influenced by those higher in authority; who do not have the courage of their convictions. There are also a great many who arrogate to themselves a disregard of public opinion; and there are also those who have mental inertia. A competent railway operating official ought not to fear publicity for accidents. He should be so well grounded in his methods as to invite publicity. The public will help him to place the responsibility where it belongs, and secure for him the individual responsibility which is essential to any well-managed property. As it now stands, the managers must bear wholly the odium of a disregard of the rules. If an accident occurs, the men implicated will frequently accuse of the officers of not enforcing the rule, a violation of which was responsible, alleging that custcm superseded it.

"The Union Pacific is, perhaps, the first railroad adopting this method of publicity. We approached it with no little timidity, it is to be confessed. Our legal department said it would not do, as it would throw open to legal 'shysters' information upon which claims would be made for damages and personal injuries. As a matter of fact, nothing of this kind has occurred; per contra, the accident having been thrown open to full public investigation, there are no mysteries for the opposition to delve into; no vague insinuation that the great cor-

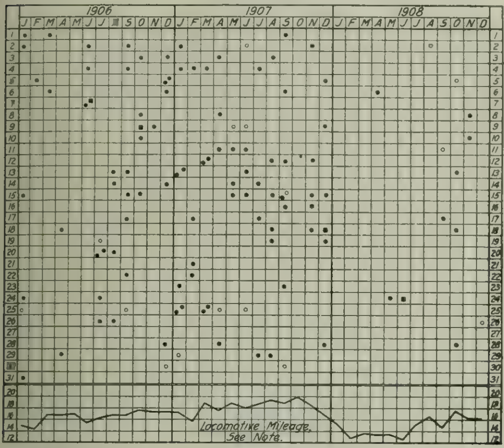


Fig. A.—Union Pacific.

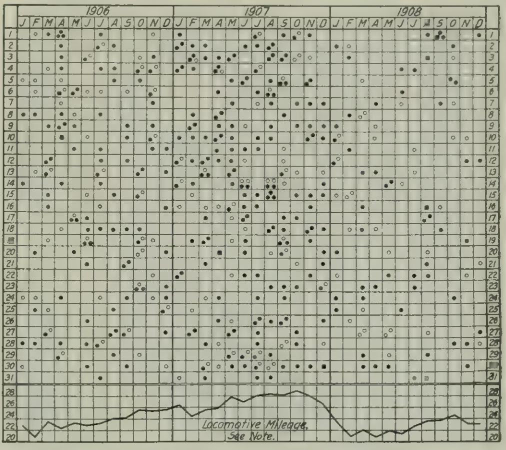


Fig. B.—Southern Pacific—Pacific System, excluding the Salt Lake Division and the lines in Oregon and in Sonora.

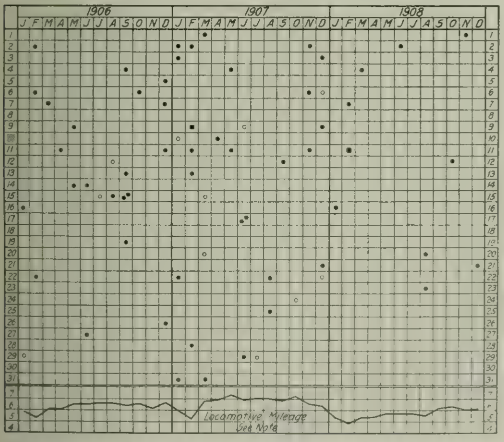


Fig. C.—Southern Pacific Lines in Oregon and the Oregon Railroad & Navigation Company.

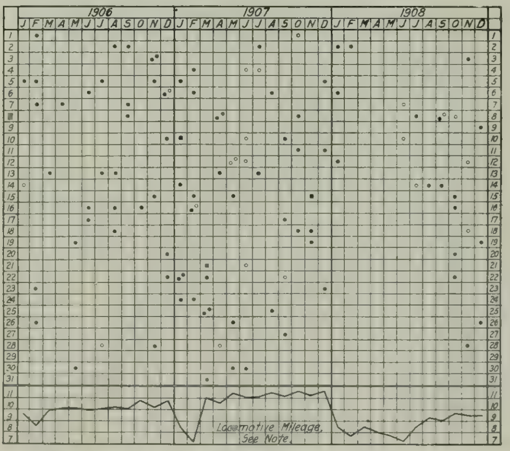


Fig. D.—Southern Pacific, Salt Lake Division and Oregon Short Line Railroad.

Dates of Serious Train Accidents on Union Pacific and Controlled Lines, Years 1906-'08.

Note.—A dot represents an accident due to negligence; and a circle one classed as unavoidable; a solid square means a broken rail. The number of miles run by locomotives each month is indicated at the bottom of each diagram in hundreds of thousands of miles. For example: Fig. A, October, 1907, 2,000,000 miles; Fig. B, August, 1907, 2,815,000 miles.

poration is crushing the helpless client by suppressing the facts—which is always a stock argument with the plaintiff in a damage case. That such investigation helps the legal department there is no doubt."

EXAMINING TRAIN MEN.*

Before coming South, I took part in preparing several books containing upwards of 1,000 rules each and looked upon them as masterpieces. Were I to make another book to-day, I would try to give all necessary instructions in not more than 50 special rules.

As for train orders, I believe that these, like the Morse instruments, within a decade will be out of date. There will be no such thing as moving trains by written train orders, as the block system will render them unnecessary, and the telephone seems likely to put every Morse instrument in the scrap heap.

It is one thing to make rules, but quite another and a far more difficult problem to enforce them. * * *

It is wise to print only such rules as are absolutely necessary, otherwise, possibly, you will find that in the rush your book of rules will not be complied with and then you will be placed in the embarrassing position of having to admit that your rules are impracticable and cannot be kept in mind.

There is one valuable and necessary rule which easily can be, but rarely is, respected and which we should make a more earnest effort to enforce. I refer to Rule 14 relating to the steam whistle. Aside from a great excess of unnecessary whistling, there is altogether too much improper whistling. Some freight enginemen seem to be under the impression that they are not earning their salary unless they whistle at least once every half mile and about fifteen times at each station. The code rule is not impracticable, nor is it unreasonable to insist that enginemen pull their whistles properly. If this is done properly on any road in the United States I have yet to ride over that road. The rule very clearly sets forth that two medium long whistles is a signal to release brakes and every railway man also knows that that is the proper signal to sound when acknowledging a proceed signal, but two short are invariably used to indicate start, as well as in answer to a signal to stop. Probably no one whistle signal in existence is more dangerous than the two short as generally used. Instead of sounding one long for stations, enginemen generally call for brakes. It has been said of the code that it prescribes a dangerous combination, one long and three short to send out a flagman, and one long and three short to indicate stop at a flag station. As sometimes used, it is unsafe, but there is no similarity whatever when properly sounded. Enginemen should wait three seconds after whistling for a station before sounding three short in answer to the conductor's air signal to stop at that station. They should also sound the station whistle for three seconds.† I often hear enginemen call for signals by using four long blasts, instead of four short. It never seems to occur to them that four long calls in a flagman from the South. I have heard an engineman call in a work train at a station by four long, instead of one long, which is not misleading. "Tapering off" is an abomination. Perhaps no one combination is more often sounded improperly than the public crossing whistle. . . .

Were you to ask me at this time to outline the best method of examination, I could conscientiously answer you only in one way: I really do not know. So much depends on the person being examined that nearly every man who comes up seems to present a new study or problem. We must get at him in a different way. We have to make use of many different illustrations to get a fact clearly fixed in his brain. After having worked on rules and orders for years I have about reached the conviction that to sit down and read the rules, explaining their meaning, and how the company wishes them understood and respected, is about as good a way as any to examine an employee. The use of several hundred questions, to be answered by the employee in his own way, gives a good general idea of a man's intelligence, and this is not a method to be despised; but few men, comparatively, can clearly express themselves in writing; or, after having answered all questions to the satisfaction of the examiner, they still may be just a little at sea in some important particular. An explanation by an examiner makes all doubtful points clear, and he is also able to elaborate by example after example until the examinee cannot fail to fully comprehend. I have always felt that a percentage examination was faulty and of doubtful value. It is unreasonable to assume that many employees will attain 100 per cent., and 90 or 95 per cent. generally is accepted as satisfactory; but when the paper is laid before the superintendent may it not be true that the questions missed are far more important, relatively, than those answered, or that men have answered questions by rote without in all cases actually appreciating the importance of or exact meaning of a rule?

*From a paper by H. W. Forman, Train Rule Examiner, of the Nashville, Chattanooga & St. Louis, read at a meeting of the Nashville Association of Railway Officers, April 24. Following his address, Mr. Forman displayed 200 train orders. He explained certain dangers liable to arise from combining two orders and pointed out the improper features of faulty orders.

†We move to amend to read two seconds.—EDITOR.

NOTES ON RAILWAY ELECTRIFICATION.*

BY JOHN A. F. ASPINALL.

General Manager of the Lancashire & Yorkshire Railway.

There is nothing so coy as capital, and if it is to be won, it must be by convincing arguments, and not by the doubtful pleadings of conflicting interests. It is probably certain that what may be called the "battle of the systems" has had the effect of causing railway companies to defer electrification until they could see that engineers were not at variance as to the system to be adopted. I have no intention of dealing with the controversial point raised in the "battle of the systems." Those who are interested will find in a recent short paper read by F. W. Carter before the Rugby Engineering Society a very clear statement of the kinds of work to which the different systems can be applied with advantage.

In dealing with the general subject, I do not for one moment suppose that I shall be able to give any additional information to those railway and electrical engineers who have already made it the object of special study. Possibly any remarks I may make will be of interest to those who have not hitherto gone into the question. It is too often stated that a general electrification of our railways would be of great advantage. A careful examination of the subject, however, appears to show that while there are certainly instances in which this work can be undertaken with great commercial success, each individual case has to be considered with the utmost care, not only on account of the costly character of the work, but because the conditions upon which success or failure depend vary in almost every place or district. The length of haul, the density of the traffic, the necessity or otherwise of express trains, the presence of steam trains, the proximity of signal boxes, the density or scarcity of population at different points of the line, and the continuity of the flow of traffic during those hours which are not "rush hours," and a variety of other circumstances, will affect the commercial prospects of such an enterprise. In dealing with the question of electrification before the Railway Congress at Washington in 1905, I said that the Lancashire & Yorkshire Railway had not gone into the work to "save money, but to make money." I further pointed out that it enabled us to defer for a long time any increase in the capacity of our terminal stations. I did so in the following words:

"Every time a locomotive train comes in or goes out you have four platform operations and eight signal operations. First of all, the train comes in, then a locomotive follows it, that is two; then the train goes out, that is three; then the loco-

*From the Presidential address before the Institute of Mechanical Engineers, April 23, 1909.

motive which brought it in goes out, that is four platform operations, which means eight signal operations. The electric motor train comes in, that is one; the motorman goes to the other end of the train, and the train goes out, that is two. You have only two platform operations, and four signal operations. The result is that, by using your motor car trains instead of locomotives, you double the capacity of your terminal accommodation."

To warrant the electric equipment of a main line of railway dealing under present circumstances with long steam-hauled trains at high speed for long distances without a stop, some great commercial advantage must be shown. The public are not likely to pay more than they do at present, and it therefore becomes a question as to whether electrical working would induce much larger numbers to travel and to travel more frequently. What would be the advantage which would weigh with them in taking more frequent journeys? The speed of trains, say between Manchester or Liverpool and London, is at present very high, some trains doing the journey without a stop from London to Liverpool (Edgehill) at 55.3 miles per hour, or from London to Manchester (Stockport) at the same speed. This would appear to be quite sufficient to satisfy the ordinary business man, who can go and return from London and arrange his journeys so as to have a clear five hours in town. If we assume a most extravagant figure, and say that trains would be run at 120 miles per hour, and the time occupied reduced by one-half, the probability is that the commercial gain to the traveler would be very small, while the increased cost to the railway would be enormous. In addition to the great first cost, say some millions, and assuming such fast trains to be run on the existing lines of way, the general usefulness to the railway company of any one track would be materially reduced, as the margins of time, before the approach of such trains, would have to be materially increased for the sake of safety, and the slower stopping trains which are interwoven between the expresses of to-day, would, to a large extent, have to be carried on other tracks. The earning capacity of what may be called, for the sake of distinction, the express track, would, therefore, be decreased. The existence of a considerable population in two towns some miles apart, without any large number of intermediate towns with a traveling population to feed a railway, would not be sufficient warrant for electrifying an existing steam road destined to carry high-speed trains. It is probable that with two towns twenty miles apart such a railway could not, in our present state of knowledge, succeeed financially compared with a steam-worked road. The cost of widening any railway the capacity of which has, owing to growing traffic, become too small for dealing with steam trains, should be carefully compared with the cost of electrifying the existing lines, with a view of seeing whether the additional capital required for electrifying would or would not exceed the cost of widening. In the case of many suburban lines from our great cities, electrification will at once double the train-carrying capacity of the tracks, while in others it will allow for an increase in capacity, and yet leave a greater time space between trains which may be utilized for the passage of steam-worked express trains coming in from the more distant parts of the line. To electrify any suburban railway, and to arrange the time table in such a way as to leave trains running at the same speed at which the steam trains formerly ran, would be to throw away most of the advantages of the change, though the working costs could be kept very low. An increase of speed, coupled with greater frequency of trains, will soon begin in a populous district to yield that flow of traffic which may naturally be expected from such facilities, but it must at once be recognized that higher speeds and more trains cost money. If, therefore, the district is not one in which there is a probability of a growth of traffic nothing can be gained. In a district where a railway has had its tracks paralleled by tramways running for some distance from the terminal of a great city, the creation of an electric railway service will have the immediate effect of bringing back to the line of railway large numbers of those passengers who have used the trams in the early stages of their construction, but who find that they cannot tolerate the great waste of time which results from the very slow speed and the many stops due to the crowded streets through which the trams have to run. It must, however, be remembered that unless an electrified railway can be continued for some distance, so as to earn a good average fare, stations which are close together and but a short distance from the great city, will yield very low fares without giving any opportunity of picking up the ever-recurring penny paid by the short-distance traveler on the trams.

Sir Herbert Jekyll, in his report to the Board of Trade on London traffic, points to the fact that one railway running northwards out of London is prohibited by law from stopping at intermediate stations unil it has got 9 miles out of London. Although this distance is probably in excess of what might be termed reasonable, such a railway, being electrified, would be saved the drawback of having to start out of the terminals with a heavy train of great seating capacity which would empty rapidly at the short-distance stations, and necessitate the haulage of a considerable weight of empty stock to whatever distance the line might be extended. The main object should be to induce a large number of people who have business in the towns to live further out, and so bring up the average fare of the railway (which has to pay for its wayleave, its land, its stations, and its signalling), to such a figure as will make it profitable, leaving the very short distance traffic to the municipal tramway, which has its right of way in the public streets, and has advantages which the railway cannot possibly obtain. Some of the advantages of electrification for local services are:

(*a*) High schedule journey speed.

(*b*) Much more frequent service when required.

(*c*) Increased acceleration and deceleration.

(*d*) Greater possible mileage per train per day, increasing the earning capacity of any given quantity of rolling stock, and increasing the loading and unloading capacity of existing platforms.

On lines of railway where third-class carriages only are necessary, great advantages in operating are gained, but there are parts of the country where the demands of the public are such that it is absolutely essential to run two classes (first and third), and where this is the case, and it is necessary to provide smoking compartments for each class, considerable difficulties in the reduction of train weights are met with; but if care is taken in proportioning the seats to the requirements of the public, the higher fares obtained from the superior class more than overbalance the additional cost of operation.

Any company which determines to convert its line from steam working to electrical working must be prepared for some difficulty in dealing with the less thoughtful sections of the public, who are unwilling to recognize the necessity for some of those delays which during the initial stages are inevitably connected with such a considerable change in methods. Notwithstanding these little troubles, one may say with R. L. Stevenson that—

"The conditions of conquest are easy; we have but to toil a while, endue a while, believe always, and never turn back."

Liverpool-Southport Railway.—In describing the particular instance of conversion to which I have referred, I propose to deal with that section of the Lancashire & Yorkshire Railway which has now been electrified for some time, and of which the working results are known, and which has been commercially successful. The Southport branch of the Lancashire & Yorkshire Railway is a coast line 18½ miles in length, having fifteen stations upon it. The total length of electrified line in and about this district amounts to 4 miles of four tracks, and 25 miles of double tracks, making a total, if sidings are included, of 70 miles of single track. After leaving Liverpool, all the stations are close to the sea. Many of them are situated in

the midst of attractive residential districts, and were thus likely to produce additional traffic, if good traveling facilities were provided. For some distance from Exchange Station, Liverpool (about 4½ miles), the railway runs parallel with the line of docks, near which there are several large goods stations. To deal efficiently with the considerable goods traffic, as well as the numerous steam passenger trains, there were four lines of way from Sandhills Junction up to Seaforth, and then two lines of way on to Southport. On the length where four lines of way existed there were four passenger stations, each having four platforms, with all the necessary waiting rooms, etc. All these platforms were required, and were used in the days of steam trains. As a matter of convenience, all four lines were electrified, and two of them are looked upon as being desirable for spare lines over which passenger traffic can be passed in the event of any obstruction occurring on the eastern lines over which, with the exception of one or two through trains, all the electric trains are now run. Although the frequency of trains has been more than doubled, the rapid acceleration and the increase in the average speed of travel has enabled the whole of the work, with the exception mentioned above, to be done on two lines of way, thus dispensing with the staff, and enabling the waiting rooms and other buildings on the western lines to be shut up, and permitting the western lines to be used almost wholly for the steam-worked goods traffic, allowing it to flow to and from the various yards without any interruption from passenger trains. This may be looked upon as a distinct gain to the railway in capacity for handling traffic. Here the cost of electrifying is a set-off against the necessity for widening and laying additional lines through a most expensive district, which would in time have become necessary if steam working had been continued or passenger trains. During the first year of electrification, and at an early period, when the increased service had shown the public the advantage of greater frequency (with the result that 14 per cent. more people were making use of the trains), it was interesting to note that the total weight of the rolling stock moved in a day between 5 a. m. and 12 midnight was 69,160 tons, against 78,393 tons in the days when steam was used. A diagram, Fig. 2, has been prepared to illustrate this, the dotted lines showing the weight of the steam trains, including the locomotives, and the full lines the weight of the electric trains during different periods of the day. A considerable addition to these weights has been the natural result of an increase in traffic since 1904.

The suburban service on the Liverpool & Southport electric line is considered to be the fastest service of such a character in existence. The stopping trains on the Southport line run 18½ miles, stop fourteen times, and do the journey in 37 minutes. The express trains, which are much easier to work, run the same distance in 25 minutes. The trains get into speed very rapidly, and are running at 30 miles an hour in 30 seconds from starting, though this varies with the number of cars. If any one were to compare the costs of operation of such a railway with another electrical line working under altogether different conditions as to speed and weight of trains and the number of stopping places, the figures would be somewhat misleading, if they were not studied with a knowledge of all the facts.

During the transition stage from steam to electrical working, there came a period when it was necessary to run steam trains in between the electrical trains at the same speed, in order to keep them out of the way of the latter. This afforded an opportunity of comparing the coal consumption of the locomotives and the power house, and it was found that the 6-wheel coupled tank engines, which did the work in 1904, consumed 80 lbs. of coal per train mile with express trains, and 100 lbs. with stopping trains. This excessive locomotive consumption was due to the high acceleration required. The consumption of coal at the power station in 1908 works out to 49 lbs. per train mile for the electrical trains, and the consumption of current at the train is 49 watt-hours per ton-mile for the express trains, and 112 watt-hours per ton-mile for express and stopping trains, including all shunting work.

During the period of conversion the work which is most likely to interfere with the ordinary traffic is the laying of the high tension cables in the ballast and the fixing of the conductor rails. On the Liverpool & Southport line the operation of cable laying was proceeded with first, so that the cables were completed and the ground filled up, leaving the way clear for men engaged upon track work. The method generally adopted was to open out a long trench in the daytime, and to

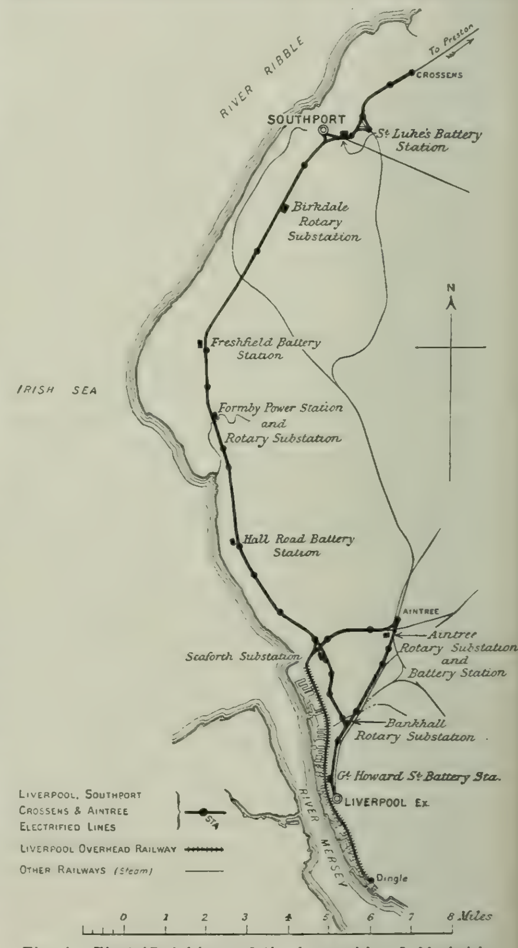


Fig. 1—Electrified Lines of the Lancashire & Yorkshire.

lay the troughing ready to receive the cables; these were brought down specially at night, the drums being mounted in suitable wagons, and uncoiled, so that the cables could be placed in the troughs, and the remainder of the work completed in the daytime. The track work, except at the busier points, such as Liverpool Exchange and Southport, was entirely carried out during the daytime, unloading of rails only being done at night. The delays to trains were never serious, and generally consisted of having to slow down when approaching and passing over the places where operations were being carried out for the time being.

The steam service from Liverpool to Crosby previous to electrification was every quarter of an hour, and to Southport every half hour in both directions, and with this number of

trains passing, hardly any trouble was caused during the period of conversion. The passing of goods trains had also to be allowed for, and it may be convenient to mention here that all good trains are still worked with steam locomotives.

The question of rapidity of conversion, after a decision is arrived at to electrify, is very important, as it is desirable to reduce to the minimum any interference with existing traffic. It is obviously of great importance also that where a large amount of additional capital is being spent, it should be made to earn money at the earliest possible date, so as to avoid loss of interest.

Once it was decided by the company that the line should be electrified, the work was proceeded with very rapidly, and the following dates will give an approximate idea of rate of progress:

1. Order given ....Oct. 22, 1902.
2. Three sub-stations built ....July 29, 1903.
3. High-tension cables completed.......................Nov. 26, 1903.
4. Power-house foundation and building erected.......Nov. 26, 1903.
5. First engine and generator completed, and H. T. current produced ....Dec. 20, 1903.
6. First sub-station complete, current supplied to line..Dec. 29, 1903.
7. First train run experimentally ....Dec. 29, 1903.
8. Third and fourth rail work practically completed..Feb. 28, 1904.
9. Partial service for the public put into operation....Mar. 22, 1904.
10. Steam trains entirely withdrawn ....May 13, 1904.

RAIL WEAR.

The wear of track rails has become a serious problem on electric railways. The special rails which have been introduced by Sandberg on some railways for the purpose of preventing this wear are not the real cure for the difficulty, which is one of construction. This does not mean that the value of those rails is not appreciated, as their prolonged life would have its commercial value in other directions. . Those who recollect the very early locomotives, which were built by Bury, Curtis & Kennedy, with their boilers carried as low down and as close to the axle as possible, their cylinders coming within a few inches of the rail, and placed at such an angle that the piston-rods were inclined upward towards the crank-axle, will remember the effect which they had on the permanent way, and how they had a tendency to burst the track. The modern steam locomotive, with a high center of gravity, is a very easy-riding machine and it is far less severe on the road, notwithstanding its great weight. The more or less modern motor truck has all the defects of the older-fashioned engines described above, with its extremely low center of gravity. The result is that the rail wear and tire wear are present, because the pressure which should be carried by the

Total Weight moved from 5 a.m. to 12 midnight:—Steam, 78,393 tons; Electric, 69,160 tons.

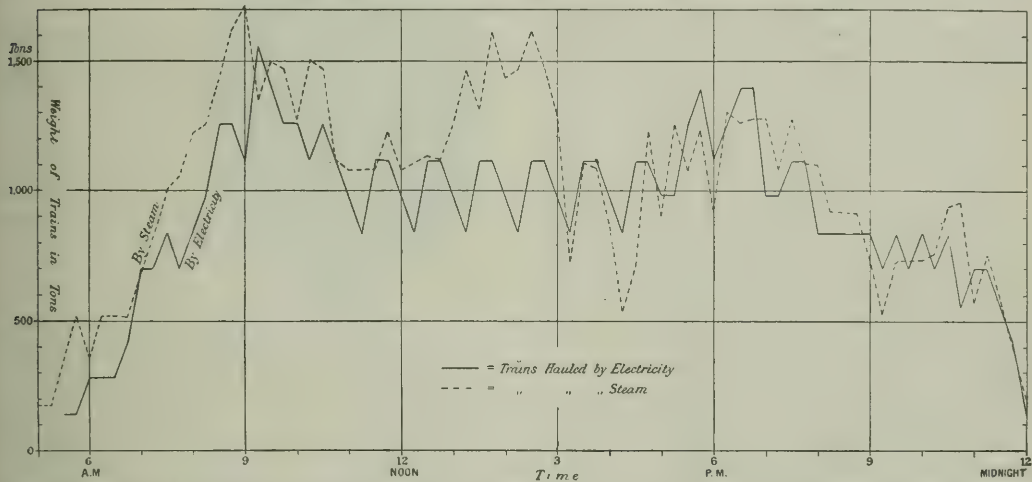


Fig. 2—Weight of Passenger Stock Moved During a Working Day Between Liverpool and Southport, 1904. Steam Before Conversion; Electric Afterwards.

tread is thrown on the flange. This is because there is no elasticity, in the form of a spring, interposed between the weight above and the tire below.

AXLE LOAD.

The construction of the steam locomotive which enables the center of gravity to be placed, according to the class of engine, from 4 ft. 6 in. to 5 ft. 6 in. above the rail level, has advantages not possessed by the motor truck, in which the motor is suspended. The center line of the motor truck is in the same plane as the center line of the axle, with the result that while about one-half the weight is supported by the truck frame, and so obtains through the springs a slightly elastic support, the other half is supported directly by the axle and clipped on to it. This greatly increases the weight which is not spring-borne. Each pair of wheels under the motor cars on the Liverpool & Southport electric line, together with the other weights which are not spring-borne, makes a total of about 3 tons per axle. A motor car, with its four axles, has a total weight of 26,880 lbs. which is not carried by the springs, the weight of the entire vehicle being 103,852 lbs. The serious side wear of the rails which has taken place on the curves of railways which have been electrified is, there is no doubt, due to the center of gravity of the motor trucks being so very low down. Except for such difficulties as would be created by raising the motor itself, and transmitting its motion by suitable mechanism to the axles, and so blocking up the passages from car to car, there is little doubt that the whole weight, except that of the wheels, axles and axle-boxes, could be supported by springs. The center of gravity would then be well above the frames, with the result that the hard grinding of the tire flange which now takes place on curves would be eliminated. The conditions would then be the same as with the steam locomotive, with which no such serious rail wear due to the flange is perceptible. On the other hand, the great advantages of the direct drive would be lost, and as practice has shown that the gears wear extremely well and show an admirably smooth surface after running many thousand miles, it may be a more commercial method to wear out the cheap rail instead of expensive mechanism. At the same time, it must be remembered that it has not been practicable to operate steam trains at the same schedule as is frequently adopted for electric service, and as a consequence there is no information as to how the tracks would have been affected if they had been so operated. These faster schedules are necessarily brought about by

higher acceleration and deceleration than is usual with steam conditions.

The division of the weights of the motive power between a large number of wheels, together with the advantage of the motive power being absolutely in balance, cannot fail to have less damaging effect upon the permanent way, provided that other conditions are equal. In the case of the Liverpool & Southport electric line, the maximum weight per axle, i. e., on a motor car is 25,760 lbs., or with such a vehicle loaded 28,560 lbs. The trailer cars work out to about 16 800 lbs. per axle. In a four-car train, composed of two motors and two trailers, therefore, the rail loads would be eight axles of 28,560 lbs., and eight axles of 16,800 lbs.—fairly well distributed. In the case of steam traction, and taking as an example the heaviest tank engines of the Lancashire & Yorkshire used for suburban work, viz., six-wheeled coupled radial tank engines with 19-in. cylinders, there would be for the engine three driving axles averaging 39,088 lbs. each, and two radial axles, the leading having 23,800 lbs. and the trailing 32,480 lbs., together with the train

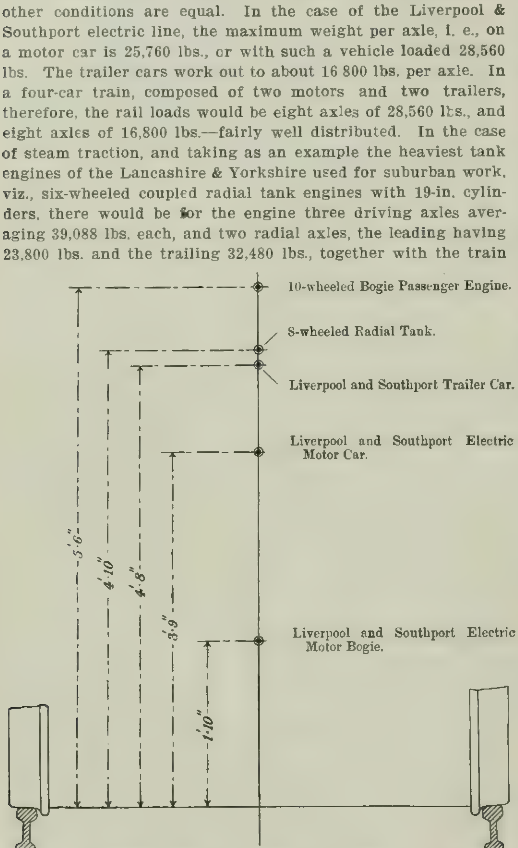


Fig. 3—Diagram Showing Heights of Center of Gravity.

of carriages of similar weights to electric trailers. This engine, however, is not sufficiently powerful to run a regular service to the electric schedule. It will be seen that there must be heavy stresses upon the track, due to the accumulated weight upon the coupled wheels, the rigidity of such coupled wheels, and the lack of balance, which to some extent is bound to be present. Owing to the heavy weights carried, a comparatively small wheel-base is essential for a motor bogie, 8 ft. being about usual. The smaller the wheel-base, the greater will be the amount of "hunting," or sinuous action, the effect of this action being greater or less according to the height of the center of graviy of the motor bogie, and its relative freedom of movement, distinct from the body of the vehicle. The advantage of a comparatively long wheel-base for bogies under certain conditions is admirably dealt with by Professor Carus-Wilson in his paper on the "Predetermination of Train Resistance."* Fig. 3 shows the position of the center of gravity in electric motor cars and locomotives.

CARS.

The construction of the cars, which have to carry large numbers of people, is of considerable importance, and it might seem at first sight as if numerous outlets in the form of doors would prove a remedy for delays at stations. A multiplicity of side doors means that a larger staff has to be employed on the platforms, if they are to be safely closed, or if they are sliding doors worked automatically there is some risk to the public of being caught by them, and there is much greater risk of sliding doors being jammed in case of accident. The system imported from America of having men on each platform between each pair of cars to open the gates and shout the names of stations, leads to an excessive train staff being employed. This multiplication of labor is an economic waste, and the effect on the public is that, having so many people to look after them, they enter and leave the cars in a very leisurely fashion, resulting in too much time being spent at stations. A system of having large side doors at each end of a 60-ft. car, which doors are readily opened or closed by the public themselves, saves the waste of labor, causes the passengers to move quickly in and out of the cars, and has shown in practice in the north of England that the trains may be got away from the stations in less time. The most crowded cars are always emptied during the rush hours in about 50 seconds at terminal stations, while intermediate stops only require 15 seconds to pick up and set down passengers. Stopping trains, with considerable amounts of luggage and parcels to handle, can be worked with two guards and a motorman, while express trains need but two men—a motorman and a guard. The great strength which is obtained by having cars made with end doors only is of much importance, frequent side doors making a very weak structure.

When the Liverpool & Southport line was operated by steam, 30 locomotives and 152 carriages with 5,084 seats were required to do the work, this number including the necessary percentage under repairs. The number of vehicles now required upon this length of 18½ miles is 38 motor cars and 53 trailer cars with 5,814 seats.

I do not give a detailed description of the plant and equipment, because that has already been very fully published in all the technical papers. The special features, however, in connection with the rolling stock on the Liverpool & Southport electric line are:

(*a*) Direct control of electric equipment on cars, as distinguished from multiple unit control, though multiple unit control has been used to a certain extent with some later cars.

(*b*) Adoption of the automatic vacuum brake, which is the brake in use upon the rest of the railway, but with specially added valves for releasing the brakes rapidly after application.

(*c*) Carriages of the exceptional width of 10 feet over all, allowing a considerable area of floor space per passenger.

CONTROLLERS.

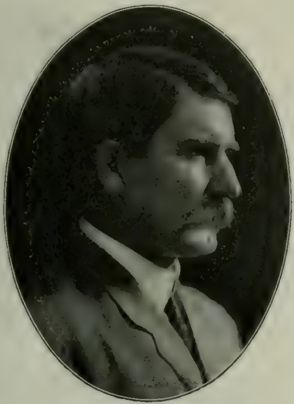
No serious attempts were made, previously to 1903, to design a main or direct controller capable of handling the amount of current required for very large trains. In the case of four-car Liverpool & Southport trains, weighing 144 tons, a maximum of 2,400 ampères is required during the period of acceleration. In addition to the main controller, the main switches and circuit breakers and ammeter are placed in the motorman's compartment. The man in charge is, as a consequence, able to realize exactly what is occurring on the train. These large controllers have justified the forethought displayed in their design by the small amount of maintenance required in their upkeep. Examination must obviously be more simple and effective, since the whole of the control equipment for eight 150 h. p. motors is contained in two motormen's compartments, and can be inspected at any time without being put over a pit or under cover from the weather. The credit for this design belongs to the contractors who supplied the equipment.

(*To be continued.*)

**Proceedings, Institution of Civil Engineers*, Vol. CLXXI., 1907-1908.

THE NEW TEXAS COMMISSIONER.

W. D. Williams, Mayor of Fort Worth, Texas, has been appointed a member of the Railway Commission of Texas. He succeeds Judge L. J. Storey, who died recently. Like the other members of the Texas commission, Mr. Williams has had no railway training and is a lawyer and a politician, but it is understood that he has taken a keen interest in the question of the regulation of railways by the state and is a man, as far as we can judge from reports, who will have rather a more decided opinion on the questions that come before the Commission than did his predecessor, Judge Storey.



W. D. Williams.

While Judge Storey was a member of the Commission, the forces of good and evil were more or less balanced. O. B. Colquitt gave expression to any bit of rabid anti-railway public opinion that seemed to meet his political views. He was a candidate for governor, and is generally believed to still have his eye on that office. The view of him most often expressed by railway men who have had to do with the Texas Railway Commission seems to be that not only did he voice popular prejudice against railways, but that he was not especially sincere in all his expressions of opinion.

Allison Mayfield, who has now been made Chairman, had a reputation for fairness and careful consideration of both sides of the question that made him respected by railway men, whether they agreed with his opinions and decisions or not.

Judge Storey at the time of his death was rather an old man, and, although meaning to be perfectly honest and fair, was inclined to be influenced by whichever fellow commissioner was most insistent, so that he acted as a kind of shifting balance in the work of the commission. It is his place that Mr. Williams has got to fill, but whatever attitude Mr. Williams adopts, it seems unlikely from his past record that it will be so pliant a one as that adopted by Judge Storey. He is more likely to throw himself whole heartedly on the side of fairness or on the side of prejudice.

The Chinese are making sad work with their first experiments in railway building, according to a correspondent of the London *Times*, who has inspected the work on a line from Shanghai southwest to Hang-Chow and thence eastward to Ning-po, being on the two sides of Hang-Chow Bay. A British syndicate advanced the money for the work, with the right to have a British engineer, the work being done by Chinese. But the engineer is not consulted; the Chinese so-called engineers have but the most elementary knowledge of their profession or none at all; all sorts of blunders are made; the materials are apparently the cheapest that could be had, and there are eight different kinds of rolling stock, explained by the fact that there are eight directors, who take turns in giving out contracts. In one place, where there was difficulty in bridging a stream the Chinese built the bridge on dry land and then dug a canal and diverted the waterway under the bridge. Both the entrance to the diversion and the exit from it were at right angles to the natural direction of the stream. The men who advanced the capital are offering their securities at 70 cents on the dollar.

THE COMMODITY CLAUSE HELD CONSTITUTIONAL.

The following is a summary of the opinion in the commodities case:

1. The claim of the government that the provision contained in the Hepburn act approved June 29, 1906, commonly called the commodities clause, prohibits a railway company from moving commodities in interstate commerce because the company has manufactured, mined, or produced them, or owned them in whole or in part, or has had an interest direct or indirect in them, wholly irrespective of the relation or connection of the carrier with the commodities at the time of transportation, is decided to be untenable.

It is also decided that the provision of the commodities clause relating to interest, direct or indirect, does not embrace an interest which the carrier may have in a producing corporation as the result of the ownership by the carrier of stock in such corporation irrespective of the amount of stock which the carrier may own in such corporation, provided the corporation has been organized in good faith.

2. Rejecting the construction placed by the government upon the commodities clause, it is decided that the clause, when all its provisions are harmoniously construed, has solely for its object to prevent carriers engaged in interstate commerce from being associated in interest at the time of transportation with the commodities transported, and therefore the commodities clause only prohibits railway companies engaged in interstate commerce from transporting in such commerce commodities under the following circumstances and conditions: a—When the commodity has been manufactured, mined, or produced by a railway company or under its authority, and at the time of transportation the railway company has not in good faith before the act of transportation parted with its interest in such commodity; b—When the railway company owns the commodity to be transported in whole or in part; c—When the railway company at the time of transportation has an interest direct or indirect in a legal sense in the commodity, which last prohibition does not apply to commodities manufactured, mined, produced, owned, &c., by a corporation because a railway company is a stockholder in such corporation. Such ownership of stock in a producing company by a railway company does not cause it as the owner of the stock to have a legal interest in the commodity manufactured, &c., by the producing corporation.

3. As thus construed the commodities clause is a regulation of commerce within the power of Congress to enact. The contentions elaborately argued for the railway companies that the clause, if applied to pre-existing rights, will operate to take property of railway companies, and therefore violate the due process clause of the fifth amendment, were all based upon the assumption that the clause prohibited and restricted in accordance with the construction which the government gave that clause and for the purpose of enforcing which prohibitions these suits were brought.

As the construction which the government placed upon the act and seeks to enforce is now held to be unsound, and as none of the contentions relied upon are applicable to the act as now constructed, because under such construction the act merely enforces a regulation of commerce by which carriers are compelled to dissociate themselves from the products which they carry, and does not prohibit, where the carrier is not associated with the commodity carried, it follows that the contentions on the subject of the fifth amendment are without merit.

4. The exemption as to timber, contained in the clause is not repugnant to the constitution.

5. The provision as to penalties is separable from the other provisions of the act. As no recovery of penalties was prayed,

no issue concerning them is here presented. It will be time enough to consider whether the right to recover penalties exists when an attempt to collect penalties is made.

6. As the construction now given the act differs so widely from the construction which the government gave to the act, and which it was the purpose of these suits to enforce, it is held that it is not necessary, in reversing and remanding, to direct the character of the decrees which shall be entered, but simply to reverse and remand the case with instructions to enforce and apply the statute as it is now construed.

7. As the Delaware & Hudson Company is engaged as a common carrier by rail in the transportation of coal in the channels of interstate commerce, it is a railway company within the purview of the commodities clause and is subject to the provisions of the clause as they are now construed.

There was but one dissenting opinion. It was by Justice Harlan, and it was very brief. He said: "As those cases are now determined wholly on a construction of the parts of the Hepburn act here in question, and as Congress, if it sees fit, may meet this construction by additional legislation, I content myself simply with an expression of non-concurrence in some of the views expressed by the court as to the meaning and scope of the act. In my judgment, the act, reasonably and properly construed, according to its language, includes within its prohibitions any railway company transporting articles or commodities if at the time it legally or equitably owns stock—certainly if it so owns a majority or all the stock in the company—that mined, manufactured or produced the articles or commodities being transported by such railway company."

The following outline of the effect of the decision was given by Robert W. De Forest, who, with John G. Johnson, argued the commodity cases before the Supreme Court:

"Practically the decision of the Supreme Court is in favor of the railways and the public, and against the contention of the Attorney General, that all coal mined by the railways, which had a direct ownership in the coal, and that all coal mined by the subsidiary coal companies, in which the railway companies had a stock interest, was barred of interstate transportation by the Hepburn act.

"Of the anthracite carriers only two, the Delaware, Lackawanna & Western and the Delaware & Hudson, have any direct legal ownership in anthracite coal. Both these companies are authorized by their charters to mine anthracite coal and to transport it.

"All the other so-called anthracite carriers, that is, the Reading, the Central of New Jersey, the Pennsylvania, the Lehigh Valley, the Erie and the New York, Ontario & Western, own stock in coal mining companies.

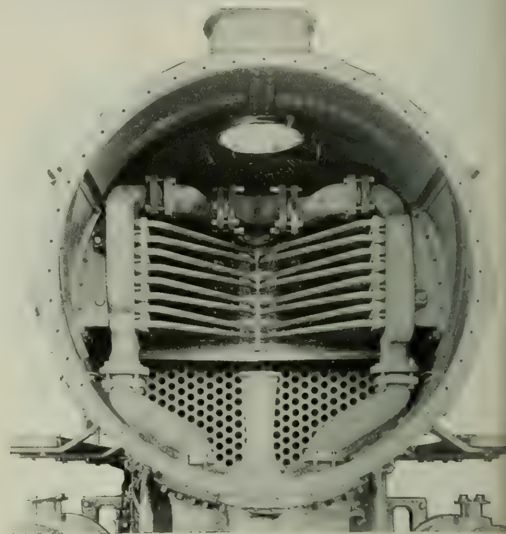
"The decision establishes the legality of anthracite coal transportation by these six last-named companies; that is, the transportation of coal mined by companies in which they have a stock interest. This leaves only the situation of the Delaware, Lackawanna & Western and the Delaware & Hudson to be considered.

"The Delaware & Hudson Company, as I understand, at the present time, and for some time past, has been accustomed to sell its coal at the mines. Therefore, the prohibition of the act, under the decision of the Supreme Court, would not apply to it. It would apply to the Delaware, Lackawanna & Western, under what I understand to be its present course of business, but it would seem quite possible for that company to adopt the practice of the Delaware & Hudson, or equally possible for that company to transfer its coal lands to another company, the stock of which can be held by it, inasmuch as the coal lands are not covered by any mortgage."

The new Austrian Minister of Public Works, Ritt, is an engineer, and the first that has ever occupied a seat in an Austrian cabinet.

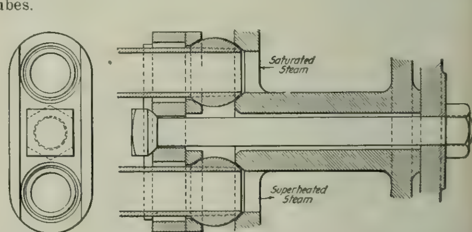
IMPROVED COLE SUPERHEATER.

The Cole superheater for locomotives, as made by the American Locomotive Co., has been modified and improved by certain changes in the arrangement of the headers and superheater tubes. The superheater is of the fire-tube type and was originally designed with enlarged fire-tubes with four



Cole Superheater in Position.

superheater tubes each. Each of these tubes had an inner and an outer tube. The inner one carried the saturated steam to the back end of the superheater tube, where it escaped into the outer tube and was led forward to a header for delivery to the cylinders. With this arrangement, which was illustrated in the *Railroad Gazette* of Sept. 2, 1904, and June 9, 1905, the superheated steam was exposed to the temperature of the pipe containing the saturated steam, so that part of the heat of the superheated steam was used for the superheating. With the new arrangement, this feature has been omitted and all superheater pipes are directly exposed to the hot gases. In the former arrangement, the steam made one passage through the tubes, while now it makes two complete round trips from the smokebox to the back end of the tubes.

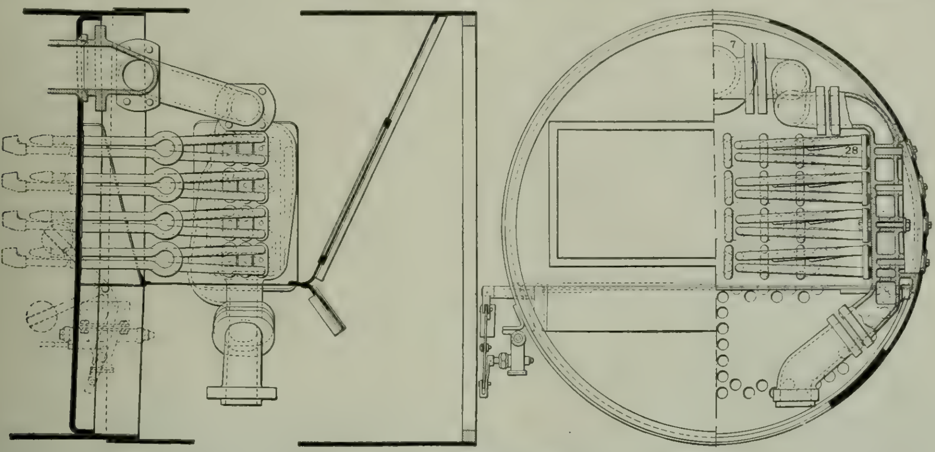


Sectional Elevation of Steam Pipe and Superheater Tube Joint.

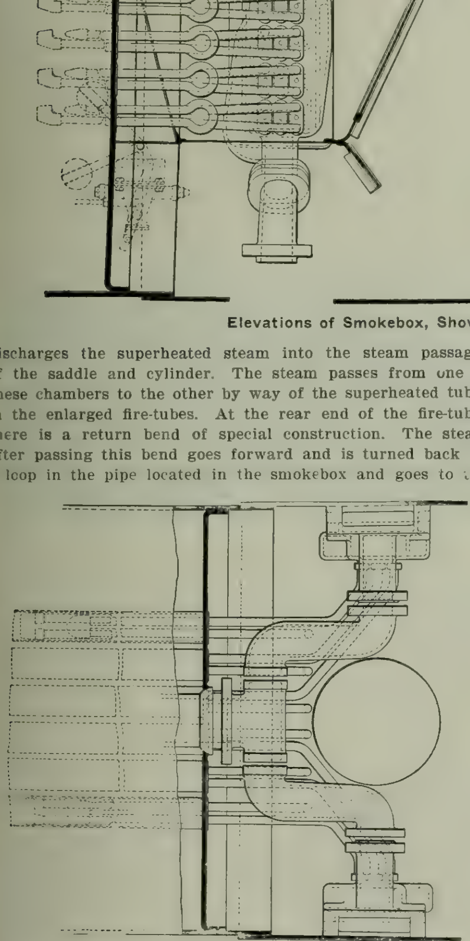
The methods of accomplishing this are clearly shown in the accompanying drawings. In the first place, there is a complete separation of the steam used on the two sides of the locomotive, the same as in an ordinary locomotive without a superheater.

The steam is delivered from the drypipe in the usual manner, and passes through the teehead into headers on either

side. These headers occupy the same position in the smokebox as the ordinary steam pipes, lying close to the shell. The vertical section of the smokebox shows that each header is divided into two chambers, separated by a zig-zag partition running up and down through the center. In one of these chambers, that towards the front of the smokebox, the saturated steam is received from the boiler. The other chamber discharges the superheated steam into the steam passages of the saddle and cylinder. The steam passes from one of these chambers to the other by way of the superheated tubes in the enlarged fire-tubes. At the rear end of the fire-tubes there is a return bend of special construction. The steam after passing this bend goes forward and is turned back by a loop in the pipe located in the smokebox and goes to the rear again to a second return bend and then comes out to the superheated side of the header.



Elevations of Smokebox, Showing Cole Superheater Arrangement.



Plan of Steam and Superheater Pipe Arrangement.

The wide temperature variations, during superheating, not only in the steam and the tubes containing it, but also in the other parts with which these tubes are connected, requires that there should be great flexibility in all connections in order to provide for the expansion and adjustments to relieve the stresses that would otherwise result. The details of the fastening of the superheater tubes to the headers are shown in the accompanying engraving. The header is a hollow casting, with holes cored through the partitions for the bolts that hold the tube caps in place. The header ends of the superheater tubes are ball-jointed to the header openings. With this arrangement, any nest of tubes can be quickly disconnected and withdrawn for inspection or replacement, and sufficient flexibility of connections is provided that expansion stresses are eliminated.

A damper at the foot of the diaphragm and in front of the superheater fire-tubes protects them from the hot gases when the engine is not using steam. This damper is opened and closed automatically as steam is admitted or shut off. Handholes are provided in the side of the smokebox for tightening the tube caps.

ENGLISH RAILWAYS.

BY WILLIAM WICKHAM TURLAY.

The president of one of our most important American railways, on his return from a vacation trip to Europe not long ago, told a newspaper reporter that we had nothing to learn from European railways. Many other American railway men have made similar statements, but not all of them have gone to such an extreme in their expressions. It must be remembered that officers everywhere are, as a class, disposed to be contented with established conditions, and adverse to changes, which are always troublesome, and which do not always bring about improvement. It is possible, also, that our higher railway officers, who usually travel in private cars, or even by special trains, when making journeys of any considerable length, do not fully realize the conditions which the ordinary traveler meets. It may be interesting to make comparisons of our methods with those of other countries, provided we keep an open mind, and are willing to recognize what we find good in foreign practice, as well as in our own.

Our American railways, built in a comparatively undeveloped and thinly populated country, have been compelled to give special attention to the hauling and transportation of freight. They have succeeded so well in this that by the use of extremely powerful locomotives and very large cars, they are able to carry train loads of coarse freight, such as coal, steel and grain, at lower rates than are found in any other country except Canada, and Canada is really not an exception, because its conditions, and the development of its railways, have been almost precisely the same as our own. The remarkable work which has been done in moving an enor-

mous tonnage of coarse freight has attracted the admiration of railway men in other countries, and they have adopted American methods in cases where the local conditions made it possible to do so, especially in some of the British colonies.

Our country has now come to the beginning of the transition period in its history, and in the operation of our railways, as in many other ways, we must adapt ourselves to the changed conditions brought about by an immense growth of population and a rapid development of commerce and manufactures. In our eastern states, at least, more attention must be given to the transportation of passengers, and of small or "less-than-carload" lots of freight. This may result in a large part of the bulky freight being carried on separate tracks built for the purpose, or by water routes, which can be constructed (or old ones improved) in many parts of the country.

We have come to understand quite well that railways and waterways are like public highways, and must be managed primarily for the benefit of the community, although with due regard to the profitable use of capital actually invested in them, and on this basis we shall in future be able to discuss possible or necessary changes with less bitterness and injustice than have attended such discussions in the past, but there will

British Suburban Station.

always be found some who will oppose any change, and unfortunately many of our prominent railway men appear to consider freight traffic much more desirable than passenger, and have produced figures to prove that the latter is unprofitable. Without going into tiresome details, it may be said in answer to such statements that they are based on figures which are largely arbitrary, because to a very great extent neither the capital charges nor the operating expenses of a railway can be divided accurately between freight and passenger traffic. For bookkeeping purposes an attempt is made to do this, and at considerable expense, but it is safe to say that fifty expert accountants, if given a free hand, would devise fifty different systems for such a division.

By degrees our railways must adapt themselves to an increased proportion of income from passengers and from *small* shipments of freight. They will meet the problem successfully, as they have met others, and the change will probably be accompanied by increased facilities and reduced rates. As these conditions have prevailed in Europe during the whole period of railway development there, let us study some of the features of English railways, which are perhaps as well managed as any in Europe, though they are not radically different from those on the continent.

PROTECTION FROM ACCIDENTS.

At an English station passengers are not allowed to cross from the construction of the platforms, which are nearly on tracks, or a subway under them, one or the other means being always provided. The enforcement of the rule is more easy from the construction of the platforms, which are nearly on a level with the floors of the cars, so that a passenger steps easily and quickly into the train through one of the numerous side doors, instead of climbing up a steep and narrow flight of steps. The train moves off without any shock or jar, and if a locomotive or car is coupled to the train at a station this is done without discomfort to the passengers by a method of great simplicity, which, while not automatic, can be operated with little danger to the employees, and insures an easy motion. This coupling being adjusted by hand for each car cannot be operated as quickly as the American automatic coupler, but it obviates the extremely violent concussions incident to the use of the latter. The line of the railways is well protected by block signals, similar to those in use on many of the best American roads; it is well fenced or hedged to keep off human and animal trespassers, and never crossed at grade by other railways, which are always carried over or under it. Highways never cross the track at grade except in a few parts of the country where the ground is very flat, and the crossings are then protected by heavy gates (not mere bars), carrying lights at night, which either completely close the highway, or, when the latter is open, swing across the tracks so that a train cannot pass without running into them. All these safeguards result in making accidents far less numerous than in America, though the orderly habits of the people, and a strict enforcement of laws against trespassing, probably go far towards reducing the number of people killed or injured when crossing or walking along the tracks. The rule of avoiding grade crossings has been followed from the beginning of railway construction in England, and has made the first cost of the lines very high. Such an expense would have been prohibitory when many of our American railways were built, and in thickly settled parts of the country they now find themselves compelled to rebuild their lines at a far greater expense than would have been necessary in the beginning had enough capital then been available.

The walls and fences of English stations are almost always covered over with advertising signs and placards, a considerable income being derived in this way. The stations, usually neat and attractive in every other respect, are thus defaced and made unsightly. Fortunately, only a few American railway companies have yielded to the temptation to increase their income in this questionable manner. The hideous "field-sign" has heretofore been seen as often in England as in America, but the owners of land along the line, and not the railway companies, are responsible for the nuisance. Laws recently enacted will gradually abolish field signs in England during the next few years. Let us hope that public sentiment may soon demand similar legislation in America.

(*To be continued.*)

General News Section.

At Washington this week the Interstate Commerce Commission gave a hearing on an order, which it proposes to issue, requiring all trains to have all cars equipped with power brakes.

The Oklahoma State Corporation Commission has fined the Atchison, Topeka & Santa Fe $100 for failing to have a warm waiting room one night last November at Tangier. The agent told the complaining passengers that no fire was needed.

The *New York Times* announces that on the night of May 3 communications were sent by wireless telegraph between the Waldorf-Astoria Hotel, in New York, and the Auditorium Annex, in Chicago. The *New York Times* and the *Chicago Tribune* exchanged congratulatory messages.

On the Panama canal works May 1, 11 workmen were killed and nine injured in a runaway of work cars. In the Gold Hill section, by some accident or mismanagement in connection with the air-brakes, a number of dump cars became uncontrollable and ran down a grade, falling into Culebra cut.

At Hauser Junction, near Spokane, Wash., on the night of April 29, a westbound passenger train of the Northern Pacific was stopped by two masked robbers, who compelled the engineman to haul the mail car several miles away from the rest of the train. The reports do not indicate how much property was stolen.

One of the big Mallet articulated compound locomotives which have been built by the Baldwin Locomotive Works for the Southern Pacific, and which were described by the *Railroad Age Gazette* in its issue of April 30, page 933, was on exhibition at the La Salle street station in Chicago this week, and large numbers of persons visited the station to see it.

The special women's cars on the Hudson Tunnel Railway are legal. This is the substance of a letter from the Interstate Commerce Commission to Thomas Dundon, who complained to the Commission that the reservation of cars for women was a violation of the law. The Commission holds that as men are not excluded from the women's cars the law is not infringed. The Commission also sent a copy of its decision to the president of the Hudson & Manhattan railway.

The Governor of New Jersey has appointed Samuel Whinery, of East Orange; Charles Hansel, of Cranford, and Frank Stevens, of Jersey City, commissioners to appraise and revalue the railway and canal property in the State. The appointments were made under authority of a joint resolution passed by the Legislature, the acknowledged purpose of which was to raise the assessments of the railways. Mr. Whinery and Mr. Hansel are well-known engineers and Mr. Stevens is said to be an expert in real estate values.

Boston's Attitude Toward Mr. Billard.

The merger situation in the Massachusetts legislature has reached this status since Governor Draper sent in his message recommending that a special corporation be chartered to hold the stock of the Boston & Maine held by John L. Billard (though that stock was not mentioned by name) and so protect Massachusetts from danger of the Billard stock passing into hostile hands: For some time the railway committee and the Governor were at loggerheads and no progress was made toward the drafting of a bill. The Governor has insisted that the committee come to his position and report a bill to do what he wanted done. But the committee has been equally insistent that the Governor should give them all the facts in the case which were at his command in order that they might act intelligently. So the matter stood till the executive modified his position and now the Attorney-General is preparing a bill which shall embody the Góvernor's views and so give the railway committee the information desired. Both the merger and the anti-merger men have said that the Governor was on their side as proved by his message. Neither side has yet shown any willingness to retreat. At the hearing by the railway committee on the message the anti-merger men, including leading Boston merchants, were as emphatic as ever against allowing the New Haven and the Boston & Maine roads to come under one management.

Telephone Despatching on Illinois Central.

The Illinois Central is installing telephones for train despatching on the four districts between Chicago and Cairo and East St. Louis. This installation will be completed within the next two weeks, after which the company will put in service as fast as possible telephone circuits on its Tennessee division, between Paducah, Ky., and Memphis, Tenn.; on its Mississippi division, between Memphis, Tenn., and Canton, Miss., and between Water Valley, Miss., and Grenada; and on its Louisville division, between Louisville, Ky., and Paducah. The wires and instruments are already up on the districts on the Tennessee, Mississippi and Louisville divisions, so that all that remains to be done before adopting telephone despatching there is to instruct the men.

This despatching scheme does not contemplate any reduction in the forces or wages of telegraph operators employed, but it is likely that the installation of the train despatching circuits will be followed by the installation of télephone message circuits for moderate distances.

Progress of the Denver, Northwestern & Pacific.

A letter from D. H. Moffat, President of the Denver, Northwestern & Pacific, to the bankers who have recently bought notes of the Colorado-Utah Construction Co. describes the notes and the property and progress of the Denver, Northwestern & Pacific as follows:

"Confirming the sale to you of $4,000,000 of two-year 6 per cent. collateral trust coupon notes of the Colorado-Utah Construction Co., would say that these notes will be dated May 1, 1909, and secured by deposit with the trustee of $8,000,000 par value of first mortgage 4 per cent. bonds of the Denver, Northwestern & Pacific. The notes will bear the personal endorsement of D. H. Moffat.

"The Denver, Northwestern & Pacific has now been completed between Denver and Steamboat Springs, a distance of 210 miles. The total amount of first mortgage bonds issued against this 210 miles is $10,900,000, being the maximum amount which, under the terms of the mortgage, can be issued against this mileage. The actual cash invested in the construction and equipment of the present line is approximately $12,800,000. The first mortgage bonds, therefore, represent some $2,000,000 less than actual cash cost. The railway company had no indebtedness except the $10,900,000 of bonds above referred to.

"The Colorado-Utah Construction Co. has a cash paid-in capital of $2,000,000. This construction company was organized to build and equip the Denver, Northwestern & Pacific, receiving in payment $40,000 bonds and $40,000 of capital stock for each mile built, equipped and put in operation, with an additional issue of $2,500,000 of first mortgage bonds and $2,500,000 of capital stock to cover the extraordinary expense of constructing the railway across the continental divide, which difficult undertaking has now been accomplished. The $4,000,000 of notes sold you covers the entire indebtedness of the Colorado-Utah Construction Co. aside from what it owes to D. H. Moffat individually, approximately $5,000,000.

"Through the ownership of all the capital stock of the Northwestern Terminal Railway Co., the Denver, Northwestern & Pacific has valuable terminals in the business portion of Denver, near the Union depot.

"The road is laid with 80-lb. rails, and is thoroughly rock-ballasted; equipment, paid for in cash, engines of highest type, built by the American Locomotive Works; freight and passenger cars constructed by the Pullman Company. With the completion of the road to Steamboat Springs practically

all the difficult features of the entire enterprise have been overcome, and earning power of greatly in excess of fixed charges can be demonstrated, even if no extension whatever should be undertaken.

"At Steamboat Springs the road will control important and increasing shipments of cattle, lumber, agricultural products, minerals, coal and other traffic from a very extensive and resourceful territory now without any other line of road built or projected. The Oak Hills Coal Mines, from which the road is now getting engine fuel, are reached some 18 miles east of Steamboat Springs; at these mines three entries have already been made, each more than 600 ft., upon a vein 9 ft. thick of high-grade bituminous coal, and the erection of hoisting and coal-mining machinery preparatory shipments of from 1,000 to 2,000 tons of coal per day to the Denver market is practically completed. In these mines and equipment Denver capitalists have already invested over $400,000. According to the United States geological reports those coal fields contain 1,200 square miles of high-grade bituminous and anthracite coal.

Estimate of Earnings from Present 210 Miles of Road for 12 Months Ending May 1, 1910

Gross earnings	$2,100,000	Int on $10,900,000 1st 4s	$436,000
Net earnings (40%) ...	840,000	Balance, surplus	404,000

"The actual cash earnings of the uncompleted road for the first five months and one week of the current fiscal year, beginning July 1, 1908, were $385,960. The road did not reach the coal fields or Steamboat Springs until January, 1909. These earnings were, therefore, derived chiefly from passenger, lumber and cattle traffic, without any business from the coal mines, Steamboat Springs or territory tributary thereto, which from now on it will have."

Railway Supply Men Oppose Railway Legislation in Illinois.

A delegation of about 100 of the higher officers of railway supply manufacturing concerns having plants in Illinois visited the state capital, Springfield, on April 29, to oppose the passage of any laws affecting railways at the present session of the legislature. The demonstration was under the auspices of the Railway Business Association and the plans were made chiefly by A. H. Mulliken, of Pettibone, Mulliken & Co., Chicago, a Vice-President of the Railway Business Association. The delegation was composed almost entirely of the presidents or vice-presidents of the supply manufacturing concerns represented. A special train of 11 compartment cars took about 75 members of the delegation from Chicago to Springfield on Wednesday night. It probably was the only train of equal length composed entirely of compartment cars that ever was run out of Chicago. The party from Chicago was joined in Springfield by about 25 officers of supply manufacturing concerns in other parts of the state, principally in East St. Louis.

At 9 o'clock a.m. on Thursday the entire party set out in a body from the St. Nicholas Hotel and marched to the state house. It was the original plan that the supply men should be given a hearing only by the committees of the legislature to which railway bills had been referred, but Speaker Shurtleff, of the House of Representatives, was so favorably impressed both with the delegation and its purpose that he accepted a suggestion that the two houses of the legislature be convened in joint session to hear what the spokesmen had to say. The members of the Senate were therefore invited and came over in a body to the House of Representatives chamber, where they were addressed by Mr. Mulliken and George A. Post, of the Standard Coupler Co., New York, President of the Association. Mr. Mulliken spoke very briefly, and closed by introducing Mr. Post. Mr. Mulliken said in part:

"Within the past year, in a most striking manner, we have had our attention called to the waste and neglect of our natural resources, the wanton destruction of our forests, the wasteful methods of production in our mines and the neglect of the natural sources of water power. There is, however, a waste and a destruction going on that causes greater loss to every individual and to the country than all other wastes combined. It is the waste and loss caused by class prejudice in business and antagonism between business interests, and the disposition of the government to harass industries instead of fostering them. This spirit of prejudice has caused and is causing the greatest possible financial loss to our people.

"It is time to make a change, a change in our ideas, a change in our common policy, a movement toward co-operation and conciliation between all the large business interests by which we work together for the good of all and by so doing we benefit all.

"It is this idea that has brought together a number of men in the railway supply business, who have organized the Railway Business Association to conserve their interests and those of their workmen. They recognize the truth of the statement that self-interest is the strongest interest. But they wish to educate that interest, so that it will be intelligent and enlightened, and so that it may bring about not only the greatest immediate results but continued prosperity. They believe that the spirit of conciliation and co-operation should be a national policy, that upon that platform all should unite, and all can stand, and it is with that idea that we are here to urge upon you a fair consideration of the business interests of the state and of the railway supply interest in particular, its employers and employees.

"We are not here to represent the railways, but when the railways are prevented from buying from us by agitation and unwise laws, we are compelled to shut down our works and discharge our men."

The following are extracts from the speech of Mr. Post:

"As business men and large employers of labor we are suitors for your attention at this moment. We have come to you to appeal for your consideration of our necessities. We have suffered tremendously during the past 18 months because of the inability of railways to buy the commodities that we are organized and equipped to produce. Our industries are but slowly recovering from prostration, and they stand in need of most careful nursing to restore their normal health. Those who are engaged in manufacturing material and equipment for railways have not enjoyed the re-employment which has come to some other lines of business.

"Those to whom railways must look for funds wherewith to carry on plans for construction, for the purchase of rolling stock and other betterments, are slow to open their purses for railway investment. After such a deluge of legislative enactments as have, in the recent past, flooded the statute books of many states, they view with apprehension the torrent of bills in the legislatures, and while they wait for the flood to subside our industries languish and our men are without work.

"The industrial and commercial interest in behalf of which we speak is the largest in the country. The industries, from raw material to finished product, having railways for their sole or large customers, employed before the depression 1,500,000 men. In addition to the 1,500,000 men employed in these industries, there were in 1907 another 1,500,000 employed by railways themselves. This comes to about 3,000,000 men, a large percentage of whom have lost the whole or a part of their wages during the period of dreadful disaster that has so long affected railways and their allied interests.

"Of this great army no other state has so many as Illinois. The reason is of course that the position of the state as a center and grand junction of the principal trunk lines, east, south and west, has concentrated the cognate activities here.

"It would be impossible to enumerate the kinds of goods made in Illinois which are consumed in great quantities by railways. In Chicago alone there are some 50 or 60 great factories; in Illinois, outside of Chicago, about 70 or 80 more. In downtown offices in Chicago may be found many thousand clerks, accountants, salesmen, administrative officers, draftsmen, engineers.

"Of the men in these industries, probably numbering upward of 200,000, we assume from our own information and from recent figures published by President Gompers, of the American Federation of Labor, that fully half are out of work altogether at the present time, while thousands more are on part time and declare they cannot live on present earnings.

"The Railway Business Association has no connection with railways, other than as purveyors of wares essential to their operation. We are business men, formed into an association, not to do the bidding of railways, but because we have found that our business has been paralyzed by conditions having their base largely in public hostility to them. We seek by

every honorable means within our power to bring about a better understanding between the public and the railways. We want to aid in establishing a profitable and permanent peace, and to put an end to contentions whose fierce fires cause widespread devastation and array brother against brother in strident strife.

"Because we want railways to prosper, and frankly say so, our utterances should not be attainted.

"The very great interest engaged in supplying the railways, perhaps because it did not appreciate its own strength and perhaps, also, because it feared to be criticised or misunderstood if it spoke on behalf of its customer, the railway, has not, until recently, sought to make contributions to the public discussions of those questions. That attitude has now been abandoned. Assured of their strength, convinced that no other motive can reasonably be imputed in face of the palpable one of desiring to put idle men back to work, the railway supply manufacturers and dealers have determined to us what influence they possess to substitute calm deliberation for angry invective, conference for agitation, to the end that public action may be inspired by a desire to foster railways, not to injure them.

"It is our hope, and has been part of our plan of work, to bring home to every employee in all our establishments the fact that to attack the railway is to attack him. The relation between the apprehensive investor and the unemployed workingman has not been sufficiently clear to the workingman. We have, however, abundant and convincing evidence that he is coming to understand the necessity to him of railway prosperity and to desire that whoever represents him as a legislator, while properly pledged to favor the regulation of the public service corporations in the public interest, should give careful consideration and investigation to proposed restrictions.

"It is not the purpose of the Railway Business Association to cry aloud that railways should be let alone by the federal and state authorities. They must be regulated. The interests of the public inexorably demand it, and, indeed, the very well-being of the railways themselves requires it.

"Story, the great jurist, uttered a profound truth when he said: 'That which the law *protects*, it has the right to regulate.' The public has asserted its right to regulate railways, and there will be no backward step. The only question that is debatable now, or ever will be in the future upon that score, will be what attempts at regulation are unwise and what are wise. Upon such questions there will naturally be differences of opinion. Sometimes so-called regulation will be simply an attempt at retaliation by angered persons or interests; sometimes it will represent purely theoretical ideas, sought to be enacted into law, at the instance of those who dream dreams, but who know naught of railway problems; sometimes personal political ambition will animate candidates to pledge themselves to enforce expenditures by railways, on the theory that giving away what isn't theirs looks generous and doesn't cost them anything; sometimes, yes, many times, for the correction of faults, for the better protection of the public, or for their convenience, the stern mandate of the law will, of necessity and of right, be resorted to.

"The mission that brings this delegation of manufacturers to wait upon you to-day is not one of cajolery or bullying. Rather would we help you by a calm resumé of a situation that finds us in distress. We do not say or believe that our lack of business, or the suffering of our men through lack of employment is chargeable to you for sins of omission or commission. But we do believe that the slow pace at which our business is returning to normal is due in large part to the fact that those charged with financing and carrying out projects for the construction and improvement of railways, fear that future enactments will be drastic and hesitate to embark upon enterprises until they can know what conditions of operation they must face.

"There are pending before this body a large number of bills affecting the operations of the railways within the state of Illinois. I shall not enumerate them, nor shall I discuss or analyze their provisions. We do not care to enter into detailed objections to particular measures now before you. We do not assert with regard to any of them that it is essentially bad and ought never to be enacted; but, whatever these bills are, you will do more for the improvement of transportation facilities, more for the shippers of Illinois, more for the thousands of idle men now walking the streets, if you shall subject each one of them to this crucial test:

"Is it certain, beyond a reasonable doubt, that the enactment of this bill, at this time, will not tend to delay still further the re-employment of men now idle?

"Subjected to this test, I believe your only possible deduction will be that every one of them can wait without harm to the people. In the existing situation the one safe rule to adopt regarding legislation is: When in doubt, do nothing.

"This is no time for experiments. An army of workmen want work. If by any possibility the passage of a batch of bills for this, that or another purpose, may cause the man with money to refuse to make investment, because he thinks it of doubtful safety, then, in Heaven's name, let us halt. What is of any importance just now comparable with the restoration of confidence in the minds of men who can give men jobs? Imbue them with confidence and furnace fires will be lighted, whistles will blow calling workmen from idleness to remunerative labor, tradesmen will have customers and the industrial world will be aglow with joy.

"Workingmen made merry by the clinking of coin in their jeans will not miss a few bills from the legislative record. They would rather have food than statutes. A stuffed law file has no such charm for them as a full dinner pail.

"In closing, I should like to impress upon your minds indelibly that the Railway Business Association is just as eager for fair play *by* the railways as *to* them. We cannot hope for jug-handled moderation or conciliation. We do not ask it: we do not want it.

"Within the breast of every manufacturer who is here present there are embedded twin hopes as to the results that shall come from the efforts of the Railway Business Association. They are: One, that every man who holds in his hands the sceptre of law-making, law-construing or law-enforcing power over our railways, may in his every act be attuned to moderation and guided by a serene desire to show wisdom in the exercise of power. The other, that every railway officer shall have as his paramount desire and untiring purpose to conduct our railways so wisely, fairly and courteously that the ardor of legislators shall hereafter find its greatest delight in enactments for their encouragement and expansion."

After Mr. Post concluded his speech, which was received apparently with great favor by the legislators, Senator Gardner, of La Salle county, arose and asked him what legislation had been passed in Illinois that had hurt the railways or supply men, or what measures were pending whose passage would hurt them. Mr. Post replied that, as a citizen of New York, it would be unbecoming in him to criticize any act either that the legislature of Illinois had passed or that it contemplated passing. Mr. Gardner then asked Mr. Post what would be the effect on the supply manufacturers of legislation to compel the railways to electrify their terminals in Chicago. Mr. Post replied that the supply men made a great many different articles and that therefore their interests were very diverse. Such legislation as Senator Gardner referred to might be beneficial to some supply interests, but, by compelling the expenditure of a large sum of money for a certain class of supplies, it might be injurious to other supply manufacturers, the demand for whose goods would be actually reduced by this enforced application of a large sum of money to a specific purpose. He said that before the legislature required the roads to spend a large sum for any specific purpose they should be sure what the condition of the railways' treasuries was.

After the hearing before the legislature the supply men's delegation went to the executive office and called on Governor Deneen. Mr. Post made a short talk, telling the Governor of the purpose of the visit to Springfield, and the Governor replied, stating both his attitude and what he understood to be the attitude of the lawmakers toward railway regulation. He cited a number of instances where one interest in the state had sought legislation that might be injurious to some other interest, and where, through the efforts of the state administration, the two antagonistic interests had been induced to confer and agree upon measures that would be beneficial to both and as little injurious as possible to either.

He said that he thought a similar course should be taken in the handling of legislation affecting railways. Representatives of employees, of shippers, of the supply men and of the railways, should get together and try to agree among themselves as to what regulatory legislation should be passed, and he was sure that if they did so the legislature would act upon their suggestion. He said it was perfectly right for the railways to have lobbyists at Springfield to keep their officers informed about pending legislation, but he criticised the officers of the roads for not coming themselves to Springfield and aiding, by the presentation of facts and by offering sound suggestions, in the work of framing fair and proper legislation. He thought that if railway managers had adopted this policy instead of following that of sending legislative agents who could do nothing but oppose all proposed legislation, there would be much less ground for just complaint about the kind of legislation passed.

The supply men were very well satisfied with the results of their demonstration. It is believed that this is the first occasion on which a joint session of a state legislature was ever convened to hear the views of a similar body of men. On the return trip to Chicago William E. Clow made a brief address thanking Mr. Mulliken and Mr. Post on behalf of the supply men for what they had done in planning the demonstration and making it a success.

Carnegie Medals for Heroism.

In a list of awards announced May 3 by the Carnegie Hero Fund Commission the names of two Baltimore & Ohio enginemen appear. Pierce D. Marsh, of Weston, W. Va., gets a silver medal and $1,000 to pay a mortgage, for preventing a possible wreck. He backed a passenger train, of which he was engineman, away from a freight train which had broken loose at the top of a grade. John Carruthers, of West Newton, Pa., gets a bronze medal and $1,000 to be applied to the purchase of a home. Carruthers saw a boy of two years crawling across the track in front of his train. Leaving the engine in charge of his fireman, he went through his cab window and to the pilot, where he seized the boy.

Hine Operating Department Organization.

Major Hine's scheme of railway organization, heretofore referred to in these columns, has been adopted on the Southern Pacific Lines in Mexico, including the Cananea, Yaqui River & Pacific and the Sonora Railway. On the Sonora division, which consists of all operated lines north of Empalme, the officers affected are N. E. Bailey, heretofore trainmaster; G. W. Megrew, heretofore resident engineer; J. E. McLean, heretofore master mechanic; G. A. Stoddard, heretofore traveling engineer. Each will now be assistant superintendent. The superintendent is H. J. Temple, office at Nogales, Sonora. Each continues charged with the responsibilities heretofore devolving upon him, and in addition assumes such other duties as may from time to time be assigned. Those who are located in the same building have one consolidated office file in common with the superintendent. The superintendent's order says: "All communications on the company's business, originating on this division, intended for the superintendent, or for any assistant superintendent, should be addressed simply, 'Assistant Superintendent' (telegrams 'A. S.'), no name being used unless the communication is intended to be personal rather than official, in which case it will be held unopened for the person addressed. An assistant superintendent will always be on duty in charge of the division headquarters offices during office hours. Each officer transacts business in his own name. Cars are to be handled by the chief despatcher. Train orders are given over the initials of the train despatcher on duty."

The superintendent of the Sinaloa division is F. W. Salter, with office at Guaymas, Sonora. On that division the assistant superintendents are: E. N. Brown, heretofore trainmaster; Thos. Hind, heretofore resident engineer; J. Q. Kiler, heretofore master mechanic; Z. S. Milledge, heretofore trainmaster; Jas. Valentine, heretofore traveling engineer. The regulations are the same as on the Sonora division.

The system has also been adopted on the Texas & New Orleans and to the Galveston division of the Galveston, Harrisburg & San Antonio. Assistant Superintendents with their former titles, are: F. B. Irvine, Assistant Superintendent; C. A. Thanheiser, Resident Engineer; W. S. Cox, Master Mechanic; H. J. Micksch, Trainmaster; F. Wessell, Traveling Engineer.

Proposed British Railway Union Abandoned.

The promoters of the bill for a working union of three important English railways, the Great Northern, the Great Central and the Great Eastern, under one management, have decided not to proceed further with the measure. This decision is no surprise in view of opinions previously expressed on behalf of individual members of the proposed partnership. The promoters had satisfied the Board of Trade by substantial concessions, but this was not sufficient for the numerous anti-railway irreconcilables in the present House of Commons, who persuaded the House to allow the second reading only on condition that the committee which was to investigate the bill should be enlarged to 15 members (instead of the usual five) and that every interest which imagined it had a grievance should have a separate hearing. The wording of the instruction would also have enabled the committee to conduct a sort of roving inquiry into the general principles of railway amalgamation; all, of course, at the expense of the promoters. In addition to these clamorous interests, the promoters would also have had to face the determined opposition of the Midland, the North Eastern and other railways whose position might have been affected by the bill. By withdrawing the bill before it reached the committee stage the promoters have undoubtedly saved themselves a long and expensive inquiry. Even if the bill had passed it would probably have been so overweighted with "protective" clauses as to make it not worth having. Without it the three companies will be able to make further arrangements among themselves for more efficient and economical working on much the same lines as the London & North Western and Midland Railways have already adopted. Indeed, something of the kind has already been effected without the help of Parliament.

Brown's Discipline on the Burlington.

Daniel Willard, Second Vice-President of the Chicago Burlington & Quincy, has issued an order that, beginning May 1, the practice of suspending from the service employees in the train and engine department because of infraction of the rules, or for other causes, shall be discontinued. Mr. Willard outlines, as follows, the practice to be pursued in future in administrating discipline on this road:

"A complete and accurate service history of all employees affected by this order will be kept in the office of each division superintendent, and also in the office of the superintendent of the employment department.

"No entry will be made a part of the record of any man until the case has been fully investigated, and the employee affected will, if desired, be given personal hearing in that connection. Whenever a record entry is made, the man affected will be given in writing an exact copy of such entry.

"Any employee found guilty of disloyalty to the company, of insubordination, or drunkenness, will be dismissed from the service, and will not be re-employed. An employee whose service record clearly indicates that he is not a safe or fit man to retain in the service will be dismissed.

"Promotion will in the future, as in the past, depend upon the service record of the man involved, and upon his fitness for increased responsibilities. When these are equal as between two men, the one older in the service will be given preference.

"An employee, upon his request in writing, will at any time be given a copy of his service record.

"Officers directly in charge of men affected by this order are especially requested to report for entry all commendable actions on the part of such employees, as well as those actions which may justify criticism or reprimand.

"The purpose of this order is to assure constant and permanent employment to those employees whose service records indicate their fitness for the positions held, or for increased responsibilities."

British Railway Accidents in 1908.

The railways of Great Britain have again gone through a whole year without having to report the death of a single passenger in a train accident. The total casualties as reported in the Board of Trade tables for 1908 are, as shown in the table below, 1,043 killed and 7,984 injured. It should be noted that this does not include accidents in which the movement of railway vehicles was not concerned. Adding to the table the accidents in this class, the totals would be as follows: Passengers killed 107, injured 3,388; employees killed 432, injured 24,181; other persons killed 589, injured 916; total passengers, employees and others killed from all causes 1,128 and injured 28,485. The other year in which no passenger was killed in a train accident was 1901. In 1905 the number was 39; in 1906 it was 58; excluding these two years, the average number of passengers killed in train accidents yearly during the last 19 years (1890-1908 inclusive) was 12.65. And the average was low for many years previous to that if we except the Tay bridge disaster in 1879 and the Armagh disaster in 1889.

	1908		1907	
	Killed.	Injured.	Killed.	Injured.
Passengers, in train accidents........	.....	283	18	534
Passengers, other causes	102	2,242	102	2,132
Employees, in train accidents........	6	164	13	236
Employees, other causes	376	4,976	441	5,577
Other persons, in train accidents.....	...	7	5	11
Do., at highway crossings..........	51	44	50	30
Do., trespassing	479	118	447	133
Do., at stations, etc.	29	150	41	158
Total	1,043	7,984	1,117	8,811

Pennsylvania Electric Locomotives.

The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has received orders for 24 electric locomotives for service in the New York terminal of the Pennsylvania Railroad. The construction of two of these locomotives will be pushed ahead at once in order to have them available as soon as possible. Each locomotive is a double unit, being articulated and consisting of two engines permanently coupled together. The wheel arrangement of the complete machine is 4-4-4-4, there being leading and trailing bogie trucks. The engines will be larger and more powerful than any electric locomotives heretofore built, each having a capacity of something like 4,000 h.p. The design is the result of long study by a committee of Pennsylvania officers consisting of George Gibbs, chairman; A. W. Gibbs, A. S. Vogt and D. F. Crawford.

Medal for James Gayley.

James Gayley, until recently first vice-president of the United States Steel Corporation, has received the Elliott Cresson medal of the Franklin Institute, Philadelphia, in recognition of his invention of the dry air blast process, which has simplified and improved the manufacture of steel and iron.

American Society of Civil Engineers

At the meeting held on May 5 two papers were presented for discussion, as follows: A System of Cost Keeping, by Myron S. Falk, Assoc. M. Am. Soc. C. E., and The Design of Elevated Tanks and Stand-Pipes, by C. W. Birch-Nord, Assoc. M. Am. Soc. C. E. These papers were printed in the March number of Proceedings.

Railway Telegraph Superintendents.

The annual convention of this association will be held at the Hotel Pontchartrain, Detroit, Mich., June 23, 24 and 25. The following papers are expected: J. G. Jennings (C., R. I. & P.), "The Necessity of Censoring Railroad Telegrams"; H. D. Teed (St. L. & S. F.), "The Difference Between the Trouble Shooter and a Division Lineman"; S. L. Van Akin (N. Y. C. & H. R.), "The Advantages and Disadvantages of Using Cable in Bringing Telephone and Telegraph Wires into Local Offices"; E. H. Millington (M. C.), "Efficient Office Organization"; J. C. Kelsey, "Telephone Construction"; E. J. Little (G. N.), "Benefits of Standards in Telegraph and Telephone Construction"; F. H. Loveridge, "Dry Batteries"; William Maver, Jr., "Wireless Telegraphy"; V. T. Kissinger (C., B. & Q.), "Wire Testing." The Secretary of the association is P. W. Drew, of the Chicago division of the Minneapolis, St. Paul & Sault Ste. Marie.

Association of Railway Claim Agents.

The next meeting will be held at the Hotel Cadillac, Detroit, Mich., on May 26, 27 and 28.

Society of Railway Financial Officers.

The annual meeting will be held at Ft. William Henry, Lake George, N. Y., September 7 and 8, 1909. C. Norquist, Chicago, is Secretary.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION. F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; May 11; St Louis, Mo

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York, May 19, 1909; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC. -E. H. Fritch, Monadnock Bldg., Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago; May 11; Cincinnati, Ohio.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS. -C. G. Phillips, 143 Dearborn St., Chicago.

ASSOCIATION OF RAILWAY CLAIM AGENTS. E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 26-28, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. -P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB. H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg, Chicago; June 1-5; Chicago.

IOWA RAILWAY CLUB. W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB. G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug., and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 17-19; Chicago.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov; Atlanta.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R. East Buffalo, N. Y.; September, 1909; Denver.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

The Omaha Commercial Club now has a traffic bureau. E. J. McVann, for many years secretary of the Omaha Grain Exchange, is manager.

James D. Walthall, Assistant Attorney General of Texas, has prepared an opinion for the State Railroad Commission, holding that railways are not permitted, under the Texas anti-pass law, to issue free transportation to the employees of contractors who make uniforms for railway employees.

It is announced that the Rock Island-Frisco lines have entered into an arrangement for making through freight rates and routes in conjunction with the Illinois Traction System, an electric railway that is now operating almost 500 miles of line, most of which is in Illinois. The tariffs cover all articles in the Illinois Classification of freight, and each of the lines that are parties to the arrangement will deliver to and receive from the others any freight destined to and from all its stations.

Testifying before F. M. Dickson, Master in Chancery at Minneapolis, Minn., on April 28, in the Northwestern Lumber Rate case, Howard Elliott, President of the Northern Pacific, said that, based on the actual value of the road, the Northern Pacific is undercapitalized. W. L. Darling, Chief Engineer, had prepared a statement showing that the road had a gross value of $672,000,000. Mr. Elliott concurred in this estimate. W. G. Johnson, Assistant Comptroller, testified that the capitalization as of March 31, 1909, was $439,219,210.

The commercial interests of St. Joseph and Kansas City have presented formal protests to the Missouri Railroad Commission against its proposed schedule of commodity rates. As already stated by the *Railroad Age Gazette*, this schedule was to take the place of the commodity rates fixed by the state commodity rate law, which the federal court recently held unconstitutional. The Kansas City and St. Joseph commercial interests claimed that the proposed rates would be discriminatory against them, as in favor of shippers at St. Louis.

The movement of passenger traffic to the Pacific coast on the low rate colonists' tickets which have been on sale for 60 days has been very large. The Chicago & North Western has had to add a large number of Pullman tourist sleeping cars to its regular equipment for the accommodation of this business, and about 100 Pullman standard and tourist sleeping cars will be in service on this line alone between Chicago and the coast for some time to come to carry transcontinental passengers. Other roads are also enjoying a large increase in this class of business.

The Erie & Western Transportation Company, controlled by the Pennsylvania Railroad and operating the Anchor Line on the Great Lakes, has ordered a 5,000-ton steel package freight steamer, to be called the "Conemaugh." She will be a sister ship of the "Wissahickon," which was put in service in August, 1907. The "Conemaugh" will be 372 ft. long, with a hold 30 ft. deep. She will be equipped with engines that will give her a speed of 13 miles an hour when loaded. She will be ready for service in August of this year, at which time the Anchor Line will have a fleet of 14 steel and iron vessels, with an aggregate capacity of 46,750 tons.

The lines belonging to the Central Passenger Association have decided to make special round trip rates to the eastern summer resorts, such as Atlantic City, Bar Harbor, etc., which will be on a basis of about $25 for the round trip from Chicago. An effort was made to prevent the low rate from being applied to New York, but the differential roads have announced a rate of $25.50 for the round trip from Chicago to New York during June, and the Michigan Central a rate of $26.85. The rate by the "standard" lines will be $28.20. The rates to the Atlantic coast summer resorts will be effective from June 1 to September 30. These rates are made mainly to meet the competition of the summer resorts west of Chicago. The western lines have been making low rates each summer to the resorts in Colorado and other parts of the West.

Counsel for the railways and counsel for the state in the litigation involving the validity of the freight and passenger rates fixed in Arkansas by the State Commission and the Legislature, have agreed upon a tentative plan for terminating this litigation. The plan has been submitted to the Governor and by him to the state legislature. Its main features are: (1) Freight rates fixed by the federal court, which are adapted to yield about 33⅓ per cent. more revenue than the rates fixed by the State Commission, to be given a trial for a year; (2) the railways to move for a dissolution of the injunction issued by the federal court restraining the state from enforcing the rates fixed by public authority the roads to be without liability on their bonds unless the suits are subsequently reinstated; (3) the roads to keep and furnish to the Commission separate accounts and detailed reports of their intrastate traffic, and open their books to inspection by the Commission and its representatives; (4) the Commission to be at liberty to correct any inequalities in rates and make changes to meet changes in conditions, but not so as to reduce materially the road's revenues; (5) the railways to reduce their passenger rates to 2½ cents a mile on roads over 85 miles long; (6) at the end of a year either party to be at liberty to reinstate the suits and proceed with the litigation.

Acting on the suggestion made by the Interstate Commerce Commission, in its decision in the Spokane rate case, the traffic officers of the Harriman and Hill roads are trying to work out a comprehensive revision of the freight rates which they apply to points intermediate between St. Paul and the Missouri river and the Pacific coast. After these roads have worked out a plan it will have to be submitted to all other interested and affected roads for approval. Should it meet with their approval it will have finally to be submitted to the Interstate Commerce Commission for its approbation. J. C. Stubbs, Traffic Director of the Harriman Lines, says that this is the most difficult task that these roads have ever undertaken. It is hoped to work out a scheme of rates not only to Spokane, but to points throughout the West, that will prove acceptable to the Commission. This will necessitate many material reductions, but the railway officers are making an honest effort to comply with what seems to be public desire and the wish of the Commission. They are willing to make some sacrifices to accomplish this end, but whether they will be able to do so satisfactorily remains to be seen. Each intermediate point, such as Spokane, Seattle, Reno, Denver, etc., wants the railways or the Commission to build a fence around a large area and dedicate it exclusively to the jobbing interests of that city. Be the rate problem worked out never so fairly, say the railway officers, it will be impossible probably to please all of the contending commercial centers. For this reason it may eventually be necessary for the strong hand of the Commission to declare that certain rates are just and reasonable per se, and must, therefore, be accepted by both the railways and the shipping communities of the West.

INTERSTATE COMMERCE COMMISSION.

Speculative Damages.

Allender et al. v. Chicago, Burlington & Quincy et al.—Opinion by Commissioner Harlan.

Through error of a railway agent complainants were unable to use the return coupons of their round-trip special excursion tickets with stop-over privilege, but without additional cost were supplied by the carrier with regular limited tickets. Upon complaint filed setting up claim for damages for loss of employment as fruit pickers which complainants hoped to secure at a point where their original tickets permitted stop-over; but such damages are altogether too speculative to be accepted either as the basis for an order by the commission or for a judgment in a court of law.

Fruit Rates from Arkansas.

Ozark Fruit Growers Association v. St. Louis & San Francisco et al. Opinion by Commissioner Lane.

Rates for the transportation of apples via defendants' lines from the Ozark fruit region in Arkansas and Missouri to St. Louis, Mo., and Kansas City, and to points in Tennessee, South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana

found not unreasonable. Minimum weight applicable on carload shipments of apples via defendants' lines found not unreasonable.

Rates for the transportation of apples via defendants' lines from the Ozark fruit region to points in Oklahoma and Texas found unreasonable. Reasonable rates prescribed for the future.

Rates on Fertilizer.

Virginia-Carolina Chemical Co. v. St. Louis Southwestern. Opinion by Commissioner Clements.

Defendant's rates on fertilizer from Shreveport, La., to certain Arkansas destinations named in the report found unreasonable, and reasonable maximum rates prescribed for the future. Reparation awarded. Fertilizer is a low-grade traffic, subject to no great risk in transit, and requiring no special service for its transportation in the sense that "special service" is generally understood. Its free movement and use is an auxiliary tending to produce and furnish a larger volume of traffic, and thus promote the prosperity of carriers and their patrons; so that, considering both commercial and transportation conditions, it is entitled to comparatively low rates.

STATE COMMISSIONS.

The Railroad Commission of Louisiana has modified its order regarding the reweighing of cars loaded with lumber when weights are disputed. The order as modified provides that for the service of reweighing a car no charge shall be made by the carrier except when the weight claimed by the consignee is not verified within 1 per cent., in which case the carrier may charge $2.50 per car. Consignee, if an additional day is required by the delivering carrier to reweigh the car, shall be allowed one day's free time in addition to the free time allowed under the car service rules of the Commission. When the consignee so requests, the reweighing shall be in his presence or that of his authorized agent, provided no delay be occasioned by compliance with this request.

The Oregon Railroad Commission has demanded that the Oregon Short Line shall make reductions in wool rates from Huntington, Ontario, Vale and other points on its lines in Oregon, to Chicago, New York, Boston, Philadelphia and other points in the East. It has also notified the Northern Pacific, the Astoria & Columbia River, the Spokane, Portland & Seattle, the Oregon Short Line, the Oregon Railroad & Navigation Company and the Southern Pacific that it considers unreasonable and unjust the increases in eastbound transcontinental rates that were made on January 1, 1909, and asks that the rates in effect prior to that date be restored. The Commission is carrying out the state law, which requires it to give such notices before complaining against rates that it regards unjust to the Interstate Commerce Commission. If the reductions it asks are not made it will no doubt complain to the Interstate Commission.

The Wisconsin Railroad Commission has ordered the Chicago, Milwaukee & St. Paul, the Chicago & North Western, the Wisconsin Central, the Chicago, St. Paul, Minneapolis & Omaha and the Illinois Central, to reduce their rates on milk and cream from 5 to 20 per cent. It found after investigation that the rates on those commodities as a whole in the state were unreasonable and so adjusted as not to meet conditions. The following are the schedules prescribed by the Commission for distances of 5 to 100 miles: Five gallons of milk, distance of five miles, 7 cents; eight gallons of milk, distance of five miles, 9 cents; ten gallons milk, distance of five miles, 10 cents; five gallons of cream, five miles, 7 cents; eight gallons of cream, five miles, 10 cents; ten gallons of cream, five miles, 12 cents. Distance of twenty miles—Five gallons of milk, 8½ cents; eight gallons, 10½ cents; ten gallons, 13 cents; five gallons cream, 11 cents; eight gallons of cream, 15 cents; ten gallons cream, 18 cents. Distance of 100 miles—Five gallons of milk, 16 cents; eight gallons of milk, 21 cents; ten gallons of milk, 25 cents; five gallons of cream, 19 7-10 cents; eight gallons of cream, 27 cents; ten gallons of cream, 30 cents.

New York: Dissenting Opinion in Buffalo, Rochester & Eastern Case.

Commissioner T. M. Osborne, of the New York State Public Service Commission, Second district, who did not sign the report made by the Commission on the Buffalo, Rochester & Eastern matter (*Railroad Age Gazette*, March 26, page 607), has published his reasons for dissenting from the majority opinion, the principal one of which is that the Commission has no duty to prevent people from making bad investments.

He says: "To attempt that will open the door to all forms of extravagant paternalism. It is our business, as I take it, to prevent fraud and dishonesty, and to stop over-capitalization wherever possible in all future issues of public service corporation securities, as such over-capitalization also tends to result in fraud upon the public.

"This Commission has already pointed out more than once that when it authorizes the issue of new securities by existing public service corporations the purchasers of such securities must take the risk involved in the possibility of existing over-capitalization. It is primarily because this wise attitude seems to me to be altered in this present decision that I dissent.

"We are setting up our business judgments as against those who are most interested—because they are the ones who propose to put their money into the road. * * * If not today, then in some future day, a railway will certainly be built along this line. As our country doubles and trebles its present population some time in the future the state will be forced to allow this highway to be utilized. It seems to me to be a grave question whether experience has not shown that when a railway corporation attains a certain size it becomes as an organization unwieldy and unable to handle its own facilities to the best advantage. There is, to be sure, no logical reason why an organization of any kind should not retain its relative efficiency as it grows larger; nevertheless I am inclined to believe that there is a point beyond which any railway organization loses effective force from the mere excess of its own weight. The troubles of the New York Central in 1907 were due not alone to deficient equipment, but largely to deficient management."

In closing Mr. Osborne says:

"First—I think the majority have failed to give sufficient weight to the claims of the various communities through which the Buffalo, Rochester & Eastern proposes to pass.

"Second—Or to the serious situation involved in the relatively diminishing export trade of New York and Boston.

"Third—That if any project is a proper one in itself, honestly exploited and not contrary to public policy, this commission should not abandon its wise course of permitting investors to run their own risks, and should not undertake in a paternalistic spirit to pass final judgment upon the wisdom or unwisdom of it as a proposed investment.

"Fourth—And so far as the action of the commission perpetuates the monopoly of the New York Central over the great commercial highway of central New York, it is contrary to sound public policy."

COURT NEWS.

The Supreme Court of the United States in the case of the St. Paul, Minneapolis & Manitoba and the Great Northern railways versus the city of Minneapolis holds that a city can compel a railway company to bridge a street crossing when the street has been established subsequent to the laying of the tracks the same as though the street had been laid out first.

The Attorney-General, as *amicus curiae*, has filed a brief in the Connecticut Supreme Court in a case brought under the Employers' Liability law, which was passed by Congress in April, 1908. The plaintiff is E. C. Mondou, who was an employee of the New York, New Haven & Hartford. The government intervenes with a view to hastening the settlement of all questions relative to the constitutionality of the act.

The Indiana Supreme Court in the case of Howard v. the Indiana Union Traction Company has decided that it is the

duty of a motorman operating a heavy interurban car to have and keep perfect control of his car at street crossings; failing to do so he renders the company liable for damages to one attempting to cross the tracks in an automobile. The interurban car has not a superior right to the street and an automobilist is not legally bound to stop, look and listen before attempting to cross the tracks.

The railways of Alabama have asked the Supreme Court of the United States to review the decision of the Circuit Court of Appeals, which has just sustained the laws passed in Alabama in 1907, limiting passenger fares to 2 cents a mile and prescribing freight rates on a large number of commodities. It is asserted in the petition that the decision of the Court of Appeals in effect "precludes all the circuit courts in the fifth circuit from ever hereafter granting an interlocutory injunction against the enforcement of rates made by a state legislature."

The United States Circuit Court of Appeals at San Francisco handed down a decision on May 3 reversing the decision of the United States District Court which resulted in a fine of $330,000 being imposed on the Atchison, Topeka & Santa Fe for giving rebates to the Grand Canyon Lime & Cement Co. In the lower court the company was convicted on 66 counts and was fined $5,000 on each count. The Circuit Court of Appeals in passing on the case said "the Interstate Commerce act forbids wilful departure from the legal rate and the question of intent must be considered, and, this being so, it necessarily resulted that the district court erred in withdrawing from the jury evidence that more or less lime, which was the commodity on which rebates were paid, shook out of the car in transit. It will be recalled that in this case the shipper claimed that out of a total of 400 cars that he had shipped, 78, while loaded to a minimum of 40,000 lbs. at point of origin, showed a total shortage of over 100 tons in weight at destination. An arrangement was made between the shipper and the Chief Clerk in the freight department of the Santa Fe at Los Angeles that if the shipper would waive his claim for the loss of the lime, which apparently had shaken out of the car in transit, the road would make a corresponding deduction from his freight bills, which amounted to from 35 cents to $13 per car, or an aggregate of $400. Every count in the indictment on which the Santa Fe was convicted was based on a concession with respect to one of these 78 carloads of lime. A full statement of the railway's position in the matter was made by President E. P. Ripley, of the Santa Fe, in a letter to *The Railway Age*, which was published November 29, 1907, page 757. Mr. Ripley was subsequently denounced by President Roosevelt in a message to Congress for his criticisms of the decision of the district court, but the decision of the Circuit Court of Appeals apparently sustains Mr. Ripley's contention that the decision of the lower court was unsound.

The Texas Supreme Court holds that the switching of trains in a city does not constitute a nuisance. The case, decided April 28, was one brought by a hotel proprietor at El Paso against the Galveston, Harrisburg & San Antonio. The complainants asked for a perpetual injunction to restrain the road from using its tracks on main street for yard and station purposes, switching, making up trains, etc., alleging that the value of their hotel, which is but 120 ft. from the tracks, was depreciated. The trial court issued an injunction restraining the company from using the tracks in question except for the moving of its regular trains in entering and leaving the city. The Appellate Court sustained this decision. But the record showed that the railway had been authorized by a city ordinance to build the tracks, and that they were in use before the hotel was bought by the plaintiffs—in fact, had been in use for 21 years, and, therefore, the Supreme Court holds that the use of the tracks which are enjoined was lawful and indispensable to the operation of the railway; that it cannot be prevented without destroying the usefulness of this public utility. Continuing, the court says: A railway cannot be operated without locomotives, which, being moved by steam, must produce noises. If removed beyond the limits of a city, so as to place the yards out of contact with business houses and residences, their value to the public would be greatly impaired. Some one must suffer these inconveniences rather than that the public interest should suffer. If the defendant were compelled to remove to another part of the city, the same nuisance to other people would be caused by the same necessary operation of the machinery, and the citizens at that point could with greater propriety than plaintiffs (in this suit) seek another injunction. These conflicting interests call for a solution of the question by the application of the broad principles of right and justice, leaving the individual to his remedy by compensation and maintaining the public interests intact. This works hardships upon the individual, but they are incident to civilization with its physical developments, demanding more and more the means of rapid transportation of persons and property.

Missouri Passenger Rate Situation.

It was erroneously stated in this paper on April 23 that all the Missouri lines had decided to make passenger fares 2½ cents a mile. When that statement was made it was understood that an agreement had been reached, but this turns out to have been a mistake. The Burlington, the Rock Island, the Frisco and the Alton announced a 2½-cent fare, and put it in effect on May 1. A number of roads, including the Santa Fe, the Gould lines, and the Missouri, Kansas & Texas, favored a 3-cent fare, and believed that no change in the rate should be made until the litigation in the federal and state courts was ended. They contended that the effect of Judge McPherson's decision in the federal court was to authorize a return to the old rate of 3 cents. The result of this difference of opinion was that beginning with May 1 part of the roads, as already stated, adopted a 2½-cent rate, while the others kept the 3-cent rate in force.

On April 28 Judge McPherson rendered at Kansas City a supplementary opinion in the rate cases, in which he refused to change his original ruling that the costs of the suit must be divided between the railways and the state equally. Referring to the contention of counsel for the railways that the court erred in saying in the original decision that a 2½-cent rate would be fair on the stronger lines and a 3-cent rate on the weaker lines, Judge McPherson said, that of course this statement was *obiter dictum*, as a court cannot fix rates; but because it was a dictum was no reason for not saying it. He added that he could fairly have said that the St. Louis & Hannibal and the Kansas City, Clinton & Springfield should have 4 cents or more per passenger per mile. Continuing Judge McPherson said:

"Passengers, like consumers, have rights. One of these rights is to have fares fixed reasonably low. But the term reasonable is a comparative one. It must be in proportion to what it is worth, and the better the service, the more it is worth. And the public is entitled to demand efficient service, provided always such is paid for.

"Whether the trains are expensive or inexpensive, daylight or night trains, through or local trains, main line or branch trains, roads through the hills, of Central Missouri or the Ozarks or over the prairies, and whether the trains carry few or many passengers, are matters largely passed over as if of no importance. To me they seem of great importance. Evidences of kindly feeling for their fellowmen need not be wholly displayed toward the man who pays $6 per year for passenger fares. A kindlier disposition would suggest an equitable division of sympathy toward the railway employees. Thousands of them have already been 'let out' because of decreased earnings."

The Gould Lines and other roads secured an order from the Missouri supreme court on May 1, prohibiting Judge Williams, of the state circuit court at St. Louis, from proceeding with the cases to enjoin the railways from restoring the 3-cent fare, which were brought by the circuit attorney at St. Louis. The writ of the supreme court was made returnable on May 15.

At Jefferson City, May 4, Attorney-General Major filed *quo warranto* proceedings in the supreme court to oust the eighteen Missouri roads from the state or to fine them for entering into an alleged conspiracy to put into effect unlawful rates.

The Lower House of the legislature on the same day passed the drastic Speer bill with an emergency clause. This prohibits railways from charging more for intrastate than interstate passengers.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Bangor & Aroostook	515	$260,348	$40,651	$311,659	$39,369	$31,304	$2,889	$87,549	$10,845	$171,956	$139,703	.....	$1,500	$138,203	$27,083
Bessemer & Lake Erie	201	259,782	19,598	284,410	42,898	82,065	7,080	109,270	6,641	247,954	36,456	.....	6,000	30,456	†38,053
Buffalo & Susquehanna	373	177,924	15,455	199,093	33,127	49,620	1,594	83,792	6,867	175,000	24,093	$134	4,000	20,227	†21,092
Buffalo, Rochester & Pittsburgh	568	469,213	63,517	546,030	39,357	136,724	9,363	169,091	12,001	366,536	179,494	65*	15,000	164,429	†13,201
Central New England	294	180,872	23,196	218,599	19,319	21,295	3,723	73,855	2,846	121,038	97,561	.....	5,600	91,961	57,550
Chesapeake & Ohio	1,896	1,771,051	347,283	2,249,643	242,612	412,947	36,308	629,851	42,126	1,363,844	885,799	2,202	67,100	820,901	218,146
Chicago & North Western	7,635	3,703,903	1,230,583	5,408,063	506,351	710,088	94,704	2,084,639	109,743	3,505,525	1,902,538	3,067*	210,000	1,689,471	†72,990
Chicago, Burlington & Quincy	9,023	4,874,952	1,436,355	6,861,502	847,491	1,099,627	137,097	2,127,135	174,393	4,385,743	2,475,759	18,253*	212,600	2,244,906	152,355
Chicago, Lake Shore & Eastern	670	346,029	....	399,395	26,293	79,366	1,419	104,065	5,653	216,796	182,599	.....	3,000	179,599	56,890
Chicago, St. Paul, Minn. & Omaha	1,739	776,421	293,561	1,146,191	104,465	151,146	24,367	468,909	27,085	775,972	370,219	979*	53,008	316,232	†12,553
Colorado & Southern	1,251	518,915	83,702	641,987	85,094	144,724	13,635	201,775	24,607	469,835	172,152	727*	21,225	150,200	9,146
Colorado Midland	337	142,412	20,937	180,019	23,886	32,543	10,122	94,649	5,746	166,946	13,073	494*	7,650	4,929	†24,867
Cumberland Valley	162	142,074	40,039	190,910	21,292	25,455	4,254	59,824	5,978	116,803	74,107	63	3,713	70,457	9,088
Delaware, Lackawanna & Western	893	2,350,910	458,669	2,969,929	190,398	412,104	51,177	815,298	52,392	1,521,369	1,448,560	31,733	98,400	1,381,893	593,301
Detroit & Mackinac	348	97,371	21,750	124,672	11,996	16,474	1,354	35,198	2,388	67,410	57,262	152*	6,877	50,233	18,616
Elgin, Joliet & Eastern	239	236,821	155	241,763	17,049	30,887	2,744	69,963	6,491	127,134	114,629	.....	10,500	104,129	43,634
El Paso & Southwestern	867	601,975	82,834	712,678	75,291	82,537	8,880	197,866	33,113	397,687	314,991	497*	17,167	297,327	......
Gulf & Ship Island	307	128,453	26,442	163,616	33,164	19,798	1,004	51,860	7,066	112,892	50,724	.....	6,850	43,874	9,931
Gulf, Colorado & Santa Fe	1,518	659,405	217,625	948,201	174,941	127,213	21,826	377,018	29,008	730,006	218,195	.....	32,649	185,546	129,441
Kansas City Southern	827	553,039	106,749	736,114	78,765	84,067	21,901	233,097	28,978	446,808	289,306	.....	25,344	263,962	42,691
Lake Erie & Western	724	296,912	51,715	366,471	60,045	82,920	9,754	149,625	9,871	312,215	54,256	.....	17,000	37,256	†7,919
Lehigh Valley	1,446	2,436,943	284,791	2,808,914	275,630	442,246	66,878	849,489	58,597	1,692,840	1,116,074	35,310*	94,600	986,163	353,799
Long Island	392	260,194	319,065	598,582	97,936	109,900	9,037	296,307	16,462	529,642	68,940	39,464	71,413	36,991	82,452
Missouri, Kansas & Texas	3,072	1,279,854	552,693	1,960,188	296,353	185,768	55,175	792,575	70,519	1,400,390	559,798	694	70,007	490,485	126,925
New York Central & Hudson River	3,587	4,482,147	2,014,546	7,264,075	771,722	1,279,830	171,893	2,890,301	164,840	5,278,586	1,985,489	10,602	353,435	1,642,655	693,113
New York, Ontario & Western	546	642,167	84,876	749,972	74,821	118,428	9,534	287,000	17,240	507,023	242,949	2,090*	14,000	226,859	80,671
New York, Philadelphia & Norfolk	112	192,423	30,872	238,643	28,746	41,280	2,674	89,444	9,036	171,180	67,463	.....	6,250	61,213	12,803
Norfolk & Southern	582	177,936	43,447	234,304	18,264	21,738	4,025	73,187	13,345	130,559	103,745	853*	5,200	97,692	54,305
Norfolk & Western	1,930	2,132,599	261,395	2,467,958	262,634	437,096	41,888	712,974	54,158	1,508,750	959,208	3,024*	82,300	873,884	167,918
Northern Central	461	791,224	163,948	1,005,140	131,603	188,786	11,683	446,833	21,451	800,356	204,785	251	32,130	172,906	66,568
Northern Pacific	5,695	3,897,394	1,243,706	5,477,835	403,707	664,487	80,220	1,586,347	85,309	2,820,070	2,657,765	16,075	191,724	2,482,116	433,485
Pennsylvania R. R. Co.	4,048	8,846,944	2,276,995	11,818,675	1,572,652	2,657,985	146,255	4,128,238	305,643	8,810,773	3,007,902	98,016*	239,161	2,670,725	317,814
Philadelphia, Baltimore & Washington	716	680,718	631,826	1,451,339	193,723	239,138	25,459	603,542	39,696	1,101,558	349,781	.....	37,435	312,346	90,394
Pittsburgh & Lake Erie	191	762,951	88,967	880,180	114,770	117,358	15,346	238,390	19,614	505,478	374,701	398*	17,000	357,303	10,858
Southern Railway	7,055	3,259,961	1,047,644	4,668,154	499,213	856,152	108,060	1,600,123	149,527	3,213,075	1,455,079	11,491	160,662	1,305,908	271,650
West Jersey & Seashore	356	136,527	191,879	352,672	73,225	51,728	8,109	173,049	8,445	314,556	38,116	484*	26,680	10,952	17,795

NINE MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Bangor & Aroostook	515	$1,678,592	$421,247	$2,201,792	$387,441	$250,820	$26,201	$661,771	$94,734	$1,420,967	$780,825	.....	$13,500	$767,325	$319,500
Bessemer & Lake Erie	201	4,070,041	229,710	4,347,507	436,380	854,011	54,537	1,208,750	79,997	2,633,675	1,713,832	.....	73,000	1,640,832	†89,923
Buffalo & Susquehanna	373	1,534,209	153,042	1,741,890	294,918	409,326	21,421	673,875	62,020	1,461,560	280,330	709*	36,000	243,621	83,010
Buffalo, Rochester & Pittsburgh	568	4,380,465	667,235	5,250,875	634,166	1,261,297	74,863	1,590,093	122,335	3,682,754	1,568,121	262	135,000	1,433,383	†190,881
Central New England	294	1,494,898	248,509	1,851,279	283,963	185,720	16,658	640,215	26,256	1,152,812	698,467	.....	50,400	648,067	391,556
Chesapeake & Ohio	1,896	15,438,365	3,345,640	19,636,252	2,186,636	3,749,951	328,265	5,477,077	384,970	12,126,899	7,509,353	9,972*	600,300	6,899,081	670,891
Chicago & North Western	7,635	33,136,155	12,887,715	50,089,788	5,791,563	5,745,272	842,407	18,734,906	844,045	31,958,193	18,131,595	7,713	2,050,000	16,089,308	1,317,640
Chicago, Burlington & Quincy	9,023	40,053,751	14,846,534	59,991,514	8,139,118	9,874,881	1,151,382	18,606,835	1,521,015	39,293,231	20,698,283	*111,371	1,913,400	18,673,512	716,977
Chicago, Lake Shore & Eastern	670	2,738,038	....	3,015,539	249,370	681,325	10,429	943,535	55,072	1,939,731	1,075,807	.....	27,000	1,048,807	31,745
Chicago, St. Paul, Minn. & Omaha	1,739	6,520,031	3,085,776	10,295,906	1,176,950	1,104,853	196,356	3,826,473	260,648	6,565,280	3,730,626	1,439	476,841	3,255,224	295,565
Colorado & Southern	1,251	5,089,197	1,132,684	6,566,178	812,024	1,189,004	124,421	2,010,063	235,876	4,371,388	2,194,790	2,011	189,257	2,007,544	†25,897
Colorado Midland	337	1,249,553	278,113	1,761,814	220,146	246,299	88,634	744,985	53,150	1,353,214	408,600	3,347*	67,899	337,354	9,781
Cumberland Valley	162	1,342,541	424,185	1,858,434	180,017	178,930	34,564	580,304	49,522	1,023,337	835,097	4,397	33,417	806,077	6,824
Delaware, Lackawanna & Western	893	18,548,155	4,932,761	25,025,152	2,291,564	3,426,682	434,836	6,999,858	491,069	13,644,009	11,381,143	221,714	799,200	10,803,657	871,112
Detroit & Mackinac	348	595,772	216,819	861,854	134,997	137,733	16,200	285,696	24,323	598,949	262,905	2,725*	64,795	195,384	†18,362
Elgin, Joliet & Eastern	239	1,806,803	462	1,864,471	188,519	292,642	23,286	605,261	68,396	1,178,104	686,367	.....	86,500	599,867	†10,931
El Paso & Southwestern	867	4,386,255	719,858	5,347,061	632,700	716,254	83,750	1,460,103	217,557	3,110,364	2,236,697	13,685*	143,043	2,079,969	......
Gulf & Ship Island	307	1,074,068	267,764	1,428,953	300,894	214,170	12,213	468,807	65,195	1,061,279	367,674	.....	40,658	327,016	†1,316
Gulf, Colorado & Santa Fe	1,518	7,241,828	2,236,555	9,978,319	1,509,434	1,547,262	184,014	3,443,185	286,033	6,969,928	3,008,391	.....	247,623	2,760,768	1,528,168
Kansas City Southern	827	4,907,895	988,284	6,495,672	701,778	756,260	195,850	2,068,160	244,930	3,966,978	2,528,694	.....	246,247	2,282,447	101,488
Lake Erie & Western	724	2,514,791	589,428	3,279,507	449,360	661,958	96,124	1,291,989	92,132	2,591,563	687,944	.....	153,760	534,184	†43,752
Lehigh Valley	1,446	20,799,955	2,905,049	24,513,966	2,603,675	4,492,569	585,139	7,531,256	486,728	15,699,367	8,814,599	90,611*	815,400	7,908,588	†477,463
Long Island	392	1,960,032	3,773,086	5,970,537	754,769	925,923	119,939	2,766,325	158,210	4,725,166	1,245,371	658,415	245,121	1,658,665	631,310
Missouri, Kansas & Texas	3,072	13,192,755	5,343,768	19,617,767	2,664,110	2,836,968	435,598	7,184,758	616,675	13,738,109	5,879,658	7,175*	876,766	4,995,717	†558,960
New York Central & Hudson River	3,587	37,919,929	20,381,797	65,093,826	7,518,850	11,508,650	1,584,552	24,518,648	1,502,646	46,633,346	18,460,480	95,492	3,417,816	15,138,157	1,315,697
New York, Ontario & Western	546	4,825,922	1,173,738	6,239,297	676,551	1,068,927	87,459	2,321,304	133,517	4,287,758	1,951,538	30,843*	134,417	1,786,279	50,860
New York, Philadelphia & Norfolk	112	1,654,700	290,886	2,087,960	191,730	375,699	27,495	772,286	94,084	1,461,294	626,666	.....	56,040	570,626	†49,883
Norfolk & Southern	582	1,173,332	469,233	1,766,721	231,151	187,708	37,494	570,473	130,266	1,157,092	609,629	1,668*	54,800	553,161	279,964
Norfolk & Western	1,930	18,295,095	2,617,315	21,646,711	2,339,990	3,666,363	355,649	6,268,552	476,091	13,106,645	8,540,066	4,342*	761,900	7,773,824	732,426
Northern Central	461	6,537,722	1,497,548	8,534,027	748,904	1,861,170	112,343	3,866,004	177,670	6,766,091	1,767,936	5,606	188,247	1,585,295	†268,313
Northern Pacific	5,695	35,981,928	12,636,947	51,580,220	5,297,273	6,027,036	630,379	15,026,459	811,533	27,792,680	23,787,540	353,059	2,115,545	22,025,054	†136,946
Pennsylvania R. R. Co.	4,048	74,574,290	21,528,638	102,996,473	11,695,223	20,661,426	1,359,113	36,536,379	2,570,025	72,822,166	30,174,307	*79,137	1,633,875	28,461,294	†1,357,522
Philadelphia, Baltimore & Washington	716	5,832,311	5,157,341	12,349,237	1,560,474	2,197,758	195,374	5,129,646	271,570	9,354,822	2,994,415	.....	286,569	2,707,846	77,375
Pittsburgh & Lake Erie	191	7,621,254	899,529	8,796,098	1,061,641	845,120	118,928	2,114,561	187,897	4,328,147	4,467,951	2,959*	148,526	4,316,466	†660,126
Southern Railway	7,055	26,375,895	10,288,442	39,872,014	4,665,112	6,201,903	915,364	13,912,205	1,299,283	26,993,867	12,878,147	105,625	1,436,545	11,547,227	3,317,682
West Jersey & Seashore	356	1,107,342	2,387,461	3,700,886	584,463	513,976	91,710	1,575,782	70,877	2,836,808	864,078	53,994	163,579	754,493	†102,254

*Deficit. †Decrease.

The Westbound "Rate War."

Announcements of reductions in westbound freight rates have appeared in the newspapers about every day during the past week, but it is difficult to tell precisely what they mean. Each cut is to take effect a month after it is published, but each is likely to be followed by a further cut by a rival line; and all of them have to do only with the comparatively small volume of freight which goes by the slow or roundabout routes. On April 21 the Chesapeake & Ohio, taking freight from New York to Newport News by water, announced reductions of 3 cents per 100 lbs., on first class, and different reductions on the other classes, to meet the cut made by the Boston & Maine in February. Presumably these rates apply only on import traffic, though none of the reporters seem to care enough about the point to say whether they do or do not. On April 25 the Baltimore & Ohio followed the Chesapeake & Ohio, but taking off different percentages. This is said to be the seventh cut after that of the Boston & Maine, and it left the B. & M. in the same relative position that it was before the cutting began. Import rates were further reduced by the B. & O. on the 29th. The Pennsylvania made reductions from Philadelphia, but not from other points. On May 1 the Interstate Commerce Commission received notice of further reductions by the Boston & Maine, designed to neutralize those made by the Southern lines. Later despatches from Washington indicated that all of the important trunk lines had filed new tariffs for rates on imported goods out of New York, designed to restore the differential between that port and Boston. Heretofore the roads out of New York had no import class rates, but the new tariffs have them, as follows: From New York to Chicago first class, 72; second class, 61; third class, 50; fourth class, 34; fifth class, 29, and sixth class 23½. The roads which have made these changes are the Central of New Jersey, the Pennsylvania, the Lackawanna, the Erie, the Lehigh Valley, and the New York, Ontario & Western.

On the 29th the Commission was notified of changes made by the lines which take freight by water to Norfolk, designed to put them on an equality with the rail and lake lines. These lines are the Merchants and Miners' Transportation Company, from Boston; the Old Dominion Steamship Company, from New York; the Clyde Steamship Company, from Philadelphia, and the Chesapeake Steamship Company and the Baltimore Steam Packet Company, from Baltimore. The tariffs read in connection with the Atlantic Coast Line, the Southern Railway, the Chesapeake & Ohio, the Norfolk & Western and the Seaboard Air Line, but apply only to Chicago and do not include common points, or points beyond; and they are not confined to import traffic. These tariffs make a reduction of 8 cents per 100 lbs. on first-class freight from Boston to Chicago, and 3 cents per 100 lbs. from New York, Philadelphia and Baltimore to Chicago. Proportionate reductions are made on other classes. They become effective on June 1. It is stated that the reductions are made solely with the object of bringing all the water and rail tariffs to common level. Before 1907 the rates on the rail and lake routes did not include marine insurance, and shippers or consignees had to pay insurance, whereas, by the ocean and rail routes, the insurance charges were included. But in 1907 the rail and lake concerns included insurance in their rates, without raising the tariffs, and this resulted in the establishment of a differential, which the ocean lines now aim to abolish. Rates to points other than Chicago have been on practically the same scale by all the water and rail routes.

Westbound transcontinental tariffs which have been filed to go into effect June 5 are reported by the Interstate Commerce Commission, and are said to show reductions of 10 cents per 100 lbs. in all commodity tariffs, meaning, presumably, all commodities below fourth class.

Freight Car Balance and Performance.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting statistical bulletin No. 44, covering car balance and performance for November, 1908, says: "During November the number of surplus cars, which had been decreasing steadily since June,

CAR BALANCE AND PERFORMANCE IN NOVEMBER, 1908.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	72,873	656,477	277,968	130,278	172,731	369,261	15,520	135,077	26,258	112,007	100,522	2,068,972
Average number of system cars on line	49,487	440,848	198,268	88,107	111,409	285,613	6,104	90,085	13,027	56,342	73,760	1,413,050
Railroad owned cars: Av. foreign on line	34,255	179,773	73,037	30,955	44,211	102,058	11,508	56,227	27,584	45,629	18,944	624,181
Total cars on line	83,742	620,621	271,305	119,062	155,620	387,671	17,612	146,312	40,611	101,971	92,704	2,037,231
Excess	10,869	....	....	....	....	18,410	2,092	11,235	14,353	....	....	....
Per cent. cars on line to total owned:												
Home	68	67	71	67	64	77	39	66	49	50	73	68
Foreign	47	28	26	24	26	28	74	42	105	41	19	30
All railroads	115	95	97	91	90	105	113	108	154	91	92	98
Private cars on line	2,994	39,286	12,181	3,270	6,348	14,629	2,026	8,280	3,141	8,089	4,137	103,481
Total, all cars on line	86,736	659,907	283,486	121,432	161,968	402,300	19,638	154,592	43,752	110,060	96,841	2,140,712
Per cent. of cars in shop	6.35	8.05	8.62	8.86	11.89	5.00	4.75	13.56	5.53	5.88	8.95	7.99
No. of freight engines owned	1,122	9,835	3,794	2,153	2,392	6,298	440	2,486	712	2,340	2,113	33,685
Av. cars on line per freight engine owned	77	67	75	56	67	64	45	62	61	47	46	64
Total freight car mileage	43,631,855	467,766,065	170,154,762	79,587,704	110,971,067	282,129,881	26,071,750	89,660,814	33,801,559	106,912,153	91,360,127	1,501,047,737
Average miles per car per day	16.4	23.6	20.0	21.8	22.8	23.5	44.3	20.1	25.8	32.4	31.6	23.5
Per cent. loaded mileage	71.9	66.3	66.5	68.4	72.4	72.5	72.1	70.2	68.7	71.1	72.9	69.3
Ton miles of freight, inc. Co. freight	438,650,807	7,224,728,480	2,417,709,172	1,089,576,974	1,545,564,439	2,406,251,212	381,720,289	1,213,468,895	387,354,828	1,593,270,687	1,277,189,338	20,975,485,121
Average ton-miles, including Co. freight:												
Per car mile	10.3	15.4	15.4	13.7	14.0	13.8	15.0	13.6	11.6	14.9	13.9	14.5
Per loaded car-mile	14.3	23.3	23.2	20.0	18.0	19.5	20.8	19.5	16.9	21.0	19.1	21.0
Per car per day	168	365	309	299	320	327	686	273	302	484	440	341
Gross freight earnings	$5,085,564	$42,881,971	$14,537,963	$7,704,028	$10,929,349	$20,361,553	$3,265,742	$10,876,791	$4,150,763	$15,005,465	$7,786,363	$142,588,552
Average daily earnings: Per car owned	$2.33	$2.18	$1.74	$1.97	$2.13	$2.39	$7.01	$2.69	$5.27	$4.46	$2.58	$2.40
Per railroad owned car on line	2.02	2.31	1.79	2.16	2.36	2.28	6.18	2.48	3.40	4.90	2.80	2.44
All cars on line	1.95	2.17	1.71	2.11	2.26	2.18	5.54	2.35	3.16	4.54	2.68	2.32

began to increase, the average for the month being 127,000 daily, or 5.93 per cent. of the total equipment. These cars, together with 2.97 per cent. 'excess' shop cars, represent the proportion of the equipment that contributed nothing to the car mileage, ton mileage or freight earnings reported in this bulletin. Making the usual adjustments, we secure the following results:

	Average miles per day.		Average ton-miles per car per day		Average earnings per car per day.	
	Inc.surp. cars.	Exc.surp. cars.	Inc.surp. cars.	Exc.surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908...	19.6	24.5	258	324	1.83	2.29
May, 1908....	19.3	24.8	254	329	1.72	2.22
June, 1908....	19.6	24.7	276	347	1.88	2.37
July, 1908....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
Sept., 1908....	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55

"There is very little change in the averages shown in the above table, with the exception of the decreases in those that include surplus cars, which decreases are explained by the increase in idle equipment. The per cent. of loaded mileage was 69.3 per cent., a falling off from the averages for September and October of 0.3 and 1.4 respectively. This result is rather surprising in view of the outward flow of cars indicated by the car balance percentages, which show a further reduction in cars on home lines to 68 per cent. of the total.

"There is a slight improvement in the tons per loaded car for the period covered by this report, while the bad order equipment continues to decrease, the average being 7.99 per cent., or 0.89 less than during the previous month."

Traffic Club of St. Louis.

The Traffic Club of St. Louis gave a dinner at the Jefferson Hotel on May 4. Among the speakers were Judge Smith McPherson, United States District Judge for the Southern district of Iowa, and Frederick W. Lehmann, of St. Louis, President of the American Bar Association.

A Fast Freight Line.

It is cheaper to ship wool to Los Angeles and then reship it to Boston than it is to ship direct to Boston from Manti. The rate from Manti [124 miles south of Salt Lake City] to Los Angeles over the Salt Lake route, is 80 cents per 100 lbs. (distance about 750 miles); the rate from Los Angeles to Boston by way of Salt Lake is $1.10. The rate from Utah common points to Boston is $2.13, so by shipping his wool to Los Angeles, having it compressed there and then reshipping it to Boston, back over the same rails which it traversed to reach the southern California city, the Manti wool grower gets a benefit of 25 cents on every hundred pounds. One wool company has purchased about one-fourth of the wool clip of Utah this year, amounting to 4,000,000 lbs., and footing up in cash about $700,000. This company has shipped all its wool to California and then back to Boston, saving the difference of 23 cents. The B. Harris Co. has shipped its wool the same way, as have other shippers.—*Press despatch from Salt Lake City.*

FOREIGN RAILWAY NOTES.

A bill pending in the French Parliament securing pensions to employees is estimated by the companies to increase their obligations by 30,000,000 francs and by the Railway Minister by 25,000,000 francs a year.

The inquiries into the thefts of railway freight in Moscow have established that in the years 1905, 1906 and 1907 more than $15,000,000 worth was taken, mostly on two railways. There were regular bands of men who unloaded the freight, others who stored it and still others, including some reputable firms, who sold it. There has also been discovered a plant for manufacturing counterfeit railway tickets, which confined itself to one railway, and made the trifling profit of $65,000. The latter was betrayed by one of its members.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. L. Terry, clerk to the First Vice-President of the Denver, Laramie & Northwestern, has been elected Assistant Treasurer, with office at Denver.

J. D. McLennan has been appointed the Auditor of Freight Accounts of the Grand Trunk, with office at Montreal, succeeding William Clark, assigned to other duties.

E. F. Stephenson, who has previously been in Secretary Pardee's office, has been elected the Assistant Secretary of the New York Central & Hudson River, with office in New York. This is a new office.

F. S. Landstreet has been elected president of the New York Dock Co., succeeding David H. King, Jr., resigned. The company owns extensive terminals, including docks and storage warehouse facilities in South Brooklyn, N. Y.

T. C. Powell, Vice-President of the Southern Railway, has been relieved of supervision of the Operating department of the St. Louis-Louisville lines, but will continue to represent this road on the boards of directors of the Terminal Association of St. Louis and of the Kentucky & Indiana Bridge Company.

L. L. Losey, Chief Claim Agent of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern, having been granted a leave of absence, L. H. Kellogg has been appointed the Acting Chief Claim Agent. H. B. Hull has been appointed the Assistant Chief Claim Agent at Memphis, Tenn., with jurisdiction over all territory south of Fulton, Ky. E. W. Sprague has been appointed District Claim Agent of the Indianapolis Southern, with office at Chicago.

Operating Officers.

The new organization of the Operating department of the Southern Pacific Lines in Mexico is described in an article under General News.

T. C. Worthington has been appointed the Assistant Superintendent of the Houston division of the Galveston, Harrisburg & San Antonio, succeeding J. D. Brennan, resigned.

A. Wilcox, Superintendent of the Canadian Northern at Port Arthur, Ont., has been transferred as Superintendent to Dauphin, Man., and given charge of the Third district, succeeding J. W. Dawsey, resigned. S. S. Foley, Chief Train Despatcher at Dauphin, has been appointed the Superintendent of the Fifth district, with office at Saskatoon, Sask.

The titles of Resident Engineer, Master Mechanic, Trainmaster and Traveling Engineer have been abolished on the Texas & New Orleans and the Galveston division of the Galveston, Harrisburg & San Antonio, and C. A. Thanheiser, W. S. Cox, H. J. Micksch and F. Wessell, who have had these titles, respectively, are each given the title of Assistant Superintendent and will continue to be charged with the responsibilities heretofore devolving upon them, while assuming such other duties as may from time to time be assigned to them. See an item under General News.

C. P. Cooper, Manager of the St. Louis-Louisville Lines of the Southern Railway, has been appointed the General Agent, Operating department, with office at Memphis, Tenn., and his former office has been abolished. C. L. Harris, Superintendent at Knoxville, Tenn., has been appointed the General Superintendent of the St. Louis-Louisville Lines, with office at St. Louis, Mo. G. W. Taylor, General Superintendent of Transportation of the Southern Railway, has been appointed also the General Superintendent of Transportation of the St. Louis-Louisville Lines, with office at Washington, D. C. W. H. Gatchell, Superintendent of Transfers, has been appointed also the Superintendent of Transfers of the St. Louis-Louisville Lines, with office at Washington, D. C.

Traffic Officers.

H. E. Dengler has been appointed a Division Freight Agent of the Lehigh Valley, with office at Hazelton, Pa., succeeding C. A. Smith, deceased.

L. B. Burford has been appointed Chief of Tariff Bureau of the Erie, with office at 50 Church street, New York, succeeding H. Thompson, promoted.

N. W. Pringle has been appointed the New England Passenger Agent of the Lehigh Valley, with office at 39 Church street, New Haven, Conn.

F. S. Fisher has been appointed a Contracting Agent of the Missouri, Kansas & Texas, with office at Fort Worth, Tex., succeeding C. F. Smith, resigned.

L. H. Geller has been appointed the Southern Freight Agent of the Erie lines west of Buffalo, with office at Chicago, succeeding C. D. Turner, transferred.

V. D. Skipworth has been appointed the Traffic Manager of Schwarzschild & Sulzberger Co., in charge of all traffic and car line matters, with headquarters at Chicago, succeeding B. S. Cusey.

E. R. Puffer has been appointed the General Freight Agent of the Illinois and Iowa districts of the Chicago, Burlington & Quincy, Lines East of the Missouri river, succeeding W. B. Hamblin, deceased.

E. T. Campbell, Purchasing Agent of the Erie, has been appointed the Traffic Manager, with office at Chicago, succeeding D. W. Cook, promoted. Willard R. Collins succeeds Mr. Campbell, with office at New York.

C. F. Smith, Contracting Agent of the Missouri, Kansas & Texas, at Fort Worth, Tex., has been appointed the Traveling Freight Agent of the Louisiana Railway & Navigation Company for the state of Oklahoma, with office at Oklahoma City, Okla.

R. W. Andrews, Division Freight and Passenger Agent of the Missouri & North Arkanas, at Helena, Ark., has been appointed the General Freight and Passenger Agent, with office at Eureka Springs, Ark. The office of Division Freight and Passenger Agent at Helena has been abolished.

G. Stephen, Assistant General Freight Agent of the Canadian Northern, has been appointed the General Freight Agent, with office at Winnipeg, Man. W. G. Manders, chief clerk in the Freight Traffic department, succeeds Mr. Stephen, with office at Winnipeg. C. W. Cooper, Assistant General Passenger Agent, has been appointed the General Passenger Agent, with office at Winnipeg. R. G. Hall, Traffic Manager of the Duluth, Rainy Lake & Winnipeg, has been appointed a Commercial Agent of the Canadian Northern, with office at Chicago.

Engineering and Rolling Stock Officers.

J. H. Conlan, General Roadmaster of the Trinity & Brazos Valley, has resigned to engage in other business.

F. B. McCutcheon, Chief Engineer of the Gulf & Ship Island, has resigned and his former office has been abolished. W. T. Stewart has been appointed the Superintendent of Roadway, and will have charge of maintenance of way, bridges and buildings.

A. Stewart, General Superintendent of Motive Power and Equipment of the Southern Railway, with office at Washington, D. C., has been appointed also the General Superintendent of Motive Power and Equipment of the St. Louis-Louisville Lines of the Southern Railway, with office at Washington.

D. W. Lum, Chief Engineer of Maintenance of Way and Structures of the Southern Railway, with office at Washington, D. C., has been appointed also the Chief Engineer of Maintenance of Way and Structures of the St. Louis-Louisville Lines of the Southern Railway, with office at Washington.

H. A. Genung has been appointed Engineer in charge of Maintenance of Way, Bridges, Buildings and Water Service on the San Antonio division of the International & Great Northern, with office at San Antonio, reporting direct to the General Manager. O. H. Crittenden, Chief Engineer, is relieved of active duties on this division, except as Consulting Engineer.

George H. Burgess, Principal Assistant Engineer of the Erie, has been appointed the Chief Engineer of the Delaware & Hudson, with office at Albany, N. Y., succeeding James McMartin, resigned. Mr. Burgess was born on June 19, 1874, at Oshkosh, Wis. After graduating from the University of Wisconsin in 1895, having taken the civil engineering course, he began railway work as a rodman on the Pennsylvania Lines West. In October, 1896, he was appointed Assistant Bridge Inspector, and two years later was promoted to Bridge Inspector. In January, 1901, he became Assistant Engineer, holding this office until September, 1905, when he left the Pennsylvania to become Assistant Engineer on the Erie. In 1906 he was made Engineer of Terminal Improvements and was put in direct charge of the extensive terminal improvements being made at Jersey City, N. J. On May 1, 1908, he was appointed Principal Assistant Engineer, which office he has since held.

G. H. Burgess.

Purchasing Officers.

Willard R. Collins has been appointed the Purchasing Agent of the Erie, with office at New York, succeeding E. T. Campbell, assigned to other duties.

W. M. Netherland, General Storekeeper of the Southern Railway, has been appointed also the General Storekeeper of the St. Louis-Louisville Lines, with office at Washington, D. C.

OBITUARY.

John M. McCully, formerly Purchasing Agent of the Louisville & Nashville, died in Chicago last week from blood poisoning.

J. A. Perkins, formerly General Agent of the Star Union Line of the Pennsylvania at Milwaukee, Wis., died at Milwaukee on April 29. He was 79 years old. He represented the Star Union Line at Milwaukee from 1886 to 1901, when he retired, having reached the age limit.

Meed Stillwell, formerly a Superintendent of the Missouri Pacific, died May 3 of heart disease at his home in Bloomfield, N. J. He was born in 1851 and began railway work in 1869 as freight brakeman. In 1890 he was made a Superintendent of the Missouri Pacific and in 1904 retired from railway work.

Thomas W. Lee, General Passenger Agent of the Delaware, Lackawanna & Western until a few years ago, died on April 26 at Idaho Falls, Idaho. He began railway work in 1876 as a telegraph operator on the Baltimore & Ohio, and was consecutively to 1882 station agent, Train Despatcher and Yardmaster. From 1882 to 1887 he was Traveling Freight and Passenger Agent, Advertising Agent and Chief Clerk in the Passenger department of the Chicago, Burlington & Quincy. From 1887 to 1889 he was General Passenger Agent of the Lake Erie & Western; from 1889 to 1891, General Passenger Agent of the Oregon Railway & Navigation Co.; from 1891 to 1893, General Manager of the Galveston, Houston & Northern, now the Galveston, Harrisburg & San Antonio; from 1893 to 1897, Superintendent of the water lines of the Oregon Railway & Navigation Co., and from 1898 to 1899, Assistant to the Chairman of the Western Passenger Association. In 1899 he became General Passenger Agent of the Delaware, Lackawanna & Western, which office he held several years. During recent years he had been dealing in lands in Idaho.

Railroad Construction.

New Incorporations, Surveys, Etc.

ACME, RED RIVER & NORTHERN.—See Quanah, Acme & Pacific.

AMARILLO, STRATFORD & NORTHERN.—Organized in Texas to build a north and south line through Sherman, Moore and Potter counties, thence to a point either in Kansas or Colorado. It is expected that the line will be in operation from Stratford to Amarillo, or from Stratford to Canyon City within two years. E. C. Gordon and the Stratford Commercial Club are said to be interested.

BLUE VALLEY TRACTION.—An officer writes that preliminary surveys have been completed but no contracts for construction work have yet been let. There will be one or two bridges across the Blue river. Construction work will be comparatively easy, although in places the grade will approximate 5 per cent. for short distances. H. J. Smith, Ch. Engr., Kansas City, Mo. (April 16, p. 871.)

CANADIAN PACIFIC.—This company is building a diversion of its line on the Lake Superior division near Jackfish, Ont., extending from Steel siding to the crossing of the Steel river, about two miles. This is being done with the object of escaping the muskegs over which the line at present passes on four long pile trestles. It has been found that the muskeg is of such character that filling in the trestles on the existing line would be expensive and will involve interruption of traffic. The new line will be principally of rock and will be ready for traffic by Jan. 1, 1910.

CLINTON & OKLAHOMA WESTERN.—An officer writes that contracts for 20 miles of grading have been let and that the work is under way. F. L. Adams & Co., contractors, Oklahoma City, Okla. G. V. McClure, Ch. Engr., Clinton, Okla. (April 16, p. 871.)

COLORADO & SOUTHERN.—An officer of the Chicago, Burlington & Quincy (which recently acquired the Colorado & Southern) writes that the line originally located between Wellington, Colo., and Cheyenne, Wyo., has been revised, but construction in the near future is not being considered at the present time.

ENID, OCHILTREE & WESTERN.—An officer writes that financial arangements have been made to build this line. A grading contract has been let to A. Key, of Fort Worth, Tex., and several miles have already been graded out of Dalhart. The proposed route is from Dalhart southeast to Dumas, thence northeasterly via Hansford to Ochiltree, 112 miles. Arrangements made to extend the line to the eastern boundary of Texas and organize an auxiliary company in Oklahoma. G. M. Perry, Pres.; A. E. Wiest, Jr., Vice-Pres. and Gen. Mgr.; H. Palmer, Asst. Secy., all of Ochiltree, and W. R. Allen, Ch. Engr., Dalhart. (April 2, p. 774.)

GARDEN CITY, GULF & NORTHERN.—Organized in Kansas, with $1,000,000 capital and offices at Garden City, to build about 400 miles of railway. The projected route is from a point in Finney county northeast to Hill City. A branch is projected from a point north of Garden City northwest to St. Francis in Cheyenne county, also one from Garden City southerly to Plains or Liberal, thence in a northeasterly direction.

GRAND TRUNK PACIFIC.—The semi-annual report of the Grand Trunk under date of April 6 refers to the work on the Grand Trunk Pacific as follows: The erection of the important bridges at Battle river and Clover Bar, near Edmonton, has been finished, and track-laying is under way on the remaining section between Winnipeg and Edmonton, and will be finished during the present season. The section between Winnipeg and Lake Superior Junction is to be finished during the summer, giving a continuous line from Edmonton, Alb., east to Fort William on Lake Superior, about 1,250 miles, for the movement of this year's harvest.

An officer writes that branch lines will probably be built this year as follows: Yorkton branch, Melville, Sask., north to Yorkton, 40 miles; Regina branch, Melville southwest to Regina, 35 miles; Battleford branch, Biggar, Sask., north to Battleford, 49 miles; Calgary branch, Wainwright, Alb., southwest to Calgary, 50 miles. It is not likely that any construction work will be done this year on the Hudson Bay line. (April 30, p. 960.)

HUDSON & MANHATTAN.—The Public Service Commission, First district, has granted a franchise for the proposed extension to the Grand Central Station, at Forty-second street, New York City, and has authorized the execution of a contract with the company. The contract was accepted within twenty-four hours. It is understood that construction will begin within six months after receiving all necessary consents and will be completed within three years.

HUTCHINSON, HUNTSVILLE & WESTERN.—Organized in Kansas, with $250,000 capital and headquarters at Huntsville, to build from Hutchinson west via Huntsville to Hudson, with a number of branches, in all 75 miles.

IDAHO ROADS.—The Northwestern Lumber Co., Philadelphia, Pa., is planning to build a railway from the Grangeville branch of the Northern Pacific from Steunenberg, Idaho, and Cottonwood.

INDEPENDENCE NORTH & SOUTH.—Organized in Kansas, with $100,000 capital and headquarters at Kansas City and Independence, to build from a point in Wyandotte county south to near Caney, at the southern boundary of Montgomery county, with a number of branches and extensions, in all 200 miles.

KANSAS NORTHWESTERN.—An officer writes that the route will extend from Wichita, Kan., northwest via Hutchinson, Great Bend, Hayes, Hill City, Oberlin and Atwood to Benkelman, Neb., about 325 miles. Contracts for grading, track-laying and bridges will be let in August or September. The country is comparatively level along the proposed route. There will be two or three steel bridges over the Arkansas, Smoky and Saline rivers. W. R. Crumpton, Ch. Engr., Great Bend, Kan. (April 30, p. 960.)

LAKEWOOD & SEASHORE (ELECTRIC).—Incorporated in New Jersey with $300,000 capital as a successor of the Trenton, Lakewood & Atlantic, organized to build from Trenton, N. J., east to a point on the Atlantic coast. The new company proposes to build from Lakewood east to Pt. Pleasant, about 10 miles. The incorporators include: C. R. LeCompte, H. J. Terwilliger, N. MacDonald, E. E. Le Compte, J. H. Butcher and R. A. Clark.

MEXICO TRANSPORTATION CO.—Organized by a Canadian syndicate to build from a point opposite El Paso, Tex., at Ciudad Juarez, Mex., south to Galena and Terrazas into the Murphy timber tract, in the state of Chihuahua, about 250 miles. The concession allows the taking over of certain of the properties formerly controlled by Col. W. C. Greene; also the property of the Sierra Madre Lumber Co. and some smaller properties, with permission to build additional lines. F. S. Pearson, Pres. and Cons. Engr., 25 Broad street, New York; Walter Dow, V.-Pres., Toronto, Ont., and E. D. Kenna, V.-Pres., Chicago, Ill.

NORTH COAST.—An officer writes that the contract, recently let to Messrs. Case, Eschbach & Dingle, for a 12-mile section of the line between Kiona, Wash., and Grandview, practically completes the grade from the Columbia river to Granger, Wash., about 60 miles. (April 23, p. 918.)

NORTHERN NEW BRUNSWICK & SEABOARD.—This company has obtained the charter of the Twin Tree Mines Railway Co., and has recently been granted permission by the New Brunswick legislature to change the name of the previous company and increase the capitalization to $1,000,000. Location surveys are being made between the Bathhurst mines on the Nipisguit river in New Brunswick and the three points of connection with the Grand Trunk Pacific, one near Bathhurst, one at Bartibog and the other at Red Pine. A subsidiary company, the New Brunswick Docks & Terminal Co., has been incorporated to build docks, terminals, etc., at Bathhurst, Newcastle or other points on the Baie Des Chaleurs and the Miramichi rivers.

Northwest Arkansas Electric Interurban Railway.—An officer writes that the projected route of this line, being built by the Arkansas Co-operation Construction Co., Bentonville, Ark., is from Joplin, Mo., south via Bentonville, to points in northwest Arkansas, total about 200 miles. W. Morris, Pres.; P. H. Sackett, Ch. Engr., Bentonville. (April 9, p. 821.)

North Yakima & Valley.—An officer writes that it is the intention to extend from North Yakima, Wash., north to Moxee, about 12 miles.

Oregon Electric.—It has been announced that the proposed extensions will not be undertken this summer, but that several thousand dollars will be spent in perfecting the present 70 miles of track between Portland, Ore., Salem and Forest Grove. These improvements will include ballasting and new equipment and several depots. Other extensions are projected from Salem to Albany, 30 miles, and from Tigard to Dallas, about 50 miles. (March 19, p. 656.)

Oregon Railroad & Navigation.—It is said that $1,000,000 will be spent during the coming summer in re-building sections of the main line along the Columbia river between The Dalles, Ore., and Umatilla, about 100 miles, the idea being to reduce curves and grades.

Quanah, Acme & Pacific.—An officer writes that this company is the successor to the Acme, Red River & Northern. The line is in operation from Acme, Tex., east via Quanah, for about nine miles, and an extension is being built from Acme southwesterly. Grading outfits are at work at various points on a section of about 50 miles, and track-laying is expected to be begun within 30 days. About 150,000 ties, 750,000 ft. of bridge timber and other lumber, also 5,000 tons of rails, are now on the way to the company's yards at Acme. Under a contract with the Pacific Construction Co. the first 50 miles is to be finished and ready for operation by Nov. 1, 1909. The line is to be laid with new 65-lb. open hearth rails. For the present the western terminus is to be at Paducah, in Cottle county. The line is eventually to be extended to Roswell, N. Mex., about 250 miles. Additional equipment has been bought and is now on the way. At the crossing on the Pease river in Cottle county there is to be a 1,000-ft. trestle, and to secure minimum grades on both sides of the river it will be necessary to remove about 100,000 cu. yds. of dirt on each side of the river. At Quanah improvements are to be made at a cost of $50,000, including roundhouses, shops and a combined station and office building. (April 30, p. 960.)

St. Louis, Oklahoma & Texas.—According to press reports, construction work will begin early in May. A company is now being organized to build the line from Honey Grove, Tex., southeast to Tyler, 125 miles. M. J. Smith, Ch. Engr., McAlester, Okla. (April 23, p. 918.)

Short Line Traction.—Incorporated in Indiana to build an interurban line from the city limits of Indianapolis, Ind., to Beech Grove. This line is being built largely to accommodate traffic to and from the shops of the Big Four. The incorporators include: J. F. Webber, F. J. Edenharter and G. F. Mull, of Indianapolis.

Southern.—An officer writes regarding the resumption of work, that a short time ago all work was suspended on the line building from Winesap, Va., to Durmid, 7.05 miles, with the exception of the boring of a 1,300-ft. tunnel, the heading of which is now finished. Work has been resumed on the rest of the line, which will furnish a new line through Lynchburg, Va., crossing the James river at a height of about 150 ft., and having a maximum grade of 53 ft. northbound and 48 ft. southbound, with a maximum curvature of 3 deg. as compared with the existing line, which has a maximum grade of 74 ft. in both directions and a maximum curvature of 10 deg.

When work was closed down on the line between Asheville, N. C., and Craggy everything was about finished for the double track, with the exception of the new crossing of French Broad river near Asheville. Work is now under way at that place on a reinforced concrete viaduct to have 22 spans about 35 ft. each, center to center. (April 23, p. 918.)

Southern Pacific.—The Beaverton & Willsburg belt line, extending around the south side of Portland, Ore., will provide for handling freight which has heretofore been handled through one of the main streets of the city. Work is under way and is expected to be completed before fall. The work will necessitate bridging the Willimette river at Oswego. This bridge will be 80 ft. above the water. (March 19, p. 658.)

Southwestern Ohio Traction.—Organized in Ohio with $10,000 capital to operate about 400 miles of electric lines. The plans provide for merging a number of existing electric lines and building an entrance into Cincinnati to connect with a number of lines reaching many of the important towns in the southern part of Ohio. New lines and branches are projected. Application made to the City Council of Cincinnati for a franchise to build an underground, elevated and surface line from the center of the city to Norwood, six miles, with branch lines. This line is to have a grade not to exceed 1 per cent., and no grade crossings. Work is to be begun this summer. G. H. Worthington, Chairman, Cleveland, Ohio; John E. Bleekman, Pres.; W. L. Moyer, S. M. Jarvis, C. Hansel and J. L. Greatsinger, all of New York, are directors; Charles Hansel & Co., 43 Exchange place, New York, are the engineers in charge.

Spokane, Portland & Seattle.—The new line between Spokane, Wash., and Portland, Ore., was opened to operation on May 3. (April 30, p. 961.)

Terre Haute & Southwestern.—Surveys said to be under way for a line to form part of a system that is to extend from Terre Haute, Ind., southwest to the Fredericktown ore fields in Missouri. The plans call for a line from Terre Haute southwest to Mt. Vernon, Ill., 125 miles, where connection is to be made with the Wabash, Chester & Western, operating 64 miles to Chester and Menard, on the Mississippi river. The W., C. & W. will probably form part of the system. H. P. Taussig, of St. Louis, Mo.; C. D. Duffy, of Massachusetts, and the Terre Haute Commercial Club are interested.

Texas Roads.—W. P. Soash, of the Soash Land Co., Waterloo, Iowa, writes that surveys are now being made between Big Springs, Tex., and the new town of Soash. No contracts for grading, track-laying, bridges, etc., have yet been let. (April 16, p. 872.)

Timpson & Northwestern.—An officer writes that a contract has been given to extend this road to Henderson, Tex. Work to be started soon, and it is expected to have the extension in operation this year. When these improvements are finished the line will be between 35 and 40 miles long. At a meeting of the stockholders to be called in June the question of changing the name to the Timpson, Henderson & Northwestern, which is to have a capital of $250,000, will be considered. Arrangements made to apply for a new charter. (April 30, p. 961.)

Timpson, Henderson & Northwestern.—See Timpson & Northwestern.

Trenton, Lakewood & Atlantic.—See Lakewood & Seashore.

United Railways Co., Portland, Ore.—Operation of the first 13 miles between Portland, Ore., and Burlington, was begun on April 18. Construction work is under way on the additional 20 miles to Forest Grove and the line is projected to the Pacific coast, about 80 miles from Portland. This company has previously been doing terminal and switching business in Portland, operating by electricity.

Wabash, Chester & Western.—See Terre Haute & Southwestern.

Watervalley Southwestern.—Projected from Watervalley, Miss., on the Illinois Central, southeast to Calhoun City, on the Mobile & Ohio, about 40 miles. An officer writes that contracts for grading, track-laying, bridges, etc., have been let to the Union Contracting Co. (See Mississippi Roads, April 30, p. 961.)

Western Georgia.—Incorporated in Georgia, with $500,000 capitalization, to build from Aberdeen, Ga., west about 60 miles.

Railroad Financial News.

ATLANTA, BIRMINGHAM & ATLANTIC.—A second protective committee has been formed composed of E. S. Marston, Frederick Ayre, Samuel Carr and John I. Waterbury. The new committee is formed with a view to protect the interests of all classes of security holders.

BALTIMORE & OHIO.—See an article in regard to this company and the Cincinnati, Hamilton & Dayton in another column.

BOSTON & MAINE.—See an item about Boston's attitude toward Mr. Billard under General News.

CHICAGO & ALTON.—The $6,000,000 5 per cent. collateral trust notes of 1907 have been called for payment on July 1.

CHICAGO, ROCK ISLAND & PACIFIC.—See St. Louis, Brownsville & Mexico.

CINCINNATI, HAMILTON & DAYTON.—Judson Harmon, whose resignation as receiver has been accepted, effective May 1, has consented to continue to act as receiver until June 1. See an article in regard to this company and the Baltimore & Ohio in another column.

DENVER, NORTH WESTERN & PACIFIC.—Hallgarten & Co. and George H. Burr & Co., both of New York, have sold $4,000,000 6 per cent. notes of 1909-1911 of the Colorado-Utah Construction Co., guaranteed by D. H. Moffat, President of the Denver, North Western & Pacific. The notes are secured by the deposit of $8,000,000 first mortgage 4 per cent. bonds of the D., N. W. & P. See an item in regard to this company under General News.

ERIE.—The directors have accepted the conditions made by the New York Public Service Commission, Second district, in regard to an issue of $30,000,000 5 per cent. 30-year bonds. (April 23, page 912.)

GENEVA, CORNING & SOUTHERN.—Stockholders will vote May 29 on the question of approving a new lease of the company's property to the New York Central & Hudson River for the term of the corporate existence of the company, and also on a question of making a mortgage securing 4 per cent. bonds of the New York Central & Hudson River not to exceed $10,000,000. The proceeds of the bonds are to be used in adjusting present indebtedness, retiring outstanding bonds and making future betterments and extensions to the property of the G. C. & S.

KANSAS CITY SOUTHERN.—A special meeting of stockholders is to be held June 28 to authorize an issue of $21,000,000 5 per cent. bonds, of which it is planned to issue $10,000,000 at once. The proceeds are to be used to pay $5,100,000 notes maturing 1912 but callable on any interest date. The notes are to be called for payment July 1. The mortgage securing the $10,000,000 improvements bonds, $6,000,000 of which are deposited as collateral for the notes and the remaining $4,000,000 of which have never been issued, will be canceled. The proceeds of the new bonds above what is needed to pay off the notes are to be used for improvements, which will enable the road to handle to advantage the additional traffic expected to result from traffic agreements with the Union Pacific and the Southern Pacific.

NEW YORK CENTRAL & HUDSON RIVER.—See Geneva, Corning & Southern.

NEW YORK, NEW HAVEN & HARTFORD.—See an item about Boston's attitude toward Mr. Billard under General News.

ST. LOUIS, BROWNSVILLE & MEXICO.—Press despatches dated Chicago say that a special meeting of the directors has been called to arrange for the transfer of the property of the company to the Chicago, Rock Island & Pacific-St. Louis & San Francisco interests.

SOUTHERN RAILWAY.—J. P. Morgan & Co., New York, have bought $15,000,000 development and general mortgage 4 per cent. bonds, being the remainder of the $20,000,000 of these bonds originally pledged as collateral for convertible 6 per cent. notes due May 1, 1911, but callable in 1909. The notes are to be called for payment November 1, 1909.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Pennsylvania has ordered 24 electric locomotives, as mentioned in another column.

The International & Great Northern has ordered five 90-ton locomotives from the Baldwin Locomotive Works. These will be in service in about 60 days.

The Chesapeake & Ohio, previously reported as having ordered 35 locomotives from the American Locomotive Co., has increased this order to 50 locomotives.

The Temiskaming & Northern Ontario, reported in the *Railroad Age Gazette* of April 16 as being in the market for two 10-wheel passenger and four 10-wheel freight locomotives, has ordered this equipment from the Canadian Locomotive Co.

The Pennsylvania will build 44 new locomotives at its Juniata shops during 1909. These locomotives are additional to those reported in the *Railroad Age Gazette* of January 29. The present order includes 20 E-3-D passenger engines; 21 H-8-B freight engines and 3 B-8 switchers.

The Boston & Maine, as reported in the *Railroad Age Gazette* of April 30, has ordered 20 eight-wheel passenger, 20 mogul freight and 10 six-wheel switching locomotives from the American Locomotive Co.

General Dimensions.

	Eight-wheel.	Mogul.	Switching.
Weight on drivers	78,000 lbs.	122,800 lbs.	119,000 lbs.
Weight, total	119,000 "	142,400 "	119,000 "
Cylinders	18 in. x 24 in.	19 in. x 26 in.	19 in. x 24 in.
Diameter of drivers	69 in.	63 in.	51 in.
Boiler, type	Ext. wgn top, radial stay.	Ext. wgn top, radial stay.	Straight top, radial stay.
Boiler, wkg. stm. press.	190 lbs.	200 lbs.	160 lbs.
Heating surface, tubes.	1,613.5 sq. ft.	1,733.8 sq. ft.	1,480.4 sq. ft.
" " firebox	137.5 "	159.39 "	155.3 "
" " total	1,751.0 "	1,893.19 "	1,635.7 "
Tubes, number	262	286	259
" outside diam.	2 in.	2 in.	2 in.
" length	11 ft. 7½ in.	11 ft. 8 in.	11 ft.
" material	Charcoal iron.	Charcoal iron.	Charcoal iron.
" maker	Worth Bros.	Worth Bros.	Worth Bros.
Firebox, type	Narrow, above frames.	Narrow, above frames.	Narrow, betwn frames.
" length	90 in.	108 $\frac{3}{16}$ in.	102 $\frac{3}{16}$ in.
" width	41⅝ in.	40⅜ in.	32⅛ in.
" material	Steel.	Steel.	Steel.
" maker	Worth Bros.	Worth Bros.	Worth Bros.
Grate area	26 sq. ft.	30.2 sq. ft.	22.8 sq. ft.
Water capacity	4,000 gals.	5,000 gals.	4,000 gals.
Coal capacity	7 tons.	10 tons.	7 tons.

Special Equipment.

Axles	Carnegie Steel Co.
Boiler lagging	Ehret Mfg. Co.
Brakes	Westinghouse-American
Brake-beams	Buffalo
Brake-shoes	Am. Brake-Shoe & Fdry Co.
Couplers	Tower
Grease for driving boxes	Elvin
Headlight	F. O. Dewey Co.
Injector	Hancock, composite
Journal Bearings	Wm. A. Hardy & Sons
Piston and valve rod packings	Hayden Mfg. Co.
Safety valve	Ashton
Sanding devices	Hanlon
Springs	Railway Steel-Spring Co.
Steam gages	American
Tires	Midvale Steel Co.
Valve gear	Stephenson

The driving boxes of the eight-wheel and the mogul engines will be gun iron, made by the Hunt-Spiller Manufacturing Co., and those of the switchers will be made by the Atha Steel Castings Co. The eight-wheel and the switchers will have Detroit No. 21 sight feed lubricators. The eight-wheel and the switchers will have wheel centers made by the Atha Steel Castings Co., and those of the moguls will be steeled cast iron. The eight-wheel engines will be equipped with American balanced valves.

CAR BUILDING.

The Western Pacific is in the market for a number of passenger cars.

The Baltimore & Ohio is preparing specifications for a number of steel passenger cars.

The Northern Texas Traction Co., Ft. Worth, Tex., is in the market for 10 double-truck cars.

The Houston Electric Co., Houston, Tex., is reported in the market for 20 pay-as-you-enter cars.

The Central of New England, reported in the *Railroad Age Gazette* of April 30 as asking prices on six passenger cars, has given this order to the Wason Manufacturing Co.

The Pacific Electric Railway, Los Angeles, Cal., has ordered 50 thirty-ton side dump gondolas from the Hicks Locomotive & Car Works.

The Boston & Maine, previously reported as being in the market for 900 thirty-ton steel underframe box cars, has ordered 1,000 forty-ton drop-bottom steel coal cars from the Laconia Car Co.

The Salt Lake & Ogden (Electric), Salt Lake City, Utah, reported in the *Railroad Age Gazette* of April 30 as having ordered twelve 56-ft. cars, has ordered the trucks for these cars from the Baldwin Locomotive Works.

The Cleveland, Akron & Columbus 100 freight cars reported in the *Railroad Age Gazette* of February 5 as having been ordered from the Standard Steel Car Co., will have Kensington all-steel journal boxes manufactured by the Union Spring & Manufacturing Co., Pittsburgh, Pa.

The Pennsylvania 2,200 freight cars for the Lines West, reported in the *Railroad Age Gazette* of February 5 as having been ordered from the Cambria Steel Co., the Pressed Steel Car Co., the American Car & Foundry Co. and the Standard Steel Car Co., will have Kensington all-steel journal boxes manufactured by the Union Spring & Manufacturing Co., Pittsburgh, Pa.

The Chicago, Milwaukee & St. Paul, as reported in the *Railroad Age Gazette* of April 9, has ordered 67 passenger cars. These cars will be 10 ft. wide, 6 ft. 11 in. high from top of sill to bottom of plate, and 61 ft. long over end sills. The special equipment will include:

Bolsters, body	Cast steel
Brake-beams	Diamond special
Brake-shoes	Christie Congton
Brakes	Westinghouse
Couplers	Ohio
Draft rigging	Miner friction
Journal boxes	C., M. & St. P. standard
Side bearings	Hammered iron
Trucks	C., M. & St. P. standard
Curtain fixtures	Forsythe
Curtain material	Pantasote
Heating system	Vapor; Chicago Car Heating Co.
Varnish	Murphy
Vestibule	Pullman

IRON AND STEEL.

The St. Louis & Southwestern is in the market for about 7,000 tons of rails.

The Pennsylvania has ordered 5,400 tons of rails from the Carnegie Steel Co.

The Chesapeake & Ohio has ordered 8,000 tons of rails from the Illinois Steel Co.

The Gilmore & Pittsburg, building from Armstead, Mont., west to Salmon City, Idaho, has ordered 15,000 tons of open hearth rails from the Indiana Steel Co.

The Northern Pacific, reported in the *Railroad Age Gazette* of April 2 as being in the market for 5,000 tons of rails, has ordered this steel from the Illinois Steel Co.

The Denver & Rio Grande has ordered 600 tons of structural steel from the Richards-Noelke Co. This is for use on the Union passenger station at Salt Lake City, Utah.

The Pennsylvania Lines West, reported in the *Railroad Age Gazette* of April 23 as being in the market for structural steel for track elevation in Chicago, have ordered 1,100 tons from the Riter-Conley Construction Co.

General Conditions in Steel.—Indications are that a gradual improvement in steel is taking place although recent reports of orders and production have undoubtedly been exaggerated. It is understood that the United States Steel Corporation has decided upon a policy as to future prices and that no effort will be made to force quotations above their present level for some time to come. The prevailing price for steel bars will probably be $1.15 per 100 lbs., and $1.25 for shapes and plates. The lowest quotation since the change in price policy was $1.05 per 100 lbs. for steel bars and $1 for structural shapes. There has been a great deal of talk about cutting wages, but actual results show that this has been confined to a few independent companies. A despatch from Chicago says that the sales department of the Illinois Steel Company reports the Gary plant running below 50 per cent. of its capacity.

RAILROAD STRUCTURES.

Asheville, N. C.—See Southern Railway under Railroad Construction.

Chicago, Ill.—The Chicago River & Indiana will build a freight warehouse 100 ft. x 800 ft.

Fort Worth, Tex.—The Texas & Pacific has purchased equipment for a coaling station to be erected within 80 days. It will be located on the site of the old coal chutes destroyed by fire recently. The cost of the equipment will be about $30,000. (April 23, p. 921.)

Galveston, Tex.—Sealed proposals in duplicate will be received at the office of John M. Murch, Auditor of Galveston county, Tex., until June 28, 1909, for building a causeway across Galveston Bay between Galveston Island and Virginia Point. Proposals will be received for the causeway in its entirety or for any of the three sections, which include the arch bridge, the lift bridge and the roadway.

The entire causeway will be 10,642 ft. long. The arch bridge will be 2,472 ft. long; the lift bridge will have a clear span of 100 ft. and the roadway will be about 8,170 ft. long.

The plans and specifications may be seen and forms of proposals and contracts may be obtained at the offices of the County Engineer or County Auditor of Galveston county. Plans and specifications may also be seen at the offices of the Chief Engineer of the G. C. & S. F. at Galveston, Tex.; Bridge Engineer of the G. H. & S. A. at Houston, Tex.; Bridge Engineer of the A., T. & S. F. at Chicago; Stone & Webster, Boston, Mass., and the Concrete-Steel Engineering Co., Park Row building, New York. (July 31, page 641.)

Havre de Grace, Md.—Bids have been asked by the Pennsylvania Railroad for building a 300-ft. span and all other work necessary to improve the condition of the bridge over the Susquehanna river. The company has appropriated $95,000 for this work, which is to be completed by October 1.

Port Arthur, Tex.—The Gulf & Interstate has contracted for a wharf shed to be built, costing about $50,000.

Quanah, Tex.—See Quanah, Acme & Pacific under Railroad Construction.

Steubenville, Ohio.—The Wheeling & Lake Erie will build a new freight station.

Taylor, Tex.—The International & Great Northern has commenced work on its new roundhouse and shops. (Feb. 19, p. 383.)

Winnipeg, Man.—The Grand Trunk Pacific has given a contract to Haney, Quinlan & Robertson, contractors, for the substructure, and to the Dominion Bridge Co. for the superstructure of the proposed bridge over the Red river. The contract price for the sub-structure is $265,000 and for the superstructure $240,000. (May 6, p. 328.)

SIGNALING.

The Opelousas, Gulf & North Eastern has let a contract to the General Railway Signal Company for a mechanical interlocking plant at Rayne, La., where its line crosses the Southern Pacific. There will be a 28-lever Saxby & Farmer machine with 23 working levers. All home signals, including dwarfs, will be pipe-connected. On the O., G. & N. E. distant signals will be operated by electric motors, model 5, of the General Railway Signal Co.; on the Southern Pacific they will be style B, of the Union Switch & Signal Co. All signals will be two-position 60 deg. indicating in the lower right-hand quadrant. Electric detector, route and indication locking will be provided and no detector bars will be used. The General Railway Signal Co. will install the plant.

Supply Trade News.

The Jones Car Door Co., Chicago, has moved its offices to 1112-1113 Monadnock block.

The Ohio Seamless Tube Co., Shelby, Ohio, has commenced operating its new plant at Shelby. It is planned to produce 1,000 tons of steel tubes a month. (Feb. 12, p. 336.)

Charles L. Harris has been elected Third Vice-President of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo. Mr. Harris will also be Sales Manager, with office in St. Louis.

Muralt & Co., New York, have opened a branch office in the Temple Court building, Toronto, Ont. J. Engh, who has been connected with the firm for many years, will be in charge as Manager.

The Independent Pneumatic Tool Co., Chicago, has moved to its new building at 1307 Michigan avenue, where it will have larger space and better facilities for taking care of business.

The repair shop of the Crocker-Wheeler Co., Ampere, N. J., has been placed in charge of Edmund Lang, who for five years held an executive position with the Wheeler Condenser & Engineering Co.

The Pilliod Co., Swanton, Ohio, has been incorporated with $100,000 capital stock to make locomotive valve gears. The incorporators are Frederick E. Pilliod, John W. Crisman, Abner D. Baker, George P. Hahn and Sigmund Sanger.

The Chicago office of Peter Gray & Sons, Inc., Boston, Mass., has been moved to 303 Great Northern building, where a full line of samples of switch, semaphore and service lamps will be carried. The stock room will be at 57 Plymouth place.

The Federal Creosoting Co., Indianapolis, Ind., has been incorporated to engage in the business of creosoting railway ties. It has a capital stock of $250,000. The incorporators are Alvin T. Hert, Richard V. Cook and Harry W. Griffith.

The Lackawanna Bridge Co., Buffalo, N. Y., has been incorporated with $500,000 capital stock. The incorporators are Beverly L. Worden, Fordyce H. Bottom, Frank R. Bacon and Jacob E. Friend, of Milwaukee, Wis., and Ralph A. Kellogg, of Buffalo, N. Y.

Kensington all-steel journal boxes, made by the Union Spring & Manufacturing Co., Pittsburgh, Pa., have been specified for 2,200 freight cars recently ordered by the Pennsylvania Lines West and for 100 freight cars ordered by the Cleveland, Akron & Columbus.

The New York office of the Detroit Graphite Co., Detroit, Mich., has been moved to 135 Broadway, corner of Cedar street, where larger offices have been secured. In addition to the "Superior" graphite paint for steel, the company is manufacturing a complete line of durable colors for use on either wood or metal, to stand exposure and hard service.

The Northwestern Expanded Metal Co., Chicago, has discarded the method of designating expanded metal by mesh, gage and width of strand. It lacked flexibility, and, being confusing, led to mistakes. Hereafter prominence will be given to areas and weights, thus making expanded metal directly comparable with other forms of reinforcing material. The change is made for the convenience of customers and it is hoped that the use of words such as "regular" and "standard" will be discontinued.

The Cardwell Manufacturing Co., Chicago, announces that it has transferred its draft gear business to the Union Draft Gear Co., of which J. R. Cardwell is President, effective April 1, 1909. All orders for the Cardwell friction draft gear and all correspondence relative thereto should hereafter be addressed to the Union Draft Gear Co., Monadnock block, Chicago. The Union company, besides taking over the draft gear business of the Cardwell company, will make and sell other improved types of friction and spring draft gear appliances.

The Williams Boltless Rail Joint Manufacturing Co. has closed a deal whereby the manufacture and selling of its boltless rail joint, together with the Twentieth Century steel tie and the Oldham automatic car seal, has been taken over by Cortlandt F. Ames, of Chicago, who has been identified with the railway supply trade for a number of years. Emil Meyer, Assistant General Manager of the Williams company, will remain with Mr. Ames, who has moved his office from the Great Northern building to room 503 Manhattan building, Chicago.

The Westinghouse Machine Co., Pittsburgh, Pa., reports another very satisfactory month during April. The company received contracts averaging, in the turbine department alone, about one machine per day, some of them, like those for the San Francisco Electric Co., for 25,000 h.p., representing the largest of that type that have ever been made. Besides the turbine business, the demand for gas engines and reciprocating steam engines has also increased, while the new gas producer, which the company recently brought out, has opened a new line of inquiries that look exceedingly promising.

The Case Manufacturing Co., Columbus, Ohio, has changed its name to the Case Crane Co. The personnel of the company has not been changed and the manufacture of cranes, hoists, grab bucket machines, etc., will be continued. The company reports a satisfactory increase in its business during the last three months. Among recent shipments made are the following: One 15-ton bucket crane to the Cairo & St. Louis Railway, at Cairo, Ill.; three 40-ton cranes to the New York Edison Co., New York; three to the Commonwealth Edison Co., Chicago, and one 30-ton crane to the Cincinnati Traction Co.

The Climax Railway Supply Co., Canton, Ohio, the incorporation of which was announced in the *Railroad Age Gazette* of April 30, is a reorganization of the Climax Stock Guard Co., Chicago, and has taken over the selling agencies of several concerns. It is the exclusive representative in central territory of the Bonney-Vehslage Tool Co., New York, which manufactures a complete line of conductors' ticket punches. It is also agent for the Durand steel clothes locker and handles a full line of wheelbarrows, baggage wagons, trucks, shop, locomotive and push brooms, tie plugs, car journal packing, etc. The general sales office is at 570 Old Colony building, Chicago. The factory and general offices are at Canton, Ohio. The officers of the company are: President, H. B. Stewart; Vice-President, Howard P. Fulton; Secretary-Treasurer, William Simpson; General Manager, Fred V. Stewart.

Among orders recently received by the Philadelphia plant of the Link-Belt Company, Philadelphia, Pa., are the following: Cuba—Coal and ashes handling machinery for iron works; four gravity discharge elevators; miscellaneous elevating and conveying machinery for handling sugar; bituminous coal handling machinery. Florida—Elevators, conveyors and miscellaneous machinery for handling phosphate rock. New Jersey—Locomotive coaling station; machinery for handling linoleum batch; coaling chutes for retail coal pocket. New York—Retail coal pocket outfit; industrial system; coal handling machinery for railway. Nova Scotia—Ashes handling machinery; screening apparatus. Pennsylvania—Barrel elevator for brewery; slat conveyor for handling boxes; two gravel conveyors; elevators for handling large bales; miscellaneous tray elevator machinery; coal handling machinery for water-works.

TRADE PUBLICATIONS.

Anniversary Medal.—The Samson Cordage Works, Boston, Mass., is mailing a card which carries a small medal, which bears the dates of 1884 and 1909. The former date is that of the incorporation of the company.

Derailers.—Catalogue 101 of The Hobart-Allfree Co., Chicago, describes Smyth and Freeland clamp derailers. Halftone illustrations show the application, and there are suggestions for installing the derailers.

Coal and Ore Handling Machinery.—The C. W. Hunt Co., New York, has just issued catalogue No. 091, which is gotten out as an engineers' edition. The catalogue contains a large number of illustrations showing installations of coal and ore handling machinery in railway yards, coal docks, coal yards, etc.

Locomotive Boiler Tubes.—A folder distributed by the Detroit Seamless Steel Tube Co., Detroit Mich., presents "an object lesson in quality." It shows micro-photographs of common lap-welded steel pipe, a lap-welded locomotive flue and a Detroit seamless cold-drawn open-hearth steel locomotive flue, to illustrate the difference in density.

Chicago, Milwaukee & St. Paul.—A "Homeseekers' Excursion" poster has been received from this company. The fertility of the soil of Montana and other states of the Northwest through which the Coast Extension passes is pictured as being so remarkable that the farmer's plow in overturning the sod leaves a furrow of golden coin behind it. Homeseekers' rates to points in these states from eastern points along the line are listed on the poster.

Steam Shovels, Locomotive Cranes, Etc.—The Browning Engineering Co., Cleveland, Ohio, has issued a number of bulletins describing the various heavy railway construction tools which it manufactures, including: Bulletin No. 31 on the Browning lifting magnet; Bulletin No. 33 on revolving steam shovels; Bulletin No. 34 on automatic buckets; Bulletin No. 35 on locomotive cranes; Bulletin No. 36 on the Browning railway ditcher, and Bulletin No. 37 on scraper bucket excavators.

Mining Machinery, Electrical Equipment, Etc.—General Catalogue No. 60, which has been issued by Fairbanks, Morse & Co., Chicago, is the first general catalogue covering the majority of its lines that has ever been issued by this company. There has been included in it a great deal of information about the mining machinery and equipment which this concern makes. Special attention has been given to its electrical mine equipment for either alternating or direct-current. A large amount of space is also given to the various devices which are made especially for the railway trade. The volume contains 656 pages and is very completely indexed so that intending purchasers may readily find illustrated descriptions of any devices handled by this company that they may be seeking.

Car Lighting and Heating.—The Safety Car Heating & Lighting Co., New York, has just issued a very unique and comprehensive catalogue which is up-to-date in every way, in loose leaf form and contained in a handsome post binder. Several innovations are introduced in compiling the book, in that materials of like nature are gathered in separate sections: for instance, application of the Pintsch gas lighting apparatus, fittings, broilers, glassware, reflectors and electric bulbs, Pintsch flat flame lamps and Pintsch inverted mantle lamps. A complete line of artistic and adaptable single mantle lamps suitable for all classes of cars are illustrated in section H, which embodies both the elevations and sections of the lamps.

Among the devices which have been given special attention are the Axle Dynamo electric lighting system and the Thermo Jet system of heating. The Axle Dynamo electric lighting system (Section K) has been brought to its present state of efficiency after 16 years' experience with this form of car lighting and the equipment now offered for sale is said to embody all that makes for efficiency, reliability and economy in an equipment of this character. These equipments have performed excellent service on the Kansas City Southern, St. Louis Southwestern, Pennsylvania, Chicago, Rock Island & Pacific, Grand Trunk and New York, Chicago & St. Louis railways, and within the past few months orders have been booked for 70 equipments for the new Rock Island cars, 10 for Pullman cars, and 3 for Northern Pacific Railway cars. Many designs of electric fixtures are covered by section J. Section B not only treats of the Thermo Jet system, but also contains detailed descriptions and illustrations of the company's controllable direct steam and hot water systems, with accurate sectional cuts of the apparatus, such as jackets, automatic traps, regulating valves, end train pipe valves and fittings, specially adapted for the requirements. The Safety company's absolutely steam-tight couplers are considered in an equally complete way in section A.

Supply Men's Delegation.

The following are among those who composed the delegation of supply men which went to Springfield, Ill., last week. An account of this appears in another column.

George A. Post, President, Standard Coupler Co., New York.
A. H. Mulliken, President, Pettibone, Mulliken & Co., Chicago.
Rudolph Ortmann, President, Ajax Forge Co., Chicago.
Ward W. Willits, President, Adams & Westlake Co., Chicago.
F. B. Bradley, Vice-President, Ajax Forge Co., Chicago.
John M. Sellers, Vice-President, Sellers Manufacturing Co., Chicago.
James Viles, President, Buda Foundry & Manufacturing Co., Chicago.
J. G. Osgood, Chicago Pneumatic Tool Co., Chicago.
W. E. Clow, President, John B. Clow & Sons.
Robert F. Carr, President, Dearborn Drug & Chemical Wks., Chicago
Walter E. Miller, Vice-President, Fairbanks, Morse & Co., Chicago
I. T. Hartz, President, Morden Frog & Crossing Works, Chicago.
W. L. Brown, Pickands, Brown & Co.
Henry S. Hawley, President, Railroad Supply Co., Chicago.
A. B. Scully, President, Scully Steel & Iron Co., Chicago.
Guilford S. Wood, Chicago.
L. L. Barth, Vice-President, Edward Hines Lumber Co., Chicago.
A. A. Sprague, 2d Director, Sprague, Warner & Co., Chicago.
J. J. Dau, Vice-President, Reid, Murdock & Co., Chicago.
J. B. Lord, President, Ayer & Lord Tie Co., Chicago.
G. V. Dickinson, Secretary, Elgin National Watch Co.
F. L. Wells, President, General Railway Supply Co., Chicago.
Joseph B. Terbell, Vice-President, American Brake Shoe & Foundry Co., Mahwah, N. J.
J. H. Whiting, President, Whiting F'dry Equipm't Co., Harvey, Ill.
P. F. Griffin, Vice-President Griffin Wheel Co., Chicago.
D. P. Donelson, President, Continental Bolt & Iron Works.
W. Morava, President, Morava Construction Co.
Horace Horton, President, Chicago Bridge & Iron Works, Chicago.
J. C. Kenny, Western Electric Co., Chicago.
W. P. Elliott, Jr., Vice-President, Pneumatic Gate Co., Chicago.
A. C. Moore, Manager, Safety Car Heating & L't'g Co., New York.
Severn P. Ker Vice-President, Republic Iron & Steel Co., Pittsburgh.
T. J. Hyman, Secretary, Illinois Steel Co., Chicago.
W. L. DeRemer, Vice-President, Spencer Otis Co., Chicago.
W. M. Turner, Director, Chicago Varnish Co., Chicago.
W. J. Spencer, Monmouth Coal Co.
Theodore Geissmann, Theodore Geissmann Co.
W. P. Rend, President, W. P. Rend & Co.
E. B. Leigh, President, Chicago Railway Equipment Co., Chicago.
Louis Benjamin, Vice-President, Block Pollak Iron Co., Chicago.
Frank Matthieson, Columbia Tool Steel Co.
Mark Ross, President, Pyle-National Electric Headlight Co., Chicago.
C. M. Baker, Murphy Varnish Co., Newark, N. J.
A. J. Babcock, Manning, Maxwell & Moore, Inc., New York.
L. O. Goddard, President, Star Coal Co.
H. B. Clow, President, Rand, McNally & Co., Chicago.
Egbert H. Gold, President, Chicago Car Heating Co., Chicago.
Edward P. Bailey, General Manager, National Malleable Castings Co., Cleveland, Ohio.
G. A. Berry, Vice-President, Hicks Locomotive & Car Works, Chicago.
Frank L. Holmes, A. C. Forbes & Co.
Geo. A. Ditewig, President, Maplewood Colliery Co.
R. H. Soller, Centralia Coal Co.
Frederick K. Maus, President, Kelley, Maus & Co., Chicago.
E. W. Heath, General Manager, Heath & Milligan Mfg. Co., Chicago.
W. White, President, National Boiler Washing Co., Chicago.
W. H. Whiteside, President, Allis-Chalmers Co., Milwaukee, Wis.
W. C. Winter, Pettibone, Mulliken & Co., Chicago.
August Ziesing, President, American Bridge Co., New York.
W. H. Forsyth, Secretary, Curtain Supply Co., Chicago.
George Mehring, Vice-President, L. H. Prentice Co.
Charles Dyer, Vice-President, Rodger Ballast Car Co., Chicago.
W. S. Carr, Secretary and Treasurer, McMaster Car Supply Co.
J. W. Motherwell, Manager, Ashton Valve Co., Boston, Mass.
C. L. Kennicott, President, Kennicott Water Softener Co., Chicago Heights, Ill.
E. L. Adreon, Jr., Vice-President and General Manager, American Brake Shoe & Foundry Co., Mahwah, N. J.
W. A. Smith, President, *Railway & Engineering Review*.
Martin Dunn, Managing Editor, *Railway Record*.
Samuel O. Dunn, Western Editorial Manager, *Railroad Age Gazette*.
L. B. Sherman, Western Manager, *Railroad Age Gazette*.
W. H. Elliott, Sec'y, Elliott Frog & Switch Co., East St. Louis, Ill.
F. E. Nulsen, Pres., Missouri Mall. Iron Works, East St. Louis, Ill.
Geo. Howard, Commonwealth Steel Co., St. Louis, Mo.
E. T. Vaughn, Standard Railway Equipment Co., St. Louis, Mo.
Mr. Pennington, Curtis Motor Truck Co., Decatur, Ill.
George R. Carr, Vice-Pres., Dearborn Drug & Chemical Wks., Chicago.
James McNally, Vice-President, Rand, McNally & Co., Chicago.
R. W. Crawford, President, Crawford Locomotive & Car Co.
Chas. A. Mason, Secretary, Pneumatic Gate Co., Chicago.
M. J. Trees, Chicago Bridge & Iron Works, Chicago.

CLASSIFIED ADVERTISEMENTS AND PROPOSALS

Undisplayed advertisements are inserted at two cents a word for first insertion and one cent a word for each consecutive insertion of same advertisement. Minimum charge, 50 cents. Proposals are inserted at twenty cents a nonpareil line per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

POSITIONS WANTED.

TECHNICAL GRADUATE, four years' experience railway location and construction, wants position as transitman, resident engineer or better. References. Address "T. G.," care *Railroad Age Gazette*, 81 Fulton St., New York.

MECHANICAL draftsman, seven years' experience in motive power and mechanical departments, now in charge of mechanical department, would like similar position or as locomotive draftsman; references. Address Box 269, care *Railroad Age Gazette*, 83 Fulton St., New York.

FIRST CLASS maintenance engineer open to engagement; graduate C.E., M Am. Soc. C. E.; 20 years' experience on best roads; practical trackman; experienced in construction, maintenance, operation, organization and economy; best references. Address Box 255, care *Railroad Age Gazette*, 81 Fulton St., New York.

SALESMAN, well acquainted with the railroad supply trade and particularly with the manufacture and sale of car wheels, wants to change his position. Address Box 259, care *Railroad Age Gazette*, 81 Fulton St., N. Y.

SINGLE man, 34, experienced as salesman, buyer, office work, correspondence, chief clerk 12 years' experience in railway, mine, mill, contractors, boiler, structural, supplies and specialties machinery, pneumatic appliances. Best references. Address Box 266, *Railroad Age Gazette*, 81 Fulton St., New York City.

POSITIONS WANTED.

THE chief of the statistical department of the president's office of a large eastern railroad, solicits through this method a proposition for a permanent connection with a responsible road in the western, central or New England States (except Maine) in any department where a man of executive ability and over ten years' experience will count. Applicant is young man, good personality and character. Would consider a "live" proposition from a manufacturing or selling corporation to act as representative. Have had five years' experience as general sales manager large brokerage house dealing with railroads. Address, with confidence, "Initiative," care *Railroad Age Gazette*.

POSITION as resident or assistant engineer on maintenance or construction, by young man, 26; university graduate; five years' experience on maintenance and construction, bridges, wharfs and concrete work; excellent draftsman; salary, $110; location, south or east. Address Box 271, care *Railroad Age Gazette*, 81 Fulton St., New York.

YOUNG man, 26; married; eight years' varied experience in operating department as chief clerk and expert stenographer, desires similar position or as confidential man with railroad, manufacturing concern or public service corporation; best references. Address Box 262, care *Railroad Age Gazette*, 83 Fulton St., New York City.

POSITIONS OPEN.

YOUNG man, 25 to 30, wanted by established railway supply company. Must have mechanical training, preferably with railroad. Good chances for advancement. State all particulars, whether married or single, and salary expected. Address Box 267, *Railroad Age Gazette*, 83 Fulton St., New York City.

MISCELLANEOUS WANTS.

I WANT to communicate with a live steel mill or railroad business man who has capital or can get it, to market an improved tie plate. A strictly first class commercial article with broad patent protection; will stand fullest investigation. For full details and information address Box 270, care *Railroad Age Gazette*, 81 Fulton St., New York.

PROPOSALS.

PROPOSALS will be received from contractor able to finance the completion of several short connecting lines, already graded. Suitable underwriting and endorsement will be loaned to assist the finance. Plan contemplates the completion of 25-mile sections and a total of 250 miles of road, in a community where ties are plentiful, and accessible to the metal markets. The bonds are underwritten. Proposition ready for immediate action, and will not require much capital. Nothing but a general proposal will be considered. Address "Utilities Consolidation," care *Railroad Age Gazette*, 83 Fulton St., New York City.

BOOKS AND PUBLICATIONS.

SIGNAL DICTIONARY. New edition now ready. This important work of reference was edited by the authority and under the supervision of a committee of the Railway Signal Association. The definition of all terms and name of every detail part used in signaling refer in each case to the drawings. These drawings, many thousand in number, include under Block signals the Manual or Telegraph block, the Controlled Manual, the Train Staff, the Automatic block and signals for electric roads, together with detailed drawings of track circuits and all parts used. All details of Mechanical and Power Interlocking are fully illustrated and treated. Full morocco binding. Sent prepaid upon receipt of price, $6.00. Send for descriptive circular. *Railroad Age Gazette*, 83 Fulton St., New York City.

LOCOMOTIVE DICTIONARY. (New 1906). Published by authority of the American Railway Master Mechanics' Association under the supervision of a committee of its members. It is an illustrated vocabulary of terms which designate American railroad locomotives, their parts, attachments and details of construction, with definitions and illustrations of typical British locomotive practice. 5,148 illustrations showing general views and detail drawings of all types of modern American and British locomotives, including details of their parts and fittings. An absolute necessity to anyone engaged in designing, building, repairing or handling locomotives. Full morocco binding. 637 pages. Sent prepaid in United States upon receipt of price, $6.00. Write for descriptive circular. *Railroad Age Gazette*, 83 Fulton St., New York City.

"WANTED" AND "FOR SALE" ADVERTISEMENTS

Displayed advertisements are inserted under this heading at the uniform rate of $1.50 an inch (1 inch deep by 1⅝ inches wide) per insertion. Replies directed in care of "Railroad Age Gazette" are forwarded without extra charge to any address in the United States, Canada or Mexico. Advertisements received at 83 Fulton Street, New York, by 9 A. M. Monday will appear in the issue for the same week.

FOR SALE CHEAP!
68 good second-hand bridges
Specifications and Blue Prints on application
One 19x24, 10-wheel locomotive.
Five 18x24 Mogul locomotives.
One 17x24 eight-wheel locomotive.
One 19x24 six-wheel switcher.
Fifteen splendid flat cars.
F. A. JOHANN
1624 Pierce Bldg., St. Louis, Mo.

Locomotives, Cars, Steam Shovels, Relaying Rails, New Industrial Track and Equipment.
C. A. RALSTON
702 Fisher Bldg., Chicago

A 25-Word Classified Ad Three Consecutive Times for a Dollar

No charge is made for the address.
Send order with remittance direct to

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83 FULTON STREET NEW YORK CITY

RELIABLE REBUILT EQUIPMENT
Bought and Sold.
2 10-Wheelers, New Fire Boxes 1 20 x 24 Consolidations, New Fire Boxes
100 60,000 and 80,000-Cap. Hopper Bottom Gondolas
Box, Refrigerator Cars, Etc. 1 95-ton. Bucyrus; 2 Model 60 Marions.
Eastern Office: Philadelphia, Pa. 916-17 Penna. Bldg. P. B. Warner, Sec.-Treas.
The Cincinnati Equipment Co.
Cincinnati, O.
Chicago Office: 1801-2 Gt. No. Bldg. F. A. Peckham Sales Manager

IMMEDIATE SHIPMENT

THOROUGHLY REPAIRED

SEVEN 80-TON MOGULS
SEVEN 50-TON SWITCHERS
FIVE 55-TON TEN WHEELERS
200 30-TON FLAT CARS

ATLANTIC EQUIPMENT COMPANY
Railway Exchange, Chicago 30 Church Street, New York

Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

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W. H. BOARDMAN, *President and Editor*.
E. A. SIMMONS, *Vice-President*. RAY MORRIS, *Sec'y and Man'g Editor*.
R. S. CHISOLM, *Treasurer*.
The address of the company is the address of the officers.

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CONTENTS

Largely through the efforts of the executive committee of the Merchants' Association of New York, the finance committee of the United States Senate, upon the suggestion of Senator Aldrich, has conceded the substance of the request for a tariff commission and has reported an amendment to the proposed tariff bill, which vests in the President ample authority to create an advisory board to collect information which will be useful to Congress in tariff legislation. The clause does not provide for any salaries for this commission, but assurance has been given that adequate funds will be provided. The ridiculous spectacle now being afforded at Washington of the way a great nation goes about its tariff revision brings new weight to the argument for a tariff commission, which was published in the *Railroad Age Gazette* January 15, 1909. We said at that time that adjustment and the rumor of adjustment were alike damaging to all conservative business, and that more especially was this true when the adjustment was expected to follow a series of rather irregular hearings in which a number of frankly selfish witnesses argued before a committee which was trying to do the work of years in a few weeks and had to deal with many absurd conflicts of testimony. We suggested at that time that a tariff commission containing not to exceed five members be created, tenure of office to be during life or good behavior; that this commission be given authority to conduct such investigations and hold such hearings as it might deem necessary and to report to Congress such changes in the tariff as might appear to it desirable during the congressional session of 1911 and thence biennially. The Aldrich amendment now makes it possible for the President to create such a commission without more formality, and adds point to our suggestion that this commission be composed of two broad-gage business men, two economists of the type of Charles Francis Adams, and one federal judge; that the commissioners devote their whole time to the task before them and receive salaries commensurate with the importance of their work. The time is ripe for those of our readers who agree with us to write to their representatives in Congress about it.

The *Railroad Age Gazette's* rule for the prevention of collisions is the rigid enforcement of the block system. This, we suppose, is fairly well known. Furthermore, if the editor were to set up as a doctor he might reasonably ask that only actual cases of sickness be brought to him for consideration. Neither doctors nor magistrates can spend time on imaginary ills. However, the editor feels a lively sympathy with train despatchers, and therefore he takes pleasure in printing the following letter from a despatcher in Arkansas:

Please give your ruling on the following question under standard rules, on single track:

If No. 7's schedule is 60 miles an hour and Extra 4 gets an order to run ahead of No. 7 from A to B, how fast should No. 7 run from A to B? (2) If Extra 4 made No. 7's schedule and No. 7 should hit rear end while Extra 4 was running, who would be at fault? (3) If Extra 4 did not make 7's schedule, and 7 hit them, who would be at fault? There is no speed limit on extras.

Question 1.—The rule under Form B in the standard code requires that No. 7 shall run no faster than the extra. If there is no rule fixing a speed for extra 4 the conductor and engineman of No. 7 would have to ask the despatcher to fix a minimum limit for No. 4. If no block system is in force an order of the kind referred to would imply the maintenance, at stations reasonably near together, of a time interval, of suitable length as related to the speed of trains.

Question 2.—Assuming, as our correspondent seems to assume, that the extra made a mile a minute continuously, the collision could not occur unless No. 7 were to run faster than the rule allows, for which excessive speed the conductor and engineman of No. 7 would be responsible. If No. 7 should pass a station within less than the prescribed time interval, the man in charge of the station would also be responsible unless he took all possible means to stop the train.

Question 3.—As No. 7 is bound to limit its speed to that of the extra, the conductor and engineman of the extra have no duty to consider No. 7's schedule; they have the right to assume that, however low their speed, No. 7 will be run equally slow; they have simply to obey rule 99. This requires them to send a flagman back the moment they are delayed sufficiently to make it possible that No. 7 "may" overtake them. The question just how much time it is safe to lose before sending the man back depends on the speeds, on the length of the time interval that is required to be maintained between trains at stations, on the distances between stations, and on the degree of strictness with which the speed of trains generally is kept within the limits prescribed by the rules. As, in addition to this last point, all the men concerned are likely to take into consideration the personal peculiarities of the engineman—in other words, are likely to guess whether such and such a one will or will not run faster or slower than he ought to—the use of such orders as the one here referred to

cannot be regarded as safe except where all of the conditions above suggested are fulfilled and where the prescribed time interval is of ample length. If we were called upon to prescribe this interval we should begin with, say, 30 minutes. If stations were close together and trainmen and stationmen were all tried and careful employees we might reduce it. On most American roads, however, experience has shown that, long before the time interval has been made short enough to be satisfactory to yard masters and to other officers who wish to start every train in a hurry, the officer fixing the interval finds himself confronted with many dangers, seen and unseen; so that, if he be wise, he concludes to adopt the space interval instead. The space interval is the only rational regulation for safeguarding trains against collisions. Train orders like that here brought up can never be made reasonably safe.

TRANSCONTINENTAL FREIGHT RATES.

The transcontinental freight rate system long has been the object of constant and severe criticism. Recently it has been attacked with unusual vigor and bitterness from several sources and on a number of grounds. As a result of the decision of the Interstate Commerce Commission in the Spokane rate case, and in deference to public opinion, the traffic officers of the Harriman and Hill lines have undertaken a complete readjustment of the entire scheme of freight rates charged by them. The public has little idea of what this means. So mighty a work seldom has been attempted by traffic managers anywhere.

The transcontinental rate system is attacked on three main grounds: (1) It is said that it is unjustly discriminatory because the rates charged from the Missouri river and points farther east to points on the Pacific coast are lower than the rates charged for the shorter hauls from the East to intermediate points such as Spokane, Salt Lake City, Ogden and Denver. (2) It is charged that transcontinental rates are fixed by agreements and combinations between the carriers that are in violation of the Sherman anti-trust act, and it is reported that the Attorney-General of the United States may start prosecutions to break up the alleged unlawful combinations in addition to the suit already in progress against the Harriman lines. (3) The Interstate Commerce Commission held in the Spokane rate case that the rates to Spokane are exorbitant *per se*, and by implication that they are excessive *per se* to other intermediate points, because they yield to the carriers' excessive profits.

It will be worth while to mention some of the obstacles—certain of them, it is to be feared, insurmountable—that the carriers will meet in trying to make a readjustment that will not be subject to all these or juster criticisms.

It is indisputable that the so-called "intermediate" points are discriminated against. But the slightest reasonable consideration will show that this is not due, as is often implied and sometimes charged, to a deliberate determination by railway men to build up the commercial centers on the coast at the expense of those inland. They are not engaged in selling goods at San Francisco, Portland or Seattle, or shipping them there. They are engaged in hauling them there. They have no such affection for the business men on the coast or dislike for those at inland points that they desire to render the former greater services than they render to the latter for less money. It costs the railways more to haul goods from the East to the Pacific coast than to intermediate points. The traffic managers are working for the railways, and not for the business men of the Pacific coast. As rational human beings, therefore, they naturally would exact higher rates for the more costly service to the coast than for the less costly service to inland points if they could get them. Since they accept lower rates for the more costly service there must be some condition which they at least think forces them to do so. That condition, of course, is water competition. The roads always have made lower rates from the East to the Pacific coast than to inland communities, not because they wanted to, but because it was thought that if they did not the business men on the coast would have their goods shipped by water and the roads would not get to haul them at any rate, high or low.

It is said, however, that if there ever was justification for this method of making rates it no longer exists. The popular opinion, and the attitude of many shippers, is reflected in an article by Charles Edward Russell, in *Hampton's Magazine* for May, in which the idea is ridiculed that water competition to the Pacific coast is still controlling. We commend this article to those who desire to find all the ignorance, prejudice and mendacity on the subject concentrated into a few lurid but not luminous pages. As a matter of fact, water competition is still not only controlling, but increasing. Formerly most of the goods moving from the East to the Pacific coast by water were carried in sailing vessels that went around Cape Horn or through the Straits of Magellan, and took 175 to 200 days for the trip. But in 1900 the American-Hawaiian Steamship Company put on a service of steamships from New York via the straits of Magellan, and the testimony in the Spokane rate case showed that in 1906 this company carried 115,000 tons of freight from New York to the Pacific coast. The average time made was 60 days; the commodities carried included goods of a wide variety that originated in large quantities at points as far west as Pittsburgh and Buffalo, and the rates charged were substantially less than the all-rail rates from the East to the Pacific coast. In 1907 the American-Hawaiian line inaugurated a route consisting of water carriage from New York to Coatzacoalcos, Mexico, of rail carriage from thence across Mexico to Salina Cruz, a distance of 193 miles, via the Tehuantepec National Railroad, and thence by water to Pacific coast destinations. The time by this route from New York to San Francisco is 25 days, to Portland 35 days and to Seattle 40 days. The rates are 20 to 60 per cent. less than the all-rail rates. The traffic manager of the steamship company estimated that he would be able from the start to handle 250,000 tons of freight per annum, and as the route is known to have done a big and growing business ever since it was opened, no doubt his expectation has been realized. In addition, a considerable tonnage moves in tramp vessels, the amount in 1906 being estimated at 25,000 tons. Now, of course, the total amount of traffic moving to the Pacific coast by water is but a small percentage of the amount moving by rail. But if the roads did not so adjust their rates as to meet this competition it unquestionably would grow fast even under present conditions on the water, and would rapidly attain such proportions as it already has on the Great Lakes, on which one-third of the total freight tonnage of the country is handled. There seems no escape from the conclusion which the Interstate Commerce Commission stated in the following language in its recent decision in the Spokane rate case: "It cannot be denied, in view of these uncontroverted facts, that water competition does exist and that it produces a *controlling effect* upon rates to the Pacific coast from many eastern destinations."

Conceding that water competition from the eastern seaboard, and even from points as far west of the Atlantic as Pittsburgh and Buffalo, is controlling to the Pacific coast, what good reason, it may be asked, is there why rates from places as far from the Atlantic ocean as Chicago and St. Paul should be lower to the Pacific coast than to intermediate cities? Perhaps this adjustment cannot be defended successfully as to all commodities to which it is now applied, but it is not hard to say why it exists. It is due to commercial as well as to transportation competition. Take, for example, the rates on steel and iron products. These commodities are manufactured at Pittsburgh and at points farther east, and also in the Chicago district. Water competition forces a lower rate from eastern points to the Pacific than

to Spokane and to other inland cities. If the western roads do not make as low a rate from Chicago to the Pacific coast as is made from the eastern seaboard, business men on the Pacific coast naturally will buy iron and steel from the mills in Pittsburgh and farther east in preference to the mills at Chicago, and the lines running west from Chicago will not get to haul these commodities at all; but because water competition thus forces a low rate from Chicago to the Pacific coast is not regarded as sufficient reason why the same low rate should be made to intermediate points, such as Spokane or Seattle, where this competition does not operate.

Meantime, the government is building the Panama canal largely in order to make competition by water between the Atlantic and the Pacific seaboards more severe than it is at present. Now, as F. A. Delano recently pointed out in an address to the City Club of Chicago, the tendency of water competition, whether independent of or due to governmental encouragement, is to make rail rates to inland points high as compared with rates to points having water transportation. In other words, the government, by building the Panama canal, will increase the force of water competition to the Pacific coast terminals, and will thereby make it much more difficult than it is now for the railways to frame a scheme of rates that will not put cities such as Spokane and Salt Lake City at a great disadvantage in competing against cities such as San Francisco, Portland and Seattle. The inland cities of the West, in asking the railways to put them now on an equality in rates with the cities on the Pacific coast, are asking them to overcome a disadvantage imposed by nature. When they ask, after the Panama canal is done—as they doubtless will—that the roads shall put them on an equality in rates with the coast cities having the advantage of water transportation via the canal, they will be asking the roads to overcome for them disadvantages created both by nature and by the national government. We are far from meaning to say that water transportation is not a good thing, or that its development should not be fostered from the public purse. But it does seem that for the public to lay out its money in developing facilities that inevitably will give the communities that have water transportation a relative advantage over communities that do not have it, and then to demand that the roads not only shall make comparatively unremunerative rates to meet the rates of the water carriers, but shall also make rates that will overcome the disadvantage—partly or wholly created by government—of the communities that have not water transportation is, if not acting with glaring inconsistency, at least dealing rather hardly with the railways.

There are several ways in which the railways might put an end to the purely railway discrimination against communities that have not water transportation. The transcontinental lines, for example, might raise their rates to the Pacific coast cities as high as their rates to inland points. But this would not benefit the inland points, even if the Interstate Commerce Commission would let the higher rates to the coast be maintained. For the coast jobbers would then begin to have more or all of their goods shipped from the East by water. They would not then get as fast transportation service, on the average, as they do now, but the rates they would pay would be lower on the average than they are at present, and they would still be able to undersell the jobbers of inland cities in most of the territory where the jobbers of the two classes of cities compete. The only effects of such action would be to raise a loud outcry by the people of the Pacific coast against the railways; to deprive the roads of a large amount of traffic to the coast, and to get them denounced, as they were when they raised their proportions of the through rates to the Orient to the basis of their local rates to the coast, for trying to make government regulation "odious."

The roads might equalize the rates to the coast and the inland cities by raising the former some and reducing the latter some. But while this would enable the jobbers at inland points to get goods from the East more cheaply, it probably would not enable them to meet the competition of the coast jobbers much, if any, better than now unless ocean rates to the coast were raised as much in proportion as rail rates to the coast.

Finally, the rates might be equalized by making the present rail rates from the East to the coast the maxima from the East to all inland points. The Interstate Commerce Commission in the Spokane case fixed the present rates from St. Paul and Chicago to Seattle as the maxima from the former points to Spokane on most of the commodities involved. There is only one effect that such a readjustment of rates would be sure to have: it would be sure to reduce heavily the earnings of the railways. If the rates to Spokane, Salt Lake City, Ogden, Denver, etc., were so drastically reduced it would be necessary to "grade back" all rates from the East; in other words, to reduce proportionately rates from the East to all points lying between St. Paul and the Missouri river, on the one hand, and Salt Lake City, Spokane, etc., on the other. The jobbers at the inland points believe that such a readjustment would enable them largely to increase their sales in the territory where they compete against the jobbers who are located on the Pacific coast. But if it had this effect, obviously it would reduce the sales of the Pacific coast jobbers in the competitive territory, and if it reduced the sales of the Pacific coast jobbers, it would reduce the amount of goods that they shipped from the East by water as well as by rail. The ocean carriers then would have an incentive to reduce their rates, and if they did so the shippers on the coast would again have an advantage over those at inland cities whether the railways met the reductions or not. If the railways *did not* meet the reduction they would be unable to compete in hauling goods to the coast, and would lose whatever profit, however small, that they might be able to get out of coast business, and if they *did* meet them without making proportionate reductions to all intermediate points, the intermediate points would again be placed relatively just where they stand now.

To what conclusion do all the foregoing facts point? Plainly, they point to the conclusion that there is absolutely but one way by which the inland cities can be put and kept on as advantageous a rate basis as points on the Pacific coast, and that is by the railways and the steamship lines agreeing to make and keep rates to the coast relatively as high as rates to the inland points. But as long as the steamship lines are under different control from the railways it will be to their interest to make rates to the coast that are relatively lower than those made by the railways to inland points. So we are brought up against the conclusion that the inland points can never hope permanently to enjoy relatively as advantageous rates as the coast points until the steamship lines and the railways are combined under a common control. So long as they are under a different control the coast cities will have smaller transportation bills to pay than the inland cities even if the railways should practically quit hauling freight to the coast. Rates to the coast were lower than to inland points before there were any railways; and they always will be if ocean carriers continue permanently to compete unrestrictedly against the rail carriers.

If, then, it be desirable to put inland points permanently on a rate parity with coast points, the correct policy to pursue would be to encourage the bringing of the steamship lines and the railways under common control. But what would the people on the coast say to that? What would the people of the country at large say to it? Evidently, they would vigorously oppose it, for their is a strong and growing sentiment in favor of expending the public money to increase the competition between water and rail lines. In other words, the public fosters the development of water transportation; the competition of the boats forces the railways either to quit hauling goods to the points where they meet water competi-

tion or to discriminate in their rates in favor of those points and against points not having water transportation; when the railways do thus discriminate the public denounces them for it, and when they try to get control of the boats in order to stop the discrimination they are denounced still more. So long as the public, legislatures and railway regulating bodies assume so utterly inconsistent an attitude, it is evident that the transportation disadvantages of which inland communities complain that both continue to exist and will continue to be complained of.

It is just as true that unfair discriminations between competing communities and shippers having only rail transportation cannot be prevented without some form of concerted action between the carriers, as it is that inland communities cannot be put on a rate parity with communities having water transportation without concerted action between the railways and the boat lines. It has been pointed out with wearisome reiteration that there is an irrepressible conflict between the Sherman anti-trust law, which forbids such concerted action between railways as is necessary to prevent unfair discrimination, and the Interstate Commerce law, the main purpose of which is to prevent such discrimination. Yet, as we have stated, one of the main counts in the indictment against the transcontinental roads is that they are in a combination to fix rates that is in violation of the Sherman law. Under the construction placed by the Supreme Court of the United States on the Sherman law in its decision in the Trans-Missouri Traffic Association case, it seems not improbable that the transcontinental roads, or some of them, have technically violated that law. There is no doubt that they have at times in fixing rates taken concerted action that may be in "reasonable restraint of trade"; and the Supreme Court held that "reasonable restraint of trade" was as much a violation of the Sherman law as "unreasonable restraint of trade." But if the transcontinental roads did not act together in changing rates, we should like to know how they would ever accomplish so comprehensive a readjustment of their schedules as the Interstate Commerce Commission indicated in its decision in the Spokane rate case that it thought they ought to make. If they did not act together, rates throughout the West would be in a state of utter chaos in six months. If the transcontinental roads are guilty of violations of the Sherman law then so are the railways in every section of the country. If the railways generally are violating that law then so are men and corporations engaged in every line of business, and so is every labor union in the country. No one can fairly criticize the federal department of justice for seeking to enforce the Sherman law just as it stands. That is its duty. But if it is going to seek to enforce it just as it stands against the transcontinental roads, obviously, it ought to do likewise with respect to all other roads, to all other business concerns, and to all labor unions. We are not sure but this would be the most salutary policy it could adopt, because if the Attorney-General and all the district attorneys of the United States should begin at once to prosecute all men and business concerns that there is reason to believe are violating the Sherman law, the business of the country in a very short time would be thrown into such a state of confusion and turmoil that Congress would be driven to do its plain duty of repealing or radically modifying that law.

The third charge against the transcontinental railways—that their rates to inland points are excessive per se because the roads have been making too large profits—ignores the fact that the earnings from transcontinental traffic will have in future to be spread over a much larger body of operating expenses and fixed charges than heretofore. The Chicago, Milwaukee & St. Paul recently has completed its extension to the coast. The Western Pacific soon will be finished. The Spokane, Portland & Seattle, the North Coast and other new roads are almost finished or are under construction. All the older roads in the West during the years immediately preceding the panic of 1907 expended enormous sums in building second track and branches, in increasing equipment and in making other necessary permanent improvements. These new lines, extensions and improvements and the greater competition that will result from them for traffic to and from the Pacific coast, will cause the public to be given much better and more adequate service than it has had in the past. But it will cost more in the aggregate to render the service, and, until the growth of traffic overtakes the growth of facilities, the profits of the carriers necessarily will be relatively smaller than they were prior to the panic. If this increase in the cost of rendering the service is accompanied by reductions in the rates paid for it, the profits of the roads, of course, will be reduced further. The shippers of the country will profit both by the improvements in service and the contemplated wholesale reductions in rates, if they shall be made. But that the proposed reductions in rates would not tend to promote further development of railways and further improvements in service seems to be a proposition not open to dispute. Whether they would tend so strongly to check railway development as to cause shippers and the public to lose more indirectly than they would gain directly, is more than anybody can tell.

THE LONG ISLAND.

Suburban service is generally considered one of the least profitable branches of the business of a railway, and the Long Island is unfortunate enough to have very little other business. Although carrying some freight and passengers through from Brooklyn or Long Island City to the eastern end of Long Island, this through business is but a very small proportion of the gross. As is to be expected from its situation, passenger traffic is much more important than freight traffic. In 1908, 53 per cent. of gross earnings came from passenger traffic, while 26 per cent. came from freight traffic. Expenses of handling this passenger business have been high in the past. Frequent service has been required with comparatively a short average haul. This average haul was 15 miles in 1908.

The problem of the Long Island has been so to cut down expenses of operation as to make its short-haul passenger business profitable and to colonize Long Island with small farmers and with manufacturers so as to build up its freight business. By the establishment of experimental farms conducted under scientific management the company has demonstrated that the soil of the island is well adapted to the raising of numerous classes of vegetables and garden truck, for which there is an excellent market in New York City.

The traffic departments have given wide publicity to the results of these experiments and to the advantages to the market gardener to be found on Long Island, and last year, as in recent years, the results of these efforts are to be found in the classified list of commodities carried. While the total tonnage carried amounted to 3,000,000 tons last year, a decrease of 230,000 tons from 1907, the products of agriculture furnished a total tonnage of 352,000 tons, or 13,800 tons greater than in 1907. The tonnage of both hay and vegetables show substantial increases. Products of mines furnished something over a third of the total tonnage, and it seems rather surprising that the tonnage of these products showed an increase of roughly 4 per cent. last year. The tonnage of bituminous coal in particular, which amounted to 171,000 tons, was 10 per cent. more than in 1907.

During the year, 4,748 dwelling houses, 18 factories, 368 stores and 238 miscellaneous buildings were constructed in villages on the lines of the company outside of Long Island City and Brooklyn. These figures ought to be very much increased as the tunnels of the Pennsylvania under the East river near completion. Land values on Long Island have risen in anticipation of increased transportation facilities,

and the business of the Long Island should show a similar increase.

During the past few years the road has been operated under particularly adverse conditions. Part of the line has been electrified, this electrification having been extended as far as Hempstead last year. While electrification was going on, the operation of the road, partly by electricity and partly by steam, largely increased operating costs without very materially bettering the service. Last year, however, the effects of improvements were apparently felt for the first time in the operating department.

Total operating expenses amounted to $7,300,000 in 1908 as against $8,500,000 in 1907, a decrease of over $1,200,000. The decrease was fairly evenly distributed between maintenance costs and transportation costs. Transportation amounted to $4,600,000 in 1908 as against $5,400,000 in 1907, a decrease of $800,000. Maintenance of way and structures per mile of first, second, etc. track (sidings and switch tracks being counted half) cost $1,540 as compared with $1,969 in 1907. It is impossible to compare unit costs of maintenance of equipment, since the figures for 1908 are given in accordance with the rules prescribed by the Interstate Commerce Commission and the 1907 figures in detail have not been rearranged to correspond. The totals, however, are comparable, and maintenance of equipment cost $1,300,000 last year as against $1,500,000 in the previous year.

This reduction in expenses enabled the Long Island to decrease the deficit, after paying fixed charges and rentals, from $860,000 in 1907 to $276,000 in 1908.

The number of passengers carried totaled 23,200,000 in 1908, a decrease of over 700,000 from the figures of 1907, due entirely, the annual report says, to the smaller attendance at the race tracks. The Long Island serves the different race tracks lying in the arc of a circle about Brooklyn, and in the past handled tremendous crowds of race-track goers on nearly every fine summer afternoon. After the passage of the bill prohibiting betting at the tracks this business fell off to a very large extent.

The extension of the subway, connecting the lower end of Manhattan island with Brooklyn, to the Atlantic avenue station of the Long Island has diverted probably a very large passenger business from Long Island City to the electrified lines terminating at Atlantic avenue. The evidence of this is shown by the discontinuance of the ferry between Long Island City and Wall street. It would be interesting to know whether this throwing of greater proportionate traffic on the electrified lines has anything to do with the decreased operating cost.

In 1908 the average earnings per passenger per mile amounted to 1.482 cents, an increase of 0.014 cents, while the average expenses per passenger per mile amounted to 1.439 cents, a decrease of 0.22 cents. It will be seen, therefore, that while the passenger business was carried at a loss in 1907, there were net earnings of 0.043 cents per passenger per mile in 1908.

Improvements are being carried on, and during the latter part of the year work was begun in the Glendale cut-off which connects the main line with the Montauk division at Glendale junction, and also on the freight cut-off connecting the north shore freight yard with the Montauk division at Dutch Kills creek. It is expected that both of these improvements will be completed and put in operation in 1909. The additions and improvements to the property and securities bought since 1903 have in part been paid for from the proceeds of the sale of $22,408,000 refunding mortgage bonds. In addition there has been advanced by the Pennsylvania for similar purposes $6,000,000, so that in all there has been spent $28,170,000 since 1903 for capital account, the two largest items of expenditure being for the Atlantic avenue improvements, which totaled $4,700,000, and the cost of road and real estate, which totaled $4,240,000.

The company carries on its general balance sheet for December 31, 1908, $4,400,000 as the amount due for construction and equipment purposes. This is an increase of $1,400,000 over the amount so carried in 1907, and in addition there are current liabilities amounting to $3,300,000, the current liabilities being slightly less than in 1907. Since the authorized refunding mortgage bonds left unsold are reserved for the retiring of outstanding securities it will be necessary for the Long Island to form some plan for funding its floating debt and raising cash for future improvements, but since the Long Island is a subsidiary of the Pennsylvania and can presumably borrow for current needs from the Pennsylvania, it can choose its own time for issuing new securities.

Taken in connection with the saving in expenses, the prospect of operating on a profitable basis after the completion of the Pennsylvania tunnels seems to be very good, and the outlook for the future is considerably better than it was a year ago this time.

The following table shows the results of operation for the years 1908 and 1907:

	1908.	1907.
Average mileage operated	392	392
Freight revenue	$2,540,033	$2,705,079
Passenger revenue	5,889,568	6,061,852
Total operating revenue	9,818,545	10,130,408
Maint. way and structures..	1,000,588	1,266,457
Maint. of equipment	1,295,513	1,473,832
Traffic	185,057	187,548
Transportation	4,555,504	5,353,537
Total operating expenses.....	7,267,235	8,526,585
Taxes	393,312	345,178
Rentals paid roads operated on basis of net earnings...	680,935	545,326
Net earnings	1,870,374	1,058,497
Gross income	2,087,242	1,390,567
Net income	*276,088	*858,829

*Deficit.

NEW PUBLICATIONS.

Convertible Securities. By Montgomery Rollins, author of "Money and Investments," "Tables of Bond Values," "Laws Regulating the Investment of Bank Funds," etc. 5 in. x 7¾ in.; leather. Price, $3 per single copy; in orders of ten or more, special prices will be made, including the buyer's firm card, stamped in gilt on the outside cover. For sale by Montgomery Rollins, Boston, Mass.

There has long been a need for a good handbook on convertible securities. As Mr. Rollins says in his preface, although the investment world has very generally accepted and approved of convertible securities, has become familiar with their characteristics and needs no definition as to what they are or advice about their good and bad points, yet there are many who know little or nothing about them. In general, bonds convertible into stock are more frequently encountered than other classes of convertibles. The author has made a compilation of all the various kinds of convertibles authorized and issued by American corporations, and has found that the live issues now authorized come to the rather startling total of $1,448,409,063.

To determine the market price at which it is profitable to convert these securities rather than to hold them is often a complicated study, especially for those who are not familiar with the situation. For example, in the case of the American Telephone & Telegraph Company convertibles, the price of the stock is now 133.7374. For one bond the company gives seven shares of stock and $63.84 in cash. Three bonds would call for $191.52 in cash, or $57.78 more than enough to pay for another share of stock at 133.7374, so that plan is carried out, and cash to the amount of only $57.78 is given to the bondholder.

A more common case of confusion is that arising where a convertible bond may simply be converted into stock at a specified price above par. For example, the Union Pacific convertible debenture 4s are convertible into common stock at 175. Therefore, when the stock sells at 175, the bond equivalent is 100. It is not difficult to work out the bond equivalent when the stock is selling at 160 or at 195, but it is perplexing to one who is not accustomed to it. Mr. Rollins' tables in the book at hand cover the price of Union Pacific convertibles

throughout the entire range between the stock price of 125 and the stock price of 212⅝, progressing by eighths.

The handbook gives an abstract of the provisions of each convertible; it contains an extensive appendix, comprising extracts from trustees, circulars from the companies, etc., in relation to conversion, redemption, registration, etc., and has also tables for accumulated dividends and accrued interest. It ought to have an important place in financial libraries.

Letters to the Editor.

RAIL SPECIFICATIONS.

Pittsburgh, May 3, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to the editorial on page 925 of the *Railroad Age Gazette*, April 30, on the new rail specifications, I note an error which I think should be corrected. You state that the angle block must weight at least 20,000 lbs., but nothing is said of the character of the foundation, which is of much importance in making drop tests "which shall in all respects be comparable." You will note in Bulletin No. 102, August, 1908, of the American Railway Engineering & Maintenance of Way Association that particular attention has been paid to the foundations in these specifications, and the manufacturers have made their drop testing machines to conform with these specifications. The specifications given in Bulletin No. 102 are the joint results of a committee representing the manufacturers and the committee on rails of the American Railway Engineering & Maintenance of Way Association.

B. TRIMBLE.
Chief Engineer, Maintenance of Way, Penn. Lines West.

THE ADVANTAGES OF MODERATELY SUPERHEATED STEAM.

Paris, April 30, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

On page 789 of the *Railroad Age Gazette of* April 9 H. H. Vaughan criticizes my article on the advantages of moderately superheated steam and suggests that I do not do justice to high temperature superheat. In view of the opinions that Mr. Vaughan expresses, it is curious to find on analysis that the figures he offers in place of mine are even less favorable to the high temperature steam. For example, I estimated the boiler efficiencies for saturated steam, moderate superheat and high superheat to be respectively 60.0, 62.1 and 56.7 per cent. Mr. Vaughan considers this too high for the moderate and too low for the high superheat. For the former he suggests 61.5 per cent., while for the latter he estimates the loss of efficiency in the superheater tubes at 1 per cent., then at the end of his letter he says: ". . . in practice the application of the smoke tube superheat reduces the amount of heating surface, and this reduction should be allowed for in the estimate of the boiler efficiencies I have made. . . . This reduction of heating surface amounts to about 15 per cent." To allow for the effect of this reduction Mr. Vaughan uses a formula which reduces an efficiency of 64.8 to 60.6 per cent. and which would reduce the efficiency of the high superheat boiler from 59.0 to 54.4 per cent. That is to say, Mr. Vaughan's method, instead of giving the high temperature boiler a higher efficiency, actually gives it an efficiency some 3 per cent. less than does the method used in the original article.

Now as to the over-all efficiency of the locomotives. Mr. Vaughan says: "Mr. Fry has neglected a further and far more important consideration; namely, that the efficiency of a boiler is a function of the work it is doing. This was shown most distinctly at the St. Louis test, and it is evident that the only proper comparison of two engines can be on the basis of equal rates of work developed." I do not think that this is a fair statement of the case. That the boiler efficiency is a function of the rate of working is a well-known fact, but as my comparison was made on the assumption that the rate of working of the boilers, as measured by the rate of firing, was the same in all cases, there was no reason for bringing this fact into consideration. I estimated the economy in coal per indicated horse-power-hour on the basis of equal rates of firing, so that compared with the saturated steam engine the superheaters, with the same coal consumption, take advantage of their greater efficiency to develop more work. Mr. Vaughan prefers to restrict the power of the superheater to that developed by the saturated steam and to estimate the consequent saving in fuel. Either method is perfectly legitimate, and comparisons made in both ways, using Mr. Vaughan's own figures, are given below. The steam consumption per indicated horse-power-hour is assumed to be 23,8 lbs. for saturated steam, 20.9 lbs. for the moderate superheat and 16.7 lbs. for the high superheat. The amounts of heat in these quantities of steam are 27,900, 24,800 and 22,000 B.t.u. respectively, and these are in the ratio of 100 to 89 to 79. I understand that Mr. Vaughan agrees that these assumptions are reasonable. When the engines are developing equal amounts of work, the boiler efficiencies given by Mr. Vaughan are 60.0, 64.4 and 60.6 per cent. respectively, so that combining the engine and boiler efficiencies the respective coal consumptions are found to be 3.10, 2.57 and 2.44 lbs. per indicated horse-power-hour, or in the ratio of 100 to 83 to 78.5. In other words, the coal economy is 17 per cent. for the moderate superheat and 21.5 per cent. for the high superheat, a difference of less than 5 per cent. in favor of the latter. Now assume the rate of firing to be the same for all three engines. Mr. Vaughan's figures, as above, show the boiler efficiencies to be 60.0, 61.5 and 54.4 per cent. By combining these with the foregoing engine efficiencies the power developed by the three engines is found to be as 100 to 115 to 114.8, the coal consumption being 3.10, 2.69 and 2.70 lbs. per indicated horse-power-hour. Neither of these comparisons give the high superheat any marked superiority over the moderate superheat.

In conclusion I should like to point out that it is at least doubtful whether the St. Louis formula, used by Mr. Vaughan, can be applied directly to determine the change in boiler efficiency due to a reduction in the amount of heating surface, the grate and firebox remaining unchanged. Personally, I think that the formula as used gives too great a reduction in the boiler efficiency, but in the foregoing comparisons I have followed Mr. Vaughan's method without change, in order to show that his figures do not justify his criticism of my original conclusions.

LAWFORD H. FRY.

PROTECTIVE COATINGS FOR STRUCTURAL MATERIAL.

Pittsburgh, Pa., May 10, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to your interesting editorial under the above title in your issue of April 23:

The shop coating of a piece of iron or steel for the purpose of preventing rust prior to the final painting of the work deserves a good deal of attention and is important because it seems that iron or steel which has once started to oxidize or rust is very prone to continue the process and spread far from the original source of the trouble.

The subject is affected, as most problems of this kind are, very largely by the question of cost. Undoubtedly if more care were taken in rolling the steel to prevent excessive oxidation, which is of itself rust, or if a pickling process could be used just prior to the painting, much good would result, but unfortunately neither of these courses is practically open in the case of heavy structural work.

The designing of a coating to be used as a shop coating for the sole purpose of preventing rust between the time of

the manufacture of the steel and its erection and final painting requires considerable experience, both technical and practical, on the part of the designer of the coating, and certainly the concession by the user that sufficient money should be allowed for the purpose of enabling the designer to use the proper material and sufficient time should be given for the proper application of the material and the proper drying.

In looking over the materials or compounds which are applicable to this field for the purpose of choosing that which is best, there is in my mind no doubt as to the choice of the coating. This should be linseed oil, as in no other material have we to the same extent the ability to change within a reasonable time from a liquid to a solid material when exposed to the atmosphere and to grip or attach itself to metal with the greatest tenacity and, what is really the most important characteristic of all, being the best possible foundation for the final coat of paint.

While linseed oil is the best material that can be used for this purpose, it is not by any means perfect, because the modern linseed oil contains a much larger percentage of impurities than is generally supposed. These impurities being fatty and non-drying in their nature make the coat of oil when applied to the iron very weak and subject to abrasion. They also, on account of their solubility in water, allow easy access to water, which, when it is once under the very tender, weak coat, will very readily tear comparatively large openings in it, allowing the introduction of destructive agents; and where a real solution of the problem is wanted these impurities must be taken out of the oil in order that a perfectly soluble, inert film, fit not only for the temporary protection of the iron, but also fit to hold the future coats of paint, may be attained, and it is perhaps apt to say that there has been very much less attention paid to the removal of deleterious impurities from linseed oil than the subject deserves.

The perfectly pure refined linseed oil is of necessity too heavy in body to be perfectly applied for shop work, as its application would be too expensive and on account of the thickness of the coat its drying would be too slow, and when we consider that the object to be attained is the coating of the iron with an impervious film, the thickness of the film having little to do with the case, it is apparent that this is a position where thinners or solvents may be used with threefold advantage. The advantage would be that the thinner would lower the cost very largely, that it would give great ease of application either by dipping or hand-painting, and that it would materially add to the rapidity of drying, as the film could be regulated in thickness so as to allow maximum rapidity of drying; and I know from practical experience that the cost of such a coating, put into the best possible shape for the work for which it is to be used, can be made not to exceed 35 cents per gallon, which is very nearly, if not quite, as low as the usual price charged for the so-called paint oils which are frequently used for this purpose and which unfortunately are made more on the principle of selling than using and into which almost invariably rosin is introduced.

A shop coating for the prevention of rust must be preceded by the removal of any rust which may be present. In some cases this is best attained by scraping; in other cases a sand blast may be used very advantageously; but it is absolutely essential that the rust should be taken off from the metal before the application of the protective coating, and it is also essential that the work should be dry and free from grease, as either water or grease will thwart the purpose to be attained.

For work of this class there is no doubt in my mind but that the best drying results would be obtained by the use of an ordinary black oxide of manganese liquid dryer and that such a dryer can be used in this position with comparative liberality.

JAMES TODD.

Contributed Papers.

PERCENTAGE OF AIR-BRAKE CARS IN TRAINS.

The Interstate Commerce Commission is considering increasing from 75 to 90 per cent. the minimum percentage of cars in a train required to be air-braked. The General Managers' Association of Chicago has issued the following argument opposing the proposed change:

"At the hearing before the Interstate Commerce Commission at Washington on November 2, 1905, called for the purpose of having railways show cause why the minimum percentage of air-braked cars in trains as prescribed by law should not be increased, a number of railways appeared and presented arguments against an increase to 75 per cent. as proposed, the grounds being mainly the conditions and amount of business on hand at that time; the shortage of cars and the difficulty in procuring additional equipment; lack of terminal facilities, etc. These arguments were ineffective and, except the last one, not prevailing at the present time.

"So far as we have analyzed the reports of accidents on railways as issued by the Interstate Commerce Commission, we are unable to find any data that will show the increase of the minimum to 75 per cent. has resulted in additional safety by a reduction in the number of accidents. This is possibly due to the constant replacement of old equipment with new, improved types of car construction, all of which are equipped with air-brakes, thus raising the standard of safety and efficiency and also probably due to the fact that the averages on most roads were high enough before the order was issued that the general average was not greatly increased thereby.

"It is also the general opinion of railway officers that the increase has not resulted in any advantage so far as safety is concerned.

"On the other hand, there can be no doubt that the increased minimum has frequently resulted in detentions in train movement and embarrassments in operation that have resulted in serious losses to the railways for which there are no compensating advantages. It is the application of a strictly technical interpretation of the law to all conditions of train service that works an unnecessary hardship. The law recognizes no difference in conditions such as grades, speeds, density of traffic, character of the service whether passenger, freight or work, character of lading whether perishable or not, character and number of cars employed, their capacities and the other great variety of controlling factors that have influenced railway officers in regard to their equipment.

"If our information is correct that it is now proposed to raise the minimum to 90 per cent., most railways not operating with extreme conditions of grades, etc., over their entire lines will be most seriously embarrassed and, we believe, without adequate cause.

"The air-brakes on passenger trains receive great care, are tested many times each day, and frequently inspected, the railway being the most interested party, and it is believed that American railway practice in this respect cannot be improved upon by any legislative enactment with the present state of the art. Considering that the large majority of passenger trains have less than 10 cars, it will be seen that even the present minimum is an unwarranted burden, and any increase thereof cannot be defended as a general proposition.

"It is true that for exceptional high speed trains and on heavy grades and in crowded territory the highest brake efficiency is necessary and desirable and is, as a rule, furnished by the railway companies, but to say that the same exalted standard is required everywhere and on all trains regardless of service and conditions is not justified by past experience. Attention is called to the fact that the percentage of braking

power is higher on passenger cars than on freight, so that the aggregate braking effect is much higher per ton of weight of passenger trains. This is necessary on account of high speeds employed and greater number of lives involved. The movement of freight train cars under an increase of the present minimum will also be very seriously handicapped when considered as a general proposition. The American public has no conception of its indebtedness to the railways for their transportation facilities, with special reference to interchange of cars. For instance, a car is loaded in Maine and goes through to California, over a dozen lines possibly, each of which, by their agreement to the M. C. B. Rules of Interchange takes the same care of that car while on its lines as it does of its own equipment. This is an exhibition of good faith that has no parallel in other corporate interests. This gives shippers the advantage of unbroken movement without the loss of time, expense and the breakage due to transferring of lading. These cars must have air-brakes to be accepted in interchange. The brakes must be effective and are maintained while in transit by renewals of brake shoes and hose as they wear out or fail, the cylinders and triples are cleaned and oiled as per schedule. These cars are distributed all over this country, in Canada and Mexico, in all climates and temperatures wherever the necessities for the public has to be served by the railway companies. It is doubtless to the advantage of the railway, as that is their business, but not less so to the public who add the cost of transportation to their goods in their disposition. The public, therefore, is interested in transportation, and anything that hinders transportation affects the public. To apply a rigid standard of brake efficiency which might be necessary on a mountain road with heavy grades, curves and tunnels to prairie roads, branch lines, or even to many main lines, is as unnecessary as it would be to require that all railways should be built without grades.

"In order to accommodate traffic the railways have developed high-capacity cars and locomotives of increased weight and power and on low-grade roads the lengths of trains have been increased accordingly. The advantage of such movement would have to be sacrificed to a considerable extent with a higher minimum than at present, on account of slowness of operation on long trains. There is, of course, an advantage in having all cars connected with air in the train pipe to guard against break in two, but this function can be obtained without operative brakes at the rear end. These long trains are generally of empty cars, and a little calculation will show a fallacy in the necessity for a high minimum number of air-braked cars in such trains.

"Assume a train of 100 cars, total weight, say, 4,000,000 lbs., and the aggregate braking power of these cars will be 3,000,000 lbs. Now assume a train, gross weight as before, 4,000,000 lbs., but in fully loaded 50-ton cars, and we have but 26 cars with an aggregate braking power of 800,000 lbs., or 20 per cent. instead of 3,000,000 lbs. or 75 per cent. to control 4,000,000 lbs. of train.

"If, as has been amply demonstrated in practice on the heaviest grades in this country, freight trains can be perfectly controlled by a total air-brake capacity equal to one-fifth of the weight of the train, it is an absurdity to require nearly four times that much control under different conditions of lading, yet that is just what is required in placing a high minimum of operative brakes in all trains.

"All railways have more or less of cars of various classes, such as cook cars, bunk cars, and for various classes of work many of which remain in one place for months at a time. Air-brakes on such cars are used so little as to be useless, but under present rules such cars can only be hauled behind a certain proportion of air-braked cars involving unnecessary expense in view of the actual necessities in the movement and to fulfil a technical requirement that is an unnecessary burden.

"Owing to the widespread distribution of freight cars to every city and hamlet with frequent long waits between movements, during which times the air-brake packing leathers and lubrication suffers more from disuse tnan from service, is it at all surprising that a 100 or a 90 per cent. efficiency of freight cars is impossible to maintain? There must be a reasonable margin in order to move cars to where they can have care and attention. Let it be the aim of railways to have trains leaving terminals with the highest possible percentage of operative brakes, this percentage is bound to be lowered by the taking on of cars en route that have not had their turn of attention, which cannot be given until arrival at next terminal. Such has been the practice for years, successful and safe in relative terms. The change from 50 per cent. to 75 per cent. cut largely into the allowable margin for movement of non-air and inoperative air-brakes to division points, but if this margin is to be further reduced and, as has been shown, to fulfil a technical requirement only, no compensating advantages of safety having been shown, with a possible excess of brakes beyond the requirements for complete control, then we maintain that such practice is unmechanical, hinders economical movement of trains and imposes an unwarranted burden of expense in operation of railways without securing any additional safety or lessening of accidents, the only point sought to be gained."

ENGLISH RAILWAYS.

BY WILLIAM WICKHAM TURLAY.

II.

LOCOMOTIVES AND CARS.

One notices quite as many different types of locomotives in England as in America, but the English locomotives are usually very simple in appearance, the working parts often being out of sight, underneath the boiler, and the latter being jacketed and painted over, like the tender; drab and green are favorite colors, black being little used. They have very little polished metal about them, but are kept in excellent repair, well painted and scrupulously clean. The cabs are much smaller and less comfortable than those on American locomotives, but English weather is seldom extremely cold. Owing to the lines being so well protected, English locomotives have no bells or cowcatchers, no headlights, except small lanterns, and extremely small whistles, the latter being little used. Thanks to good design and construction, and careful handling, they work very quietly,and do not pour out clouds of black smoke as our American locomotives too generally do. The absence of noisy exhausts, smoke, whistling and bell ringing, adds much to the comfort of passengers and of residents along the lines of railways, and enables one to sleep undisturbed in the railway hotels which adjoin the stations in most of the larger cities. English locomotives are usually smaller than ours, the height and width being limited by the dimensions of tunnels and overhead bridges built many years ago, but they are powerful for their size, and as the cars are correspondingly light they are able to do their work easily and well. The engineers and firemen, as we would call them, or "drivers" and "stokers," as they are called there, deserve great credit for their skill and carefulness, which are especially naticeable in their use of soft coal without producing black smoke or cinders, and in the way they start and stop trains without shock or jolt.

English passenger cars, or "carriages," as they are called, are radically different from ours. They are lower and usually shorter, the bodies resting on underframes built of steel beams, carried on three separate pairs of wheels, or on two four-wheeled trucks. Internally they are divided cross-wise into a number of compartments, each entered by a side door, and accommodating from four to six passengers in the corridor cars, or from six to ten in the old style cars, on seats facing one another, the seating space allotted to each passenger vary-

ing somewhat, according to the class of his ticket, more space being given to first class passengers and less to second and third. The upholstery of the seats also differs for the several classes. The older cars have no passageways connecting the compartments, have no lavatories or steam heating apparatus, and are not vestibuled. While they answer very well for short distances, they are not as comfortable for long journeys as the "corridor cars," which have replaced them on long distance trains, and will soon replace them altogether except for suburban service.

The corridor cars are undoubtedly the highest development up to the present time in the way of cars for general passenger service and deserve careful study. They are connected by vestibules, are provided with lavatories, heated by steam, and have passageways or corridors running along one side from end to end, on to which the compartments open. These corridors reduce the seating capacity as compared with the old-style English cars, though they occupy little if any more space than the aisles of American cars, but the corridor cars combine all the good features of the older English cars and of the American cars without the defects of either. The compartments afford comparative privacy and freedom from the annoying and dangerous drafts produced in American cars when doors or windows are opened, as well as from jostling and confusion caused by people passing through the aisles. The numerous side doors allow passengers to enter or leave the train quickly and comfortably at stations, thus greatly reducing the length of stops. The corridors and vestibules allow access to any part of the train, while the compartments

Typical British Passenger Locomotive.

are especially convenient and cozy for small parties of people traveling together. Owing in part to the subdivision of the cars and in part to the general avoidance of needless noise in operating one can speak in an ordinary tone of voice and be easily heard. In an American car with the passengers seated in pairs conversation is almost impossible except with one's seat-mate, while in the English compartment it is easy, and even a person traveling alone is likely to soon find himself engaged in conversation with one or more of his fellow passengers. The privacy, freedom from annoyance, and the comfortable grouping of people facing each other, seem to promote a sociable spirit, but anyone who prefers to avoid conversation is quickly allowed to do so. It is customary to reserve a certain number of compartments of each class for the exclusive use of women, and some for smokers. English dining and sleeping cars are usually provided with doors at the vestibules only, as in America, quick access to and from the station platforms not being necessary. The side doors used in the corridor cars make it impossible to build the bodies of the cars as strongly as could otherwise be done, and in case of collision or derailment there is greater danger to the passengers than in the stronger American cars. Until our railways are able to prevent such accidents to a greater degree than they have done heretofore this will probably be a good reason for not using side doors. They are not a necessary feature of corridor cars, but in connection with high platforms at stations they afford such convenience and save so much time and confusion that it is to be hoped they may be used in America whenever our standard of safety in operation of railways becomes high enough to warrant their general adoption. They are already used in cars built especially for suburban service on at least one American railway.

CLASS SYSTEM.

In theory there are no class distinctions on American railways, but in practice on all except accommodation trains we have Pullman cars and ordinary cars (also tourist cars in the West) and we sometimes find emigrants carried at a special low rate occupying the cars intended for the use of smokers, who have bought so-called "first-class" tickets. In England, as in Europe generally, class distinctions are frankly recognized and two or three classes of cars (in Germany four) are provided, aside from sleeping cars and special private cars, so that a traveler may within certain limits adjust his expenses to his taste or means. In England first class cars

Corridor of an English Vestibuled Car.

are relatively little used except by those whose social or official position makes it obligatory, or by people who are going on long journeys and desire the greater amount of space and the softer cushions. The first class car may thus be said to correspond to our Pullman parlor car. The second class cars are also little used, though more so probably than the first class, especially on suburban trains near the large cities, where many commuters use second class tickets. The vast majority of people travel third class, the cars of this class, except on suburban trains, usually being comfortably fitted and quite satisfactory. Several of the leading English railways have abolished the second class within recent years, retaining only the first and third classes and thus simplifying their service.

PASSENGER RATES.

The third class fare one way is almost invariably at the rate of one penny (two cents) per mile, the second class

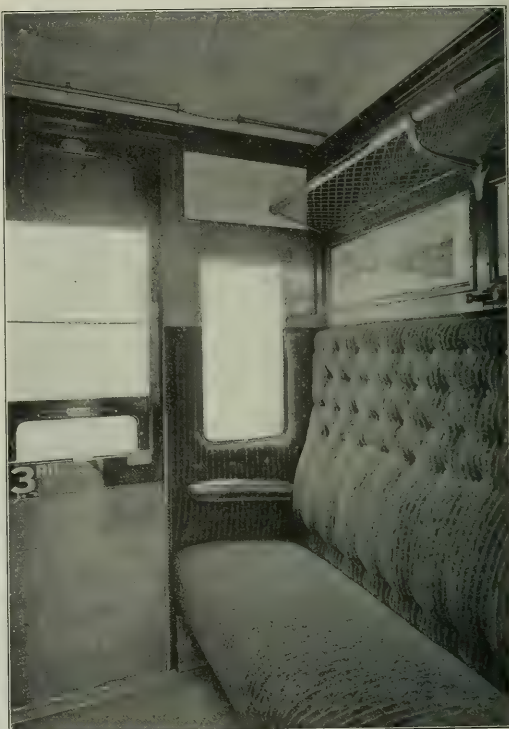
(when there is one) from 25 per cent. to 50 per cent above the third class, and the first class from 60 per cent to 100 per cent. above the third class. On roads which have abolished the second class the first class rate is usually lower than on those which still maintain three classes, possibly because of the economy in service caused by the simplification and a desire to attract enough first class passengers to make this portion of the service profitable. It will be seen that the English traveler who rides in a first-class car pays relatively more than the American who rides in the Pullman parlor car, as the latter in addition to buying a first class ticket pays an additional charge of only $2 to $2.50 for a journey of 8 to 12 hours duration (which may include a distance of 250 to 450 miles) and at a slightly higher rate for shorter distances.

Return or round trip tickets are usually but not always sold at reduced rates and the commercial travelers through their organization, which is virtually a trade union, have secured the valuable privilege of buying round-trip tickets between their home towns and any other stations at the ordinary rate for a ticket in one direction only. These tickets are good for "the week-end" and are much used, as a commercial traveler can thus go home over Saturday and Sunday, even from a considerable distance, at less expense than if he remained at a hotel. Week-end tickets are sold to the general public to and from various popular resorts at reduced rates, usually 25 per cent. above the fare one way, and considerable travel is thus developed. Tickets can also be obtained at reduced rates

First Class Compartment, Looking Toward Corridor.

for "circular tours" to places of interest, these usually being issued jointly by two or more rail and steamer lines. Exceptionally low rates are often made for excursions by special trains which attract many people who are willing to be crowded and uncomfortable if they can travel cheaply. For example, on the occasion of a recent football game excursion trains were run from London to Bristol, 117½ miles, and return, a total distance of 235 miles, at a rate of four shillings and three pence* ($1.02), a trifle over 43/100 cents per mile. Special school, commutation and workmen's tickets are also issued as in America.

Although the commutation rates for suburban stations near London are very low receipts from this travel have fallen off greatly during recent years, in spite of the increase of



Interior of Third Class Carriage.

population. Officers of the railways most injured by the change think that private motor cars are now carrying many of their former first class commuters and new lines of motor omnibuses and street railway cars are carrying the second and third class passengers.

(To be continued.)

GOVERNMENT REPORT OF BLOCK SIGNAL MILEAGE.

The tables shown in the following five pages are copied from a bulletin just issued by the Interstate Commerce Commission giving the statistics as of January 1, 1909. These are in substantially the same shape as those published one year ago and reprinted in the *Railroad Gazette*, April 17, 1908.

The total length of road in the United States here shown as being operated under the block system on January 1, 1909, was 59,548.7 miles. Of this mileage 12,190.6 was automatic and 47,358.1 was manual. There was an increase of 1,387.6 miles in the length of road covered by automatic block signals over that shown in the report of January 1, 1908, while the manual mileage has decreased 517.6 miles. The net increase of block signal mileage in the United States during the year was 870 miles.

Figures for this same date—January 1, 1909—were pub-

*As a matter of convenience, the value of the English shilling has been taken as 24 cents and that of the penny as 2 cents, though the actual value of the shilling is more nearly 24¼ cents and that of the penny 2¹/₄₈ cents.

lished in a table given in the *Railroad Age Gazette* December 25 last, page 1638. A comparison of that table with Table No. 1 now printed shows differences in many items and in the totals. The Grand Trunk appears to have given us an erroneous report this year, and last year both the Government table and our own had it wrong. The Minneapolis, St. Paul & Sault Ste. Marie appears in the Government table this year for the first time. Other differences are due to the fact that for a half-dozen roads, indicated in our table by daggers, we were unable to get corrected figures in season for our December issue. The Pennsylvania reports a considerable increase in manual. Still other differences are unexplainable, and we can only say that our information was official, from the managers of the companies. The Government's information also is official, of course. The more detailed requirements of the Interstate Commerce Commission probably led to more careful compilations by some of the companies.

It will be seen that telephones are used for manual block signals on 2,357 miles more road than one year ago. They are now used extensively on the Atchison, the North Western, the Burlington, the St. Paul, the Northern Pacific, the Pennsylvania and the St. Louis & San Francisco. The Illinois Central, which a year ago reported 769 miles of single-track line worked by controlled manual block signals with telephones (telephones as auxiliary, apparently), now reports only 5 miles of manual block signaling—business so slack that the danger of collision no longer troubles them!

The Commissioner's bulletin contains the following—

NOTES ON THE TABLES.

Atlantic Coast Line: Block system discontinued on 108.2 miles single-track road.

Boston & Maine: Increase of 157.8 miles automatic; decrease of 90.6 miles manual.

Chicago & Northwestern: Manual installed on 143.7 miles and discontinued on 211.4 miles of road.

Missouri Pacific: Manual discontinued on 221.7 miles; staff system installed on 4 miles of road.

Northern Pacific: Manual installed on 248.5 miles and discontinued on 80.9 miles.

Oregon Railroad & Navigation Company: Automatic installed on 109.5 miles.

Oregon Short Line: Automatic installed on 157.1 miles.

Pennsylvania: Increase of 246.5 miles manual and 1 mile automatic. Discontinued, manual 8.6 miles.

Philadelphia, Baltimore & Washington: Manual installed on 85.2 miles.

Southern Pacific, Pacific System: Automatic installed on 144.6 miles and manual discontinued on 6.9 miles.

The present compilation includes a number of roads not shown in the report of January 1, 1908, notably the Chicago, Milwaukee & Puget Sound and the Minneapolis, St. Paul & Sault Ste. Marie, both of which now have the manual block system throughout. During the past year a few small roads have discontinued the block system altogether.

Automatic block signals are in use on the following roads not reporting to the Commission:

Boston Elevated, 9 miles; Interborough Rapid Transit (New York City), 13.5 miles; Philadelphia & Western, 11.5 miles; Philadelphia Rapid Transit, 5 miles.

It will be noted in Table 1 that the total block signal mileage of the Chicago, Burlington & Quincy, the Lake Shore & Michigan Southern and the Lehigh Valley roads exceeds the total mileage of passenger lines operated. In the case of the Chicago, Burlington & Quincy this is due to the fact that on 715.2 miles of that road, on which but one engine is regularly in service, manual block rules become effective whenever more than one engine is employed. The column showing the total miles operated does not include lines on which only one engine is in service. This condition also exists on some portions of the branch lines of the Lehigh Valley; and this road in addition has portions of its lines which are used exclusively for freight traffic worked by the block system. The Lake Shore & Michigan Southern also has 74.9 miles of road covered by the block system on which no regular passenger trains are operated.

On the Atlantic Coast Line 34 stations are closed eight months of the year, and on the Long Island 6 stations are closed six months.

Table 1.

Boston & Maine: The single-track items include 21.7 miles of double-track road, the westbound track being worked by manual signals and the eastbound track being equipped with automatic signals.

Chicago, Burlington & Quincy: The figures include 715.2 miles of road on which only one engine is regularly in service, which mileage is not included under the total miles of passenger lines operated.

Erie & Jersey; Newburgh & South Shore: These are freight lines.

Illinois Central: Figures include some road of more than four tracks.

Lehigh Valley; Lake Shore & Michigan Southern; Philadelphia & Reading; Galveston, Harrisburg & San Antonio; Union: These figures include some mileage over which passenger trains are not regularly operated.

Pennsylvania; Washington Terminal: Figures include some road of more than four tracks.

Table 2.

Atchison, Topeka & Santa Fe: In addition to mileage shown there are electric motor automatic signals on 78.5 miles of road worked by the manual block system.

Chicago & Eastern Illinois: In addition to mileage shown there are inclosed disk signals on 8.7 miles of road worked by the manual block system.

Boston & Albany: In addition to signals shown in this table there are 9.1 miles of electric slot signals.

Michigan Central: In addition to signals shown in this table there are 5.3 miles covered by electric slot signals.

New York Central & Hudson River: In addition to signals shown in this table there are 2 miles of road (four-track) in tunnel where "light signals" are used.

Table 3.

Bessemer & Lake Erie: The figures here shown include 8.9 miles of single track used exclusively by freight trains, not included in Table No. 1.

Chicago & Eastern Illinois: The figures here shown include 5.8 miles of single track used exclusively by freight trains, not included in Table No. 1.

Pennsylvania: These figures include 2.4 miles of three-track road, of which two tracks are worked by telegraph block systen and one track by controlled manual.

Northeast Pennsylvania: Staff system on this road is used only four months of the year.

NEW WORK.

The reports of the railway companies to the Commission indicate that the following installations of the block system are contemplated during 1909:

Baltimore & Ohio Southwestern: To cover entire line with manual, an addition of 921.6 miles.

Chicago, Burlington & Quincy: 468.3 miles double-track automatic and substitute controlled manual for manual on 1,419.2 miles.

Cincinnati, Hamilton & Dayton: 7.3 miles double-track automatic.

Grand Rapids & Indiana: 55.8 miles single-track manual.

Long Island: 7.1 miles double-track and 3.3 miles three-track automatic.

Newburgh & South Shore: 3.1 miles double-track manual.

New York, Ontario & Western: 11.7 miles single-track automatic.

Southern Pacific: 168 miles single-track automatic.

St. Louis & San Francisco: 364.9 miles single-track and 20.6 miles double-track automatic.

Table 1.—Aggregate Length of Lines on Which the Block System was in Use, January 1, 1909.

Names of railroads.	Automatic block signals.					Nonautomatic block signals.					Total, automatic and non-automatic.	Total miles operated (passenger lines).	Per cent operated under block system.
	Single track.	Double track.	Three track.	Four track.	Total.	Single track.	Double track.	Three track.	Four track.	Total.			
Atchison, Topeka & Santa Fe	39.4	39.5			78.9	1,042.7	414.4			1,457.1	1,536.0	5,376.7	28.6
Coast Lines	7.4	1.0			8.4	4.3				4.3	12.7	1,908.1	.7
Gulf, Colorado & Santa Fe	8.3				8.3	2.1				2.1	10.4	1,411.2	.7
Atlanta & West Point							6.0			6.0	6.0	225.0	2.2
Atlantic Coast Line						407.6	87.9			495.5	495.5	3,745.8	13.2
Baltimore & Ohio	11.4	161.9			173.3	209.7	576.5	82.5	18.8	887.5	1,060.8	3,083.0	34.4
Baltimore & Ohio Southwestern						8.7	48.5		2.2	59.4	59.4	981.0	6.0
Baltimore & Sparrow's Point							3.0			3.0	3.0	4.7	63.8
Bessemer & Lake Erie						95.1	91.0			186.1	186.1	188.3	98.8
Boston & Maine	26.7	307.0	0.5	2.1	336.3	21.7	11.3			33.0	369.3	2,238.6	16.5
Boston, Revere Beach & Lynn		13.8			13.8						13.8	13.8	100.0
Buffalo, Rochester & Pittsburg						298.6	123.3			421.9	421.9	421.9	100.0
Butte, Anaconda & Pacific	7.9				7.9						7.9	25.7	30.7
Caldwell & Northern						2.4				2.4	2.4	23.4	10.3
Central of Georgia						52.3	7.4			59.7	59.7	1,915.9	3.1
Central of New Jersey	13.0	165.5	2.4	31.5	212.4						212.4	475.8	44.6
Central Vermont						1.5				1.5	1.5	403.3	.4
Chesapeake & Ohio		11.1			11.1	1,193.7	278.2			1,471.9	1,483.0	1,507.3	98.4
Coal River						51.3				51.3	51.3	51.3	100.0
Chicago & Alton	171.3	141.1			312.4	351.9	37.9			389.8	702.2	998.9	70.3
Chicago & Eastern Illinois		98.4			98.4	163.6	57.5			221.1	319.5	693.0	46.1
Chicago & Northwestern		591.2	12.5	2.4	606.1	2,287.2	228.5			2,515.7	3,121.8	7,706.8	40.5
Chicago & Western Indiana		17.8			17.8		6.3	3.2		9.5	27.3	27.3	100.0
Chicago, Burlington & Quincy		25.0		3.1	28.1	8,151.6	502.6	19.1	1.4	8,674.7	8,702.8	8,218.4	100.0
Chicago Great Western		7.9			7.9	264.2	26.8			291.0	298.9	735.0	40.7
Chicago, Milwaukee & St. Paul	5.9	42.6			48.5	3,488.7	385.4			3,874.1	3,922.6	6,550.2	60.0
Chicago, Milwaukee & Puget Sound						622.7				622.7	622.7	622.7	100.0
Montana						92.9				92.9	92.9	153.3	60.6
Chicago, Peoria & St. Louis Ry. of Illinois	1.3				1.3						1.3	235.3	.6
Chicago, Rock Island & Pacific	55.9	208.5			264.4	356.9	61.8			418.7	683.1	7,101.3	9.6
Chicago, St. Paul, Minneapolis & Omaha		6.4			6.4	591.6	64.1			655.7	662.1	1,486.5	44.5
Chicago Terminal Transfer		5.4			5.4						5.4	45.8	11.8
Cincinnati & Muskingum Valley						11.4				11.4	11.4	148.4	7.7
Cincinnati, Hamilton & Dayton						73.0	27.9			100.9	100.9	907.0	11.0
Cleveland, Akron & Columbus						126.5	15.6			142.1	142.1	177.8	79.9
Colorado Midland						2.5				2.5	2.5	331.0	.1
Cornwall & Lebanon						8.3	13.7			22.0	22.0	22.0	100.0
Cumberland & Pennsylvania						4.3		3.0		7.3	7.3	31.3	23.3
Cumberland Valley		6.7			6.7	16.6				16.6	23.3	163.2	14.3
Davenport, Rock Island & Northwestern						40.6	1.1			41.7	41.7	41.7	100.0
Delaware & Hudson	177.2	208.6	4.3	17.5	407.6	.6				.6	408.2	743.9	54.8
Delaware, Lackawanna & Western	14.7	464.6	5.9		485.2	1.6				1.6	486.8	778.2	61.3
Syracuse, Binghampton & New York		9.8			9.8						9.8	81.0	12.1
Duluth & Iron Range						14.8	2.0			16.8	16.8	168.0	10.0
Duluth, South Shore & Atlantic						4.2				4.2	4.2	593.4	.7
Durham & Southern						56.0				56.0	56.0	56.0	100.0
Erie		62.0		13.6	75.6	643.5	618.9			1,262.4	1,338.0	1,744.6	76.7
Chicago & Erie						240.4	8.4			248.8	248.8	248.8	100.0
Columbus & Erie						12.6	9.8			22.4	22.4	22.4	100.0
Erie & Jersey		42.3			42.3						42.3		
New Jersey & New York		10.5			10.5	26.1				26.1	36.6	51.8	70.7
New York, Susquehanna & Western and Wilkes-Barre & Eastern						20.7				20.7	20.7	208.4	9.9
Grand Rapids & Indiana							2.2			2.2	2.2	436.5	.5
Grand Trunk System: St. Clair Tunnel	1.1	1.6			2.7						2.7	2.7	100.0
Great Northern	8.2	62.0			70.2	259.7				259.7	329.9	6,893.8	4.7
Hocking Valley						74.7				74.7	74.7	337.0	22.2
Illinois Central	30.6	234.4		12.0	277.0		5.0			5.0	282.0	4,273.1	6.6
Yazoo & Mississippi Valley	6.6				6.6						6.6	1,191.7	.6
Iowa Central						11.0				11.0	11.0	502.3	.2
Kansas City, Clinton & Springfield						8.4				8.4	8.4	155.0	5.4
Kentucky & Indiana Bridge & R. R. Co.						7.2	2.7	.7		10.6	10.6	10.6	100.0
Lackawanna & Wyoming Valley						1.0	2.4			3.4	3.4	22.6	15.0
Lehigh Valley	14.1	421.0	34.6	11.1	480.8	691.3	50.5			741.8	1,222.6	1,144.8	100.0
Long Island	4.0	73.6		3.7	81.3		22.7			22.7	104.0	392.0	26.5
Louisville & Nashville	25.2	10.3			35.5	91.2	43.9			135.1	170.6	3,775.0	4.5
Maine Central	146.4	44.7			191.1						191.1	910.6	20.9
Marquette & Southeastern						3.7				3.7	3.7	50.8	7.3
Minneapolis, St. Paul & Sault Ste. Marie						1,992.1				1,992.1	1,992.1	1,992.1	100.0
Missouri, Kansas & Texas	2.0				2.0						2.0	3,043.0	
Missouri Pacific	43.5	17.2			60.7	27.1				27.1	87.8	3,194.7	2.8
St. Louis, Iron Mountain & Southern	83.1	8.7			91.8	6.3	1.1			7.4	99.2	2,505.6	4.8
Mobile & Ohio		4.7			4.7	42.4				42.4	47.1	825.0	9.6
Monongahela	.5				.5						.5	57.6	.9
Monongahela Connecting							4.0			4.0	4.0	55.0	8.0
Nashville, Chattanooga & St. Louis						89.8	5.4			95.2	95.2	1,236.5	7.7
Newburgh & South Shore c						3.1	2.1			5.2	5.2		
New York & Long Branch		38.0			38.0						38.0	38.0	100.0
New York Central Lines:													
Boston & Albany		180.0	0.4	17.0	197.4		3.5		3.1	6.6	204.0	359.3	56.9
Chicago, Indiana & Southern		2.0			2.0	17.4				17.4	19.4	303.2	6.4
Cleveland, Cincinnati, Chicago & St. Louis						541.3	325.8			867.1	867.1	1,762.7	49.2
Lake Erie & Western						9.7	8.9			18.6	18.6	719.0	24.5
Lake Shore & Michigan Southern a	6.9	325.6	64.7	121.2	518.4	969.6	23.1			992.7	1,511.1	1,446.2	100.0
Dunkirk, Allegheny Valley & Pittsburg						90.3				90.3	90.3	90.3	100.0
Lake Erie, Alliance & Wheeling						87.7				87.7	87.7	87.7	100.0
Michigan Central		271.9			271.9	901.1	19.1			920.2	1,192.1	1,192.1	100.0
New York Central & Hudson River		129.4		16.5	145.9	1,708.4	650.0	25.1	303.8	2,687.3	2,833.2	2,846.2	99.2
Peoria & Eastern						3.6	1.7			5.3	5.3	337.9	1.3
Pittsburg & Lake Erie		105.3	8.3	33.5	147.1	21.5	2.9			24.4	171.5	183.9	93.8
New York, New Haven & Hartford	20.5	235.8			256.3	258.0	208.4		75.8	542.2	798.5	1,968.0	40.6
New York, Ontario & Western	27.3	109.7			137.0						137.0	492.8	27.8
Norfolk & Western	3.0	64.0			67.0	1,470.8	186.3			1,657.1	1,724.1	1,921.1	89.7
Northern Pacific	1.7	17.7			19.4	1,016.1	263.4			1,279.5	1,298.9	4,731.9	27.4
Northwestern Pacific	.6	9.4			10.0						10.0	327.2	3.0
Pennsylvania		56.2	3.0	185.3	244.5	1,253.2	731.4	35.4	192.4	2,212.4	2,456.9	3,296.4	71.1
Northern Central						287.0	126.4		19.5	432.9	432.9	439.5	96.2
Pennsylvania Company	18.3	79.0	18.9	35.3	151.5	217.1	491.8	4.2	4.5	717.6	869.1	1,312.3	66.2
Philadelphia, Baltimore & Washington		11.4		21.0	32.4	107.1	150.2	17.1	14.6	289.0	321.4	637.8	50.4
Pittsburg, Cincinnati, Chicago & St. Louis		7.2		2.1	9.3	610.5	407.0	58.9	17.8	1,094.2	1,103.5	1,416.6	77.9
West Jersey & Seashore		89.1	4.5		93.6	51.4	29.0			80.4	174.0	291.2	60.0
Peoria & Pekin Union							6.0			6.0	6.0	15.4	38.9
Pere Marquette	12.9				12.9	19.0				19.0	31.9	1,537.0	2.1
Philadelphia & Reading	14.8	290.9	41.1	15.8	362.6	155.2	124.8			280.0	642.6	851.5	73.5
Atlantic City		87.0			87.0	22.3				22.3	109.3	163.9	66.7
Northeast Pennsylvania	2.9	1.9			4.8	1.7				1.7	6.5	25.6	25.4
Perkiomen						38.3				38.3	38.3	38.3	100.0
Philadelphia, Newton & New York	4.2	1.6	1.8		7.6						7.6	21.8	34.9
Reading & Columbia						35.7				35.7	35.7	53.3	67.0

(Continued on next page.)

TABLE 1.—(*Continued*).

Names of railroads.	Automatic block signals.					Nonautomatic block signals.					Total, automatic and non-automatic.	Total miles operated (passenger lines).	Per cent operated under block system.
	Single track.	Double track.	Three track.	Four track.	Total.	Single track.	Double track.	Three track.	Four track.	Total.			
Queen & Crescent Route:													
Alabama Great Southern	73.5				73.5						73.5	290.5	25.3
Cincinnati, New Orleans & Texas Pacific	266.3	68.0			334.3	.9				.9	335.2	335.9	99.8
Richmond, Fredericksburg & Potomac						9.8	77.9			87.7	87.7	87.7	100.0
St. Joseph & Grand Island						.3				.3	.3	251.6	.1
St. Louis & San Francisco	25.3	16.2			41.5	370.4	20.6			391.0	432.5	4,726.6	9.2
St. Louis Merchants Bridge Terminal		5.7			5.7		1.1			1.1	6.8	9.9	68.6
St. Louis Southwestern	.4				.4						.4	621.5	
San Pedro, Los Angeles & Salt Lake	1.1				1.1						1.1	1,066.4	.1
Seaboard Air Line						213.5				213.5	213.5	2,436.5	8.8
Southern		3.0			3.0	1,403.9	194.7			1,598.6	1,601.6	6,092.3	26.2
St. Louis—Louisville Lines						68.4				68.4	68.4	526.2	13.1
Southern Illinois & Missouri Bridge		4.6			4.6						4.6	4.6	100.0
Southern Pacific, Atlantic System:													
Galveston, Harrisburg & San Antonio	90.0				90.0						90.0	1,270.6	7.1
Louisiana Western	103.6				103.6						103.6	140.3	73.8
Morgan's Louisiana & Texas	95.3				95.3						95.3	242.0	39.4
Texas & New Orleans	108.2				108.2						108.2	438.5	24.7
Southern Pacific, Pacific System	1,765.2	131.4		1.0	1,897.6	95.4				95.4	1,993.0	5,966.4	33.4
Staten Island Rapid Transit		10.1			10.1						10.1	10.9	92.6
Terminal Railroad Association of St. Louis		6.0			6.0		1.1			1.1	7.1	12.6	56.3
Ulster & Delaware	24.4				24.4						24.4	129.3	18.8
Union		.6			.6	1.4				1.4	2.0	7.4	8.1
Union Pacific	804.3	415.5		2.2	1,222.0	11.1				11.1	1,233.1	3,134.4	39.3
Oregon R. R. & Navigation Co	415.7				415.7						415.7	1,309.1	31.7
Oregon Short Line	333.9				333.9						333.9	1,306.5	25.6
Vandalia						201.6	36.3			237.9	237.9	828.2	29.9
Virginian						2.2				2.2	2.2	359.1	.6
Wabash		7.2			7.2	1,726.7	94.0			1,820.7	1,827.9	1,954.9	93.5
Wabash Pittsburg Terminal		3.5			3.5						3.5	63.5	5.5
Washington Southern						32.1				32.1	32.1	32.1	100.0
Washington Terminal		1.1		1.0	2.1						2.1	2.1	100.0
Wisconsin Central							4.4			4.4	4.4	783.2	.5
Total	5,126.0	6,312.8	202.9	548.9	12,190.6	38,407.4	8,047.6	249.2	653.9	47,358.1	59,548.7	161,451.1	

TABLE 2.—KINDS OF AUTOMATIC SIGNALS IN USE.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores. Electro-pneumatic.		Semaphores. Electric motor.		Semaphores. Electro-gas.		Normal clear, miles of track.	Normal danger, miles of track.	Total automatic signals.		
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.			Miles of road.	Miles of track.	Number of block sections.
Atchison, Topeka & Santa Fe			13.3	26.6			65.6	118.0			144.6		78.9	144.6	79
Coast lines			6.4	7.4			2.0	2.0			9.4		8.4	9.4	9
Gulf, Colorado & Santa Fe			8.3	8.3							8.3		8.3	8.3	6
Baltimore & Ohio			8.7	8.7			71.3	139.9	93.3	186.6		335.2	173.3	335.2	370
Boston & Maine			1.3	3.1			326.1	629.7	8.9	17.8	631.2	19.4	336.3	650.6	843
Boston, Revere Beach & Lynn							13.8	27.6			27.6		13.8	27.6	59
Butte, Anaconda & Pacific			7.9	7.9							7.9		7.9	7.9	7
Central of New Jersey					29.7	116.0	163.3	323.2	19.4	38.0	439.2	38.0	212.4	477.2	741
Chesapeake & Ohio							11.1	22.2			22.2		11.1	22.2	9
Chicago & Alton							312.4	453.5			136.8	316.7	312.4	453.5	293
Chicago & Eastern Illinois							98.4	196.8			196.8		98.4	196.8	165
Chicago & Northwestern			599.8	1,216.9	6.3	12.6					1,229.5		606.1	1,229.5	513
Chicago & Western Indiana							17.8	35.6			35.6		17.8	35.6	59
Chicago, Burlington & Quincy			23.0	46.0	5.1	16.4					62.4		28.1	62.4	65
Chicago Great Western							7.9	15.8			15.8		7.9	15.8	20
Chicago, Milwaukee & St. Paul			2.4	2.4			42.6	85.2	3.5	3.5	85.2	5.9	48.5	91.1	102
Chicago, Peoria & St. Louis Ry. of Illinois							1.3	1.3			1.3		1.3	1.3	1
Chicago, Rock Island & Pacific			6.3	12.6			258.1	460.3			472.9		264.4	472.9	439
Chicago, St. Paul, Minneapolis & Omaha							6.4	12.8			12.8		6.4	12.8	[illegible]
Chicago Terminal Transfer			1.0	2.0	3.2	6.4	1.2	2.4			10.8		5.4	10.8	10
Cumberland Valley							6.7	13.4			13.4		6.7	13.4	7
Delaware & Hudson			37.8	75.6					369.8	601.7		677.3	407.6	677.3	773
Delaware Lackawanna & Western			15.9	31.8			469.3	929.8			961.6		485.2	961.6	1,301
Syracuse, Binghamton & New York			9.8	19.6							19.6		9.8	19.6	22
Erie							75.6	178.4			4.0	174.4	75.6	178.4	97
Erie & Jersey							42.3	84.6			84.6		42.3	84.6	44
New Jersey & New York							10.5	21.0				21.0	10.5	21.0	11
Grand Trunk System: St. Clair Tunnel					2.7	4.3						4.3	2.7	4.3	3
Great Northern							70.2	132.2			128.0	4.2	70.2	132.2	138
Illinois Central			27.7	102.4			83.4	152.2	165.9	329.8	83.7	500.7	277.0	584.4	489
Yazoo & Mississippi Valley							6.6	6.6			6.6		6.6	6.6	[illegible]
Lehigh Valley			259.8	544.2			206.5	431.1	14.5	29.0		1,004.3	480.8	1,004.3	1,073
Long Island							81.3	166.0			162.0	4.0	81.3	166.0	265
Louisville & Nashville							35.5	45.8			45.8		35.5	45.8	74
Maine Central							191.1	235.8			235.8		191.1	235.8	209
Missouri, Kansas & Texas			.5	.5			1.5	1.5			2.0		2.0	2.0	[illegible]
Missouri Pacific							60.7	77.9			77.9		60.7	77.9	38
St. Louis, Iron Mountain & Southern							91.8	100.5			100.5		91.8	100.5	60
Mobile & Ohio							4.7	9.5			9.5		4.7	9.5	3
Monongahela							.5	.5			.5		.5	.5	1
New York & Long Branch							38.0	76.0			76.0		38.0	76.0	98
New York Central Lines:															
Boston & Albany	76.1	155 4	8.6	33.0			97.5	207.0	6.1	12.2	286.6	121.0	188.3	407.6	476
Chicago, Indiana & Southern							2.0	4.0			4.0		2.0	4.0	6
Lake Shore & Michigan Southern			5.3	5.3			335.7	741.2	177.4	590.5	742.1	594.9	518.4	1,337.0	544
Michigan Central			81.1	162.2			185.5	371.0			533.2		266.6	533.2	356
New York Central & Hudson River			11.2	22.4			124.7	278.4	8.1	16.2	317.0		144.0	317.0	553
Pittsburg & Lake Erie							147.1	369.5			369.5		147.1	369.5	206
New York, New Haven & Hartford	170.9	322.9	63.1	126.2			22.3	43.0			492.1		256.3	492.1	270
New York, Ontario & Western	76.3	130.3					60.7	116.4			246.7		137.0	246.7	135
Norfolk & Western							67.0	131.0			131.0		67.0	131.0	67
Northern Pacific			3.0	4.5			12.6	25.0	3.8	7.6	37.1		19.4	37.1	42
Northwestern Pacific							10.0	19.4			19.4		10.0	19.4	30

(Continued on next page.)

TABLE 2.—(*Continued*).

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores. Electro-pneumatic.		Semaphores. Electric motor.		Semaphores. Electro-gas.		Normal clear, miles of track.	Normal danger, miles of track.	Total automatic signals.		
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.			Miles of road.	Miles of track.	Number of block sections.
Pennsylvania			5.0	10.0	228.4	836.7	11.1	22.2			868.9		244.5	868.9	1,460
Pennsylvania Company							151.5	374.2			374.2		151.5	374.2	192
Philadelphia, Baltimore & Washington					32.4	106.8					106.8		32.4	106.8	155
Pittsburg, Cincinnati, Chicago & St. Louis							9.3	22.8			22.8		9.3	22.8	21
West Jersey and Seashore					93.6	191.7					191.7		93.6	191.7	249
Pere Marquette			10.0	10.0			2.9	2.9			12.9		12.9	12.9	9
Philadelphia & Reading			347.2	760.2	1.2	2.4			14.2	20.5	2.4	780.7	362.6	783.1	874
Atlantic City			87.0	174.0								174.0	87.0	174.0	90
Northeast Pennsylvania			4.8	6.7							6.7		4.8	6.7	8
Philadelphia, Newton & New York			7.6	12.8								12.8	7.6	12.8	15
Queen & Crescent Route:															
Alabama Great Southern	29.0	29.0	9.0	9.0			35.5	35.5			73.5		73.5	73.5	48
Cincinnati, New Orleans & Texas Pacific	39.0	39.0	55.9	55.9			234.4	299.4	5.0	8.0	357.3	45.0	334.3	402.3	323
St. Louis & San Francisco			8.0	11.0			33.5	46.7			50.7	7.0	41.5	57.7	53
St. Louis Merchant's Bridge Terminal							5.7	11.4			11.4		5.7	11.4	28
St. Louis Southwestern							.4	.4			.4		.4	.4	1
San Pedro, Los Angeles & Salt Lake							1.1	1.1			1.1		1.1	1.1	1
Southern							3.0	6.0			6.0		3.0	6.0	9
Southern Illinois & Missouri Bridge							4.6	9.2			9.2		4.6	9.2	18
Southern Pacific, Atlantic System:															
Galveston, Harrisburg & San Antonio			0.9	0.9			89.1	89.1			90.0		90.0	90.0	76
Louisiana Western							103.6	103.6			103.6		103.6	103.6	73
Morgan's Louisiana & Texas							95.3	95.3			95.3		95.3	95.3	72
Texas & New Orleans							108.2	108.2			108.2		108.2	108.2	75
Southern Pacific, Pacific System			1.0	1.0	6.0	14.0	1,890.6	2,017.0			2,032.0		1,897.6	2,032.0	1,696
Staten Island Rapid Transit			10.1	20.2								20.2	10.1	20.2	49
Terminal R. R. Assn. of St. Louis							6.0	12.0			12.0		6.0	12.0	16
Ulster & Delaware							24.4	24.4			24.4		24.4	24.4	20
Union	0.6	1.2									1.2		.6	1.2	1
Union Pacific			10.4	20.8			1,176.3	1,546.1	35.3	70.6	1,637.5		1,222.0	1,637.5	1,239
Oregon R. R. & Navigation Co.							415.7	415.7			415.7		415.7	415.7	282
Oregon Short Line			22.3	22.3			311.6	311.6			333.9		333.9	333.9	211
Wabash							7.2	14.4			14.4		7.2	14.4	25
Wabash Pittsburg Terminal							3.5	7.0			7.0		3.5	7.0	5
Washington Terminal					2.1	18.2						18.2	2.1	18.2	13
Total	391.9	677.8	1,781.4	3,584.4	410.7	1,325.5	8,665.1	13,071.2	925.2	1,932.0	15,711.7	4,879.2	12,174.3	20,590.9	18,605

TABLE 3. —METHODS AND APPARATUS USED WITH MANUAL BLOCK SYSTEM.

Names of railroads.	Morse telegraph.		Telephone.		Electric bells.		Controlled manual. No track circuit.		Controlled manual. Track circuit at stations.		Controlled manual. Continuous track circuit.		Electric train staff.		Block signal stations.	
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Total number.	Number closed part time.
Atchison, Topeka & Santa Fe			1,418.8	1,812.6									38.3	58.9	291	94
Coast lines													4.3	4.3	2	
Gulf, Colorado & Santa Fe													2.1	2.1	2	
Atlanta & West Point	6.0	12.0													3	
Atlantic Coast Line	492.9	578.9	2.6	4.5											106	48
Baltimore & Ohio	879.0	1,676.9									8.5	8.5			241	2
Baltimore & Ohio Southwestern	59.4	114.5													18	4
Baltimore & Sparrows Point	3.0	6.0													3	2
Bessemer & Lake Erie	195.0	286.0													88	7
Boston & Maine	28.2	34.7							4.8	9.6					9	3
Buffalo, Rochester & Pittsburg	421.9	545.2													[illegible]	48
Caldwell & Northern	2.4	2.4													2	2
Central of Georgia	59.7	67.1													19	5
Central Vermont							0.4	0.4			1.1	1.1			2	
Chesapeake & Ohio	1,195.8	1,372.0					147.4	147.4	92.1	184.2	28.9	37.7	7.7	8.8	367	75
Coal River			51.3	51.3											10	10
Chicago & Alton	352.1	390.0							19.2	19.2			18.5	18.5	82	30
Chicago & Eastern Illinois	161.1	217.3	8.9	10.2			56.9	56.9							36	14
Chicago & Northwestern	1,984.5	2,001.0	531.2	743.2											391	244
Chicago & Western Indiana					9.5	22.2									19	
Chicago, Burlington & Quincy	5,912.0	5,918.0	1,504.0	2,043.0			1,201.8	1,201.8			56.9	56.9			1,102	770
Chicago Great Western	288.9	315.7									.5	.5	1.6	1.6	63	22
Chicago, Milwaukee & St. Paul	3,864.3	4,249.7									1.0	1.0	8.7	8.7	646	262
Chicago, Milwaukee & Puget Sound			622.7	622.7											55	
Montana			92.9	92.9											7	
Chicago, Rock Island & Pacific	409.7	471.5											9.0	9.0	77	31
Chicago, St. Paul, Minneapolis & Omaha	269.8	269.8	385.9	450.0											122	54
Cincinnati & Muskingum Valley	11.4	11.4													3	
Cincinnati, Hamilton & Dayton	100.9	128.8													29	9
Cleveland, Akron & Columbus	142.1	157.7													31	
Colorado Midland													2.5	2.5	2	2
Cornwall & Lebanon	22.0	35.7													7	7
Cumberland & Pennsylvania	7.3	13.3													9	3
Cumberland Valley	14.6	14.6					2.0	2.0							10	
Davenport, Rock Island & Northwestern							41.7	42.8							11	6
Delaware & Hudson			6	6											2	
Delaware, Lackawanna & Western											1.6	1.6			2	
Duluth & Iron Range			16.8	18.8											6	4
Duluth, South Shore & Atlantic													4.2	4.2	2	
Durham & Southern	56.0	56.0													11	9
Erie	476.2	643.8			786.2	1,237.5									370	74
Chicago & Erie	248.8	257.2													60	8
Columbus & Erie	22.4	32.2													3	3
New Jersey & New York					26.1	26.1									11	5
New York, Susquehanna & Western and Wilkes-Barre & Eastern					20.7	20.7									17	2
Grand Rapids & Indiana	2.2	4.4													3	3

(Continued on next page.)

Table 3.—(*Continued*).

Names of railroads.	Morse telegraph.		Telephone.		Electric bells.		Controlled manual.						Electric train staff.		Block signal stations.	
							No track circuit.		Track circuit at stations.		Continuous track circuit.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Total number.	Number closed part time.
Great Northern	174.8	174.8	......	......	......	......	65.5	65.5	......	......	......	......	19.9	19.9	59	3
Hocking Valley	74.7	74.7	......	......	......	......	......	......	......	......	......	......	......	......	24	11
Illinois Central	......	......	......	......	......	......	5.0	10.0	......	......	......	......	......	......	2	......
Iowa Central	11.0	11.0	......	......	......	......	......	......	......	......	......	......	......	......	3	......
Kansas City, Clinton & Springfield	5.9	5.9	2.5	2.5	......	......	......	......	......	......	......	......	......	......	5	5
Kentucky & Indiana Bridge & Railroad Company	10.6	14.7	......	......	......	......	......	......	......	......	......	......	......	......	9	......
Lackawanna & Wyoming Valley	......	......	1.2	2.4	......	......	......	......	......	......	......	......	2.2	3.4	3	1
Lehigh Valley	735.6	786.1	......	......	......	......	......	......	......	......	......	......	6.2	6.2	161	108
Long Island	......	......	......	......	14.1	28.2	......	......	8.6	17.2	......	......	......	......	37	10
Louisville & Nashville	135.1	179.0	......	......	......	......	......	......	......	......	......	......	......	......	47	......
Marquette & Southeastern	3.7	3.7	......	......	......	......	......	......	......	......	......	......	......	......	2	2
Minneapolis, St. Paul & Sault Ste. Marie	1,967.7	1,967.7	24.4	24.4	......	......	......	......	......	......	......	......	......	......	214	180
Missouri Pacific	15.8	15.8	......	......	......	......	1.9	1.9	......	......	1.2	1.2	8.2	8.2	11	3
St. Louis, Iron Mountain & Southern	4.6	4.6	......	......	.5	.5	......	......	1.1	2.2	1.2	1.2	......	......	7	......
Mobile & Ohio	42.4	42.4	......	......	......	......	......	......	......	......	......	......	......	......	15	......
Monongahela Connecting	4.0	8.0	......	......	......	......	......	......	......	......	......	......	......	......	6	......
Nashville, Chattanooga & St. Louis	95.2	100.6	......	......	......	......	......	......	......	......	......	......	......	......	36	......
Newburgh & South Shore	......	......	......	......	......	......	5.2	7.3	......	......	......	......	......	......	4	4
New York Central Lines:																
Boston & Albany	......	......	......	......	......	......	......	......	......	......	6.6	6.6	......	......	12	......
Chicago, Indiana & Southern	17.4	17.4	......	......	......	......	......	......	......	......	......	......	......	......	6	3
Cleveland, Cincinnati, Chicago & St. Louis	867.1	1,292.9	......	......	......	......	......	......	......	......	......	......	......	......	221	41
Lake Erie & Western	18.6	27.5	......	......	......	......	......	......	......	......	......	......	......	......	5	2
Lake Shore & Michigan Southern	972.7	995.8	20.0	20.0	......	......	......	......	......	......	......	......	......	......	167	105
Dunkirk, Allegheny Valley & Pittsburg	90.3	90.3	......	......	......	......	......	......	......	......	......	......	......	......	17	15
Lake Erie, Alliance & Wheeling	......	......	87.7	87.7	......	......	......	......	......	......	......	......	......	......	22	16
Michigan Central	920.2	939.3	......	......	......	......	......	......	......	......	......	......	......	......	143	73
New York Central & Hudson River	2,194.0	2,687.0	4.5	14.6	1.4	2.8	4.0	8.0	45.9	122.2	437.6	1,264.5	......	......	768	278
Peoria & Eastern	......	......	5.3	7.0	......	......	......	......	......	......	......	......	......	......	6	......
Pittsburg & Lake Erie			......	......	......	......	24.4	27.3	......	......	......	......	......	......	11	5
New York, New Haven & Hartford	304.4	350.8	......	......	......	......	......	......	234.8	621.2	3.0	6.0	......	......	192	61
Norfolk & Western	1,657.1	1,843.4	......	......	......	......	......	......	......	......	......	......	......	......	215	158
Northern Pacific	1,046.5	1,156.9	231.7	384.7	......	......	......	......	......	......	......	......	1.3	1.3	232	57
Pennsylvania [a]	2,017.0	3,238.0	186.9	345.3	......	......	......	......	......	......	10.9	10.9	......	......	603	......
Northern Central	432.2	616.4	......	......	......	......	......	......	......	......	.7	1.4	......	......	118	......
Pennsylvania Company	703.5	1,212.4	14.1	18.9	......	......	......	......	......	......	......	......	......	......	200	4
Philadelphia, Baltimore & Washington	287.6	514.4	......	......	......	......	......	......	......	......	1.4	2.8	......	......	89	......
Pittsburg, Cincinnati, Chicago & St. Louis	1,083.2	1,660.3	2.5	3.6	......	......	......	......	......	......	8.5	8.5	......	......	273	19
West Jersey & Seashore	51.4	51.4	29.0	58.0	......	......	......	......	......	......	......	......	......	......	23	......
Peoria & Pekin Union	6.0	12.0	......	......	......	......	......	......	......	......	......	......	......	......	3	......
Pere Marquette	19.0	19.0	......	......	......	......	......	......	......	......	......	......	......	......	4	......
Philadelphia & Reading	275.8	400.4	1.1	1.3	......	......	......	......	......	......	1.1	1.1	2.0	2.0	105	84
Atlantic City	22.3	22.3	......	......	......	......	......	......	......	......	......	......	......	......	7	7
Northeast Pennsylvania	......	......	......	......	......	......	......	......	......	......	......	......	1.7	1.7	2	2
Perkiomen	38.3	38.3	......	......	......	......	......	......	......	......	......	......	......	......	12	9
Reading & Columbia	35.7	35.7	......	......	......	......	......	......	......	......	......	......	......	......	12	12
Queen and Crescent Route:																
Cincinnati, New Orleans & Texas Pacific	......	......	......	......	......	......	......	......	......	......	......	......	.9	.9	2	......
Richmond, Fredericksburg & Potomac	87.0	166.9	......	......	......	......	......	......	......	......	......	......	.7	.7	22	4
St. Joseph & Grand Island	......	......	......	......	0.3	0.3	......	......	......	......	......	......	......	......	1	......
St. Louis & San Francisco	4.1	8.2	383.9	400.4	......	......	......	......	......	......	......	......	3.0	3.0	76	36
St. Louis Merchant's Bridge Terminal	1.1	2.2	......	......	......	......	......	......	......	......	......	......	......	......	3	......
Seaboard Air Line	206.6	206.6	......	......	......	......	......	......	......	......	......	......	6.9	6.9	45	16
Southern	1,589.5	1,784.2	9.1	9.1	......	......	......	......	......	......	......	......	......	......	341	74
St. Louis—Louisville lines	62.5	62.5	......	......	......	......	......	......	......	......	......	......	5.9	5.9	17	8
Southern Pacific—Pacific System	......	......	......	......	......	......	......	......	......	......	1.0	1.0	94.4	94.4	39	......
Terminal Railroad Association of St. Louis	......	......	......	......	......	......	......	......	1.1	2.2	......	......	......	......	2	......
Union	......	......	......	......	......	......	0.9	0.9	......	......	.5	.5	......	......	2	......
Union Pacific	......	......	......	......	......	......	......	......	......	......	......	......	11.1	11.1	4	......
Vandalia	237.9	274.2	......	......	......	......	......	......	......	......	......	......	......	......	55	......
Virginian	2.2	2.2	......	......	......	......	......	......	......	......	......	......	......	......	2	......
Wabash	1,820.7	1,914.7	......	......	......	......	......	......	......	......	......	......	......	......	261	128
Washington Southern	31.2	62.4	......	......	......	......	......	......	......	......	......	......	......	......	9	......
Wisconsin Central	......	......	4.4	8.8	......	......	......	......	......	......	......	......	......	......	4	......
Total	38,073.8	44,978.8	5,641.0	7,233.5	858.8	1,338.3	1,557.1	1,572.2	407.6	978.0	572.2	1,413.0	261.3	284.2	9,439	3,322

Table 4.—Practices in the Operation of the Manual Block System.

Names of railroads.	Permissive signaling forbidden.		Permissive signaling allowed.						Rear end protection only.		Signals opposite office.	
			By three-position signal.		By two-position signal or flag.		By caution card.					
	Miles of road.	Miles of track.	Miles of road.	Milea of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.
Atchison, Topeka & Santa Fe	38.3	58.9	1,418.8	1,812.6	......	......	......	......	......	......	......	......
Coast Lines	4.3	4.3	......	......	......	......	......	......	......	......	......	......
Gulf, Colorado & Santa Fe	......	......	2.1	2.1	......	......	......	......	......	......	......	......
Atlanta & West Point	6.0	12.0	......	......	......	......	......	......	......	......	......	......
Atlantic Coast Line	11.6	17.3	......	......	......	......	[a] 483.9	[a] 566.1	407.6	407.6	487.9	568.2
Baltimore & Ohio	96.9	168.1	[a] 790.6	1,517.3	......	......	......	......	......	......	......	......
Baltimore & Ohio Southwestern	......	......	[a] 59.4	114.5	......	......	......	......	......	......	......	......
Baltimore & Sparrows Point	......	......	3.0	6.0	......	......	......	......	[c] 3.0	6.0	......	......
Bessemer & Lake Erie	.9	.9	......	......	......	......	[a] 194.1	285.1	......	......	......	......
Boston & Maine	4.8	9.6	28.2	34.7	......	......	......	......	......	......	28.2	34.7
Buffalo, Rochester & Pittsburg	......	......	......	......	[d] 421.9	545.2	......	......	......	......	......	......
Caldwell & Northern	2.4	2.4	......	......	......	......	......	......	......	......	......	......
Central of Georgia	59.7	67.1	......	......	......	......	......	......	......	......	......	......
Central Vermont	1.5	1.5	......	......	......	......	......	......	......	......	......	......
Chesapeake & Ohio	......	......	......	......	......	......	[d] 1,471.9	1,750.1	......	......	1,028.1	1,060.5
Coal River	......	......	......	......	......	......	51.3	51.3	......	......	......	......

(Continued on next page.)

TABLE 4.—(Continued).

Names of railroads.	Permissive signaling forbidden.		Permissive signaling allowed. By three-position signal.		By two-position signal or flag.		By caution card.		Rear end protection only.		Signals opposite office.	
	Miles of road.	Miles of track.	Miles of road.	Milea of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.
Chicago & Alton	37.7	37.7					a 352.1	390.0				
Chicago & Eastern Illinois	12.9	12.9	a b d 214.0	271.5								
Chicago & Northwestern							a d 2,515.7	2,744.2			2,515.7	2,744.2
Chicago & Western Indiana	58.3	58.3			9.5	22.2						
Chicago, Burlington & Quincy	291.0	317.8			d 8,616.4	9,161.4			d 6,803.8	7,206.4	8,673.3	9,214.1
Chicago Great Western	743.9	766.6										
Chicago, Milwaukee & St. Paul							a d 3,130.1	3,492.8				
Chicago, Milwaukee & Puget Sound							a 622.7	622.7				
Montana							a 92.9	92.9				
Chicago, Rock Island & Pacific			9.0	9.0			418.7	480.5			409.7	471.5
Chicago, St. Paul, Minneapolis & Omaha							a b 655.7	719.8				
Cincinnati & Muskingum Valley			d 11.4	11.4							11.4	11.4
Cincinnati, Hamilton & Dayton			a 59.1	87.0	a 41.8	41.8						
Cleveland, Akron & Columbus			b 142.1	157.7							142.1	157.7
Colorado Midland	2.5	2.5										
Cornwall & Lebanon					a 22.0	35.7						
Cumberland & Pennsylvania	3.0	9.0	a 4.3	4.3								
Cumberland Valley	3.5	3.5					13.1	13.1	13.1	13.1		
Davenport, Rock Island & Northwestern					a 41.7	42.8						
Delaware & Hudson	.6	.6										
Delaware, Lackawanna & Western	1.6	1.6										
Duluth & Iron Range							16.8	18.8	16.8	18.8		
Duluth, South Shore & Atlantic							d 4.2	4.2				
Durham & Southern									56.0	56.0		
Erie			a 1,262.4	1,881.3							963.1	1,428.7
Chicago & Erie			a 248.8	257.2							240.4	240.4
Columbus & Erie			a 22.4	32.2							22.4	32.2
New Jersey & New York			a 26.1	26.1							26.1	26.1
New York, Susquehanna & Western and Wilkes-Barre & Eastern			a 20.7	20.7							20.7	20.7
Grand Rapids & Indiana	2.2	4.4										
Great Northern	10.4	10.4					a d 249.3	249.3			259.7	259.7
Hocking Valley					a 11.0	11.0			c 74.7	74.7		
Illinois Central	5.0	10.0										
Iowa Central												
Kansas City, Clinton & Springfield	8.4	8.4										
Kentucky & Indiana Bridge & Railroad Company			a 10.6	14.7								
Lackawanna & Wyoming Valley	3.4	5.8										
Lehigh Valley	741.8	792.3										
Long Island							22.7	45.4				
Louisville & Nashville	8.5	8.5	126.6	170.5								
Marquette & Southeastern			3.7	3.7								
Minneapolis, St. Paul & Sault Ste. Marie							a 1,992.1	1,992.1	1,992.1	1,992.1		
Missouri Pacific							a 20.0	20.0				
St. Louis, Iron Mountain & Southern	2.3	3.4			.5	.5			4.6	4.6		
Mobile & Ohio	17.6	17.6			a 24.8	24.8			24.8	24.8	42.4	42.4
Monongahela Connecting					a 4.0	8.0						
Nashville, Chattanooga & St. Louis	95.2	100.6										
Newburgh & South Shore			5.2	7.3					5.2	7.3	1.0	2.0
New York Central Lines:												
Boston & Albany	6.6	19.4										
Chicago, Indiana & Southern	17.4	17.4										
Cleveland, Cincinnati, Chicago & St. Louis	863.3	1,189.1			b 12.8	12.8						
Lake Erie & Western	18.6	27.5										
Lake Shore & Michigan Southern	992.7	1,015.8									969.6	969.6
Dunkirk, Allegheny Valley & Pittsburg	90.3	90.3									90.3	90.3
Lake Erie, Alliance & Wheeling	87.7	87.7									87.7	87.7
Michigan Central	920.2	939.3									920.2	939.3
New York Central & Hudson River	2,682.2	4,288.8					295.2	590.4				
Peoria & Eastern					b 5.3	7.0						
Pittsburg & Lake Erie	24.4	27.3										
New York, New Haven & Hartford	542.2	978.0										
Norfolk & Western	404.0	450.8	1,253.1	1,392.6					1,253.1	1,392.6		
Northern Pacific	425.8	530.0					a 853.7	1,012.9			1,279.5	1,542.9
Pennsylvania	653.1	871.2	d 1,542.1	2,701.0	19.6	19.6	19.6	19.6				
Northern Central	1.3	2.6	a 431.6	615.4								
Pennsylvania Company			b d 717.6	1,231.3							717.6	1,231.3
Philadelphia, Baltimore & Washington	152.5	307.5	a 136.5	209.7							34.4	34.4
Pittsburg, Cincinnati, Chicago & St. Louis			b d 1,094.2	1,672.4							1,094.2	1,672.4
West Jersey & Seashore	80.4	109.4										
Peoria & Pekin Union			a 6.0	12.0								
Pere Marquette	19.0	19.0									19.0	19.0
Philadelphia & Reading	30.5	47.0					b 249.5	357.8				
Atlantic City	22.3	22.3										
Northeast Pennsylvania	1.7	1.7										
Perkiomen							a b 38.3	38.3				
Reading & Columbia							b 35.7	35.7				
Queen & Crescent Route:												
Cincinnati, New Orleans & Texas Pacific					a [illegible]	[illegible]						
Richmond, Fredericksburg & Potomac							87.7	97.5				
St. Joseph & Grand Island									b 0.3	0.3		
St. Louis & San Francisco	3.0	3.0					a 388.0	408.6				
St. Louis Merchants' Bridge Terminal	1.1	2.2									1.1	2.2
Seaboard Air Line	6.9	6.9					a 206.6	206.6				
Southern	10.8	10.8					a 1,587.8	1,782.5				
St. Louis-Louisville Lines	5.9	5.9					a 56.4	56.4	6.1	6.1		
Southern Pacific—Pacific system	95.4	95.4										
Terminal Railroad Association of St. Louis	1.1	2.2										
Union	1.4	1.4										
Union Pacific							11.1	11.1				
Vandalia			237.9	274.2							237.9	274.2
Virginian	2.2	2.2										
Wabash							a 1,820.7	1,914.7	849.1	849.1		
Washington Southern							b d 32.1	64.2				
Wisconsin Central	4.4	8.8										
Total	10,444.6	13,694.9	9,887.5	14,550.4	9,232.2	9,932.8	17,989.7	20,134.7	11,510.3	12,059.5	20,323.7	23,177.8

a By dispatcher.
b By rule.

c Applies only to passenger trains.
d Applies only to freight trains.

SHOP NOTES FROM THE C., ST. P., M. & O.

The sketch herewith (Fig. 1) shows a device used at the St. Paul shops of the Chicago, St. Paul, Minneapolis & Omaha for turning off the riveted ends of crank pins to remove them from driving wheel centers, instead of chipping them. A hole is first drilled in the center of the crank pin to admit the small center-guide pin of the device. The drill is driven by an air motor, the whole being clamped to the wheel by an "old man." The cross-bar carrying the tool is adjustable in the direction of its length, being held by the cap screw in the forward end of the stock. It is made of 1-in. diameter tool steel and has a ⅝-in. flat for the cap screw bearing. The tool is connected back to the sliding collar by a small rod and slides through the cross-bar as it is fed up to the work. The set screw in the end of the bar, which has a jam-nut, holds the tool steady. The tool is fed forward by a clamp or wrench of ½-in. round steel which fits in the groove in the screw collar back of the sliding collar. The device has a range of 8 in. diameter.

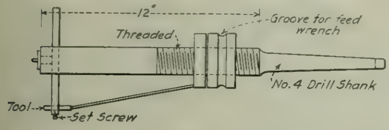


Fig. 1.

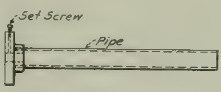


Fig. 2.

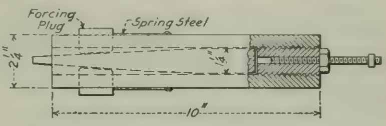


Fig. 3.

Shop Devices; Chicago, St. Paul, Minneapolis & Omaha.

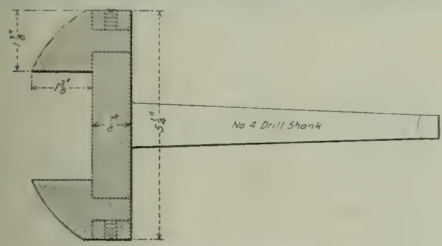


Fig. 4—Ball Reamer.

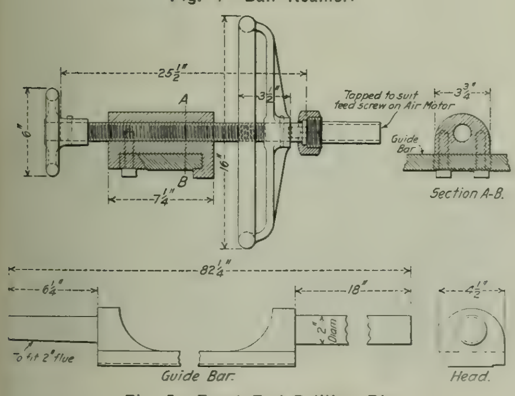


Fig. 5—Front End Drilling Rig.

A simple holder for grinding squares on taps having the square broken off, to save setting up in a milling machine, is shown in Fig. 2. The tap is held by a set screw having a fine thread to prevent its working loose. The hole in the head is made for the larger taps, and a special holder for insertion in this hole is provided for small-size taps. The pipe handle is a drive fit in the head.

A device for starting stuck bolts is shown in Fig. 3. The barrel, which is 2¼ in. in diameter, is made of heavy steel tubing, 1¼ in. inside diameter. The two forcing-plugs are each secured to the barrel by a piece of spring steel and are forced apart by the wedge-shaped piece within the barrel, this piece being circular above the wedge part and a loose fit in the tube. It is retained by the pressure of the forcing-plug springs. The wedge is forced forward by the screw, which is threaded through the bush nut in the back end of the tube. In using the device the plug opposite the one in contact with the bolt must have a solid backing, of course.

The ball reamer shown herewith, Fig. 4, has the advantages of being easily made and easy to sharpen and repair. Danger in hardening is minimized, and one holder can be used for balls of different radii. As the plan view of the sketch indicates, the particular style here shown has six cutter inserts, and is for a 5¼-in. ball having a 2¾-in. radius. These inserts are circular in plan and are 1⅜ in. in diameter. They are held by set screws bearing against a ½-in. flat on the insert shank, as shown.

Valve and wheel trams are made with removable points for convenience of grinding. For wheel trams the bar, which is round, is split at the end and the point clamped with a screw. For the valve tram the point that is in line with the bar is screwed into the end of the same and held by a jam-nut. Stuffing box spanners also are made with inserted points, long enough so that in case of breakage they can be reground.

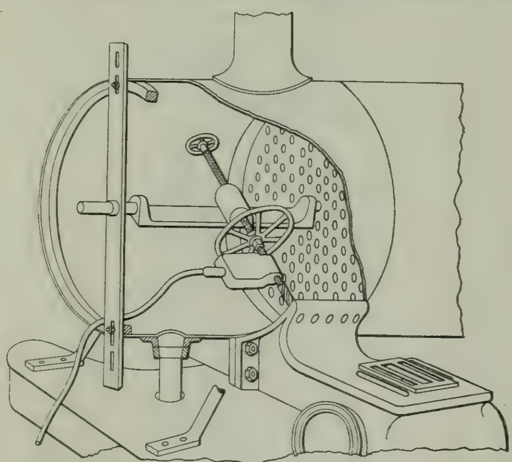


Fig. 6—Front End Drilling Rig in Position.

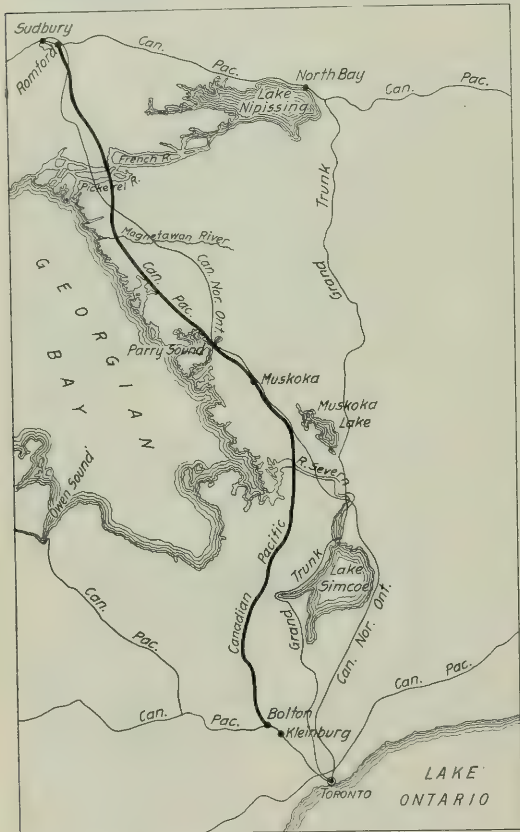
A rig for drilling holes in boiler front-ends which have been newly applied in the course of general repairs is shown in Fig. 5, and a perspective sketch of its application in Fig. 6. As shown by the latter, the head slides on a guide-bar having one end inserted in a central flue and the other supported by a flat bar bolted to the smoke-box ring. The drilling is done with an air motor, and, as will be seen from Fig. 6, any point within the smoke arch can be reached without difficulty.

All but the last of these devices were invented by Arthur Munch, Tool Room Foreman at these shops.

SUDBURY-KLEINBURG BRANCH OF THE CANADIAN PACIFIC.

BY F. S. DARLING, M. AM. SOC. C. E.*

The Canadian Pacific Railway, as built through the province of Ontario, consisted of the main line through the northern part of the province and the Ontario section through the southern and thickly settled portion, the two joining near the easterly end of the province. This gave a long roundabout route for the shipment of manufactured goods from the factories in Ontario to the West. To avoid this long detour of some 444 miles, a traffic agreement was entered into between the Canadian Pacific and the Grand Trunk, whereby freight was handled over the Grand Trunk between a point on the

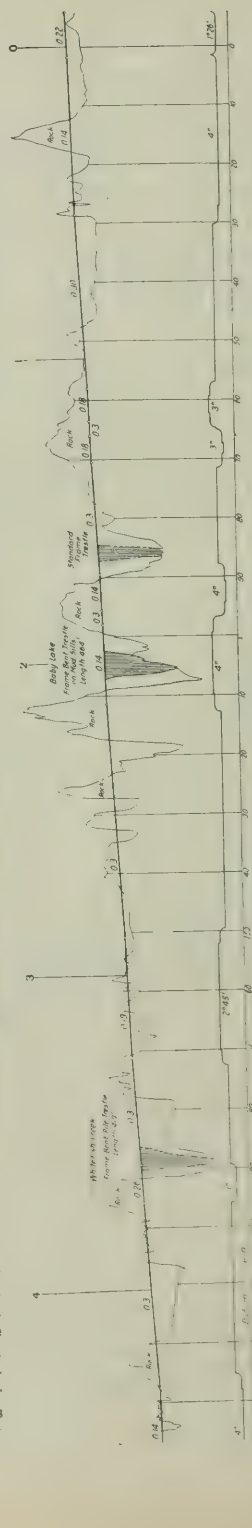


Sudbury-Kleinburg Branch; Canadian Pacific.

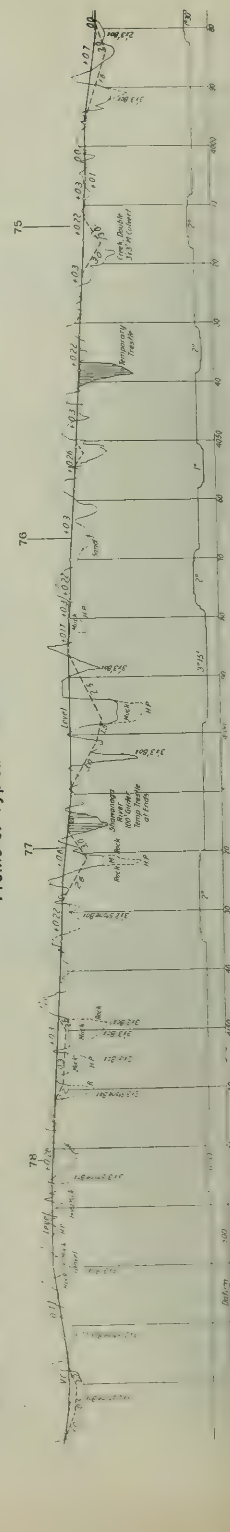
Ontario system of the Canadian Pacific and North Bay, which is on the main line in the northeastern part of the province; the Grand Trunk also handled Canadian Pacific coaches on its passenger trains. This arrangement saved 217 miles.

As the West began to settle up, and the shipments in that direction became larger, the Canadian Pacific felt the necessity of having a track of its own, joining the Ontario system with the main line to the West. The Minneapolis, St. Paul & Sault Ste. Marie from St. Paul and Minneapolis, and the region adjacent, connects with the Canadian Pacific main line at Sudbury. It was therefore important that a line joining the Ontario system with the main line connect either at Sudbury or some point east of it. In 1898 a survey was

*Division Engineer, Canadian Pacific Ry.



Profile of Typical Section at North End.



Profile, Showing Method of Using Depressed Grades.

made for a line between Woodbridge, on the Owen Sound section, 17 miles northwest of Toronto, north to Romford, on the main line, seven miles east of Sudbury. This line as located had a maximum grade of 1 per cent. in both directions and maximum curves of 6 deg. The line thus located was not built at that time, however. In 1902 the company decided the connecting line must be built and a new reconnaisance and a survey were made to see if it was possible to improve the old location. The reconnaisance and reports showed that a 0.3 per cent. compensated grade in both directions could be secured on virtually the same route as the other location, with a 4 deg. maximum curvature. Preliminary and location surveys were therefore made, giving the gradient and curvature mentioned, without lengthening the line or increasing greatly the cost of the work. A shorter line could have been obtained by hugging the shore of Georgian Bay more, but this would have left out the Muskoka lake region, to which there is a large tourist traffic. For this reason the line was thrown to the eastward along the westerly shores of the Muskoka lakes.

French River Bridge.

Pickerel River Bridge.

The survey for this line showed the total distance to be 226.5 miles, reducing the distance between Toronto and Sudbury by 46 miles as compared with the North Bay route. The northerly 160 miles was through a country composed entirely of bald granite rock and muskeg swamps, and very sparsely settled; in fact the upper 100 miles had no settlement along the line. The granite was badly broken and upheaved. The southerly 66 miles was through a good farming country.

The direction of the line and its closeness to Georgian Bay on the north avoided any pronounced high lands. Owing to the light grade used it became necessary to take advantage of every low point in the hills, as heavy cutting was extremely costly on account of the nature of the material to be handled. This necessitated keeping up on the high ground as much as possible, and out of the swamps. The territory through which this line runs is a timber country, and the streams, both main and tributary, are run with logs by lumber companies in the spring. On account of this it was necessary to keep the grade high enough above these swamps to allow them to be flooded in the spring when the lumber firms put in their dams and back up the water in the swamps to float their logs. Also, where there were long stretches of tamarack swamps which were not flooded by lumber companies, and which had extremely deep soundings, it became necessary to cross them with a grade line just above the surface line, leaving sufficient room for a good matting of corduory. The grade line of the profile became a very complicated question on this account. The cuttings were all bald rock and 90 per cent. of the fills were across tamarack swamps. The cost of handling the granite rock being very high, and timber for temporary bridging being very costly, the grade line was laid high in cuts to avoid as much rock cutting as possible and yet allow enough material to get across the fills. To accomplish this, temporary depressed grades were resorted to to get across fills and avoid the heavy rock cuttings. This allowed the grade line to be laid high in the cuts and low across the fills. These depressed grades were put in with a 3 per cent. gradient and the cuts made just large enough to give the necessary material to carry across the fill to enable the track to be laid; a work train doing the balance of the filling of the embankments with earth, which could be handled far more cheaply than the rock.

The bottoms of the embankments were all made of rock, which acted as a cutting edge in the tamarack swamps for carrying to rock bottom the embankments when filled later. This bottom layer of rock, when it became heavier than the swamp, sank straight down until it reached its equilibrium, and these rock fills were brought up to a point above the water line so that the track could be laid across. When the embankment was put on, the additional weight sank the rock down to the bottom and carried the fill along with it. The fills were thus carried straight down and avoided the fanning out of the embankments, as is most always the case in filling swamps with earth. In most cases on this line the train-filling could be done 20 per cent. cheaper than by filling with rock.

Velocity grades were also used in several places to avoid extremely heavy work. They were put in at very few points, however, and only where absolutely necessary, as it was very important, on account of the cost of the line and the length of time it would take to build it, to have it opened up to

travel as quickly as possible; also, to have the velocity grades placed so that they would not interfere with the hauling of freight trains loaded for a 0.3 per cent. grade. Furthermore, they were put at points where they could be taken out, whenever the traffic warranted, by train-filling, no further rock cutting being required.

The line was built under Canadian Pacific standard specifications, using steel or concrete for all openings. At points where not enough material was obtainable for making large fills, even by using depressed grades, standard Canadian Pacific timber trestles were put in to gain time in construction. These timber bridges are to be filled later, as soon as the life of the timber is gone. The permanent abutments, piers, arches, etc., were all built during the construction of the roadbed. Great difficulty was encountered in building these concrete substructures for the bridges and arches ahead of the track, as there were no roads in the country to facilitate handling the material, nor were there any railways within a number of miles, nor water transportation. Materials had to be teamed, in some cases, 20 miles across a wilderness.

The track, which has 80-lb. rails, was laid on this uncompleted roadbed, and over this the heavy steel bridges had to be transported to continue the track construction. All the heavy bridge material was carried over this skeleton track without accident to a single bridge member. As soon as the track-laying was far enough advanced, the train-filling was begun and pushed vigorously, the line being virtually completed this winter. Very little or no damage was done to the rails by using them on the temporary roadbed in spite of hauling the heavy bridge material and the filling trains over the skeleton track.

As was to be expected on a line through a country abound-

Magnetawan Trestle.

Baby Lake.

ing in swamps, there was considerable trouble from the fills continuing to settle, but, as anticipated, they settled straight down and gave very little difficulty beyond this continuous settlement until solid bottom was reached. These swamp fills have now nearly all settled virtually to solid foundation.

Several large bridges were necessary in the construction of this line, one being the French river bridge, having a span of 415 ft., with two 60-ft. plate girder approach spans. This river is the proposed route of the Georgian Bay ship canal. The large span was erected on the shore, the outer end resting on a truss carried on floats, and when finished it was jacked into position. It is designed to be used as a draw span later, if the ship canal is ever constructed, by building a pivot pier under it. The Pickerel river has a 249-ft. span. The Seguin valley viaduct is a combination steel trestle and truss bridge 1,694 ft. long. It crosses over part of the town of Parry Sound and is 120 ft. high at the highest point. The Severn river bridge has a span of 208 ft. There are also many plate girder spans, from 10 ft. to 110 ft. in length.

Seguin Valley Viaduct; Parry Sound.

Track Laying.

All sidings in the rock country were excavated through the rock cuts, and the embankment portion made later by train-filling. Canadian Pacific standard buildings of all kinds have been built at the various sidings. A divisional yard was built where the site had to be hewn out of solid rock. It has six miles of track and locomotive terminal facilities, including an eight-stall concrete engine house, a 70-ft. turntable, water tanks, coaling station, Ord ashpit, boiler and engine house, electric light plant, sand and oil house, etc.

The construction of this line involved moving 2,111,000 cu. yds. of solid rock, 488,000 yds. of loose rock, and 3,511,000 yds. of common excavation, requiring the use of 6,300,000 lbs. of dynamite and powder. The bridges and culverts took 80,000 barrels of cement. All concrete substructures are a broken rock or gravel 1:3:5 mixture, using local Portland cements. There was also put into the work to bring it to the true grade 3,509,000 yds. of train-filling. During the past year 24 work trains were used on the work, which was pushed forward winter and summer alike. Hart convertible cars, Lidgerwood unloaders and Jordan ballast spreaders were used for all train-filling and ballasting. To prevent the material from freezing to the bottoms of the Hart cars in the winter, salt brine was thrown on the bottom before loading. No trouble at all was experienced; a train could be left standing with a load over night and could be easily plowed off the next morning. The work was commenced in March, 1904, and the line was opened to traffic on June 15, 1908. Foley Brothers, Larson & Co. built the roadway for the northerly 59 miles; Ross, Harris & Co. built the roadway, laid the track and did the train-filling and ballasting for the next 40 miles, and the Toronto Construction Co. built the roadway, laid the track and did all the train-filling for the southerly 127 miles. This line was built to main line standards, double spiking all curves, using tie plates on all ties, and spring frogs in all switches. Just north of Tottenham, between mile-posts 11 and 13 from the northern terminus, are two miles of doubling grade. This was put in to avoid a loop of five miles which would be necessary to obtain the 0.3 per cent. grade. This loop will be built later, whenever traffic warrants.

North Naiscootyong River Bridge.

RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY.
Professor of Economics, Harvard University

II.

THE EXIGENCIES OF RAILWAY COMPETITION.

The foregoing description of the development of a mileage tariff is applicable to only a part of the traffic. A very large volume of tonnage, said to be not less than 75 per cent. in America, 63 per cent. in Prussia and 50 per cent. in the United Kingdom,—moves under special rates made in quite another way in response to the exigencies of commercial competition. The making of these freight rates in practice is an extremely complicated matter. No single road is independent of rates made by its rivals—rates applicable not only to competing commodities and markets, but also as affected by apparently the most remote and disconnected contingencies. Thus railway rates, as has well been said, are not a set of independent threads; they form a fabric. They are so interwoven everywhere that if one thread be shortened, it may cause a kink in the fabric that may run almost anywhere. In order to understand this it will be necessary to describe somewhat in detail the nature of competition as applied to transportation; and then to show by a few concrete illustrations, the various factors which actively enter into the determination of specific rates. Laymen and legislators do not sufficiently appreciate the extremely delicate nature of the work. Much discussion relative to railway competition seems to be based upon the assumption that it consists in the main of the competition of railway lines more or less parallel or else operating under substantially like conditions. As a matter of fact competition in transportation is to a large degree far more complex.

Railway competition is of three entirely distinct sorts. These may be denominated respectively, competition of routes, competition in facilities and competition of markets. The first of these, competition of routes, as the name suggests, is limited to the activities of the carriers alone. It occurs whenever two railways are exposed to identical commercial conditions both at the point of origin and of destination. The rivalry is direct and physical. The only competition possible is that concerning the route by which traffic may move between those two points. Such competition is most likely to arise between more or less parallel lines, as for instance between the various trunk roads from New York to Chicago. The classic instances in our history are of the rate wars due to the West Shore and the Nickel Plate which were built for the express purpose of engendering competition with the then existing lines,—the New York Central and the Lake Shore respectively. The same sort of simple competition prevails of course between a railway and a parallel canal or other waterway. As for instance, between the Erie Canal and the trunk lines, or the Illinois Central and the Mississippi river. Such simple competition as this where confined to railways alone almost inevitably leads to one of two results: the roads may remain independent, preventing ruinous rate wars by pooling; or else, as a result of long continued cut-throat competition, the bankrupt road may be bought up and merged with the solvent one. This was the fate of the old New York and New England railway finally purchased by the New Haven system; of the West Shore and Nickel Plate lines and of the Kansas Pacific unloaded on the Union Pacific by Jay Gould. The nature of railway competition is indeed such that no other result than consolidation or pooling can ensue. This first form of competition of routes or as it has been called of alternative routes, often obtains where conditions of competition are more obscure than in these simple instances above named. In the rivalry for the imported plate glass or crockery traffic between the trunk lines and the Gulf roads, the competition is none the less of routes between Liverpool and Chicago, although the water carriage by way of New Orleans or Galveston is so much more roundabout. Freight actually moves from Boston to Chicago by a line 1786 miles long, via Asheville, N. C., while the direct distance is only 1004 miles. Manifold instances of such roundabout carriage have been elsewhere described in full.* They differ from the competition of parallel routes, however, in the important regard, that absorption of the long lines by the short ones becomes both physically and financially impossible. Whenever a large area like the Pacific slope is devoid of manufactures, and wherever the source of supplies is sufficiently concentrated, as for instance in the manufacture of agricultural implements which are almost exclusively made in or about Chicago, we still have to do with a clear case of competition of routes, although a great number of carriers may participate in the business. When molasses or rice are only to be had from New Orleans, the center of such business, the carriers to all tributary consuming points compete for the routing of it over their own respective lines. These carriers may operate either by land or sea or by a combination of both; and they may transport commodities by the most roundabout ways.† The determinant feature, however, distinguishing this class of competition is neither the mode or carriage nor its length; but is found in the fact that the commercial conditions at both ends of the line, points of origin and destination, are identical for each participant in the business. Direct competition of routes therefore has to do with pure transportation,—the creation of place values,—and this being the case the relative cost of service is always a factor of moment.

Competition of facilities, the second of the three phases of railway competition, above-mentioned, deals, as its name implies, not at all with the rates charged but with the facilities or convenience afforded. Such competition is confined solely to rivalry for business at the established rates. Immediately on the appearance of any departure from these conditions the question becomes one of competition of either of the other two sorts. An instance of competition of facilities would be the introduction of reclining chairs or of a superior service in passenger business. When the Rock Island system offered such facilities without an extra charge, it became necessary at once for others to meet this competition in the same way that they would meet a reduction of rates. Any reduction in time of transit for freight business between two given points without extra charge would in the same manner give rise to competition of facilities. Such facilities, however, as might have a distinct money value, as for instance, free storage, cartage, demurrage or milling-in-transit, any one of which practically amounts to giving value without charge, are, of course, equivalent to a reduction of the rate; and do not belong in this class of considerations at all. Only those conveniences or facilities, which, while attempting to secure business may not be compounded for money, should be classified in this group. It should also be observed that competition of facilities may as readily arise between parts of the same railway system or under pooling agreements to maintain rates, as between distinct and independent companies. And such competition between parent and child often arises. Thus, for instance, business was as actively solicited as ever by the Pennsylvania and the Baltimore & Ohio in competition during the several years of financial control of one by the other prior to 1907. The New Haven railway may compete with its own water lines around Cape Cod or on Long Island Sound. But in all of these instances the cardinal feature to note is that the competition is always at the established rate. For New England, although the New Haven system and the Boston and Maine do not compete on rates at their points of contact, there is constant rivalry in respect of facilities or service. The same thing is undoubtedly true of the Atchison and the

*Ripley, Railway Problems, p. 490 *et seq.*

†Albert Fink's detailed description of the numberless alternative routes by which traffic moved into the South, is perhaps one of the best instances in print.—U. S. Reports, Internal Commerce, 1876, App. pp. 1-16. (The Danville, Va., case before the Interstate Commerce Commission is an admirable instance.—Ripley, Railway Problems, pp. 378-404.)

Southern Pacific in the carriage of California fruits. Although operated under pooling agreements, yet they were competitors in the matter of the service offered. Each sought a larger volume of tonnage, but not by cutting the agreed rate.

The third form of competition in transportation is dependent upon the competition of markets; and is not in reality direct competition between carriers at all. This is the most difficult of all forms to understand.* Yet although indirect and often obscure, it is of fundamental and conclusive importance in the determination of freight rates. Commercial competition deals not with a mere choice of routes, but with alternative markets. The carriers act, not independently and of their own volition, but only as agents or representatives for their constituents, the shippers. They may become tools or weapons in the hands of merchants or manufacturers who are the real contestants. It is largely in this sense, that it is so often alleged, and rightfully, that railway traffic managers oftentimes do not *make* rates at all. Their energies are bent to the analysis of those circumstances by which their rates are made for them. The preparation of commodities for final consumption falls naturally into two distinct parts; the creation of form value succeeded by the conferring of place value. Transportation is concerned alone with the latter process. Of these two operations, the latter, the creation of place values, is by far the more elastic and adaptable process. The grower, the miner or the manufacturer has his first costs more or less rigidly fixed by natural or human conditions; such as the fertility of the soil, the grade of ore, the prevailing scale of wages, and so on. His proximity to the status of a marginal producer depends upon his relative position in these respects. With the carrier, matters are more contingent. Including within its reach, as it does, many grades of producers and consumers, each more or less rigidly held bound by his own circumstances and conditions, as above said, the carrier is able to exercise a wide range of choice in fixing the margin of value received which it reserves for itself. And at all times, by reason of the factors set forth elsewhere, primarily its subjection to the law of increasing returns, this intermediate share of the carrier tends to adjust or accommodate itself to the end that it may discover or produce a wider margin beween values in the hands of producer and consumer respectively. This may be best accomplished by a progressive widening of its field of activities, that is to say, by an enlargement of its physical reach and scope. It is always striving to lower the cost of production made by the marginal producer. Its motto must ever be, to get more business, if not right at home by search for it abroad;—and this always with the chance that the greater the distance between the producer and the consumer, the greater the possible margin of place value, remaining as its individual share.

This ever-present incentive to widen the market carries with it a direct consequence. A market is a commercial area characterized by a prevalent equality of prices. Phenomenal development in this respect is characteristic of the United States. For many commodities the market is coextensive with the national domain. It is the chosen function of transportation agents, by rail and water, to ensure this result; to preserve an equality of prices, despite the variety of producing and consuming conditions. The railway is the agent by which the market is thus widened and rivalries are thus equalized. In railway parlance this is what is known as "keeping everyone in business." The following quotation from the Senate Committee Hearings of 1905 adequately describes the process: "I am interested in the erection of a mill that has just been completed, and sometime since I was figuring on the question of a smokestack. I wanted to have that stack built out of brick that is burned in New Jersey, and that is several hundred miles away. It is a long way to ship freight from New Jersey to North Carolina. A quotation was made me by the stack builder, whose office is in New York, and I remarked to him, 'That price is prohibitive; I cannot pay that price for that stack.' He said, 'That is the best I can do; but if you will tell me what you can afford to pay for that stack, in competition with home-burned brick, I will see what I can do with the railway people.' He said, 'All right; I will take it up with the railway people.' His quotation included the delivery of the brick and the erection of the stack at my plant. It would require something like about fifty carloads of brick to build that stack. Within a week he had his price revised, and gave me a satisfactory quotation and took my contract for the stack. Of course he had to get a special rate from the railway people, because there is no regular tariff on brick from New Jersey to North Carolina." In this instance the railways actually created this new business by so adjusting the margin between the minimum cost of making brick in New York and in North Carolina, as to make it possible for the traffic to move. The special rate here mentioned, however, should be carefully distinguished from a secret rebate offered to one contractor as against another in the same place. This commodity rate, while special to meet a particular contingency, was open to any other shipper similarly circumstanced. The student cannot too carefully discriminate between these two sorts of special rates. They are constantly confused in the public mind. The effect of these open commodity rates is, not to create difference of opportunity between individuals, but to generalize economic conditions and equalize prices throughout wide areas.

The most satisfactory way to describe commercial competition as applied to carriers is by concrete illustrations. There are two distinct varieties or degrees of it, which may be denominated primary and secondary. These might as properly, perhaps, be called simple and complex, or direct and indirect. Of these, the first concerns those cases wherein a commodity undergoes no physical transformation between producer and consumer. Shipments are usually direct. Only one rate is involved. Shall St. Louis and the South, for example, be supplied with salt from the Kansas or Michigan fields? This is a case of pure transportation,—the creation of place value, alone. The Aroostook farmers of Maine compete in prices with the potato growers of Michigan in the New York market. Each district is usually represented by a railway, dependent upon the prosperity of its particular constituency. Competition of markets is usually more keen where a number of carriers are concerned, each representing its own clients; but it may conceivably arise as between several markets served by the same company, especially with the growth of great railway systems. The Southern Pacific must insure a rate from California on oranges to eastern markets, as compared with the rates over the Southern roads from Florida, sufficiently low to warrant the venture of capital in the industry. Marble from the quarries of Vermont and North Carolina, and paving blocks from the Lithonia district in Georgia, and from Wisconsin or South Dakota, must meet in Chicago on even terms. Such competition, although simple and direct, recognizes no national bounds. Copper from Montana must be laid down in Liverpool at rates to permit of meeting the price on Chili bars from South America. Our entire grain and cotton crops must be transported at rates which will enable them to hold their own in European markets. The California raisin has, in this manner, had to make its way into Eastern markets in the United States against the pressure of importations from Spain, as described in another place. The cotton mills in New England and in the South must have their output carried to China under conditions which will enable them to meet the price made by the British manufacturer. This last instance, however, introduces us to the second form of competition, inasmuch as a double transportation is involved; first from the fields to the mill, and thereafter from the mill to the consumer.

Secondary or indirect forms of commercial competition in

*Albert Fink's description in U. S. Reports Internal Commerce. 1876. App. p. 38, is a classic.

transportation, concerning, as has been said, not one but two distinct carriages of entirely different products, needs to be in turn subdivided still further. The products of agriculture and mines afford the best instances. The lumber business is peculiarly suggestive in this connection, owing to the fact that in the United States a vast treeless area in the Middle West is surrounded with forest tracts available for development. The market again in this case is limited only by our national frontier. Omaha is supplied with yellow pine and cypress from Louisiana after a 1,200-mile haul; Oregon fir brought 1,800 miles in each instance for fifty cents per hundred pounds; and with Michigan hemlock and pine transported less than 500 miles for eleven and a half cents. These various sorts of lumber are all more or less competitive. And in each case the final cost of laying down the product in Omaha is determined; first, by the rate from the stump to the mill, and then as sawed lumber, thence on to destination. The Eau Claire, Wisconsin, lumber case* before the Interstate Commerce Commission, fully describes the intricacies of adjustment needed to hold a number of such producers on a parity. In this instance Eau Claire, "next the stump," as an important lumbering centre was shown to be declining in importance relatively to Mississippi river towns, which received their logs by raft down stream. A differential of a few cents was threatening the welfare of a considerable population. The Wichita, Kansas, cases are suggestive in a similar way. Sugar is laid down at this market from every point of the compass. From Hawaii it is shipped in the raw state to San Francisco, and then brought East, like the Oregon lumber, cheaply, as a backload to counterbalance west-bound shipments of grain and manufactures. From New Orleans refineries comes the Louisiana product, and from the Atlantic sea ports the Cuban sugar; but in each case the carriage is broken at an intermediate point, at which manufacture or jobbing ensues. A large class of operations analogous to this, known as "milling in transit" and "floating cotton," elsewhere described in detail, involve the same complexity and interrelation of rates. The point to carry forward is that commercial competition demands that in every case not single rates but the sums of all the interlocked rates for each competing person or region shall be properly adjusted. If this be not done, some one will be excluded from that market and "put out of business."

By this time in our ascending scale of complexities, it will be observed that manufacture now begins to outweigh mere transportation in importance. With low grade products, like salt or sugar, the increment of value due to transportation is relatively high as compared with manufacturing costs. As the grade of product rises, however, the differences in value and in form between the raw and the finished product render the problem of location of the manufacture more difficult as affected by the relative adjustment of rates of transportation for the two. According to the data of the Federal Bureau of Corporations, the cost of refining crude petroleum, worth three to four cents a gallon at the wells in Pennsylvania, should not exceed one-half cent a gallon. This sum would barely pay for the first hundred miles of its carriage by rail, as ordinarily shipped. The market is, of course, extraordinarily extensive; hence the persistent flagrancy of the practices of secret rebating by the Standard Oil Co.* To obtain such special favors in transportation outweighed in importance the incentive to introduce economies in production. In this industry, where little waste occurs in manufacture, the refineries may well be located at the consumers' door. The manufacture of furniture for the Pacific states, on the other hand, must be located "next the stump," in North Carolina or New England. The long carriage must be applied, not to the bulky lumber but to the finished product. The freight rate on lumber from Oregon to Pittsburgh is just about equal to the value of the logs at the mill. Obviously the large proportion of waste or common lumber will not bear a high addition to its cost by carriage to any distance. In the manufacture of fur hats a shrinkage of weight occurs of one-half between the fur scraps and the finished product. In such a case it is imperative, either that the factory be near the source of supply or that the rate on the two distinct commodiies be nicely adjusted. The decision of the United States Steel Corporation to build a large plant at Duluth for supplying the Northwestern market is the outcome of such considerations. The main point is that the adjustment of a number of rates may determine not only the general welfare of the industry, but even its specific geographical location, with reference to the raw material on the one side and the market on the other.

(To be continued.)

*Railway Problems, pp. 203-223.

*We think it should be pointed out, in justice to the Standard Oil Company, that most of this rebating was done at a time when it was accepted practice among large shippers to bargain for their transportation. We believe that the business of the company, as now conducted, is conspicuously free from unfair practices.—Editor.

NEW 4-4-0 ENGINES, NORTH-EASTERN RAILWAY.

We are indebted to Wilson Worsdell, Chief Mechanical Engineer of the North-Eastern Railway, for the details and dimensions of his latest express passenger engines, designed and

Eight-Wheel Passenger Locomotive for the North-Eastern Railway.

built by him at Darlington for the North-Eastern Railway.

The engines are built for working the heavy East Coast express passenger traffic between York and Edinburgh. They are four-wheeled coupled with a four-wheeled truck in front. The coupled wheels are 6 ft. 10 in. in diameter. The cylinders are placed inside the frames and are 19 in. diameter, with a stroke of 26 in. The barrel of the boiler is 11 ft. 6½ in. long and 5 ft. 6 in. diameter outside. The firebox is 9 ft. long, with a grate area of 27 sq.ft. The working pressure is 225 lbs. per square inch.

The engines are designed to work trains equal to 20 carriages loaded, and to run 124½ miles at 53 miles per hour without a stop. The weight of the train behind the tender will vary from 350 to 400 tons. From the above it will be seen that the work these engines are required to do is of the heaviest and fastest description Grades of 1.04 per cent. for about 5 miles and others of 0.66 per cent., 0.59 per cent. and 0.50 per cent. are met on different parts of the line.

The 10 engines of this class are fitted with the patent variable blast pipe and spark ejector which is now being applied to North-Eastern locomotives generally. The blast pipe is designed to relieve the back pressure on the pistons and to eject the sparks from the smokebox.

The driver can regulate the blast on the fire by means of a valve rod and handle in the cab, thus preventing waste of steam. A valve at the bottom of the blast pipe is fully open when the engine is starting and when taking heavy gradients. This increases the blast pipe orifice from 4¾ in. to 7½ in., and consequently reduces the amount of sparks drawn through the tubes into the smokebox. Any accumulation of sparks in the smokebox is prevented by vertical passages cast onto the outside of the blast pipe, as by means of these passages the sparks are ejected after being broken up in passing through them to such smallness that the possibility of causing roadside fires is reduced to a minimum.

The engine may be regarded as typical of the latest development of this class of locomotive in England, and it is especially adapted to the peculiar class of service that it will be called upon to handle.

The following are some of the principal dimensions of these engines:

Cylinders, diameter of cylinders	19 in.
" stroke of piston	26 "
" diameter of piston valves	10 "
" width of ports	1⅜ "
" distance apart of cylinders, c. to c.	2 ft.
" distance bet. centers of valve spindles	1 ft. ½ in.
" lap of valve	1⅛ "
" maximum travel of valve	4 3/32 "
" lead, piston valve. Forward full gear, 3/16-in. F.P.; 1/16-in. B.P.	
" link motion	Stephenson
" diameter of piston rod	3¼ in.
" diameter of piston rod, tail end	2½ "
" length of slide block	1 ft. 3 "
" length connecting rod bet. centers	6 " 8 "
Wheels and axles:	
Diameter of driving wheels	6 " 10 "
Diameter of truck wheel	3 " 7¼ "
Thickness of all tires on tread	3 "
Width of all tires on tread	5½ "
Dist. bet. c. of truck and c. of leading wheels	11 ft.
Center of truck wheels	6 ft. 6 in.
Centers of driving wheels	9 " 6 "
Distance from center of driving wheels to front of firebox	1 " 10¾ "
Distance from center of truck to front buffer beam	6 " 1 "
Distance from center of trailing wheels to back buffer plate	6 " 5 "
Crank axle, diameter of wheel seat	9 in.
" " " of bearings	8 "
" " " at center	7¾ "
" " distance bet. c. of bearings	3 ft. 10½ "
" " length of wheel seat	7 9/16 "
" " lengths of bearings	9½ "
Main axle, diameter of wheel seat	9 "
" " " of bearings	8 "
" " " at center	7¾ "
" " distance bet. c. of bearings	3 ft. 10½ "
" " length of wheel seat	7 9/16 "
" " length of bearings	1 ft. 0¼ "
Truck axle, diameter of wheel seat	7½ "
" " " of bearings	6 "
" " " at center	5¾ "
" " Length of wheel seat	7¼ "
" " length of bearings	11 "
" " dist. bet. centers of bearings	3 ft. 7 "
Driving, diameter crank-axle pin (inside connecting rods)	8¼ "
" length of bearing (inside conn. rods)	5 "
Driving, diameter of crank pin (coupling rods)	3¾ in.
" length of bearing (coupling rods)	4 1/16 "
Frames, distance between frames	4 ft.
" thickness of frames	1 in.
" distance between truck frames	2 ft. 8 "
" thickness of truck frames	¾ "
Boiler, center of boiler from rail	8 ft. 11 "
" length of barrel	11 " 6½ "
" diameter of boiler (outside)	5 " 6 "
" thickness of plates	⅝ "
Tube plates, copper, thickness smokebox tube plate	1 "
" " pitch of rivets	2 "
" " diameter of rivets	⅞ "
Firebox casing, steel, length outside	9 ft.
" " breadth outside at bottom	3 ft. 11 "
" " depth bel. c. boiler, front end	5 " 3½ "
" " do., at back end	4 " 6½ "
" " thickness of front plate	⅝ "
" " thickness of back plate	⅝ "
" " thickness of sides and top plate	⅝ "
" " distance of copper stays apart	4 "
" " diameter of copper stays	1 "
Inside firebox	Copper
" " length at the bottom inside	8 ft. 3½ in.
" " breadth at the bottom inside	3 " 2½ "
" " from top of box to inside shell	1 " 7½ "
" " depth box inside at front	6 " 4⅜ "
" " depth of box inside at back	5 " 7⅜ "
Tubes, copper, number of tubes	254
" number of stay tubes	7
" length of tubes between tube plates	11 ft. 3⅛ in.
" diameter outside	2 "
" thickness	No. 11 and 13 W. G.
" diam. variable blast pipe nozzle from 4¾ to	7⅛ "
" height of stack above rail	13 ft. 3 "
" heating surface in tubes	1,579 sq. ft.
" heating surface in firebox	158 "
" total	1,737 "
" area of grate	27 "
Weight of engine in working order:	
On bogie wheels	39,200 lbs.
On driving wheels	94,080 "
Total	133,280 "
Weight of tender in working order:	
On front wheels	30,240 "
On middle wheels	28,672 "
On trailing wheels	33,152 "
Total	92,064 "

Tender.

Wheel base, from front buffer beam to center of leading wheels	4 ft. 2 in.
" " from center of leading wheels to center of middle wheels	6 " 4 "
" " from center of middle wheels to center of trailing wheels	6 " 4 "
" " from center of trailing wheels to back buffer beam	4 " 5 "
Wheels, diameter of wheels on tread	3 " 9¾ "
" thickness of tires	3 "
" width of tires on tread	5½ "
Axles, diameter of bearings	5 "
" length of bearings	10 "
" diameter of wheel seats	7¼ "
" length of wheel seats	7½ "
" distance of centers of bearings	6 ft. 10 "
Frames, distance between inside frames	4 " 1 "
" thickness of inside frames	½ "
" distance between outside frames	6 ft. 2¾ "
" thickness of outside frames	⅞ "
Capacity of tank	3,669 gals.
Capacity of well	456 "
Total	4,125 "
Coal space	5 tons
Tractive effort	21,891 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.25$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 6.08$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 70.60^{*}$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 1026.51$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 64.33$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 9.44^{*}$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 54.16$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 76.72$$

$$\text{Displacement, 2 cylinders, cu. ft.} = 8.53$$

$$\frac{\text{Total heating surface}}{\text{Displacement, 2 cylinders}} = 203.63$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 3.17$$

*Per cent.

NOTES ON RAILWAY ELECTRIFICATION.*

BY JOHN A. F. ASPINALL.
General Manager of the Lancashire & Yorkshire Railway.

II.

TRANSMISSION LINES.

Cables form a very costly part of electrical equipment, and their accessibility when laid along a line of railway is one of the points which requires the most careful consideration. The underground railways of London are fortunate in possessing miles of tunnel walls upon which their cables can be neatly fixed, and each one readily got at without any necessity for touching the others. Experience on the Liverpool & Southport line does not point to the practice of laying the cables on the solid system in the 6-ft. way as being satisfactory, and where a railway runs through an open district, there seems to be distinct advantages in having bare wires carried overhead on suitable poles. The arrangement is cheaper to erect, can always be seen, and is much easier to repair. It is to be assumed that a railway company can generally find a path for an overhead transmission along its own property. If the line runs through a populated district, and has numerous telegraph and telephone circuits, with many signals and junctions, and if the points at which the transmission line would cross the railway are numerous, then there is no doubt that cables are the safer and possibly the cheaper in the long run. This is because the conditions stated involve a capital expenditure on the overhead line almost equal to that for cables, and are probably accompanied by an atmosphere that will considerably increase the cost of maintenance of the overhead line, owing to carbon and sulphur which will be deposited from the atmosphere. On the other hand, if a fairly clear run can be obtained, there is no question as to the large economy which can be effected by using overhead conductors. In modern practice large spans are used, the number of poles in some cases not exceeding ten per mile. In the particular instance of the high-tension line connecting Aintree with Seaforth, the cost per mile of the overhead equipment was £1,300, whilst the cost per mile of the cable line was £2,030, the cost per kilowatt transmitted per mile being—for overhead £1.25, for cable £2.67, based on 500 ampères per square inch of conductor section. This, however, does not represent the full saving which might be obtained by overhead transmission, as the spans were necessarily short, and for a certain distance erection was difficult as the line ran on the top of a high embankment. Lightning arresters, a doubtful requirement for the atmospheric conditions prevailing in this country, are also included in the cost for overhead transmission..

BATTERY PLANT.

As may be realized, at the inception of pioneer electrification such as I am describing, it was not easy to forsee exactly what would transpire in the way of load upon the power house and sub-stations. Eventually the fluctuations of load were found to be extremely heavy. When regular working conditions had been in operation for some considerable time, bearing in mind also the fact that the development of traffic would necessitate sooner or later some increase in power house and sub-station plant, it was decided in 1905 to install battery plants. It was felt that these were necessary, not only on account of mechanical requirements, but also with a view to creating an almost absolute assurance that trains could be run during the busiest hours of the day when a large number of business people were using the railway, even if some serious accident happened at the central generating station. The general idea was to put in a battery plant which would keep the whole railway going for one hour.

These batteries were of the well known buffer type, controlled by automatic boosters to respond readily to the load, the main objects and uses of these batteries being:

(1) To equalize the load on the power house and sub-stations.
(2) To reduce the peaks of current and to act as the equivalent of additional plant for such places.
(3) To improve the general load factor and efficiency, and so enable more economical production and distribution of supply to take place.

The railway was originally equipped with a power station containing five generators, four of 1,500 kw., and one of 750 kw. capacity; four sub-stations, three equipped with four 600 kw. rotaries, and one with three 600 kw. rotaries. The number of trains in traffic was twelve, each being equipped with motors rated at 1,200 h.p., and taking a maximum power during acceleration of 1,000 to 1,200 kw. To meet these heavy peaks it was necessary to run 5,250 kw. of power house plant, though the average load was only 3,500 kw. The fluctuations of load were so great that at times the engines would entirely cease to take steam, the vacuum being actually produced in h.p. cylinders; within a few seconds the load would rise to 4,000 or 5,000 kw., and superheated steam would be admitted to the cooled h.p. cylinders. This not only led to uneconomical working, but produced severe stresses in the engine.

It may be asked why the policy of combined rotary and battery stations was not followed, which would doubtless have been done in the case of a railway such as the London Tubes. It would have effected a saving in wages and made it possible to have the load more uniform still at the power station.

About the time it was decided to introduce the battery sub-stations, the traffic had considerably increased, and the lighting at certain points was not all that could be desired. Also power was required at Liverpool, and the drop in potential at the train was becoming too great. It was therefore decided to place the battery sub-stations at points intermediate to the rotary sub-stations, as this would enable the conditions mentioned above to be met and improved. It will be noted from the map, Fig. 1, that one place is almost at Exchange Station, Liverpool, and another at Southport; the former acts as a medium of supply for electric light and power to a large goods yard, Exchange Station and hotel, in addition to its use for tractive purposes. The one at St. Luke's, which is 2½ miles from Birkdale, serves to take the load and general lighting at the Southport end, and assist development in the Crossens direction. These batteries were installed in September, 1905, and the results have amply justified the policy that was adopted. The momentary peaks in the load were reduced from a maximum of 7,000 kw. to 4,500 kw., and the hourly peak during the rush hours was reduced from 3,800 kw. to 3,100 kw., enabling the load to be carried during the winter with 4,500 kw. of plant, and during the summer with 3,750 kw. of plant.

Four battery plants were installed aggregating 5,200 ampère hours. The batteries have a guaranteed efficiency of 85 per cent. in ampère-houre and 75 per cent. in watt-hours. Tests made in 1907 showed that 14 per cent. of the total rotary sub-station direct current output passed through the batteries, the total loss due to the batteries being about 3.5 per cent. of the rotary sub-station output. In addition to fulfilling the purposes for which they were originally installed, the batteries have proved a valuable standby in cases where one or more rotary sub-stations have beeen temporarily disabled, and also for running special trains during hours of shut down. The coal consumption was reduced by 8.5 per cent. and the consumption for train services became 0.412 lb. per ton-mile.

The following table shows the increase in the load since 1905, and the variation of the load during rush hours:

Year.	Average load, rush hour.	Momentary variation peak to minimum.	Kennedy load factor.
1905.........	4,500 No batteries.	7,500-2,590	0.68
1906.........	3,600	4,500-2,500	0.90
1907.........	4,000	5,600-3,100	0.98
1908.........	5,000	7,000-4,000	0.90
1908......... Special test.	5,600 No batteries.	8,600-2,500 Variation within 1 minute.	....

*From the Presidential address before the Institute of Mechanical Engineers, April 23, 1909.

EFFICIENCY OF TRANSMISSION.

In July, 1906, investigations were made as to overall efficiency of transmission. The direct current meters at the sub-stations were specially calibrated, and with a daily sub-station output of 57,190 units, and a power-house output of 63,819 units, the calculated losses were as follows:

Source of loss.	Units.	Per cent. loss on power-house output.
Cables	1,264	1.97
Transformers	1,885	2.95
Rotaries	3,480	5.37
Total	6.629	10.29

The overall efficiency of transmission from alternating current bus bars being 89.7 per cent. It is exceedingly difficult to ascertain the exact losses in live rails; calculations made, however, in various ways seem to indicate that these losses amount to about 9 per cent. of the sub-station output. The total efficiency from alternating current bus bars to circuit breakers on the trains is about 81 per cent.

In considering the question of coal consumption per unit, the most reliable figure to take for comparison is the coal burned at the power house per unit of direct current delivered to the third rail, that is with all losses due to conversion. This, for twelve months ending December, 1908, was 3.28 lbs. These figures for coal consumption must not be confused with those given for the generating stations.

MAINTENANCE.

One of the necessities of a branch of a steam-worked line being worked electrically is that there should be a local workshop for repairs of the rolling stock close to one of the terminal stations, and this must be considered as part of the cost of equipment.

It has been found to be of the greatest importance to have careful periodical examination of the different parts of the electrical equipment, and experience has shown that the examination should be specialized, different groups of apparatus always being dealt with by the same workmen. Careful charts of these inspections are prepared and afterwards examined daily by the foreman, so as to prevent any portion of a car not being dealt with at the proper period.

OPERATING COSTS.

Some details as to the cost of operation are given below, which will be useful when comparing the work done with that on other railways, whether slow moving electric trains or the older steam-trains are considered.

The very great difference in cost involved in the initial construction, and later, in the working of the generating plant and sub-stations by difference of location, by rates and taxes, cost of condensing water, and other important items which affect both the interest on capital outlay and the daily working expenditure, make it desirable to speak of "works cost" only, so that anyone familiar with the working of any other installation can add their figures for all items of general charges, and arrive at an approximate comparison.

On this basis it may be said that any railway company having the opportunity of putting down its own plant in the country with ample facilities for getting cheap coal and water should be able to produce current at the generating stations at a "works cost" of less than 0.25 of a penny per B.t.u., the coal consumption being under 3 lbs. per a.c. unit.

With such figures as these, it is possible to work a high speed service such as I have indicated at 9.5*d.* (19 cents) per train-mile, including "works costs" for the power-house, sub-stations, battery stations, "operating costs" for motor and electrical equipment repairs, car repairs, guards' and motormen's wages, lighting and heating of cars, repairs of third and fourth rails, bonds and cables, and all working stores. The cost per car-mile varies between 2.75*d.* (5½ cents) and 3*d.* (6 cents), according to the number of cars run. The total current producing charges, including conversion at sub-station, the cost of battery stations, and depreciation of batteries, absorbs 4.52*d.* (9.04 cents) out of the 9.5*d.* (19 cents) per train-mile. With the exception of the depreciation of batteries, no sum is included for depreciation of plant, or for interest on outlay. The above figures are not intended to, and do not include any part of the cost of maintaining the running track, the passenger and goods stations, or costs for the platform staff, or any other items required for the railway, whether worked as a steam line or as an electric line. It follows that if track maintenance becomes more expensive, for reasons referred to elsewhere any increase will have to be put down to electrical working and must be added to the above figure. The great economy to be hoped for in the future for electrical railways, where no water power is available, is in the production of electricity in very large quantities, the total current producing charges indicated above forming so large a proportion of the total operating cost. The other directions in which economies may be sought for in future designs are mainly in such improvements in the motors as will lead to less repairs, and a very careful consideration of the whole design of the motor truck, with a view to giving those large bearing sur-

PARTICULARS OF VARIOUS ELECTRIC LOCOMOTIVES, AND L. & Y. MOTOR CARS.

Name.	Maker.	Type of traction.	No. of motors.	H.-p. of each.	Total, h.-p. Max.	Length, ft. in.	Width, ft. in.	Height. ft. in.	W'ght. tons.	Gear ratio.	Draw-bar pull, lbs.	Remarks.
Metropolitan Railway..	Westinghouse.	D. C.	4	300	1,200	45. 0	....	....	..	.....	....	120 tons* train at 36 miles per hour.†
Westinghouse	Westinghouse.	1-Ph.	6	250	1,500	45 0	9 8	17 0	135	18/95	50,000 up to 25 miles per hr.	...................‡
North Eastern Goods..	Br. Thomson-Houston Co.	D. C.	4	..	.....	37 11	8 8	11 9	50	3.28	....	200 ton train at 14 miles per hour on level; 150 ton train start and run 9 to 10 miles per hour with 1 in 27 gradient.§
N. Y. C. & H. R. R.R..	General Electric Co. of America.	"	4	550 nor. 750 max.	2,200 3,000	45 0	9 8	17 0	135	direct.	34,000 max....	450 tons at 60 miles per hour.‖
Baltimore & Ohio	General Electric Co. of America.	"	4	360	720	35 0	9 5	14 0	86	direct.	28,000 full load 48,000 start'g	1,900 lbs. at 12 miles per hour.‖
Baltimore & Ohio	General Electric Co. of America.	"	4	200	.....	29 7	9 3½	14 9¼	73	81/19	35,000 full load 40,000 start'g	2 of these units are used together, giving double the draw-bar pull.‖
Paris-Orleans	General Electric Co.	"	4	250	1,000	34 10	9 7	12 9	49	78/19	24,000 max....	300 tons at 20 miles per hour.‖
Lancashire & Yorkshire Motor-Car.	Dick, Kerr and L. & Y.	"	4	150	600	....	....	....	46	43/22	12,400 up to 20 miles per hr.	2 motor cars take a train of 170 tons total up to 50 miles per hour.
Lancashire & Yorkshire Motor-Car.	Dick, Kerr and L. & Y.	"	2	125	250	....	....	....	22	41/19	4,440 max.....	On level.

*The long ton of 2,240 lbs is ordinarily used in Great Britain.—[EDITOR.]

References: † *Tramway and Railway World*, Vol. 17, p. 530; ‡ *Electric Journal*, Vol. 2. p. 360, and *Tramway and Railway World*, Vol. 17, p. 530; § *Light Railway and Tramway Journal*, Vol. 11, p. 346; ‖ *Electric Railway Engineering*, p. 293.

faces at every point where the locomotive experiences of many years have shown them to be necessary.

It should be remembered that steam-worked suburban trains are generally hauled with one tank engine. Electric trains of the weights I have spoken of have at least two motor-cars, one in front and one in the rear. The first cost of the locomotive part of the motor-car (omitting the carriage), is about equal the cost of one locomotive. Therefore, the two motor-cars cost twice as much as one locomotive. The cost of the annual maintenance of one motor-car is more than the cost of maintaining a locomotive, But the average miles run per annum per locomotive are 20,000, whereas the electric motor-car will run 50,000. The general result is that the cost per train-mile run becomes less for the electric motor-car, and less again per motor-car mile, if each motor-car is looked upon as a separate locomotive.

Brake gear is an expensive item, the continual stopping causing rapid wear of all pins and brake blocks, which, combined with the dust and dirt of the road, all help to increase the cost, and therefore to make one hope for the time when some form of regenerative control, which will be of a simple character not involving the carrying of extra weights and a complete change of equipment, will be produced by our electrical brethren.

Those items, which may be put down as giving no trouble whatever are: controllers, commutators, steel spur-gearing, and the third rail. The latter is easy to lay, cheap to maintain, and has proved by long experience to be the cause of very few accidents.

EFFECT OF HIGH SPEEDS ON OPERATION AND COSTS.

The steam services in operation previous to conversion ran to the following schedules:

Class of train	Stopping.*	Stopping.	Express.
Running bet. Liverpool and..	Hall Road.	Southport.	Southport.
Total distance, miles	7⅛	18½	18½
No. of stops	8	14	1†
Av. distance of stations, miles.	0.89	1.32	..
Total time, minutes	25	55	25
Sched. speed, inc. stops, miles	17	20	44.5
Av. speed, not inc. stops, miles	20	23	..
Length of stop, seconds	30	30	..

*The steam service was between Liverpool and Crosby, but it is given between Liverpool and Hall Road to compare with the electric service given below.
†Birkdale.

The schedule for the stopping trains was increased considerably when electric traction was installed, but the express trains maintained the same service.

(1) For each schedule the train is accelerated at the same rate under ordinary service conditions.

(2) For the 30-m.p.h. schedule the brake is applied immediately after the power is switched off.

(3) For the 27.5 and 25-m.p.h. schedule a certain amount of coasting is done.

Electric Service.

Class of train	Stopping.	Stopping.	Express.
Running bet. Liverpool and...	Hall Road.	Southport.	Southport.
Total distance, miles	7⅛	18½	18½
No. of stops	8	14	1†
Av. distance of stations, miles	0.89	1.32	..
Total time, minutes	16	37	25
Sched. speed, inc. stops, miles.	26.75	30	44.5
Av. speed, not inc. stops, miles	30	33	..
Length of stop, seconds	15	15	..

The curves for acceleration, coasting and retardation are based upon actual figures obtained in tests, and from these time-speed curves have been constructed for the three schedules with stations 1, 2 and 3 miles apart, and trains ranging from 2 to 7 cars, the slower schedules being obtained by more or less coasting.

The following table shows the chief comparisons between the various schedules. From this table it will be seen that the percentage drop in emergency consumption is approximately the same for any size of train from 2 to 7 cars in each of the cases taken. The averages are given in the last section.

Schedule including stops, m.p.h.	Average speed, excluding stops, m.p.h.	Number of cars.* 2.	3.	4.	5.	6.	7.
		Percentage watt-hrs. per ton-mile.					
Stations 1 Mile Apart.							
30.0	33.0	100.0	100.0	100.0	100.0	100.0	100.0
27.5	30.0	67.2	68.8	70.5	71.8	73.3	75.2
25.0	27.0	44.8	46.3	47.4	49.2	50.8	53.1
Stations 2 Miles Apart.							
30.0	33.0	100.0	100.0	100.0	100.0	100.0	100.0
27.5	30.0	68.0	67.0	66.5	65.5	65.5	65.5
25.0	27.0	49.2	48.5	47.7	47.5	47.4	48.6
Stations 3 Miles Apart.							
30.0	33.0	100.0	100.0	100.0	100.0	100.0	100.0
27.5	30.0	72.6	72.7	72.6	72.8	73.4	74.0
25.0	27.0	56.5	55.1	54.5	54.0	54.4	55.1

Averages of the Above.

Schedule including stops.	Distance between stations 1 mile.	2 miles.	3 miles.
	Percentage watt-hours per ton-mile.		
30.0	100.0	100.0	100.0
27.5	71.1	66.3	73.0
25.0	48.6	48.15	54.9

*Two motor cars used in each case.

This table points out very clearly the great effect that any increase in the schedule has on the energy, or what is the same thing, the coal consumption.

A high schedule speed necessitates a high acceleration, and this has an effect on the cost of maintenance of the motors. Other things being equal the current through the motors will be proportional to the acceleration, and therefore to the schedule; but the heating effect of this current varies as its square, and since there is no coasting the motors have very little time in which to cool down. This heating acts detrimentally on the insulation of the motor and decreases its life.

(To be continued.)

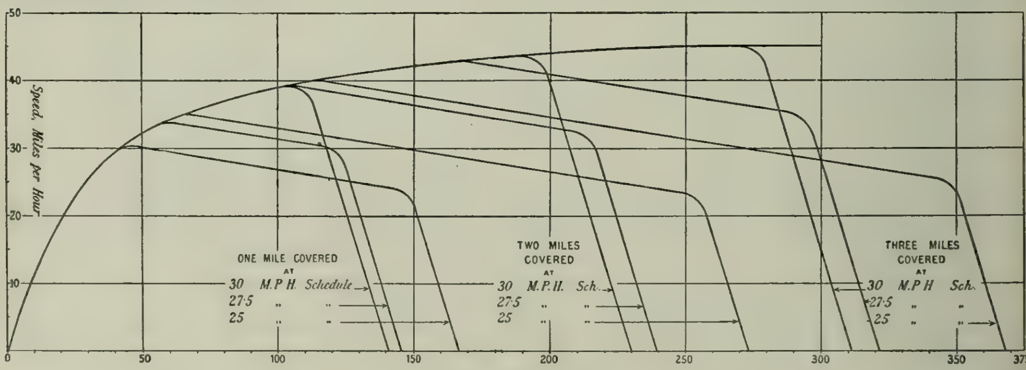


Fig. 4—Time Speed Curve.

In making comparisons between steam and electric traction for coal consumption per ton-mile any increase in the schedule speed should be taken into consideration. With a view of showing the effect of speed on electric services, a series of curves, shown on Fig. 3 has been worked out for schedules of 30, 27.5 and 25 m.p.h. respectively.

The following points have been assumed in working out the speed time curves (Fig. 3) for the various schedules:

General News Section.

The thirteenth international conference of Railroad Young Men's Christian Associations will be held in St. Louis on May 27-30.

The New York legislature has passed a law regulating the hours and conditions of labor of men working in tunnels and caissons where compressed air has to be breathed.

An officer of the Pullman Company says that during the year ended July 31, 1908, the number of passengers carried in standard Pullman sleeping cars was 18,603,067, and that only one of these was killed.

The Wisconsin Railway Commission has announced that the total valuation of railways in Wisconsin for 1909 is $274,948,000 as against $267,861,500 in 1908. The tax is at the rate of 1.143084076 cents on the dollar and amounts to $3,142,887.

Representative Wanger, of Pennsylvania, a member of the Committee on Interstate and Foreign Commerce, has introduced in Congress a bill to forbid railways to own stock or securities in any business enterprise, such as a coal mine, which ships freight over its line.

At Fort Wayne, Ind., one day last week a foreman and 21 men in the freight house of the Pennsylvania Company were overcome by fumes of bromide gas from a box which was found to be smoking, and which the men tried to remove. All of the men had to be sent to the hospital.

The railroad commission of Indiana, acting under the law requiring all railway trains to be equipped with surgical cases, has made an order requiring that all passenger and freight trains be equipped with such cases, containing material for first aid to the injured, within 90 days from the entry of the order.

The city councils of Baltimore, engaged in a strenuous endeavor to abolish smoke in the railway tunnels of that city, held a hearing this week to investigate the subject; but representatives of the Pennsylvania declare that to install electric power in the tunnels would cost $6,000,000; and to operate trains in that way would cost $486,000 a year, an expense which could not be borne.

In regard to the reports concerning the further electrification of the New York, New Haven & Hartford, it is announced that preliminary estimates have been submitted to the Board of Directors, but that it is unlikely that any definite action will be taken or authority granted for some time. The estimates were for the electrification of the main line from Stamford, Conn., the present terminus of electric operation, to New Haven.

Vice-President Byrnes, of the New York, New Haven & Hartford, has announced that that company contemplates running through passenger trains in the summer between New York City and Cape Cod, by way of Providence, Fall River and New Bedford. The necessary connections at Providence can readily be made, as the tunnel through that city is now finished; but at Fall River the two divisions of the road are separated by a hill which would have to be pierced with a tunnel.

The committee of the national association of railroad commissioners, F. K. Lane, chairman, has drafted a code of demurrage reules designed to be applicable alike on intrastate and interstate transportation and will give a public hearing on June 4 and 5, at Washington. The object of this hearing is to give representatives of shippers as well as carriers an opportunity to be heard before final approval of the rules. Briefs will be received until June 12.

The Court of Appeals, the highest court of the State of New York, has affirmed a decision awarding heavy damages to a woman who was in an automobile who was injured by being struck by a locomotive at a grade crossing at Van Cortlandt Park, New York City, in June, 1904. The woman, who was so badly injured that one leg had to be amputated below the knee, receives $25,000 from the railway company, the original judgment having been reduced by the next higher court from $35,203, to the sum first named.

Chicago Railway Club.

The Chicago Railway Club had a meeting and dinner at the Grand Pacific Hotel on May 8, at which a permanent organization was effected by the election of the following officers: President, W. B. Barr (C. T. T); Vice-President, Bruce W. Duer (B. & O.); Secretary, E. L. Bevington (Transcontinental Passenger Association); Treasurer, C. Nyquist (C., R. I. & P.); Board of Directors, E. J. Skene (I. C.), E. J. Engel (S. F.), F. H. Tristman (Wabash), H. Deeming (G. M. Ass'n.), C. G. Hall (C. & N. W.), W. J. Leahy (C., R. I. & P.), F. H. Schneider (N. Y. C.), H. J. Cronin (C. & E. I.). Mr. Barr presided and Gardiner Lathrop, General Solicitor of the Atchison, Topeka & Santa Fe, spoke on "The Advantages of Co-operation Through the Means of a Club." Mr. Lathrop said that a club which brought together socially, and also for the purpose of discussion of their work, officers and employees of the different departments of the railways, would tend to broaden all of them and thereby increase the efficiency of the service. Touching upon the subject of government regulation of railways, he said that he had heard some railway men say that the government ought to let the railway business alone. He thought, however, that men who thus expressed themselves were mistaken. He believed that government regulation of the railway business has come to stay, and that in the long run this will be for the good of the railways as well as the public. He congratulated railway men on the fact that legislation and the enforcement of the laws was making it profitable for men in railway service to act right and lawfully and dangerous for them to act otherwise. He referred to the time when the railway traffic man was required to get business, even though he had to violate the law, and felicitated his hearers on the fact that that time was past. He urged railway officers and employees not only to strive to increase the efficiency of railway operation, but also to work together to raise the moral tone of the entire business. Samuel O. Dunn, Western Editorial Manager of the *Railroad Age Gazette*, also spoke briefly on the good that could be accomplished by the new club.

A proposition to furnish club rooms was received from the Grand Pacific Hotel, which is in most ways satisfactory to the directors, and probably will be accepted.

"Nickel Plate" Operating Rules.

The New York, Chicago & St. Louis has issued a revised book of rules for the transportation department, from which it appears that the company has adopted as standard a train order signal of semaphore type, with the arm moving in the upper quadrant. A vertical arm or a white light indicates clear; arm inclined 45 deg. upward or a green light, stop for train orders; arm horizontal or red light, absolute stop. The horizontal position is used to keep trains five minutes apart. The time interval, prescribed in rule 91, is five minutes.

Rule 10 prescribes the colors for signals (red for stop, green for caution, white for proceed), and also describes slow boards and regulates their use. A slow board is painted green and has on its face a number plate, which indicates the speed to which trains are limited. For example, "10" would indicate that the speed must be brought down to 10 miles an hour at a point 3,600 ft. distant. If the number cannot be seen, the speed must be reduced to six miles an hour. A "Resume speed board" indicates that full speed may be resumed when the rear car of the train has passed that board.

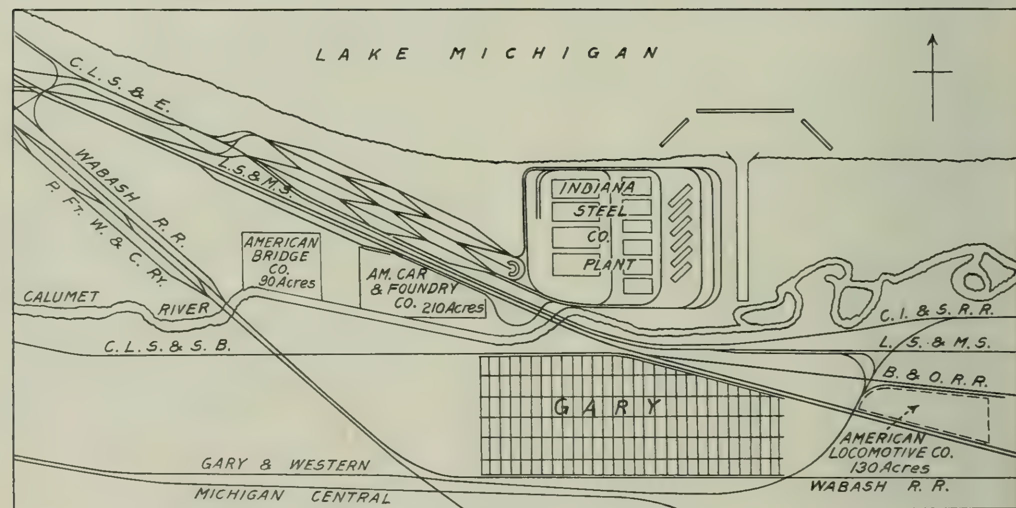
Rule 19 reminds enginemen that when engines are coupled to trains, the marker lamps on the engine must be extinguished—a rule which is needed on many roads. Under rule

83, trains detouring are required to report for orders at the telegraph office when returning to the home road. If there is no telegraph office at that point, instructions must be given to the train before it goes on to the foreign road.

Railway Equipment Plants at Gary.

On the recent inspection trip of the Maintenance of Way Association to Gary, Ind., the members were shown the sites of the proposed plants of the American Car & Foundry Co., New York, and the American Locomotive Co., New York. The location of these plants, as well as one for the plant of the American Bridge Co., New York, are shown on the accompanying plan in their relation to the Indiana Steel works, the town of Gary and the main lines of the Lake Shore, the Wabash and the Baltimore & Ohio.

The proposed plant of the American Car & Foundry Co. is located directly northwest from the town of Gary, with the Calumet river as its southern boundary and the freight classification yards of the Chicago, Lake Shore & Eastern and the Lake Shore main line on the north. This plant occupies 210 acres. Directly west is the site of the future plant of the American Bridge Co., occupying 90 acres. The proposed new plant of the American Locomotive Co. will be located along the east line of the corporate limits of the town of Gary and south of the Baltimore & Ohio and the Lake Shore main lines, the tract comprising 130 acres.



Railway Equipment Plants at Gary.

The map shows also the new location of these lines, as well as that of the Chicago, Indiana & Southern. When the plans of the Indiana Steel works were completed it was found that the mills would require about 1,000 acres in one compact body. This required the entire removal of the Baltimore & Ohio and the Chicago, Indiana & Southern, as they ran diagonally across part of the site. These lines were moved south and are now located between the Indiana Steel works and the town of Gary. They are elevated at this point so as to eliminate the grade crossing of the main street, Broadway, which is the principal avenue of communication between the town and the works.

Special Train to the Mechanical Conventions at Atlantic City.

The Pennsylvania Lines will run a train, to be known as the "M. M. Special," from Chicago to Atlantic City for the accommodation of members of the American Railway Master Mechanics' Association and the Master Car Builders' Association and their friends going to the annual conventions of these organizations. This train will leave Chicago at 5.30 p. m. on Monday, June 14, and will arrive at Atlantic City at about 5 p.m. of the following day. It will be composed of Pullman sleepers, observation car, library smoker and two dining cars. The fare will be $26 for the round trip. Tickets will be on sale from June 1, with a 30-day return limit, and will allow stop-overs at Philadelphia, Washington, Baltimore and Pittsburgh returning. Those who desire to take advantage of the privilege of stopping at Washington or Baltimore will have to so state at the time of buying tickets. Diagrams for this train are now in the office of the City Ticket Agent at 248 South Clark street, Chicago, and reservations may be secured by applying to the City Ticket Agent or to G. G. Beltzhoover, District Passenger Agent; F. O. Birney, Local Passenger Agent, or T. R. Wilt, City Passenger Agent.

Association of American Railway Accounting Officers.

The annual meeting of the Association of American Railway Accounting Officers was held at Cincinnati, Ohio, on April 28, 29 and 30. The principal report made was that of the standing committee on Corporate, Fiscal and General Accounts. This committee had been in touch with Prof. Henry C. Adams, of the Interstate Commerce Commission, for a year, and presented a form of balance sheet and a text therefor and a form of classification for additions and betterments and a text therefor. No formal action was taken by the association on this report, as it had been submitted to the executive officers of the various railways for their consideration. The standing committees on freight and passenger accounts made lengthy reports, which, in the main, were adopted as presented. Prof. Henry C. Adams addressed the convention on the subject of the Relation of Uniform Accounting to Government Regulation of Railways.

Over 250 members were in attendance. The next meeting will be held at Colorado Springs, Colo., beginning the last Wednesday in June, 1910. The following officers were elected for the ensuing year:

President, C. F. Krebs, Comptroller, Illinois Central.

First Vice-President, W. E. Bailey, General Auditor, Atchison, Topeka & Santa Fe.

Second Vice-President, L. A. Jones, Vice-President and Comptroller, New Orleans & Northeastern.

Secretary, C. G. Phillips, Tribune building, Chicago.

The executive committee is made up as follows: Terms expiring in 1910, G. N. Wilson (Lehigh Valley), M. P. Blauvelt (Erie), W. J. Healy (A., T. & S. F.) and H. J. Stirling (U. P.); terms expiring in 1911, J. G. Drew (G. N.), E. A. Stockton (Pennsylvania), M. F. Molloy (C., N. O. & T. P.) and R. A. White (N. Y. C. & H. R.).

American Street and Interurban Railway Association.

The annual convention of this association and those affiliated with it will be held at Denver, Colo., on October 18, 19, 20, 21 and 22, 1909. The days upon which the different associations will hold their meetings have not been definitely decided. Since the western membership of the association represents about 20 per cent. of the total, and these western companies have been most generous in their attendance at the eastern conventions, it was decided that the welfare of the association could best be served and the western companies given the consideration which is their due by holding the 1909 convention in some city west of the Mississippi river.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York, May 19, 1909; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 26-28, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago. June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug., and Sept.; Boston
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July. Aug.; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 17-19; Chicago.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R, East Buffalo, N. Y.; September, 1909; Denver.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

The Governor of Pennsylvania has signed the bills which were passed by the last legislature allowing the subway and the surface street railways in Philadelphia to carry freight at night.

It is announced in New Orleans that the Southern Steamship Co. will, on June 1, begin semi-monthly sailings between that city and Philadelphia. The reports say that the Southern Pacific Company is interested in this new line.

The lines west of Chicago have decided after considerable discussion of the subject to discontinue the checking of baggage to or from residences and hotels. The number of people who took advantage of the accommodation was so small that it caused the roads more trouble than it was worth.

The Baltimore & Ohio Southwestern, it is reported, has announced that it will reduce the rate on coal from all points as far west as Zaleski, Ohio, to Athens, from 40 cents to 35 cents a ton. It is said that this reduction is largely due to a threat of the coal operators to take the question of coal rates before the Ohio Commission unless some change was made.

A permit to operate in Texas was granted on May 7 by the Secretary of State to the Pullman Company, on the payment of a franchise tax of $10,000 and the execution of an affidavit that it is not a party to any trust. This is the first time that the Pullman Company has obtained a permit to operate in Texas, and, owing to past differences between it and state officials, proceedings are now pending against it to oust it from the state.

The Southern Engineering & Electric Company has brought suit at Little Rock, Ark., against the St. Louis, Iron Mountain & Southern for damages amounting to $48,225 for alleged discrimination against it in freight rates. It states that it bought a lease of a stone quarry and rock crusher near Argenta, Ark., and began business on May 15, 1908; that the railway charged it $5 to $10 a car for hauling its rock to Little Rock, while it made a rate to the Big Rock Stone & Construction Company for a slightly longer distance of $3.50 a car, and that owing to this discrimination the complaining concern was finally compelled to sell out and quit business.

The Pennsylvania Railroad has instructed its division freight agents to communicate with the banks in their respective districts with a view to persuading the officers of these banks to decline to accept bills of lading not properly endorsed; this with a view to meeting the complaint of the banks that "order" bills of lading ought to be made in a form more to their liking. The company also has issued to its agents elaborate and detailed instructions as to the exact methods of preparing bills of lading which may be issued for banking collateral. The banks assert that large sums of money are every year lost through the acceptance of bills of lading which are defective either in form or endorsement; but the remedy, or at least an important element of the remedy, is for the bankers themselves to realize the importance of insisting that bills of lading shall have thrown around them the safeguards common to reliable commercial paper. Bankers everywhere frequently negotiate all kinds of unconventional instruments which are supposed to be bills of lading, but the irregularity of which is apparent to the careful observer. Of course a carrier cannot deliver freight on the basis of imperfectly prepared and endorsed documents, and so deliveries are liable to be delayed and consignees subjected to serious hardships. So defective are some of these documents that it is often necessary to return them to the shipping point for correction before the carrier can deliver the property which they represent. An officer of the Pennsylvania declares that practically all of these losses to banks have been the result of imperfections in the bills of lading accepted as collateral; and he says, rightly, that if bankers, in handling bills of lading, would exact the same conventionalities which are provided by statute and by custom for the protection of commercial paper the situation would be at once improved.

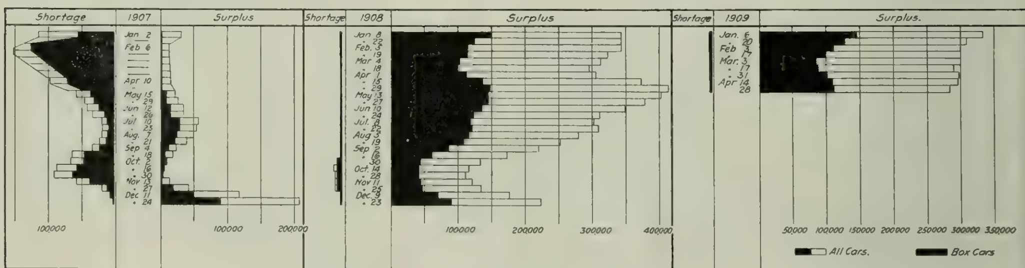
Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 45-A, giving a summary of car surpluses and shortages by groups from February 19, 1908, to April 25, 1909, says:

CAR SURPLUSES AND SHORTAGES, FEBRUARY 19, 1908, TO APRIL 28, 1909, INCLUSIVE.

		Surpluses.					Shortages.				
	Number of roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
April 28, 1909	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
April 14, 1909	163	108,291	17,692	122,982	47,698	296,663	80	135	109	19	343
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
March 17, 1909	161	88,459	20,328	139,997	42,634	291,418	310	74	27	139	550
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249

"This report shows a reduction in the surplus of 14,335 cars, bringing the total down to 282,328. The principal part of this decrease is in coal and gondola cars, the surplus of which is now reduced to 110,538, a decrease of 12,444 since our last report. The decrease in box amounts to only 626 cars. The largest decreases are in groups 4 (North Atlantic) and 6 (Northwestern). There are increases in groups 5 (Southern), 7 (Montana, etc.), and 10 (Pacific)."



Car Surpluses and Shortages in 1907, 1908 and 1909.

Condition of the Wheat Crop.

The crop reporting board of the department of agriculture estimates that on May 1 the area of winter wheat to be harvested was about 27,871,000 acres, or 2,478,000 acres (8.1 per cent.) less than the area harvested in 1908, and 2,163,000 acres (7.2 per cent.) less than the area sown last fall (30,034,000 acres, which includes 150,000 acres of winter wheat sown in Montana, not included in the December estimate).

The average condition of winter wheat on May 1 was 83.5 compared with 82.2 on April 1, 89.0 on May 1, 1908, and 86.0, the average for the past ten years on May 1.

The average condition of rye on May 1 was 88.1, compared with 87.2 on April 1, 90.3 on May 1, 1908, and 89.1 the average for the past ten years on May 1.

Traffic Club of St. Louis.

The Traffic Club of St. Louis gave a dinner at the Jefferson Hotel, St. Louis, on Tuesday evening, May 4. George J. Tansey, President of the St. Louis Transfer Company, was the toastmaster. The speakers were Judge Smith McPherson, of the United States Circuit Court; Frederick W. Lehman, a prominent lawyer of St. Louis, and Isaac N. Lionberger, former Assistant Attorney-General of the United States.

The speech of Judge McPherson was notable because of the position taken by him that justice to the railways and the public good require that regulation of railways shall ultimately be exercised solely by the federal government.

Mr. Lehman defended judicial restraint, which is "a check on the public whim." Capricious, injurious, violent sentiment, he said, is formed by seekers for public office "who do not say what they think, but what they think other people think." He criticized Congressman Murphy, of Missouri, for attacking Judge McPherson for his decision in the Missouri rate case. Referring to railway regulation, Mr. Lehman said that if the railways would take his advice "they would send to the state capitals to inform the legislatures the same kind of men who manage the roads and would call back the sort of men who cannot face a jury with courage." Mr. Lionberger also vigorously defended Judge McPherson and cautioned the public to pay proper respect to the courts, both federal and state. The club adopted a resolution declaring its "respect for and confidence in our state and federal courts, and in the courage, fairness and integrity of the judiciary; deploring the tendency exhibited in some quarters to seek the attainment of personal or official ends through criticism of the courts rather than by resort to the established form of judicial procedure."

California Demurrage Rules.

A press despatch of May 11 says that the Governor of California has signed the "reciprocal demurrage act" and that it becomes effective June 17. After that date the railways will be fined $5 a day for each day's delay on each car ordered by shippers. When 10 cars are ordered five days will be allowed for delivery and 15 days for 50 cars. To protect railways against irresponsible orders, the shipper is required to deposit with the agent one-fourth of the freight charges in advance. The railways are liable to the shipper for any actual damage caused by delay in furnishing cars. On the other hand, if the shipper does not load the cars within 48 hours of the time they are furnished, he is liable to the railway company for $6 a day [?] demurrage.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1909.
(See also issue of May 7, 1909.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Trans- portation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,549	$4,852,140	$1,548,975	$6,931,517	$842,203	$863,273	$125,638	$1,844,693	$132,386	$3,808,193	$3,123,324	.....	$231,472	$2,891,852	$344,259
Atlantic Coast Line	4,468	1,966,413	602,758	2,764,669	314,244	300,062	37,681	793,367	67,467	1,512,821	1,251,848	.....	90,000	1,161,848	376,325
Baltimore & Ohio	3,992	4,422,333	1,085,882	5,854,441	736,774	959,647	134,958	2,057,964	130,754	4,020,097	1,834,344	$42,897*	160,090	1,631,357	644,838
Boston & Maine	2,242	2,091,610	965,283	3,295,678	273,752	471,763	38,161	1,678,221	89,806	2,551,703	743,975	2,470	153,023	593,422	178,502
Central of Georgia	1,916	734,586	194,159	1,010,380	139,817	197,848	26,762	293,438	37,773	695,638	314,742	4,576	45,697	263,621	15,315
Central of New Jersey	668	1,652,440	316,636	2,082,518	156,684	307,694	25,273	528,320	40,616	1,058,587	1,023,931	11,823*	46,626	965,482	627,339
Chicago & Alton	998	693,026	274,335	1,060,119	98,986	126,340	42,631	359,486	29,766	657,209	402,910	1,094*	30,000	371,816	†87,106
Chicago, Milwaukee & St. Paul	7,516	3,766,116	934,708	5,064,982	387,292	582,274	109,970	1,781,165	90,173	2,950,874	2,114,108	8,449	206,638	1,915,919	342,264
Chicago, Rock Island & Pacific	7,414	3,242,237	1,256,397	4,783,796	604,561	619,561	119,628	1,914,313	129,218	3,387,276	1,396,520	13,115*	171,075	1,212,330	135,800
Cleveland, Cincinnati, Chic. & St. L.	1,982	1,483,612	506,286	2,186,121	249,831	408,729	68,246	858,684	42,903	1,628,393	557,728	6,284*	74,000	477,444	153,853
Delaware & Hudson	845	1,332,349	161,877	1,540,813	111,964	218,729	14,365	600,734	74,038	1,019,830	520,983	617*	35,000	485,366	†31,031
Denver & Rio Grande	2,516	1,281,699	322,701	1,676,302	182,640	317,558	39,555	646,515	42,682	1,228,950	447,352	1,801	65,000	384,153	†22,045
Erie	1,901	2,940,046	612,423	3,805,455	228,991	692,508	82,402	1,246,485	73,372	2,323,758	1,481,697	11,490*	105,994	1,364,213	688,571
Great Northern	6,961	2,951,313	805,604	3,996,094	508,105	465,176	63,124	1,222,990	79,059	2,338,454	1,657,640	7,329	220,814	1,444,156	693,696
Illinois Central	4,518	3,211,030	848,617	4,660,543	417,474	1,056,072	97,741	1,589,670	91,498	3,252,455	1,408,088	1,803*	189,224	1,217,061	79,567
Lake Shire & Michigan Southern	1,511	2,385,665	689,694	3,485,236	370,552	587,246	68,036	1,136,530	66,014	2,228,378	1,256,858	7,214*	125,000	1,124,644	164,308
Louisville & Nashville	4,388	2,861,212	802,191	3,907,398	450,440	686,871	86,702	1,242,958	74,443	2,541,414	1,365,984	9,369	112,700	1,262,653	411,458
Maine Central	931	501,733	184,198	728,671	64,855	108,917	6,548	271,406	20,963	472,689	255,982	1,890	31,962	225,910	67,635
Michigan Central	1,746	1,630,971	431,615	2,259,011	246,301	346,180	58,722	889,216	36,484	1,576,903	682,108	9,808*	94,000	578,300	88,455
Minneapolis, St. Paul & S. Ste. Marie	2,395	738,221	209,582	990,563	85,718	111,458	15,635	316,560	24,727	554,098	436,465	13,922	71,541	378,846	124,619
Nashville, Chatt. & St. Louis	1,230	749,439	177,237	992,970	167,811	163,705	37,442	344,202	23,178	736,338	256,632	.....	20,668	235,964	48,656
New York, Chicago & St. Louis	556	747,175	86,396	860,856	111,416	113,981	38,441	340,148	12,755	616,741	244,115	1,557*	26,000	216,558	†1,745
New York N. H. & Hartford	1,998	2,385,089	1,744,098	4,532,941	393,548	558,125	29,960	1,941,883	97,943	3,021,459	1,511,482	95,532	305,000	1,302,014	349,512
Oregon R.R. & Nav. Co.	1,327	699,876	238,257	999,486	107,372	77,850	27,059	293,613	27,688	533,582	465,904	355*	68,985	396,564	8,581
Oregon Short Line	1,456	1,069,773	289,253	1,445,359	79,629	167,663	19,198	290,041	32,228	588,760	856,600	1,597*	50,000	805,003	306,571
Pensylvania Co.	1,416	2,378,949	522,450	3,188,135	422,008	586,483	62,377	1,188,511	68,294	2,327,673	860,462	3,881*	149,900	706,680	†4,658
Pere Marquette	2,362	986,644	236,834	1,306,245	126,203	189,125	29,097	534,208	31,121	909,754	396,491	4,985*	46,265	345,241	151,128
Philadelphia & Reading	1,006	3,039,717	457,726	3,643,179	266,627	613,231	33,542	1,049,617	55,980	2,018,997	1,624,182	45,554	60,867	1,608,869	613,012
Pittsburgh, Cin., Chic. & St. Louis	1,472	1,962,476	530,802	2,806,434	352,287	553,325	58,567	990,239	56,913	2,011,331	795,103	172*	114,000	680,931	†40,645
St. Louis & San Francisco	4,727	2,102,412	700,296	3,052,888	267,162	234,193	77,156	996,079	90,597	1,665,187	1,387,701	.....	120,781	1,266,920	376,863
Seaboard Air Line	2,613	1,152,320	355,169	1,658,369	201,966	222,103	48,868	522,521	44,211	1,039,669	618,700	510*	54,053	564,137	188,288
Texas & Pacific	1,885	782,597	297,939	1,147,423	198,869	211,820	16,331	522,336	35,897	985,253	162,170	964*	41,648	119,558	22,858
Union Pacific	3,310	2,634,464	667,843	3,606,243	226,361	423,554	98,312	939,528	96,994	1,784,749	1,821,494	5,030*	111,783	1,704,681	377,382
Vandalia	829	487,344	166,430	741,216	99,265	133,721	21,564	287,283	17,421	559,254	181,962	.....	24,365	157,597	†17,222
Wabash	2,515	1,519,958	449,610	2,149,660	268,320	342,826	71,810	835,385	66,693	1,585,034	564,626	3,362*	68,215	493,049	195,221
Yazoo & Mississippi Valley	1,371	601,918	144,508	792,318	152,260	166,312	14,996	291,400	24,001	648,969	143,349	1,626	30,835	114,140	†47,807

NINE MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Trans- portation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,549	38,597,224	13,800,648	56,845,647	7,198,832	8,805,388	1,163,712	15,415,599	1,191,777	33,775,308	23,070,339	.....	1,858,677	21,211,662	3,101,755
Atlantic Coast Line	4,468	13,781,610	4,442,395	19,647,859	2,640,715	2,716,362	322,219	6,344,728	553,033	12,587,057	7,060,802	.....	810,000	6,250,802	1,781,450
Baltimore & Ohio	3,992	40,304,150	9,714,156	53,138,448	6,412,134	8,044,533	1,185,565	18,534,634	1,105,253	3,528,119	17,856,329	408,250*	1,533,207	15,914,872	1,882,421
Boston & Maine	2,242	17,105,983	10,149,323	29,497,866	3,303,702	3,426,539	350,877	13,488,606	701,139	21,270,864	8,227,002	80,681	1,324,492	6,983,191	610,006
Central of Georgia	1,916	5,976,273	2,102,436	8,833,503	1,198,219	1,625,429	237,064	2,694,840	328,423	6,083,975	2,749,528	44,880	363,258	2,431,150	282,427
Central of New Jersey	668	12,353,491	3,171,014	16,423,653	1,564,186	2,750,415	227,595	4,463,996	337,708	9,343,900	7,079,753	230,242	748,017	6,561,978	67,680
Chicago & Alton	998	5,957,628	2,912,290	9,654,524	895,434	1,087,094	354,398	3,099,422	272,480	5,708,829	3,945,695	8,809*	270,000	3,666,886	585,326
Chicago, Milwaukee & St. Paul	7,516	32,572,341	9,675,575	45,813,300	5,201,638	5,583,894	980,632	16,448,732	805,053	29,019,949	16,793,351	156,472	1,808,775	15,141,048	477,225
Chicago, Rock Island & Pacific	7,414	28,102,090	12,790,901	43,532,121	6,529,376	5,634,962	1,013,469	16,343,390	1,151,587	30,672,784	12,859,337	102,041*	1,627,639	11,129,657	573,885
Cleveland, Cincinnati, Chic. & St. L.	1,982	12,494,391	5,194,604	19,537,699	2,094,656	3,500,761	626,313	7,807,302	395,434	14,424,466	5,113,233	31,913*	633,347	4,447,973	472,151
Delaware & Hudson	845	11,374,394	2,099,425	13,904,585	992,679	1,557,217	163,415	4,998,416	354,490	8,066,217	5,838,368	1,039*	311,749	5,525,580	†649,978
Denver & Rio Grande	2,516	11,229,280	3,615,722	15,544,999	1,730,063	2,650,262	342,989	5,469,991	456,896	10,650,201	4,894,998	36,070	584,750	4,346,118	†878,568
Erie	1,901	24,028,392	6,087,653	32,402,506	3,070,352	6,473,710	712,937	11,119,440	688,429	22,064,869	10,337,637	213,424	906,683	9,644,379	3,288,937
Great Northern	6,961	30,266,778	8,104,900	40,743,788	6,804,589	4,951,717	528,976	11,221,824	752,032	24,259,139	16,484,649	161,588	1,902,762	14,743,475	352,577
Illinois Central	4,518	27,565,496	8,276,588	40,951,008	4,623,324	9,108,317	878,471	14,063,542	859,209	29,532,863	11,418,145	23,864*	1,687,849	9,706,432	280,099
Lake Shire & Michigan Southern	1,511	20,048,117	7,133,293	31,027,829	3,500,175	4,636,622	740,339	9,969,023	522,463	19,368,622	11,659,207	26,907*	1,148,647	10,483,653	478,492
Louisville & Nashville	4,388	24,822,568	7,667,457	34,630,638	3,850,173	6,073,315	752,797	11,074,122	706,821	22,457,228	12,173,410	81,226*	1,012,125	11,080,059	3,719,786
Maine Central	931	3,719,301	2,113,275	6,244,691	905,297	879,380	65,030	2,273,682	200,582	4,323,971	1,920,720	21,316	281,110	1,660,926	†176,117
Michigan Central	1,746	12,582,237	4,700,181	18,949,109	2,187,955	2,681,430	535,961	7,356,197	314,851	13,076,394	5,872,715	44,961*	847,694	4,980,060	†447,521
Minneapolis, St. Paul & S. Ste. Marie	2,395	6,605,780	2,211,297	9,257,812	902,241	1,025,552	172,091	2,866,303	204,749	5,170,937	4,086,875	215,545	662,450	3,639,970	769,838
Nashville, Chatt. & St. Louis	1,230	5,957,013	1,889,688	8,420,453	1,260,290	1,533,281	309,063	2,994,210	208,532	6,305,377	2,115,076	6,653*	181,336	1,927,087	124,553
New York, Chicago & St. Louis	556	5,685,852	1,055,356	6,969,727	697,283	755,137	385,962	2,854,590	117,734	4,810,706	2,159,021	10,516*	263,510	1,884,994	†343,379
New York N. H. & Hartford	1,998	19,432,238	17,020,123	40,066,126	4,660,642	4,781,536	218,279	16,916,719	837,828	27,415,004	12,651,123	915,190	2,612,000	10,954,313	986,961
Oregon R.R. & Nav. Co.	1,327	6,583,591	2,509,743	9,658,841	967,530	656,683	201,860	2,644,196	260,825	4,731,094	4,928,747	22,740*	473,352	4,432,655	†476,783
Oregon Short Line	1,456	9,395,959	2,949,398	13,132,932	1,108,986	1,251,166	165,933	2,534,600	269,421	5,330,106	7,802,826	1,472*	448,048	7,353,306	1,561,362
Pensylvania Co.	1,416	22,703,239	5,086,761	30,424,461	3,023,315	4,968,422	555,589	10,560,823	637,320	19,745,469	10,678,992	26,212*	1,365,698	9,287,082	30,148
Pere Marquette	2,362	7,261,786	2,559,537	10,639,764	1,238,154	1,569,949	242,000	4,272,990	267,874	7,590,967	3,048,797	3,814	450,688	2,601,924	458,872
Philadelphia & Reading	1,006	23,640,625	4,520,637	29,391,598	2,273,933	5,807,681	318,460	8,966,800	496,948	17,863,822	11,527,776	270,393	549,188	11,248,981	127,106
Pittsburgh, Cin., Chic. & St. Louis	1,472	16,460,332	5,175,118	24,436,057	2,715,224	4,310,974	551,625	8,599,818	502,360	16,680,001	7,756,056	4,750*	1,077,755	6,673,551	118,115
St. Louis & San Francisco	4,727	18,032,343	6,945,783	27,058,623	3,851,477	3,466,119	588,428	9,304,578	836,190	18,046,792	9,011,831	.....	1,139,048	7,872,783	336,336
Seaboard Air Line	2,613	8,521,970	2,642,598	12,333,550	1,738,943	1,776,649	434,850	4,221,528	422,714	8,594,684	3,738,866	11,112*	461,606	3,266,148	820,382
Texas & Pacific	1,885	7,792,543	2,844,464	11,404,425	1,326,810	1,721,724	137,638	4,374,164	300,538	7,860,974	3,543,451	19,416*	500,388	3,023,647	286,948
Union Pacific	3,310	25,097,333	7,298,530	35,293,251	3,198,285	3,681,316	754,545	8,354,827	906,914	16,895,887	18,397,364	16,882*	986,070	17,394,412	4,375,396
Vandalia	829	4,246,102	1,653,109	6,646,272	941,449	1,099,376	190,654	2,568,053	151,053	4,950,585	1,695,687	.....	227,287	1,468,400	†94,568
Wabash	2,515	12,927,430	4,833,537	19,360,103	2,116,670	2,965,431	611,278	7,489,332	619,355	13,802,066	5,558,037	14,919*	612,431	4,930,687	†100,079
Yazoo & Mississippi Valley	1,371	5,567,858	1,614,491	7,638,384	1,489,507	1,373,545	142,326	2,918,587	213,507	6,137,472	1,500,912	24,248	300,045	1,225,115	†141,001

*Deficit. †Decrease.

Missouri Rate Case.

A. P. Murphy, Representative in Congress from the Sixteenth district of Missouri, on May 3 introduced a resolution in the lower house of Congress asking for a congressional investigation of the conduct of Judges Smith McPherson and John F. Philips in connection with the trial of the cases involving the validity of the Missouri freight and passenger rate laws. The resolutions allege that the state was treated unfairly in the trial of these cases, and refer to a fishing trip that was made by Judges McPherson and Philips as guests of Gardiner Lathrop, General Solicitor of the Atchison, Topeka & Santa Fe, in Mr. Lathrop's private car. The party went to Tampico, Mex., and other persons besides those mentioned were in the party. Judge McPherson issued a statement at St. Louis on May 4, in which he said that Judge Philips had practically nothing to do with the rate cases, and the references to him did him a great injustice. Referring to his own conduct, Judge McPherson said he was willing to undergo a congressional investigation if a single member of Congress besides Mr. Murphy thought there should be one. He reviewed the various steps in the rate litigation; said that they were all taken publicly and in their proper order, and vigorously denied that the state had not been treated with all proper consideration. He said that he was glad to be the guest of Mr. Lathrop, who was his personal friend and a "man of the highest character," on the fishing trip alluded to. It was merely a pleasure trip and the rate cases were not discussed.

It was reported that Mr. Murphy would ask for the impeachment of the two jurists, but it was later given out at Washington that he would not press the matter at this session of Congress. Governor Hadley, of Missouri, gave out a statement entirely repudiating any connection with Mr. Murphy's resolution. Frank Hagerman, who was counsel for the Missouri roads in the litigation, sent a telegram to Attorney-General Wickersham denouncing the resolution as an "outrageous tissue of misrepresentation by one who has no knowledge of the facts."

Judge McPherson heard arguments of counsel in Kansas City on May 5 on the application of the railways for an order permanently to restrain the state from proceeding in the courts of Missouri to prevent them from advancing their passenger rates. During the hearing Judge McPherson asked Attorney-General Major if he intended to appeal to the United States Supreme Court from the decision holding the Missouri freight and passenger rate laws unconstitutional, and Mr. Major replied that he did. Judge McPherson continued the injunction to restrain the circuit attorney of St. Louis from prosecuting the suit filed by him in the state circuit court of that city to restrain the roads from raising their passenger rates to 3 cents a mile.

INTERSTATE COMMERCE COMMISSION.

Report on Hocking Valley and Wheeling & Lake Erie Coal Traffic.

The Interstate Commerce Commission on May 10 sent to Congress a report on the inquiry which it has made, under the resolution of March 7, 1906, relative to charges of discrimination and monopoly in the coal traffic in the state of Ohio, including also the Kanawha & Michigan Railway, which lies in West Virginia.

The report fills twenty pages, and about three-fourths of this space is taken up with detail statement of the relations of the railway companies to various coal mining enterprises. The Hocking Valley was organized in 1899. It has no important competitors in the Hocking Valley coal districts. The Toledo & Ohio Central, working with the Kanawha & Michigan, hauls coal from the Kanawha district in West Virginia. Both the Hocking and Kanawha fields compete with the Pittsburgh district, all shipping to Lake Erie and beyond. The Hocking Valley and the Toledo & Ohio Central work in complete harmony, though there is no joint control or ownership. The Zanesville & Western is owned by the Toledo & Ohio Central, having taken this from the Hocking Valley, and in turn the Toledo & Ohio Central conveyed to the Hocking Valley the control of the Kanawha & Michigan.

The Hocking Valley Railway controls and largely owns the stock of the Sunday Creek Coal Company, which includes several subsidiary companies, and also controls the Raybould Coal Company and the Boston Coal, Dock & Wharf Company.

The Hocking Valley and the Toledo & Ohio Central railways in 1901 guaranteed $2,750,000 of bonds of the Kanawha & Hocking Coal & Coke Company owning coal properties on the Kanawha & Michigan Railway. In the agreement under which this guarantee was made the coal company bound itself to ship coal over the Kanawha & Michigan and the Kanawha & Michigan agreed to buy its fuel from the coal company.

In 1902 the two railways guaranteed the same amount of bonds for the Continental Coal Company, formed for the purpose of acquiring coal lands in the Hocking district, on the lines of the Hocking Valley and the Toledo & Ohio Central. In both of these guarantees officers and directors of the railway companies, or firms in which they were partners, were interested, and received bonuses in stock.

In April, 1906, the Sunday Creek Coal Company was dissolved and the Sunday Creek Company succeeded it, and in this reorganization it appears that for the bonus stock received by the members of the Kanawha & Hocking Coal & Coke Company and the Continental Coal Company syndicates they received $3,885,000 of 5 per cent. collateral trust bonds of the Sunday Creek Company. In other words, the members of the syndicates, or the subsequent parties in interest, received $3,885,000 in bonds issued by a company whose entire capital stock was owned by the Hocking Valley and Toledo & Ohio Central railways, and to which was conveyed the property of the Sunday Creek Coal Company.

When the bonds of the Sunday Creek Company were offered for sale it was asserted that its property was worth $36,000,000.

The total investments of the Hocking Valley Railway Company in coal stocks at its organization amounted to $4,003,299. and during the succeeding seven years (to 1906) the railway spent $362,760 for Sunday Creek Coal Company stock, and its coal property holdings now aggregate four and three-fourths millions.

The Sunday Creek Company has thus far shown no profits, although its constituent companies formerly showed profits in some of the years, though losses in others.

The Toledo & Ohio Central owns the Imperial Coal Company and the National Coal Company ($460,000 of stock), but these companies lease their lands. This road owns $513,700 stock in the Sunday Creek Company; it is a joint guarantor with the Hocking Valley on $3,091,000 of the bonds of the Kanawha & Hocking Coal & Coke Company and $2,413,000 of the bonds of the Continental Coal Company.

The Wheeling & Lake Erie Railroad in 1904 got certain coal companies to furnish 1,500 coal cars under an agreement that the railway should subsequently buy the cars, the railway company claiming that it had neither capital nor credit with which to buy cars sufficient for its coal traffic. In 1901 the Wheeling & Lake Erie acquired $1,250,000 of stock of the Pittsburgh, Wheeling & Lake Erie Coal Company, and it has advanced $104,590 to that company, and to this extent has impaired its ability to supply itself with cars. The Wheeling & Lake Erie has made many contracts with coal mines for side tracks, but there is no evidence of discrimination.

In 1903 the Baltimore & Ohio, the Lake Shore & Michigan Southern (New York Central), the Pittsburg, Cincinnati, Chicago & St. Louis (Pennsylvania), the Chesapeake & Ohio, and the Erie jointly purchased a large amount of the common stock of the Hocking Valley Railway, resulting in a practical control of the Hocking Valley by the so-called "Trunk Line Syndicate." The Norfolk & Western and the Wheeling & Lake Erie were not interested in this purchase, but with the exception of these two railways, with the identity of officers and inter-relations between the Hocking Valley, the Toledo & Ohio Central, the Zanesville & Western, and the Kanawha & Michigan—with the trunk-line control of the Hocking Valley—an identity of interest was created which in effect results in practical control of the transportation of coal from the districts named by three interests; that is, the Pennsylvania, the Baltimore & Ohio, the New York Central, the Hocking Valley, the Chesapeake & Ohio, and the Erie as one interest; the Wheeling & Lake Erie as the second, and the Norfolk & Western as the third. The Trunk Line Syndicate appears

to have actively controlled the policy of the coal roads, especially in refusing to make track connections at mines and in directing the policy of the coal companies allied with the Hocking Valley.

The Hocking Valley and the Toledo & Ohio Central have guaranteed more than six million dollars of the bonds of the coal companies, and from these transactions the officers and directors have received large profits.

The right of the railways to hold interests in coal companies has been before the courts in a number of cases, and numerous decisions are cited to show that the railway companies have exceeded their powers.

In summing up, the Interstate Commerce Commission finds that the Hocking Valley and the Kanawha & Michigan, after acquiring their two large coal companies, discouraged all further development of coal mines by refusing to make track connections and by imposing burdens when connections were made. Details are given of attempts of coal mines to secure track connections. In a number of cases the railway called upon the coal company to have a railway company incorporated to operate the connecting track, and also required the coal company to furnish some cars. "These so-called railways are not railways," says the commission; for the courts have decided that tracks laid for such private purposes cannot be classed with common carriers.

The Hocking Valley did not substantially increase its equipment from 1902 to 1908, whereas if it had properly expended the four and three-fourths millions which it advanced to the coal companies, it could have provided for the wants of all the coal operators and all the new mines that might have been opened. Other coal districts in Ohio, Pennsylvania and West Virginia have greatly increased their output since 1900, while on the Hocking Valley there has been no increase. While the Hocking district is not a new one, and consequently its tonnage would not increase as would that of a new district, yet the presumption seems reasonable that by the elimination of individual operators and their strife for business, and the impairment of its financial ability to furnish additional facilities the Hocking Valley Railway has prevented increase in the quantity of coal originating on its lines.

The results of the operation of the Sunday Creek Company show large losses, which must necessarily be the loss of the Hocking Valley and the Toledo & Ohio central railways, which own all of the stock of the Sunday Creek Company. It would be but natural for those railways to throw all their influence to the securing of coal contracts to the Sunday Creek Company, even at prices which would not show a profit in the production of the coal.

The commission finds that on the Kanawha & Michigan the policy of discouraging new enterprises was the same as on the Hocking Valley. The commission has heard no complaint as to the rules of car distribution, or of mine rating in force on either the Hocking Valley, the Toledo & Ohio Central, the Zanesville & Western, the Kanawha & Michigan, or the Wheeling & Lake Erie roads. It does not appear that stock in coal companies served by these roads is owned by any subordinate officials of the railways, or by persons who have charge of the distribution of cars.

STATE COMMISSIONS.

W. H. Boys, Chairman of the Railroad Commission of Illinois, has tendered his resignation to Governor Deneen, and B. A. Eckhart, one of the Commissioners, is acting Chairman.

The Railroad Commission of Oregon has made an order reducing all rates of the Pacific Express Company. The reductions vary from as low as 10 per cent. to as high as 50 per cent.

Thomas J. Hillery has been appointed a member of the New Jersey Railway Commission, succeeding Borden D. Whiting, whose term of office expired May 1. Frank N. Sommer has been elected President of the Commission.

The Railroad Commission of Texas has called on the railways for fuller monthly reports of accidents. If an accident is due to defect of track or equipment, such defect must be fully described, and if to negligence of employees, explanation must be given as to the nature of the negligence. The report must also give the extent of damage to property and injuries to persons.

The State Railroad Commission of Indiana has extended for one year the time within which certain railways of that state must adopt the block system. The law applies to all roads earning $7,500 per mile per year gross. Power was granted to the commission to exercise its discretion in postponing the date for compliance, but not more than one year from July 1, 1909. According to the press despatches the companies named in the order are the Grand Rapids & Indiana, the Wabash, the Toledo, St. Louis & Western, the Grand Trunk, the Chicago, Indianapolis & Louisville, and the New York, Chicago & St. Louis. The commission will probably grant similar extensions to other companies. The ground of the decision is said to be the bad financial condition of the roads.

William J. Wood, Chairman of the Railroad Commission of Indiana, has been reappointed by Governor Marshall for a term of four years. Mr. Wood was one of the commissioners appointed when the Commission was organized two years ago, and the general fairness that has marked his official attitude is indicated by the fact that he was endorsed for reappointment by shippers, railway officers and railway employees. Mr. Wood has taken a lively interest in the matter of railway accidents, and it is largely due to him that the Indiana Commission has done what it could to reduce the number of accidents to wayfarers at crossings and to trespassers. His reappointment is generally regarded by those familiar with the work of the Commission as a proper recognition of faithful public service.

COURT NEWS.

In the Supreme Court of New York, May 10, Addie M. Hunt, a trained nurse, was awarded $58,000, by a jury, in her suit against the Long Island Railroad. In boarding a train Miss Hunt sustained injuries necessitating amputation of both legs. The case had been tried before and $25,000 awarded; but that verdict was set aside on the ground that the amount was insufficient; and the Appellate division of the Supreme Court had sustained the action of the lower court in thus deciding.

In the United States Circuit Court at Richmond, Va., May 6, the Southern, the Atlantic Coast Line, the Norfolk & Western and the Chesapeake & Ohio withdrew their suits against the chairman of the State Corporation Commission. The suits were based on objection to the 2-cent passenger fare, which was fixed by the state. The railways say they are satisfied with the increase to 2½ cents a mile. The court absolves the railways from liability for any of the coupons issued under the order of the Corporation Commission or to any holder of such coupons, which are declared void and worthless.

Decision in Santa Fe Rebate Case.

As stated by the *Railroad Age Gazette* in its issue of May 7, 1909, page 1002, the United States Circuit Court of Appeals for the Ninth circuit on May 3 rendered a decision reversing the decision of Judge Wellborn of the United States District Court for the Southern district of California, in the case of the United States against the Atchison, Topeka & Santa Fe, in which Judge Wellborn fined the defendant road $330,000 for the alleged giving of rebates to the Grand Canyon Lime & Cement Company on shipments of lime from Nelson, Ariz., to Los Angeles, Cal. The decision of the United States Circuit Court of Appeals is important both because of its reversal of a decision which was given wide notoriety and which imposed the largest fine ever levied on a railway for alleged rebating, and because of the interpretation it places on certain provisions of the Elkins act, which are still a part of the amended Interstate Commerce act.

The specific provision of the Elkins act, which it was alleged was violated, is the following:

"The wilful failure upon the part of any carrier subject to said acts to file and publish the tariffs or rates and charges as required by said acts or strictly to observe such tariffs until changed according to law, shall be a misdemeanor; . . . and it shall be unlawful for any person, persons or corporation to offer, grant or give or to solicit, accept

or receive any rebate, concession, or discrimination in respect of the transportation of any property in interstate or foreign commerce by any common carrier subject to said act to regulate commerce and the acts amendatory thereto whereby any such property shall by any device whatever be transported at a less rate than that named in the tariffs published and filed by such carrier, as is required by said act to regulate commerce and the acts amendatory thereto, or whereby any other advantage is given or discrimination practiced."

Judge Ross, in delivering the opinion of the court, said in part:

"On the trial the government introduced the tariff established by the defendant company and filed with the Interstate Commerce Commission, showing the rate over its line of road on lime from Nelson to the stations referred to in the indictment to be $3.50 per ton for a minimum carload weight of 40,000 lbs.

"It was also shown on the trial that during the time covered by the indictment—more than one year—384 cars, or thereabouts, of lime, aggregating between 9,000 and 10,000 tons, and on which the total freight amounted to about $32,000, were shipped from Nelson over the defendant's road, concerning 66 of which cars (those embraced by the indictment) a question arose between the shipper and the railway company in respect to lime claimed by the shipper to have been lost therefrom in transit, amounting in value to from 35 cents to $14.35 a car, and aggregating less than $500. Frederick P. Gregson, the freight agent of the defendant company having charge of such matters, was called as a witness by the government, and was examined by its counsel as well as by the counsel for the railway, and, in respect to those claims made by the shipper for those losses, gave testimony tending to show that in respect to each of the 66 shipments covered by the indictment, the shipper complained to the company that the full minimum carload weignt of 40,000 pounds had been loaded into the cars of the plaintiff in error at Nelson, and that a freight bill for the minimum carload, according to the tariff, of $70 had been made, and that that amount was demanded by the defendant company for freight on each of those cars, but that, as a matter of fact, according to the railway company's scales at or near the destination of the shipment, it appeared that each of the 66 cars contained less than 40,000 pounds of lime, in consequence of which the shipper insisted that the company had lost in transit his lime to the amount of the difference between 40,000 pounds and the weight so shown by the scales, and insisted that he should not lose the lime and at the same time pay freight on the lime so lost; that it cost $3.50 per ton to produce the lime at Nelson, and as the freight, according to the tariff, was $3.50 per ton, the shipper offered to waive any claim for the loss of the lime if the company would waive demand for the freight on the amount so claimed to have been lost, and that a compromise was made between the witness, acting for the railway company, and the shipper on that basis, and that the company accepted payment only on the lime actually transported, at the rate of $3.50 a ton. Other witnesses gave testimony tending to corroborate that of Gregson, all of which evidence was subsequently, on motion of counsel for the government, withdrawn from the consideration of the jury and stricken out, and the jury subsequently instructed, in part, as follows:

"'The parties having stipulated that the government's exhibit No. 5 is a copy of the tariff filed by the defendant with said Commission (Interstate Commerce Commission), said exhibit was, at the times mentioned in the indictment, its legal tariff, under and by virtue of which the rate of freight on lime in carload lots from Nelson to points on its line south of Barstow is fixed at $3.50 per ton, applicable to quantities of not less than 40,000 lbs., or 20 tons, and that said tariff was binding and conclusive on the defendant, and it could not by any means whatever lawfully charge or collect for the transportation of any of the property mentioned in the indictment any greater or less rate than that specified in said tariff. You are further instructed that if the defendant did accept for the transportation of said lime a less rate than that fixed by its legal tariff, it is wholly immaterial whether the difference between the tariff rate and the rate so accepted was large or small. You are further instructed that if you find that the defendant did accept and receive for the transportation of said lime a less rate than that fixed by said tariff, you need not inquire or determine whether or not the defendant intended thereby to violate the law, for such intention or lack thereof upon its part is entirely immaterial.'

"These rulings and instructions of the court below, as well as the instructions hereinafter referred to, were excepted to by the defendant, and are here assigned as error.

"The indictment does not charge, nor in the record is it anywhere contended, that there was in the first place any agreement or understanding of any nature that the defendant should carry the lime at any departure or concession from the established rate, and, while it is entirely true that it was the purpose of the statutory enactments upon the subject to cut up by the roots the entire system of rebates and discriminations, however made, by railways in favor of particular localities, special enterprises, favored corporations or individuals, and that the courts should be astute to discover and severely punish any and every such unlawful and wicked act, it was not, we think, the purpose of Congress to punish as a crime any innocent act committed by a corporation any more than by an individual.

"The view taken by the trial court of the nature of the charge made by the indictment in its ruling on granting the government's motion to strike out all of the evidence tending to show that the deductions made from the original freight bills by the defendant's agent, varying from 35 cents to $14.35, on the 66 carloads in question, because of the contention of the shipper that he was not legally bound and should not in justice pay freight on lime lost by the company in transit and which it did not transport, is shown by the ruling itself, where the learned judge said:

"'I hold that the acceptance by the defendant of a less sum of money than that named in its tariff for the transportation of the property described in the indictment, if there has been such acceptance, was a departure from the legal rate, and that it is no justification for such a departure, nor is it any defense to a prosecution therefor, that the acts of the carrier were done in compromise of claims for loss of property in transit.'

"Passing, for the moment, the question whether the collection of less than $3.50 a ton for all the lime in fact transported by the railway for the shipper between the stations mentioned is in law or fact any departure from the established rate of $3.50 a ton on that commodity between those stations, it is plain, we think, that if the charge upon which the defendant was being tried was, as indicated in the ruling of the court from which we have quoted, 'a departure' by the defendant from its established rate, then clearly the intention with which such departure was so made was of the essence of the offense, because made so by the statute itself in expressly denouncing such departure when 'wilfully' made.

"When the court below, however, came to charge the jury, it instructed them that to constitute the offense charged in the first count of the indictment, 'five things are necessary,' the first three of which need not be referred to, since they were stated by the court to be admitted. The fourth and fifth were stated by the court to be as follows:

"'Fourth. That the defendant, as alleged in said count, filed with the Interstate Commerce Commission a tariff or schedule of rates, of which U. S. exhibit No. 5 is a copy, and that the lawful amount of freight due the defendant on said shipment under said tariff was $70.

"'Fifth. That said amount of $64,75 was paid by said Schirm and that its acceptance by defendant was a concession by defendant to said Schirm whereby said lime was transported at a less rate than that named in said tariff.'

"If, as we take it, by the word 'concession' in these instructions the court meant the 'departure' from the tariff rate referred to in its above-quoted ruling in striking out the evidence referred to, the same observations are of course applicable to such 'concession' as to the departure from the tariff rate, that is to say, it must have been 'wilful' to constitute a crime under the statute.

"Although the charging part of count one of the indictment does not use the word 'concession,' it does allege in effect that the rate established and published by the defendant per car from Nelson to Los Angeles was $70.00 and that notwithstanding that sum was a lawful rate for the transportation between those points for such carloads of lime the defendant did charge, demand and receive for the car referred to in count one the sum of $64.75 and no more. Since the defendant of course knew and must be held to have known the tariff of rates established and published by itself, the averment that notwithstanding the alleged rate of $70.00 for the car referred to, the defendant, in fact, charged and accepted $64.75 only would seem to be sufficient to constitute the concession prohibited by the statute. The name is of but little moment; the essence of the thing is what characterizes and identifies it. Therefore, we conclude that the objections made by the defendant to the sufficiency of the indictment are not well taken.

But the established and published tariff introduced by the government does not support that charge. The tariff rate as established and published by the defendant for the transportation of bulk lime between Nelson and Los Angeles was $3.50 a ton in carload lots of not less than 40,000 lbs. It is true that to entitle the shipper to that rate he was required to put into the car at least 40,000 lbs., and it is also true that by loading that quantity he was entitled to that rate regardless of how much the carrier might deliver at the point of destination. If the shipper put in the car more than 40,000 lbs. he was not entitled to a rate of $70.00. In that event he was required to pay not $70.00 only, but $3.50 a ton on the quantity actually loaded and delivered, that is to say, $3.50 a ton was the established and published rate—not $70.00 a car. It is true that the freight would amount to $70.00 in cases where exactly 40,000 lbs. were loaded and transported; but that was a mere incident. It might be more and it might be less—more when more than 40,000 lbs. were loaded and transported, and less where at least 40,000 lbs. were loaded, but not that amount was transported and delivered at the point of destination; the rate, however, all the time remaining the same, to-wit, $3.50 a ton. Gregson testified, among other things, that the shipper explained to him how the loading was done at Nelson, which was a remote and unimportant station, and convinced him that at least 40,000 lbs. of lime were loaded into everyone of the cars shipped from that place. The shipper was, therefore, as has been said, legally entitled to have each of those shipments transported at the rate fixed in the defendant's tariff, to-wit, at the rate of $3.50 per ton. The loss of some of the lime by the carrier in transit could not legally or justly deprive the shipper of the rate applicable to the minimum carload weight, any more than it would confer upon the carrier the right to charge for the transportation of that which it did not transport. The loss in transit was the fault of the carrier, for which loss it, and not the shipper, must be held to be the sufferer. Assuming, as of course we must in passing upon the rulings of the trial court, the facts to be as the evidence tended to prove them, we do not see how, under the circumstances testified to, it can be fairly said that the shipper in this case had his lime transported at a less rate than the regularly established and published rate; he was entitled to the carload rate of $3.50 a ton because he loaded at least 40,000 lbs. in each of the cars in question, and he was not legally or equitably bound to pay freight on any of the lime which the carrier lost in transit and failed to deliver at the point of destination.

"Of course, if all of this was a mere pretence, and if in truth it constituted but a concocted scheme or device of the defendant for the purpose of departing in any way from its established and published schedule or making to the shipper any concession of any character, the crime denounced by the statute was committed; but that was a question of fact for the jury, in the consideration and determination of which the evidence stricken out was important to the defendant. 'While courts rightly are keen to penetrate an innocent appearing device to reach an illegal transaction,' said the Court of Appeals for the Seventh Circuit in a case involving an alleged criminal violation of the Elkins Act, 'they should also be alert to save a lawful act though it be hid under a false cover.' Chicago & A. Ry. Co. v. United States, 156 Fed. 558, 560. And in the case of Camden Iron Works v. United States. 158 Fed. 561, 564, which was also based on the Elkins Act, the Circuit Court of Appeals for the Third Circuit said: 'It is pertinent to remark that the legislation which has been under examination is highly penal in its character, and while it is the duty of the courts to so construe its terms as to suppress, if possible, the mischief against which it is directed, it is no less their duty to see to it that no person, natural or artificial, shall be held guilty of a crime, upon an interpretation of the statute creating it, which does not appear with at least a reasonable degree of certainty to be the correct one.' * * *

"The question of intent entered into the charge made by the indictment against the defendant in the present case, and, that being so, it necessarily results that the court below was in error in withdrawing from the consideration of the jury the evidence to which reference has been made, and in the giving of its instructions.

"The judgment is reversed and cause remanded for a new trial."

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

L. S. Miller, General Manager of the Central New England, has been elected President of the Millbrook Company.

Albert T. Perkins has resigned as Expert Adviser of the Municipal Bridge and Terminals Commission of St. Louis, Mo.

Charles G. Cunningham has been appointed the General Counsel of the Toledo Terminal Railroad, with office at Toledo, Ohio, succeeding F. W. Stevens, resigned.

Rodney S. Durkee has been appointed Auditor of the Nevada Northern, with office at East Ely, Nev., succeeding W. T. Ford, resigned to engage in other business.

The Rapid City, Black Hills & Western has acquired the property of the Missouri River & Northwestern. The following officers of the Rapid City, Black Hills & Western have been elected: President, George E. Macomber, Augusta, Me.; Vice-President, A. B. Osborne, Erie, Pa.; Treasurer, James Halley, Rapid City, S. Dak.; Secretary, Charles E. Hoyt, South Norwalk, Conn. The general offices of the company are located at Rapid City, S. Dak.

The promotion of C. P. Cooper from Manager of the St. Louis-Louisville Lines of the Southern Railway to the office of General Agent in the Operating department, with office at Memphis, Tenn., was announced by the *Railroad Age Gazette* last week under the heading "Operating Officers." Mr. Cooper's duties as General Agent are of an executive nature, and he will report to and perform such duties as may be assigned to him by the President or Vice-Presidents.

Operating Officers.

Geo. W. Turner has been appointed the Assistant Superintendent of the Butte division of the Great Northern at Great Falls, Mont., succeeding C. F. Murphy, resigned.

J. D. Finnegan, Secretary and Treasurer of the St. Louis, Brownsville & Mexico, has been appointed the Superintendent of Transportation, succeeding T. J. McCune, resigned.

D. T. Murphy, Trainmaster of the Duluth, Rainy Lake & Winnipeg, has been appointed the Assistant Superintendent, with office at Virginia, Minn., and his former office has been abolished.

H. F. Matthews has been transferred as Assistant General Superintendent of Sleeping, Dining and Parlor Cars of the Canadian Pacific from Montreal, Que., to Winnipeg, Man., succeeding W. Bell, transferred.

W. E. Moore has been appointed the General Manager and J. L. Soule has been appointed Superintendent, both with office at Rapid City, S. Dak., of the Rapid City, Black Hills & Western, which has acquired the property of the Missouri River & Northwestern.

The Hine system of organization having been adopted on the Maricopa & Phoenix and on the Phoenix & Eastern, T. J. Marks, Trainmaster, has been appointed an Assistant Superintendent; A. N. Munn, Master Mechanic, has been appointed an Assistant Superintendent, and J. G. Dilly, Roadmaster, has been appointed an Assistant Superintendent, all with office at Phoenix, Ariz. Their former titles have been abolished.

For the better handling of its traffic, the Denver & Rio Grande has divided its Western line, from Grand Junction, Utah, to Ogden, into two divisions, to be known as the Salt Lake and the Green River divisions. A. B. Apperson, Assistant Superintendent of the Utah lines, has been appointed the Superintendent of the Salt Lake division. O. J. Ogg, Assistant Superintendent of the Utah lines, with office at Helper, Utah, has been appointed the Superintendent of the Green River division. C. W. King, Trainmaster at Salt Lake City, has been appointed Assistant Superintendent, with jurisdiction over the main line from Ogden to Thistle, and over the Herbert, Tintic and Marysville branches. F. O. Haymond,

Trainmaster at Bingham, Utah, has been appointed Assistant Superintendent, with jurisdiction over the Garfield and Cuprum branches and over the Copper Belt Railway. C. T. Roberts, Trainmaster at Tucker, has been appointed Assistant Superintendent, with jurisdiction over the main line from Thistle to Helper and over the Pleasant Valley branch. The office of Trainmaster, from which the officers referred to have been promoted, has in each case been abolished.

Traffic Officers.

W. H. Thompson, until recently Chief Clerk of Tariff Bureau of the Erie, has been appointed the Chief Clerk to the General Freight Agent.

W. S. Weber has been appointed a Traveling Passenger Agent of the Great Northern with office at Spokane, succeeding Edward Furniss, deceased.

W. B. Barr, General Freight and Passenger Agent of the Chicago Terminal Transfer, has become Vice-President of the Traffic Service Bureau, with office at Washington, D. C.

Geo. B. Smith has been appointed a Traveling Freight and Passenger Agent of the Chicago, Burlington & Quincy, with office at Tacoma, Wash., succeeding L. E. Le Hane, resigned.

J. D. Gowin, Soliciting Freight Agent of the Rock Island-Frisco Lines at Fort Worth, Tex., has been appointed a Travelling Freight Agent with office at Dallas, succeeding J. F. Brooks, promoted.

F. S. Speelman has been appointed a Traveling Freight Agent of the Missouri Pacific with office at Pueblo, Colo., succeeding W. W. Trimble, promoted to Traveling Freight Agent at Memphis, Tenn.

John Kurvy has been appointed the General Eastern Passenger Agent of the Chesapeake & Ohio, with office at 362 Broadway, New York, succeeding U. L. Truitt, resigned to engage in other business.

T. F. Butler, Commercial Agent of the Ann Arbor Railroad & Steamship Lines at Toledo, Ohio, has been appointed a Division Freight Agent, with office at Toledo. The office of Commercial Agent has been abolished.

H. C. Franks, Traveling Freight Agent of the Chicago, Rock Island & Gulf at San Antonio, Tex., has been promoted to Commercial Agent of the Rock Island-Frisco Lines, with office at San Antonio, succeeding R. O. McCormack, resigned. John T. Brooks succeeds Mr. Franks.

J. P. O'Donnell, formerly General Freight and Passenger Agent of the Oklahoma Central, at Purcell, Okla., has been appointed a Traveling Freight Agent of the United Steamship Company, with headquarters at Galveston, Tex., succeeding F. A. Morris, transferred to Havana, Cuba.

The following Commercial Agents of the Detroit, Toledo & Ironton have been appointed Division Freight Agents: H. A. Fidler, at Ironton, Ohio, in charge of territory from Ironton to Waverly; J. F. Blumensteil, at Springfield, Ohio, in charge of territory from Sosco, Ohio, to Lima; D. W. Dirr, at Detroit, Mich., in charge of territory from Cairo, Ohio, to Detroit, Mich. The office of Commercial Agent has been abolished in each of these places.

F. D. Burroughs, Chief of the Tariff Bureau of the Chicago, Milwaukee & St. Paul, with office at Chicago, has been appointed an Assistant General Freight Agent of the Chicago, Milwaukee & Puget Sound, temporarily at Chicago, and later to be at Seattle, Wash. W. P. Warner has been appointed an Assistant General Freight and Passenger Agent, with office at Butte, Mont., having supervision of traffic in Montana west of and including Lombard, Mont. W. J. Keeley has been appointed a Division Freight and Passenger Agent, with office at Miles City, Mont., having supervision of traffic in South Dakota, North Dakota and in Montana east of Lombard. Hugh Chittick has been appointed General Live Stock Agent, with office at Miles City, Mont.

Engineering and Rolling Stock Officers.

F. E. Fox, Master Mechanic of the Denver & Rio Grande, at Denver, Colo., has resigned.

J. G. Kirby has been appointed the Assistant General Foreman of the Locomotive department shops of the New York Central & Hudson River at Avis, Pa.

Sheridan P. Jordan has been appointed the Roadmaster of the Sandusky division of the Lake Shore & Michigan Southern, with office at Sandusky, Ohio, succeeding C. Buhrer, resigned on account of ill health.

The titles of Master Mechanic and Roadmaster have been abolished on the Maricopa & Phoenix and the Phoenix & Eastern and the new positions created in consequence are announced under Operating officers.

A. H. Gairns, Division Master Mechanic of the Oregon Short Line, with office at Pocatello, Idaho, has been appointed Master Mechanic of the Idaho division only, with office at Pocatello. H. Carrick, Assistant Division Master Mechanic at Pocatello, has been appointed Master Mechanic of the Montana division, with office at Pocatello. George Ross, district foreman at Salt Lake City, Utah, has been appointed Master Mechanic of the Utah division, with office at Salt Lake City, and the office of district foreman has been abolished. The office of traveling engineer, formerly held by Peter Sorensen, has been abolished.

J. H. Davis, Assistant Electrical Engineer of the Baltimore & Ohio, has been appointed the Electrical Engineer, with office at Baltimore, Md., succeeding L. T. Gibbs, deceased. Mr. Davis studied both civil and electrical engineering at the University of Arkansas, receiving the degree of Electrical Engineer in 1897. He then became associated with the St. Francis Levee Board, doing dike and levee work along the Mississippi in the neighborhood of Memphis, Tenn., under the supervision of the United States Army. In 1901 he became connected with the Electrical department of the Pennsylvania, and in 1905 was appointed Assistant Electrical Engineer of the Baltimore & Ohio.

OBITUARY.

R. P. Algeo, formerly District Passenger Agent of the Cincinnati, Hamilton & Dayton, died May 6 at his home in Cincinnati, Ohio.

Albert D. Kelly, Assistant General Baggage Agent of the Pennsylvania, died at his home in Sewickley, Pa., from a hemorrhage on May 7.

J. Fewson Smith, a Civil Engineer, and at one time an Assistant Engineer on the Union Pacific, died at his home in Salt Lake on May 5 after a long illness.

J. A. Perkins, agent in Milwaukee, Wis., for the Star Union Line of the Pennsylvania up to Jan. 1, 1901, on which date he retired on a pension, died in Milwaukee at the age of 79 years. Two daughters and a son survive him.

J. H. Bond, formerly Auditor of the Railroad Commission of Texas, died on a Southern Pacific train near El Paso, Tex., on May 4. He was appointed Auditor of the Texas Commission in 1906 and held that position up to his resignation a short time ago. Before entering the employ of the Texas Commission he had held different positions in the Auditing departments of the Southern Pacific, the Galveston, Harrisburg & San Antonio and the Texas & Pacific.

S. M. Manifold, formerly General Superintendent of the Western Maryland, died at his home in York, Pa., on May 8 from pneumonia. He was born in 1842 in York county, Pa., and began railway work in 1872 on the Peach Bottom Railway, now the Maryland & Pennsylvania, as axman for the engineering corps. By 1876 he had become Superintendent and Chief Engineer, and in 1881 was made Manager for the Receiver. In 1892 he became connected with the transportation department of the Pennsylvania, and in August, 1899, became Superintendent of the Baltimore & Harrisburg division of the Western Maryland. In 1903 he was made General Superintendent, and in December of that year was made General Manager and Chief Engineer of the York County Traction Co. and also General Manager of the Edison Electric Light Co. at York, Pa. In 1905 he became Chief Engineer and Superintendent of Construction of the New Park & Fawn Grove Railway. Mr. Manifold is survived by a wife and eight children.

Railroad Construction.

New Incorporations, Surveys, Etc.

Alaska Central.—According to press reports, about 500 men will shortly be at work on this line, building from Seward, Alaska, north. About 58 miles of the line are finished, and 20 miles additional will shortly be under construction across Placer Valley into Turuagail.

Arnprior & Pontiac.—An officer writes that this company was organized to build a number of lines radiating from Fitzroy Harbor, Ont., to connect with large electric smelters, which the company proposes to build in connection with the hydraulic development of 110,000 h.p. at Fitzroy Harbor. The lines will reach large deposits of iron ore in the immediate vicinity. The expenditures for these improvements will represent an investment of about $6,000,000. L. Simpson, of Valleyfield, Que., is the promoter and controls the water power. A. H. N. Bruce, Ottawa, Ch. Engr. (April 30, p. 960.)

Atchison, Topeka & Santa Fe.—A contract is said to have been given to A. Moore, of Newton, Kan., for building the first section of 40 miles from Plainview, Tex., on the proposed line from Texico, N. Mex., southeast to Brownwood, Tex. (March 19, p. 651.)

Bangor & Aroostook.—An officer writes that the branch from Van Buren, Me., northwest to Grand Isle, may be built this year. (April 23, p. 918.)

Buffalo, Rochester & Pittsburgh.—The Walsh Construction Co., contractor, Davenport, Iowa, has been given the contract for two miles of line revision work on the Clearfield & Mahoning division, near Rockton, Pa. (April 30, p. 960.)

Canadian Northern.—Contract is said to have been given to Janse & McDonnell, of Lethbridge, Alb., to build a 10-mile cut-off at Stanley Junction, Ont.

According to reports, a branch is to be built at once from Makinak, Man., northeast about 12 miles to Ste. Rose du Lac.

A contract will soon be awarded for the first 125 miles of the Vegreville, Alb., branch. (April 30, p. 960.)

Construction will be started at once on the branch from Camrose, Alb., to Calgary, 125 miles.

Canadian Pacific.—Contract is said to have been given to W. T. Parsons, of Winnipeg, Man., for a cut-off near Jackfish, Ont. (May 7, p. 1007.)

Central Ontario.—The Ontario legislature has voted a subsidy of $3,000 a mile for a 15-mile extension of the line now terminating at a junction with the Canadian Atlantic, between Whitney, Ont., and Madawaska. Construction work must be started within three months and completed within two years. (March 19, p. 660.)

Champlain & Sanford.—This company has filed with the New York Public Service Commission, Second district, an application for permission to change this route and motive power. When permission was granted to build this road it was specified that it should be operated by electric power. The company now asks that it may use either electrically-driven or oil-burning locomotives. (March 19, p. 652.)

Chicago, Rock Island & Gulf.—The Amarillo division has been extended from Wildorado, Tex., west to Vega, 13.9 miles. (See Chicago, Rock Island & Pacific, Jan. 29, p. 235.)

Columbus, Plain City & Urbana.—Incorporated in Ohio, with $10,000 capital and headquarters at Columbus, to build from Columbus west to Urbana, about 45 miles.

Dousman & Marlboro.—Incorporated in Wisconsin, with a capital stock of $25,000, to build a railway from Dousman, Wis., to Marlboro, about 6¾ miles. At Dousman the line will connect with the Madison division of the Chicago & North Western. The incorporators include: J. M. Pereles, T. J. Pereles, Jr., W. H. Lindwurm and H. Campbell, all of Milwaukee.

Dunnville, Wellandport & Beamsville (Electric).—Work is said to be under way by Contractor Lloyd, of Beamsville, Ont., on a 10-mile line between Dunnville, Ont., and Moulton townships. W. E. Werner, of St. Catharines, Ont., is said to be interested.

Grand Trunk.—An officer writes that it is probable in the near future the Hamilton-Niagara Falls line will be four-tracked to accommodate the increasing service, but that nothing has been done towards making plans to carry out this improvement.

Kansas City Junction.—Organized in Kansas, with $50,000 capital and headquarters at Kansas City, Kan., to build a line in Wyandotte county.

Kansas City, Lamar & Denver.—Incorporated in Kansas, with $100,000 capital and headquarters at Concordia, Kan., to build from Concordia south to Salina, about 50 miles.

Kansas City, Mexico & Orient.—An officer writes that it is expected to have the line in operation about August 1 from Wichita, Kan., south to San Angelo, Tex., 510 miles. Work in Mexico is under way west of Minaca and east of Topolobampo. (April 23, p. 918.)

Mansfield Railway & Transportation Co.—The line from Mansfield, La., southwest to Hunters, 14 miles, is now in operation.

Montana, Idaho & Pacific.—According to press reports the Harriman interests have incorporated this company with $16,000,000 capital to build from Lapwai Junction, Idaho, east through the Clearwater section of Idaho and the Lola Pass of the Bitter Root mountains, to Missoula, Mont., thence through Granite, Powell and Deer Lodge counties to Butte, where connection is to be made with the Oregon Short Line, about 350 miles. The incorporators include: J. H. Richardsand and C. E. Chrisman, of Boise, Idaho; J. G. Wilson, of Portland, Ore., and J. L. Wines.

Missouri Southern.—This company has extended its line from Reynolds, Mo., northeast to Bunker, 10 miles, giving the line a total mileage of 54 miles. (March 19, p. 656.)

New York, New Haven & Hartford.—Preliminary estimates relative to the extension of the electrification have been prepared and submitted for the information of the board of directors. The matter is now being considered, but it is not likely that any definite action will be taken or authority granted for some time.

Northern Pacific.—A contract is said to have been given to Porter Bros. & Welch to build from Mandan, N. Dak., south, following the Missouri river to the Standing Rock Indian reservation. Work is to be started at once. Later reports say a contract has been given to E. A. Wickham, of Council Bluffs, Iowa, at $350,000, to build 40 miles from Mandan south to Cannon Ball. It is expected to have a large force of men at work soon.

Peola & Snake River Railroad & Navigation Co.—Incorporated in Washington with $400,000 capital and headquarters at Tacoma, to operate a line from Dead Man's Hollow at the Snake river, Garfield county, Wash., southeast to Peola. This is thought to be a Harriman project. W. Christian, of Tacoma, is interested.

Pine Bluff, North & South.—Incorporated in Arkansas, with $1,000,000 capital, to build from Pine Bluff, Ark., north to a point on the Missouri & North Arkansas, 1½ miles west of Georgetown, in White county, about 65 miles. Address V. O. Alexander, Pine Bluff.

Quebec & Saguenay.—See Quebec Railway, Light & Power Co.

Quebec Railway, Light & Power Co.—An officer writes regarding the report that this road is to build an extension, that the Quebec & Saguenay proposes to build from the northern terminus of the Q. R. L. & P. Co. at Cape Tourmente, Que., northeast along the north bank of the St. Lawrence river, about 56½ miles. It is probable that the work will be started this fall; the line will cost $2,000,000, and arrangements may be made with the Q. R. L. & P. Co. to operate the line when built.

South Dakota Interurban.—Incorporated in South Dakota, with headquarters at Centerville, and a capitalization of $1,000,000, to build an electric line from Sioux City, Idaho, northeast to Bijou Hills, S. Dak., about 160 miles. The incorporators include: F. E. Graves, W. E. Muller, R. W.

Thwing, C. E. Todd, all of Bijou Hills, and G. A. Miller, of Academy, S. Dak.

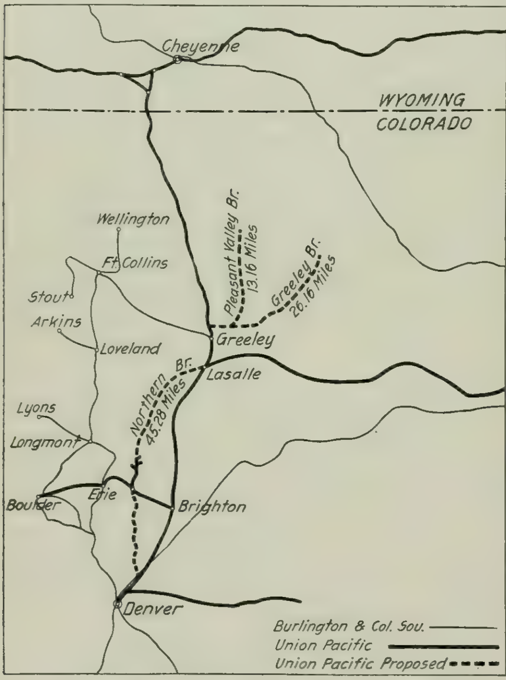
Southern.—The Tennessee & Carolina Southern has been opened for business from Maryville, Tenn., south to Chilhowee, 25.2 miles. (March 19, p. 658.)

Southern Pacific.—The San Joaquin division has been extended from Rademacher, Cal., eastward to Little Lake, 36 miles.

Tennessee Railway.—A new branch called the Nicks Creek branch, from Smoky Junction, Tenn., to Nicks Creek, three miles, has been opened for business.

Texas & New Orleans.—Announcement is made that the Rusk branch is open for business from Gallatin, Tex., on the Dallas-Sabine branch, south to Rusk, 8.29 miles. (March 19, p. 658.)

Union Pacific.—The work now under contract in Colorado includes the Pleasant Valley and Greely branches, building east and north from a point on the main line north of Greely, Colo.; a branch from Denver to a connection with the Boulder



Union Pacific Branch Lines in Colorado.

branch, near Erie, and one from Lasalle south to a branch of the main line. These latter branches will form a second line between Denver and Lasalle. The accompanying map indicates present progress. (March 19, p. 658.)

Wichita, Kinsley, Scott City & Denver Air Line.—Organized in Kansas with $200,000 capital and headquarters at Kinsley, to build through the counties of Sedgwick, Reno, Kingman, Pratt, Stafford, Edwards, Hodgeman, Lane, Finney, Scott, Wichita, Logan and Wallace.

Wisconsin Roads.—W. R. Lyle and W. H. Englebright, of Ripon, Wis., are said to be organizing a company, capitalized at $50,000, to build a railway from Ripon, Wis., to Green Lake, about 7½ miles. It is the intention to operate with gasolene motor cars.

Wyandotte & Lawrence.—Organized with $510,000 capital and headquarters at Kansas City, Kan., to build through the counties of Wyandotte, Leavenworth, Johnson and Douglas to a point near Lawrence, about 40 miles.

Railroad Financial News.

Canadian Northern.—A mortgage securing an issue of bonds amounting to $10,000 per mile on the company's line running from a point near Etoimami to Pas Mission, about 88 miles, has been filed.

Chicago & Eastern Illinois.—The suit brought by a bondholder of this company to set aside the traffic agreement dated April 14, 1904, between the Chicago & East Illinois, the St. Louis & San Francisco and the St. Louis, Memphis & Southeastern has been discontinued, it is said. An agreement was entered into in 1902 putting the properties of the Chicago & Eastern Illinois into the hands of a trustee in order to preserve these assets for the benefit of the stockholders, and trust certificates were then issued against the bonds of the railway. A second agreement made in 1904 gave the St. L. & S. F. nearly all the traffic of the C. & E. I., and on the strength of this agreement $16,000,000 bonds secured by the properties of the St. Louis, Memphis & Southeastern were issued. The tariff agreement expires June 1 and it is understood that the St. Louis & San Francisco interests have agreed not to renew the arrangement.

Chicago Great Western.—The following plan, differing only slightly from the tentative plan published in these columns on March 26, for the reorganization of the Chicago Great Western, which is in the hands of Horace G. Burt as receiver, is understood to be authoritative:

Holders of the present debentures will receive in exchange therefor 110 per cent. in new preferred stock.

Holders of preferred A stock will receive 120 per cent. in new common stock.

Holders of preferred B stock will be assessed 15 per cent. and will receive 60 per cent. in new common and 15 per cent. in new preferred stock.

Holders of the common stock will be assessed 15 per cent. and will receive 40 per cent. in new common and 15 per cent. in new preferred stock.

It is expected that the plan will be put into operation at once.

Interstate Railways (Philadelphia).—The interest coupons due February 1 on $10,776,600 Interstate 4 per cent. bonds, which interest was defaulted in February, were paid May 1. Foreclosure proceedings are apparently prevented.

Metropolitan Street Railway (New York).—The decree of sale dated March 18 has been modified by Judge Lacombe so as to adjourn the sale from June 1 to June 29. The purchaser is required to assume all pending contracts made prior to the sale by the receiver of the New York City Railway or the Metropolitan Street Railway, and to discharge any unpaid indebtedness incurred by the receivers before the delivery of the property which shall not have been paid by the receivers out of the proceeds of the sale.

New York City Railways.—See Metropolitan Street Railway.

St. Louis & San Francisco.—Speyer & Co., New York, are offering $10,000,000 general lien 5 per cent. bonds of 1907-1922-1927 at 91 to yield about 5⅞ per cent. Of the total authorized issue of $109,850,400 there are outstanding (including the above $10,000,000) $36,052,000. Speyer & Co. will accept St. Louis, Memphis & Southeastern five-year 4½ per cent. bonds maturing June 1, 1909, at 100⅛ in payment for the general lien bonds at 91. There are $15,529,929 of the 4½ per cent. bonds outstanding.

The bonds now offered are a direct obligation of the company covering all its property, and on June 1, 1909, on the redemption of the St. Louis, Memphis & Southeastern 4½ per cent. bonds, the 5 per cent. bonds will become a first mortgage on 665 miles of line of the St. L., M. & S. E., subject only to $489,125 existing bonds for the redemption of which general lien bonds are reserved.

Virginia Passenger & Power, Richmond, Va.—The property was sold on May 4 to a representative of the reorganization committee, which was the only bidder, for $8,100,000. The company's property includes electric lines in and around Richmond, Va., aggregating about 119 miles. (Aug. 7, 1908, page 694.)

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Southern is reported in the market for locomotives. This item is not confirmed.

The Coahuila & Zacatecas is reported to be figuring on a number of freight locomotives.

The Peoria & Pekin Union has ordered three six-wheel switching engines from the American Locomotive Co. for July delivery.

The New York Central Lines has ordered 3,000 fifty-ton steel hopper cars from the American Car & Foundry Co. The New York Central & Hudson River will receive 1,000 of these cars and the Lake Shore & Michigan Southern will receive 2,000.

The Chicago, Milwaukee & St. Paul is building 20 mikado locomotives at its shops in Milwaukee for use on its Pacific coast extension; one of them has been in service about two months and has met with the expectations of the builders in every respect. These engines will have cylinders 24 in. x 30 in. Diameter of driving wheels, 63 in. Tractive power, 46,630 lbs.

The New York Central Lines has ordered 71 locomotives from the American Locomotive Co. This is the locomotive equipment which was reported in the *Railroad Age Gazette* of March 12, and is as follows: Lake Shore & Michigan Southern, 20 freight; Michigan Central, 18 freight, 12 passenger, 15 switch, 1 decapod; Cleveland, Cincinnati, Chicago & St. Louis, 5 passenger. The Dunkirk and Schenectady plants will build 62 of these locomotives for delivery during June and July, and the Montreal Locomotive Works, Ltd., will build nine for delivery in August.

The Ann Arbor has ordered 12 consolidation locomotives from the American Locomotive Co.

General Dimensions.

Weight on drivers	188,000 lbs.
" total engine	213,000 "
Cylinders	22 in. x 30 in.
Diameter of drivers	57 in.
Boiler, working steam pressure	200 lbs.
Boiler, diameter	80 in.
Heating surface, tubes	3,318 sq. ft.
" " firebox	182 "
" " total	3,500 "
Tubes, outside diameter	2 in.
" number	425
" length	15 ft.
Firebox, length	108 in.
Firebox, width	66 "
Grate area	49.5 sq. ft.
Water capacity	8,000 gals.
Coal capacity	15 tons
Valve motion	Walschaerts

CAR BUILDING.

The Coahuila & Zacatecas is reported to be figuring on a number of gondola cars.

The Halifax & Southwestern has ordered two cafe-parlor cars from Rhodes-Curry & Co.

The Peoria & Pekin Union has ordered two passenger and one combination coach and smoking car from Barney & Smith.

The Canadian Pacific has ordered one steel coal car and one Hart-Otis ballast car from the Dominion Car & Foundry Co.

The Ann Arbor has ordered one cafe-parlor car and two passenger coaches from the Pullman Co. for delivery June 15, 1909.

The Red Springs Street Railway Co., Mt. Pleasant, Tex., is reported to be in the market for two 25-h.p. gasolene motor cars. This item is not confirmed.

The Interborough Rapid Transit Co., New York, is in the market for 100 company standard elevated train cars and 100 steel, center side-door, subway train cars.

The Canadian Pacific is building one baggage-express car, one mail-express car, 61 box cars and one stock car at its Angus shops, and one van at its Farnham shops.

The Western Pacific, reported in the *Railroad Age Gazette* of May 7 as being in the market for a number of passenger cars, will divide this equipment as follows: 50 passenger, 40 baggage, 10 buffet and 8 dining cars.

The Commissioners of the New Brunswick Railway & Coal Co. are inquiring for a second-hand combination baggage and first-class passenger car. They are also preparing to equip the balance of their freight cars with air-brakes.

The Pacific Electric Railway, Los Angeles, Cal., as reported in the *Railroad Age Gazette* of May 7, has ordered 50 thirty-ton side dump gondola cars from the Hicks Locomotive & Car Works. These cars will be 34 ft. long over end sills and 8 ft. 6 in. over side sills. The special equipment will include:

Axles	M. C. B. standard
Bolsters, body	Simplex
Bolsters, truck	Simplex
Brakes	Westinghouse
Brake-beams	Simplex
Couplers	Tower
Journal bearings	M. C. B. standard
Trucks	Diamond
Wheels	M. C. B. standard

The Atchison, Topeka & Santa Fe, as reported in the *Railroad Age Gazette* of March 26, has ordered nine baggage and four passenger coaches from the Pullman Co., for June delivery. The special equipment will include:

Bolsters, body	Commonwealth
Bolsters, truck	Steel
Brakes	Westinghouse
Brake-beams	Creco
Brake-shoes	National
Draft gear	Miner
Heating system	Chicago Car Heating Co.
Journal boxes	Symington
Lighting system	Pintsch
Springs	Simplex
Vestibules	Pullman
Wheels	Company standard

The Harriman Lines, reported in the *Railroad Age Gazette* of January 29 as being in the market for 1,500 refrigerator cars, have placed this order with the Pullman Co. for delivery about August 10. These cars will weigh 46,000 lbs. and have 60,000 lbs. capacity. They will be 33 ft. 2¾ in. long, 8 ft. 2¾ in. wide, 7 ft. 5⅛ in. high, inside measurements, and 40 ft. 11⅛ in. long, 9 ft. 6 in. wide and 12 ft. 11⅛ in. high, over all. The bodies will be of wood and the underframes of steel. The special equipment will include:

Axles	M. C. B. standard
Bolsters, body	Bettendorf
Bolsters, truck	Simplex
Brake-beams	National hollow
Brake-shoes	Am. Brake-Shoe & Fdry Co.
Brasses	Hewitt Mfg. Co.
Couplers	National Mall. Castings Co.
Draft gear	Miner
Journal boxes	National Mall. Castings Co.
Side bearings	Miner gravity roller
Springs	Railway Steel-Spring Co.
Trucks	Barber roller
Wheels	Cast-iron

The Boston & Maine, as reported in the *Railroad Age Gazette* of May 7, has ordered 1,000 forty-ton drop-bottom steel coal cars from the Laconia Car Co. These cars will be 40 ft. long, 9 ft. 5½ in. wide and 3 ft. 10 in. high, inside measurements, and 42 ft. 7½ in. long over couplers, 10 ft. 1 in. wide over all and 8 ft. 2¾ in. high over brake shafts. The special equipment will include:

Bolsters, body and truck	Steel
Brakes	Westinghouse, 10-in. cylinder
Brake-beams	I-beams
Brake-shoes	Steel back
Brasses	M. C. B. standard
Doors	Drop
Door fastenings	Standard Steel Car Co.
Draft gear	Miner tandem, E.
Dust guards	Wood, M. C. B. standard
Journal boxes	Malleable iron, M. C. B. standard
Paint	Metal, B. & M. standard
Side bearings	B. & M. standard
Springs, draft	Class G
Springs, truck	Class C
Trucks	Arch bar
Wheels	33-in. chilled

The Central of New England, as reported in the *Railroad Age Gazette* of May 7, has ordered two passenger, two smoking and baggage and two smoking, baggage and mail cars from the Wason Manufacturing Co. These cars will be 60 ft. 3½ in. long, 9 ft. 1 in. wide, 9 ft. 1 in. high, inside measure-

ments, and 68 ft. 8 in. long, 10 ft. ¼ in. wide and 13 ft. 8 in. high over all. The bodies will be of wood and the underframes of steel. The special equipment will include:

Bolsters, body	Double wrought iron
Bolsters, truck	Wrought iron
Brakes	Westinghouse
Brake-beams	Diamond special
Brake-shoes	Am. B. S. & Fdy. Co.
Couplers	McConway & Torley and Buhoup
Curtain fixtures	Forsyth
Curtain material	Pantasote
Dust guards	Harrison
Heating system	Gold
Lighting system	Acetylene
Platforms	Standard Coupler Co.
Seats	Heywood Bros. & Wakefield Co.
Seat covering	Green plush in passenger cars Pantasote in smoking cars
Side bearings	Creco
Springs	Railway Steel-Springs Co.
Wheels	33-in. rolled steel

IRON AND STEEL.

The Chicago, Milwaukee & St. Paul is figuring on about 400 tons of structural steel.

The Missouri Pacific has ordered 200 tons of structural steel from the Pennsylvania Steel Co.

The International & Great Northern is said to be in the market for 4,000 tons of 80-lb. rails.

The Toledo, St. Louis & Western has ordered 550 tons of structural steel for bridge work from the American Bridge Co.

The New York, Chicago & St. Louis has ordered about 1,400 tons of structural steel for grade crossing elimination work from the American Bridge Co.

General Conditions in Steel.—The inquiries for steel products continue to improve. Besides the large consumers, the small ones are also making inquiries, which latter condition is always taken as heralding general improvement. Probably no more definite idea of conditions can be gotten than from the following operating percentage, as reported in the *Wall Street Journal*: United States Steel Corporation, about 67.5 per cent. of capacity; Republic Iron & Steel Co., 100 per cent. of furnace capacity and between 75 per cent. and 80 per cent. of finished steel capacity; Lackawanna Steel Co., about 80 per cent. of capacity; Jones & Laughlin Steel Co., 80 per cent.; Pennsylvania and Maryland Steel companies, 75 per cent.; Cambria Steel Co., 75 per cent., and Carnegie Steel Co., about 85 per cent.

RAILROAD STRUCTURES.

CANADIAN STRUCTURES.—The contract for building the stations on the Grand Trunk Pacific between Winnipeg, Man., and Lake Superior junction, has been let to Contractor Vopni, Winnipeg, Man., price $114,000.

Bids will soon be asked by P. Ryan, Secretary of the National Transcontinental Railroad Commission, Ottawa, for the building of the following shops east of Winnipeg: Freight car shop, 200 ft. x 600 ft.; paint shop, 100 ft. x 325 ft.; coach shop, 125 ft. x 250 ft.; planing mill, 100 ft. x 300 ft.; lumber shop, 60 ft. x 115 ft., and dry kiln, 40 ft. x 50 ft.

CHICAGO.—The Chicago, Burlington & Quincy has given a contract for the erection of a one-story freight house to the Charles A. Moses Construction Co., Chicago. It will be of brick, 57 ft. x 702 ft.

EDMONTON, ALB.—Work on the high level bridge of the Canadian Pacific over the Saskatchewan river will be commenced within a month. The estimated cost of this structure is about $350,000. (March 26, p. 729.)

IOWA FALLS, IOWA.—The St. Paul & Des Moines is building a passenger depot.

MCHENRY, ILL.—The Chicago & North Western has given a contract for the erection of a passenger station to William Adams Construction Co., Chicago. It will be a one-story brick building, 21 ft. x 133 ft.

NEENAH, WIS.—Adolph Green, contractor, Green Bay, Wis., has been given a contract by the Chicago & North Western for two steel bridges across the Fox river near Neenah, Wis., and also for a steel bridge across Little Lake Buttes des Morts. The Buttes des Morts bridge will be about one mile long, and the combined length of the two Fox river bridges will be about one mile. These bridges will be double-track.

NEW CARLISLE, QUE.—The New Canadian Company, of New Carlisle, is said to be asking bids up to May 21 for the steel superstructures of 14 bridges, aggregating 4,900 ft., for the Atlantic, Quebec & Western.

PORTLAND, ME.—According to press reports plans are being made by the Grand Trunk to rebuild the pier and sheds destroyed by fire last December. (Dec. 11, p. 1564.)

SASKATOON, SASK.—The Canadian Northern will build a depot here to cost about $50,000.

SIGNALING.

The Central New England is going to try single-track operation without time-table and train-order rights, and has awarded to the Union Switch & Signal Co. a contract for the signaling of 15 miles of line for this purpose. This line is between Berea, N. Y., and Highland, west of the Poughkeepsie bridge. The signals will be controlled manual, with control apparatus from station to station, and also will be controlled by continuous track circuits. There will be 40 signals, all style B, electric motor semaphores. Those at the entrance to the sections will be absolute and be locked against the opposing entrance signals. To allow for following movements intermediate automatic home and distant signals will be employed. No permissive entrance signal indications will be given.

FOREIGN RAILWAY NOTES.

A concession has been granted by the Nicaraguan government to a firm to establish in western Nicaragua the cultivation of bananas for export, together with a line of steamers on the Pacific coast. The concession carries a grant of land, the privilege of constructing the necessary railways and docks for the proper handling of the banana crops, and also the free importation of all machinery, construction materials and supplies that may be required in establishing and conducting the enterprise. The address of the concessionaires is filed for reference at the Bureau of Manufactures, Washington, D. C.

According to a consular report, the Chilean government has several lines under construction, two important lines about to be let, and the following new lines are to be begun during the year at a total cost of $2,914,736 gold:

Lines.	Length, miles.	Gage Ft.	Gage In.	Cost.
Alcones to Pichilemu	44.88	5	6	$1.860.371
Linares to Panimavida	20.46	2	3.6	203,620
San Clemente to Colorado	17.36	3	3.36	236.220
Rancagua to Donihue	13.00	3	3.36	205.870
Selva Oscura to Cura Cautin	17.98	3	3.6	306.455
Union to Rio Bueno	7.44	2	3.6	102.200
Total	91.12			$2.914.736

The chief industry of the British colony of Southern Nigeria, on the west coast of Africa, is agriculture, and crops consist of maize (corn), plantains, groundnuts, yams and cassava, while cocoa, coffee and cotton are also grown. (It is reported by the British Cotton Growing Association that at present over 50,000 bales of cotton are grown annually in the Zaria and Kano provinces of Northern Nigeria, the physical hinterland of Southern Nigeria.) The natural products exported are palm oil and kernels, ivory, gum, copal and rubber, with a steady increase in the export of cotton and maize. A railway has been built from Iddo island to Oshogbo, on the mainland, a distance of 185 miles, and is now being extended to the Niger at Jebba, whence it will run to a point near Zungern, in Northern Nigeria, thus connecting with the railway from Kano in that protectorate, which has also been authorized. The principal imports are cotton goods, cooper's stores, hardware, cutlery and spirits. The total imports in 1906 amounted to $15,316,224, while the total exports amounted to $15,331,644.

Supply Trade News.

The C. F. Pease Blue Print Machinery & Supply Co., Chicago, has moved to 167 East Adams street, Chicago.

The Inter-Ocean Steel Co., Chicago, has ordered 5,000 tons of structural steel for its new plant from the Cambria Steel Co.

The Franklin Railway Supply Co., New York, has opened an office in Chicago at 115 Adams street. R. G. Coburn has been made resident Sales Manager in charge of that office.

Edwin J. Haddock has resigned as Chief Engineer of the Jeffrey Manufacturing Co., Columbus, Ohio, to engage in business for himself in Columbus, Ohio, as mechanical, structural and mill engineer.

The Empire Motor Car Co., Indianapolis, Ind., has been incorporated with $100,000 capital stock. The incorporators are: Carl G. Fisher, James A. Allison, Charles E. Test, A. C. Newby and Robert H. Hassler.

The Southern Wisconsin Power Co., Madison, Wis., recently installed a 30-ton traveling Northern crane and a 6-ton electric mono-rail hoist, both furnished by the Northern Engineering Works, Detroit, Mich.

W. L. Brown, formerly Assistant Engineer of Tests of the Pennsylvania Railroad, has gone to the sales department of the Geo. M. Newhall Engineering Co., Philadelphia, Pa. Mr. Brown's headquarters will be in Philadelphia.

The Case Crane Co., Columbus, Ohio, mentioned in our issue of last week as having changed its name from the Case Manufacturing Co., has appointed George B. Foster, with office in the Fisher building, Chicago, its representative in that territory.

P. H. Wilhelm, for some time with the American Steel & Wire Co., Cleveland, Ohio, and for a number of years engaged in selling railway supplies, has been appointed special railway representative for the Asbestos Protected Metal Co., Canton, Mass.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, recently received a large order for Falls hollow staybolt iron from a railway in England. The railway wishes to give this staybolt iron a preliminary test with a view of its adoption on its entire system.

The Bucyrus Co., South Milwaukee, Wis., recently sold a locomotive pile driver and four ballast unloaders to the Southern Pacific. The company has also contracted to furnish another steam dredge for government service. It will be used on irrigation work in the state of Washington.

E. J. Arlein, who was formerly with the Patton Paint Co., Chicago, has resigned to accept the position of Western representative for James B. Sipe & Co., Pittsburgh, Pa., and will have headquarters in the Chamber of Commerce building, Chicago. Mr. Arlein succeeds Thomas D. Henderson, who died suddenly in the latter part of March.

The German American Car Co., of Chicago, and Warren, Ohio, is distributing a paper weight novelty—a bronze model of a steel under-frame tank car of the German American pattern. The company is a tank car "specialist," being the only concern engaged exclusively in building and renting tank cars. The paper weight is a miniature of the latest design of steel tank car.

Bids will be received by the Isthmian Canal Commission, Washington, D. C., until May 24, for supplying locomotive cranes, orange-peel buckets, pneumatic hoists, duplex pumps, pipe-threading machine, woodworking machines, flanging clamps, driving-wheel jacks, washer cutters, belt punches, malleable-iron castings, steel forgings, chain, steam and vacuum gages, park benches, lumber, etc. (Circular No. 508.)

The Rogers Journal Packing Co., Chicago, has appointed Willis C. Squire, 307 Western Union building, General Sales Agent for the Rogers improved journal packing and receptacles. All orders for Rogers packing should be sent to the general sales office. The company is now making an improved journal packing, using the original Rogers steel wool in combination with a high grade cotton waste mixed with sponge, and is prepared to fill orders in any amount for this packing.

An American consular officer in a Latin-American country reports that it is possible that a few miles of narrow-gage railway, together with a small wharf and customs-house buildings, will shortly be constructed in the city in which he is located. If American firms interested in this project desire to send to him catalogues of implements, railway supplies and other material needed, he will see that they get into the hands of the proper persons. (Inquiry No. 3347, Bureau of Manufactures, Washington, D. C.)

On all of the new coaches for the New York Central Lines, ordered recently from the Pullman Company, the American Car & Foundry Co. and the Barney & Smith Car Co., Edwards window design No. 7-D-2, made by the O. M. Edwards Co., Syracuse, N. Y., will be used on windows that have double sash, and design 7-D-1 on all windows with single sash. These fixtures are to be furnished in statuary bronze finish to conform in color with the rest of the car fittings. Orders have also been received from the Silliker Car Co. and from Rhodes, Curry & Co. for window fixtures for Canadian Northern Railway equipment.

L. E. Burton is now in charge of sales of the American Blower Co., Detroit, Mich., in the states of Washington, Oregon and Idaho, with headquarters at the Arcade annex, Seattle, Wash. Mr. Burton is a graduate of the Engineering Department of the University of Michigan and has had considerable experience as engineering salesman for the company at Detroit and in connection with the Chicago office. His later experience consists of engineering positions with J. T. Mooney & Co., Nashville, Tenn., and more recently with the W. J. McPherson Co., Portland, Ore. Thomas W. Fitch, until recently sales manager of the Capell Fan & Engineering Co., is now connected with the American Blower Co., representing the Sirocco mine fan department in the bituminous coal district. Mr. Fitch makes his headquarters at the Pittsburgh, Pa., sales office.

Henry B. Robischung died suddenly of apoplexy at his country home, Guernsey Lake, near Kalamazoo, Mich., on May 3. Mr. Robischung was born in Scottsville, N. Y., on May 28, 1850, and was taken to Kalamazoo when two years old, and while his business called him to various parts of the country, he always maintained Kalamazoo as his home. He was Master Mechanic of the old Cincinnati, Wabash & Michigan, now part of the Cleveland, Cincinnati, Chicago & St. Louis, and was one of the first to apply the Eames vacuum brake. He was with the company that made this brake and with Thomas Prosser & Sons, New York, until 1885, when he was employed by E. B. Leigh, then managing the American Brake Company, St. Louis, Mo. He remained with this company until the latter part of 1887. For nearly a year he did special work for the Campbell Printing Press Co. On the reorganization of the National Hollow Brake Beam Co., he was again employed by Mr. Leigh, this time as Superintendent of this company. He remained with the National Hollow Brake Beam Co. and its successor, the Chicago Railway Equipment Co., Chicago, until 1898, when he retired from active work, remaining with the Chicago Railway Equipment Co. in a consulting capacity, however, up to his death. He was a great leader in the development of the metal brake beam; he was the original inventor of the steel back brake shoe, and more than 50 patents were taken out in his name. There is hardly a railway in the country that is not using equipment devised or improved by him. He was a superior mechanic, and was generally and favorably known to the older railway men. His death will be regretted by a large circle of friends.

German Roads.

It has been proposed to build, by a private company, a high-speed electric railway for passengers only between Dusseldorf and Dortmund, already connected by the State Railways. The Railway Minister, to whom the plan must be submitted, has intimated that he will be inclined to disapprove of such a plan to invade the state's traffic.

TRADE PUBLICATIONS.

Hollow Staybolts.—The Detroit Seamless Steel Tube Co., Detroit, Mich., has issued a pamphlet on its hollow staybolt for locomotive, marine and other types of boilers. This is a new product of this company.

Steel-Tired Wheels.—The Standard Steel Works Co., Philadelphia, Pa., has just issued a catalogue which contains a large number of half-tone cuts showing elevation and cross-sectional views of the steel-tired car wheels which it manufactures.

An Address.—The Chicago Railway & Equipment Co., Chicago, is mailing a convenient sized pamphlet containing a re-print of a paper read by E. B. Leigh, President of the company, before the American Malleable Castings Association at the Auditorium Annex, Chicago, in November, 1908.

"*Camping in the Rockies.*"—Under this title a guide to the most desirable hunting, fishing and outing places in Colorado, Utah and New Mexico, called "the playground of America" by ex-President Roosevelt, an attractive little booklet, is being distributed by the passenger department of the Denver & Rio Grande.

Highway Roads.—The Barrett Manufacturing Co., New York, has just issued an attractive catalogue which contains a large amount of information regarding the building and preservation of macadam roads and the prevention of dust. A number of full-page half-tone illustrations show sections of a large number of roads treated with Tarvia, a preparation made from coal tar.

Northern Pacific.—The passenger department of the Northern Pacific is distributing Homeseekers' Pamphlet No. 1. It shows a large map of the territory served by the Northern Pacific and contains a list of homeseekers' excursion fares from eastern gateway points to stations in North Dakota, Montana, Idaho, Washington, Oregon and British Columbia, to which these fares apply. These stations are arranged in alphabetical order.

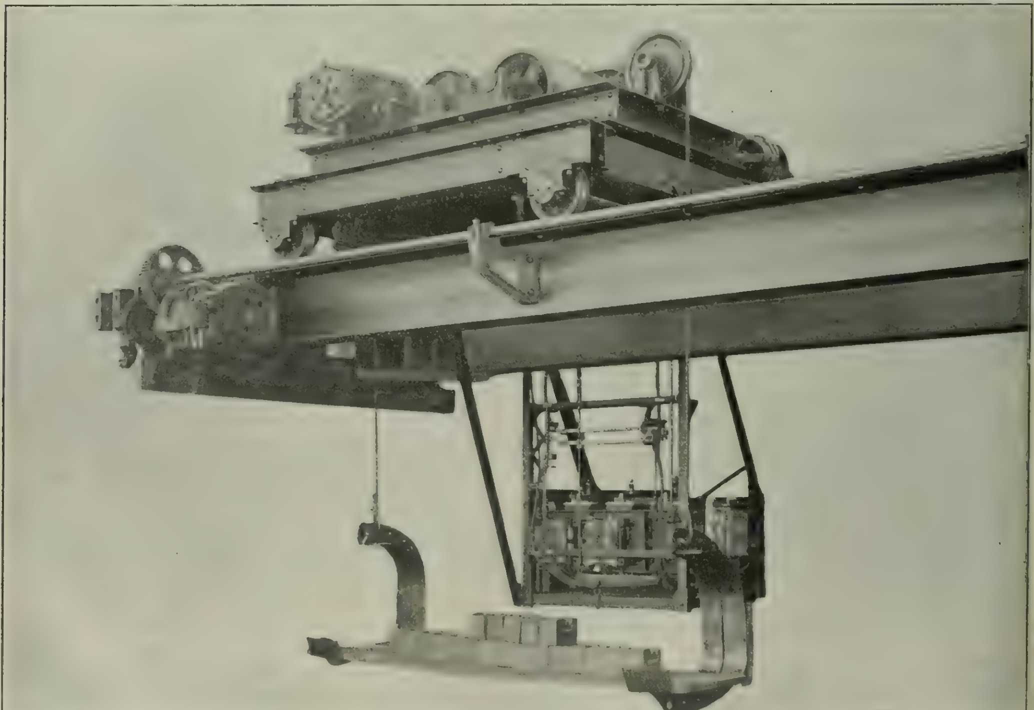
Denver & Rio Grande.—The passenger department is distributing an illustrated circular relating to the National Encampment of the Grand Army of the Republic, which will be held at Salt Lake City August 9 to 14. Attention is called to various points of interest along this line. The illustrations include reproductions of photographs of all the Commanders-in-Chief from 1866 until the present time.

Chicago & North Western.—A folder describing the plans for the Alaska-Yukon-Pacific Exposition and the grounds and buildings, giving the special railway rates made from the East to Seattle, and describing the many points of interest to which side trips may be made, is being circulated. The folder contains a large amount of valuable information for the prospective traveler.

Railway Jacks.—The Joyce-Cridland Co., Dayton, Ohio, is issuing an attractive series of bulletins describing various lines of jacks suitable for railway use. Bulletin No. 25, on the subject of screw and traversing jacks, is ready for distribution, as is Bulletin No. 32, describing various kinds of track jacks. The latter bulletin describes a new jack suited for track leveling, and contains interesting information regarding the operation of automatic jacks.

Three-Motor Electric Traveling Scale Crane.

A new type of scale crane is shown in the accompanying illustration. The novel feature of this crane consists in the application of the scales for weighing material, which are supported on the trolley truck frame and carry the hoisting mechanism mounted on an independent steel framework. The scale beams are in the cage suspended from the trolley, and readings are taken and recorded by the crane operator. There are three beams—two scale beams with self-recording poises, and one tare beam, enabling scale weights of several different items of material to be determined easily and accurately. A simple movement of a hand lever transfers, when desired, all load from the knife edges of



Whiting Three-Motor Electric Traveling Scale Crane.

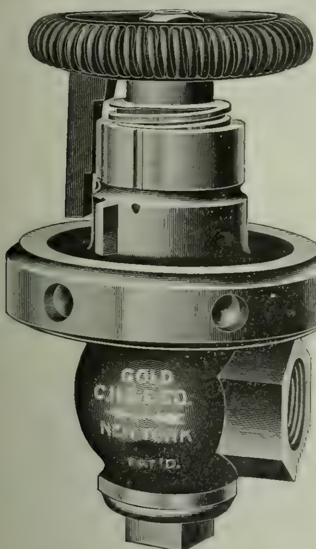
the scale to the trolley truck frame, operation then being the same as with an ordinary trolley.

The previous method of crane weighing involved hanging a scale device on the hook. This required a special man to read, enter and calculate weights and deduct the tare, a process much more laborious than with the new arrangement, which also eliminates the liability of personal error. The scale device on the hook also occupied considerable head room, often a consideration of importance.

An open-side platform is furnished for carrying long pieces, such as rods, bars, etc. The design of this platform is made to suit the material to be handled. A crane of this type is most useful in loading material, checking invoiced weights, and in loading for shipment, for inventory, etc. Application has been made for a patent covering the essential features of this design. The Whiting Foundry Equipment Co., Harvey, Ill., is the maker. Six of these cranes, of five tons capacity each, 37 ft. 10¾-in. span, worked by alternating current, have been built for the new warehouse of the Scully Steel & Iron Co., Chicago.

Gold Stop Valve Temperature Regulator.

It is necessary to provide some means for regulating the steam pressure in each car in order to satisfactorily heat a passenger train by steam from the locomotive. This may be accomplished with ordinary stop valves, but such are not highly practicable, since they require constant attention to prevent the radiating pipes from receiving full train-line pressure. The result is that the forward cars of the train use so much steam that unless an excessive train-line pressure is carried, the rear cars do not receive sufficient steam to keep them properly heated. To meet this condition the stop-valve temperature regulator here shown was designed. This regulator may be set to supply any pressure up to 20 lbs., which is sufficient to heat a car in the coldest weather. It may also be used as a stop valve, so that the steam may be shut off entirely. This regulator occupies the same position in the piping as does the ordinary inlet valve. The handle is supplied with an indicator in which a spring is inserted to hold the valve in any desired position. No steam gage is necessary, since a single turn of the wheel gives 20 lbs. pressure, a half-turn, 10 lbs., and any intermediate position a corresponding pressure.

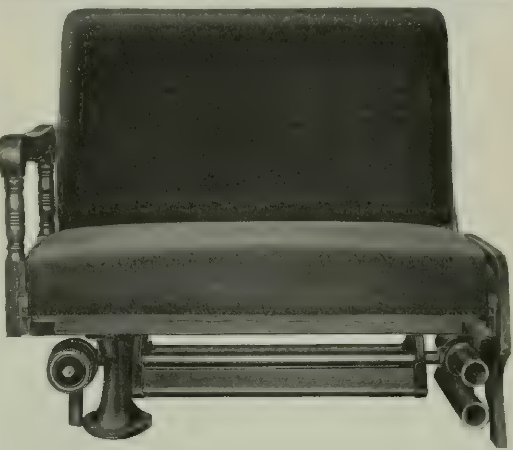


Gold Stop Valve Temperature Regulator.

With this device, the train-line pressure may be materially reduced. It is claimed that where the entire train is equipped with these regulators, the train-line pressure necessary to maintain sufficient steam has been reduced to 50 per cent. of that formerly carried. This results in a great saving of steam and steam hose, and relieves all parts of the heating equipment from excessive strain. The regulator is made in both straight-way and angle types; the latter, illustrated herewith, being used for passenger car coils, and the former for baggage and express cars. All parts of the two types are interchangeable.

In operation, steam from the train line enters in the direction of the arrow and passes through a strainer, which protects the valve seats from dirt or grit. As the wheel handles is turned from left to right, a spring, acting through a diaphragm, opens two valves and admits steam to the radiator. After the required pressure has been delivered, any increase will overcome the tension of a large coiled spring in the top of the regulator, and this permits a small spring at the bottom to lift two balanced valves to their seats, thus cutting off the admission of steam. As the pressure decreases in the radiator, it also decreases under the diaphragm in the central portion of the regulator, and the tension on the large spring again forces the two balanced valves downward, holding them in this position and admitting sufficient steam to compensate for the amount lost by radiation. When the required pressure is again delivered, the valves close automatically as before. If additional heat is required, the pressure must be increased. To do this, the wheel handle is turned farther to the right. If lower temperature is desired, it should be moved in the reverse direction. When the wheel handle is turned back to the stop, the valve is closed. An auxiliary valve permits a limited supply of steam when the occasion so demands.

Before applying these regulators all pipes should be blown out with steam to free them from dirt and scale. A strainer nipple is screwed into the cross, fitting in such a manner that it extends a short distance



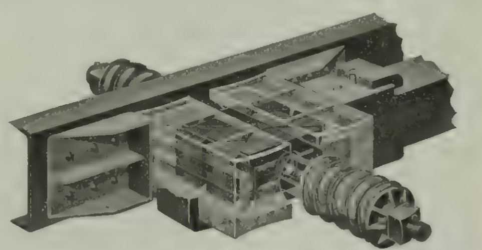
Location of Regulator and Piping in Passenger Coach.

into the train line. When the strainer is so placed, the steam, in passing through the train line, will keep it perfectly clean. This regulator can be applied to any car heating system.

This device is made by the Gold Car Heating & Lighting Co., New York.

Cardwell Friction Gear.

The Union Draft Gear Co., Chicago, was recently organized with the following officers: James R. Cardwell, President and General Manager; Charles A. Jennings, Vice-President; John D. Ristine, Secretary and Assistant Treasurer; C. H. Tobias, Treasurer and Assistant Secretary. The company, which has a paid up capital of $2,000,000, has bought the draft gear patents and business of the Cardwell Manufacturing Co., Chicago, and will continue the manufacture and sale



Cardwell Friction Gear.

of the friction draft gear which was started by this company in the latter part of 1904. The Cardwell friction gear was described in the *Railroad Gazette*, June 8, 1906. Although the Cardwell company pursued a careful and conservative policy in the production and sale of its gear, it has equipped many thousands of cars. The results in service have shown the value of the gear and its effect in saving in the cost of maintenance of car equipment.

The evolution of draft gear has shown that a gear for simply cushioning the blow when cars are bumped or jerked will not suffice, but that the gear must absorb the blow. Reports of drop tests recently made of Cardwell friction gear show that a blow of 1,660,500 lbs. is reduced to 115,312 lbs. in passing through it, and a blow of 1,037,812 lbs. is reduced to 15,375 lbs. It is the failure of draft gears thus to absorb buffing shocks that adds so greatly to repair bills. The Cardwell gear is designed to reduce by one-half the speed of the blow or impact in transmitting it to the car. This reduces the force of the blow to one-fourth. This fourth is resisted by springs on a floating spring rod, actuated by the operation of twelve transversely-acting friction faces which continue the work of absorp-

tion, so that the ultimate shock to the car frame is enormously reduced.

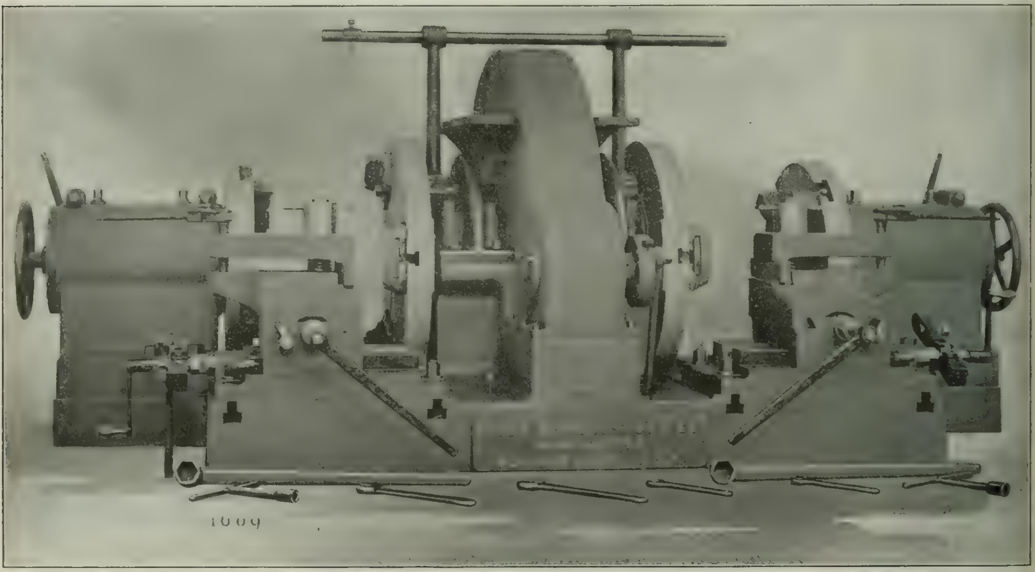
Another feature of merit claimed for this draft gear is ease of application. The springs are applied after the gear is put on, so that there is no trouble in placing the gear between the draft lugs. The springs are on the outside of the center sills and therefore easily accessible, so that in case of a broken spring all that has to be done to remove and replace it is to take off one nut. Also, the springs are in plain view of the inspector every time he looks over the car. Other claims are: that the gear is designed on highly practical engineering lines and is adaptable to any class of equipment; the parts are strong and simple, and the design such as to be automatically adjustable and no lost motion need occur in it. The description of the gear previously published showed a diagram of a compression test of the gear, made by R. W. Hunt & Co., Chicago. The release line dropped vertically to about 5,000 lbs., from which point horizontal movement of the coupler began.

The Union Draft Gear Co. starts in business with a large number of contracts, with considerable orders on hand, and with unfinished business amounting to equipment for more than 9,000 gears. Its principal business will be the manufacture of the Cardwell friction draft gear, but it will also sell spring draft gears where they are desired.

Pond Lathe for Steel-Tired Car Wheels.

The accompanying illustration shows a recent design of lathe for turning steel-tired car wheels. Actual results show this machine capable of turning from 12 to 14 pairs of 42-in. wheels a day. This is not an average obtained from tests, seeking to establish the output of the machine under special conditions, but rather that showing results of everyday working conditions. Test results are vitally interesting only as such, while everyday results show what may be expected in actual output.

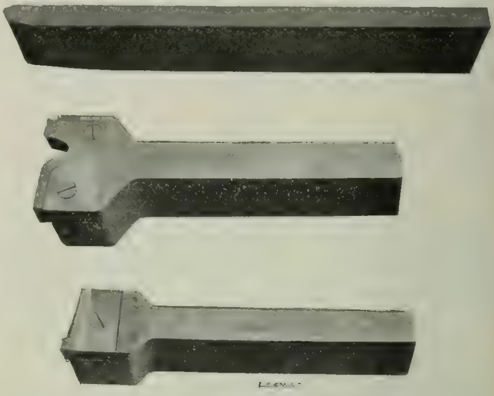
This lathe permits of rapid and easy placing and removing of a pair of wheels. Rails are placed so that the wheels may be run into the machine from the rear and at the exact height of the tail-stock centers, the face plates being cut away to accommodate the axle. The latest form of "sure grip" diving pieces are used, which have independent adjustment by convenient set screws. The floor in front of the lathe is often depressed to form a pit for the operator.



Pond Lathe for Steel-Tired Car Wheels.

A feature of this machine, and one which greatly assists in increasing output, is the single-screw tool clamp used. With this clamp it is necessary to tighten and release but one screw, which permits of great saving in time over those tool clamps having a loose plate held in position by four bolts. The illustration shows this tool clamp to have an adjusting nut near the end which binds the tool. This is set by hand, and the lever is tightened by lifting the opposite end. The washer under the adjusting nut becomes the fulcrum, and the tightening screw is moved through the ratchet handle shown. The coil spring frees the tool for removal.

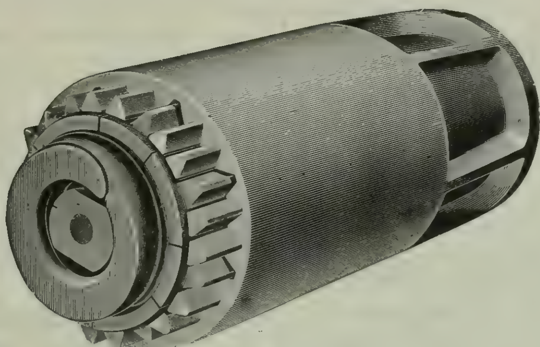
The number of tools required for tire turning is also reduced by the use of the three designs shown. The roughing tool is first used at about ¼-in. to ¾-in. feed across the tread at a speed of about 15 ft. to 20 ft. per minute. This same tool is used in roughing both sides of the flange in one setting. The combination flange and tread tool is



Set of Tools for Pond Car Wheel Lathe.

then used, and about three revolutions should finish the flange and part of the tread. The chamfering and beveling tool should finish the outside of the tread in from two to three revolutions. The clamp bolts which hold the tires against the drivers may be loosened during the last revolution of the lathe. Each lathe should be provided with a full set of tools to provide for dressing and grinding. This set includes six or eight roughing tools, both right and left handed, made of 3-in. x 1¼-in. air hardening steel; one of each design of tool stock and at least two of each design of scraper. The two finishing tools have wrought iron tool stocks and air hardening steel blades or scrapers for the cutting edges. The combination flange and tread tool cutting edge is made to the contour of the M. C. B. standard gage, usually with a milling cutter.

These lathes are made by the Niles-Bément-Pond Co., New York, at its Pond Works, in Plainfield, N. J.



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CONTENTS

The New York State Public Service Commission, Second district, has held a hearing on a complaint of shippers at Troy who since January 1 have been denied the help which was formerly given by the railways in loading carload freight. Rates on carload freight are based on the assumption that the railway shall not be obliged either to load or to unload the goods, but at Troy the freight agents had been so free with their assistance that now the shippers are claiming that their expenses are materially increased—in some cases as much as two or three dollars a car. This question has been settled rationally by the Interstate Commerce Commission and it would seem that the Albany hearing was a waste of the shippers' and railway officers' time. The federal decision that such aid, if granted, must be regulated by proper rules, printed in the tariffs, is the only proper principle for adoption in New York state, or any state. Like demurrage, this "concession" is difficult to regulate satisfactorily. Irregularities in connection with it are pretty sure either to be too small to call for formal notice, or else become rate cutting devices. The Troy shippers' demand is exactly parallel to a demand for a reduction in freight rates. There have been many cases where the railways began the helping process as a means of cutting the rate (below that of some competitor) and such can have no ground for surprise if the public ask to have the cut made permanent. If the matter could be kept free from the rate cutting feature it might well be that economy would in some cases be got by railway employees and shippers' employees working together in loading a car. A freight house man by giving an hour's time can often save the shipper a half day's time. A shipper, on the other hand, can often do the railway a similar favor in handling less than carload freight. Perhaps the only practicable course for the state is to make practice uniform—without much regard to these conveniences. For sinners and saints rules need to be straight and rigid. When we all become saints rules may have gentle curves to the end of convenience and economy.

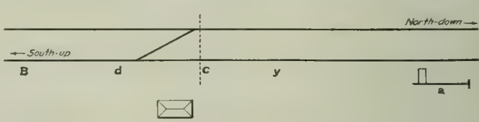
Outside of the individual investors in railway securities there are three big groups: (1) The savings banks, (2) the large trust corporations and (3) the great body of individual trustees. Of these, generally speaking, the savings banks and individual trustees are held down pretty closely by investment statutes while the trust companies—in which may be included insurance corporations—have pretty large latitude. In between, however, there is a corporate group of investors which, better than the others, supplies a real test of the quality of railway investment. It is represented by such institutions as Yale and Harvard universities where usually freedom of investment is allowed the treasurers subject to the judgment of investment committees. Their investment policy may be described under the three words freedom, conservatism, discretion. Harvard's financial report just published shows that she has vested funds of $20,269,992, of which $5,261,512 are in railway bonds and $1,612,909 in railway stocks. Yale's last annual report shows that out of $8,513,193 investments—excluding cash—she has $2,658,723 in railway bonds and about $600,000 in railway stocks. Practically all the railway investments of both universities are of a conservative kind. Expressed in ratios about 34 per cent. of Harvard's funds are in railway securities and somewhat more than 38 per cent. of Yale funds are invested in the same line—or, taking two universities together out of total funds of $28,783,185 there are $10,135,144, or more than 35 per cent. invested in railway securities. A qualifying fact is that such institutions as Yale and Harvard often have shady railway securities willed to them but, as they are usually sold quickly, the fact is not an important one. The figures are impressive and interesting. The two universities with their great funds are large types of other eastern institutions of the same kind in a highly capitalized region of the country; they indicate a most striking likeness of railway investment policy, not only in character but in degree; and they certify to a bed-rock confidence in conservative railway investment which must give the well-managed railway corporations good cheer.

The doctrine, originally enunciated, we believe, by Judge Landis in the Standard Oil case, that any departure from a legal rate, or any use by a railway or a shipper of a rate that has not been published, filed and posted, is a crime regardless of the intent and effect of the act, is being fast knocked to pieces by the higher federal courts. It was repudiated by the United States Circuit Court of Appeals for the Seventh circuit in reversing Judge Landis in the Standard Oil case. It has now been repudiated by the United States Circuit Court of Appeals for the Ninth circuit in reversing Judge Wellborn in the case in which the lower court fined the Atchison, Topeka & Santa Fe $330,000 for the alleged giving of rebates to a shipper of lime. The Circuit Court of Appeals held explicitly in the Santa Fe case that to constitute a crime there must be not only a departure from the published tariff, but that the departure, in the language of the Elkins law, must be "wilful." That is, before a criminal act is committed the published rate must be departed from knowingly, deliberately and intentionally, and not merely inadvertently or mistakenly, or, perhaps as in the Santa Fe case,

for the purpose of making good a loss that a road has caused to a shipper. It has been asserted that the decisions of the higher courts in the Standard Oil and the Santa Fe cases have "weakened" the law against rebate. As a matter of fact, they have merely established that a wrongful intent is an essential element of rebating just as it is of every other crime and have made the law less dangerous for innocent persons, although probably no less dangerous for the guilty. The doctrine enunciated by Judges Landis and Wellborn was strange to Anglo-Saxon jurisprudence. The fact that when the original decisions in these cases were rendered they were received with enthusiastic public and official approval, while their reversals have been received with hardly any manifestations of public disapproval and with no fulminations of official displeasure at Washington, indicate that both official and public sentiment regarding railway matters are growing more intelligent and fairer.

The statistics which we published recently (*Railroad Age Gazette*, April 23, page 915) showing the effect of 2-cent fare legislation on the Rock Island lines throw interesting light on the psychology of travel. The advocates of such legislation confidently predicted that it would cause so great an increase in passenger traffic that the railways would make more money on a 2-cent fare than they had made on a 3-cent fare. But the statistics alluded to demonstrate that the reduction in fares caused no increase in travel at all. There was a substantial increase in number of passengers carried one mile; but that this was not due to fare legislation seems to be proved by the fact that the average percentage of increase in the number of passengers carried one mile was as great in the states where a 3-cent, and even a 4-cent, fare was maintained as in states where the fare was reduced to 2 cents. The only effect of the 2-cent-fare laws was to cause a reduction in railway passenger earnings at a time when it was especially hard for the roads to bear it. Many academic writers state that a reduction in railway rates will cause an increase in traffic, as if this were one of the immutable and invariable laws of railway economics. Why, then, did the cause fail to produce its usual effect in this case? The answer is, that whether a reduction in rates will cause an increase in traffic depends on the conditions under which it is made and the kind of traffic to which it is applied. A reduction in the freight rate on a bulky, cheap commodity, such as stone or coal, is pretty sure to cause an increase in traffic, because the rate enters largely into the price of the commodity at the market. But no conceivable reduction in the rate on a valuable commodity such as hats would cause an increase of an ounce in the traffic. Now, passengers for the most part are high-class traffic; and they are like high-class commodities in that no practicable reduction in the flat rate on them is apt to cause an increase in the number of them transported. If in the ordinary course of affairs a man wants to move with his family 500 or a thousand miles, or to take a business trip, he will pay 3 cents as readily as he will pay 2 cents; and on the other hand a flat 2-cent rate will no more cause him to make a trip in the ordinary course of affairs that he would not otherwise take than will a 3-cent rate. But suppose the usual rate is 3 cents and the railways make for a short period, or for some particular occasion, a 2-cent rate. Then, many people will go on trips to take advantage of the reduced rate, which if the usual rate were 2 cents, they would never go on at all. Similarly, the development of some new facility of transportation, such as electric interurban railways, may create a large amount of new passenger traffic, not so much because of the relatively low rates charged by them as because of the frequent and convenient service afforded. By making special reduced rates the roads may increase the total traffic; and this—because of the relatively large numbers handled per car and per train on such rates—not only without a decrease, but with an increase in their net revenue from passenger business. But a reduction in the ordinary flat rate neither increases the total business nor in any case causes the increase in the number of passengers per car or per train that is necessary to enable a road to haul passengers on a reduced rate at a profit.

The risk that is incurred when a crossover is incompletely signaled because it is not often used is illustrated in a disastrous collision of freight trains that occurred on the Midland Railway of England a few weeks ago. Incidentally American signal engineers will be reminded of the value of track circuit locking. This simple precaution would have prevented the collision in this case, but the government inspector makes no mention of it. Indeed, his suggestion that a dwarf signal ought to have been in use is made in the mildest possible form, though that also would undoubtedly have prevented the disaster. The collision occurred at Sharnbrook February 4, about 4 a.m. A northbound freight was standing on the southbound track at B (see diagram) waiting to follow a superior train. The superior train having passed, the signalman set the switches, as he supposed, for the crossover, and gave a



hand-lamp signal for the train at B to start; and the train started. In fact, the crossover switches had not been set and the train continued along track *y*. As soon as the rear car of the train had passed the point *c*, the signalman, setting normal the lever which he had reversed, cleared signal *a* for the southbound train. The engineman of the northbound soon discovered that he was on the southbound track; but not until he saw signal M cleared did he take active measures to set back, for he assumed that he was being sent forward for some local purpose. He had got back to or south of his original position when the collision occurred, killing the engineman and fireman of the southbound train, which was running at 55 miles an hour. It appears that the signalman, instead of pulling lever 8 for the crossover, must have pulled lever 7, which was for another switch and which was free to move. There was no fixed signal at *d*, hence the giving of the signal by hand. The signal cabin, though exactly opposite the crossover, is 46 ft. from track *y*, there being two freight tracks between it and the passenger tracks. This man had been a signalman 34 years and at this cabin 21 years.

RAIL SECTIONS AND SPECIFICATIONS.

In the *Railroad Gazette* of September 6, 1907, we gave in parallel columns the rail specifications of the American Society of Civil Engineers, the American Railway Engineering & Maintenance of Way Association, and the American Society for Testing Materials; and in the issue of December 20, 1907, the rail specifications proposed by the American Railway Association. In both of the above issues we commented fully on the difference in the requirements of these specifications.

In April, 1908, the American Railway Association adopted new specifications for both Bessemer and open-hearth steel rails, and referred these specifications, with their rail sections, to the American Railway Engineering & Maintenance of Way Association by the following resolution:

"Your committee respectfully recommends that the series of sections of types 'A' and 'B' and the specifications for Bessemer and open-hearth steel rails, submitted with this report, be adopted as the recommended practice of the association, and that the sections and specifications be referred to the American Railway Engineering and Maintenance of Way Association, with the request that they follow up the question of determining the details as to drop test, etc., by observing the actual results of rails rolled under the new sections, and that they also ar-

range to collect from the different members and tabulate all information as to comparative wear of rails rolled from the different parts of the ingot, and all other information necessary to a proper study of the problem. That they be further requested to keep careful record of the comparative results in service of rails of types 'A' and 'B,' and to prepare and submit to this association a single type of section which will embody their ideas as to the best type that can be designed for use as a single standard to be adopted by this association, giving due weight to every factor entering into the problem.

"Respectfully submitted,

"The Committee on Standard Rail and Wheel Sections."

On January 1, 1909, the Steel Manufacturers of America issued standard specifications for Bessemer and open-hearth rails.

A great deal of work has been done during the past year by the committees of the American Railway Association, the American Railway Engineering & Maintenance of Way Association and by the Manufacturers, who have co-operated with these committees in every way. As a result of this the new specifications of the American Railway Association and of the Manufacturers may be considered the latest thought in specifications and practice in the manufacture of steel rails. The general requirements of these two specifications agree very closely and will be of great assistance to committees of other engineering societies in settling the points of difference in their specifications.

In order to put this matter clearly before those interested in the subject, we give on another page, in parallel columns, all of the five specifications referred to for Bessemer and open hearth steel rails brought up to date.

For convenience of comparison, the sequence of the paragraphs has been slightly modified to adapt them to the specifications adopted by the American Railway Association. The requirements of these specifications are given under 13 headings, more than half of which are practically the same in all specifications. The material differences in the other requirements have been printed in italics (except in the tables of chemical content, all of which differ), and are as follows:

Process of Manufacture.—Omitted in Manufacturers specification; practically the same in other four, except per cent. of discard to remove piping; is now in general practice, merely a matter of price when greater than the customary discard is required; is still being investigated.

The committee on Standard Rail & Wheel Sections of the American Railway Association, in its report of March 23, 1908, to the association, stated:

"In pursuing its investigation of this discard question, the committee received a suggestion from William Metcalf to the effect that it would be reasonably practicable to apply the above theory to the manufacture of rails by arranging to test to destruction a number of rail butts representing a certain proportion of the total output, and to base rejections on the results of these tests.

"In order to determine the practicability of this suggestion, the committee arranged for a trial lot of rails to be rolled from the ingot without any discard whatever except such as was necessary to enable the bloom to enter the rolls, and after these rails had been cut into small pieces, they were broken under the hammer and the fracture examined. This test proved to the satisfaction of the committee that if 'pipes' or other physical defects were present they could be detected by this means. The test also proved quite conclusively that it is possible to so conduct the process of manufacture that the 'pipes' or other physical defects will be reduced to a minimum, and that these defects may not occur at all, even in rails rolled from the top portion of the ingot.

"In order to avoid an unnecessary waste of good material, the committee set about to devise means by which the rejection of defective material could be insured without requiring an arbitrary and definite percentage of discard in every case, and a committee of the Pennsylvania Railroad, pursuing the same line of investigation, adopted a tentative specification which provided for a physical test of this nature, and which further provided that when physical defects were discovered, all top rails of the heat should be rejected. This would result in a discard of about 25 or 30 per cent. of the entire metal in the heat whenever physical defects were discovered, and it was felt that a requirement of this nature would not only provide for the rejection of defective material, but would insure the greatest care on the part of the manufacturer.

"A trial lot of rails, of a section corresponding to type 'B' submitted with the committee's report of last October, was recently rolled under this specification as to discard, and the results convinced the committee that a development of this idea would prove the best solution of the discard problem."

Chemical Composition.—

Chemical Requirements for 100-lb. Rail.

	C.	Mn.	Si.	P.	S.
American Ry. Assn......	.46 to .56	.90 to 1.20	.10 to 20	.10	.075
Manufacturers'	.45 " .55	.84 " 1.14	.20 max.	.10	...
A. S. C. E..............	.55 " .65	.80 " 1.05	.20 "	.085	.075
A. R. E. & M. W. Assn...	.55 " .65	.80 " 1.05	.20 "	.085	.075
A. S. T. M..............	.45 " .55	.80 " 1.10	.20 "	.10	...

The committee on Standard Rail & Wheel Sections of the American Railway Association, in its report of March 23, 1908, to the association, stated:

"In the matter of chemistry specifications for Bessemer steel rail, statistics were obtained from the officers of the Ore Producers' Association which convinced the committee that it would be impossible for the mills to furnish more than a small percentage of the total rail requirements of the railways with a phosphorus specification less than .10.

"The optional specification for .085 phosphorus prepared by the joint committee of manufacturers and railway men is now in the hands of all members, and is therefore available for use by those who are able to obtain low phosphorus Bessemer rails. It is not considered proper, however, to require less than .10 phosphorus in a specification intended for general use. Members desiring to obtain low phosphorus rails will have the further option of using open-hearth steel.

"The committee conferred with a number of disinterested experts on both the discard and phosphorus questions, and among the principal authorities consulted were William Metcalf, of Pittsburgh; Robert Forsyth, of Chicago, and Henry M. Howe, of Columbia University. These gentlemen all agreed that it would be preferable to test the finished product rather than specify a fixed percentage of discard, and they also agreed that it would be unreasonable to require less than .10 phosphorus in a specification for Bessemer rails intended to cover purchases for all American railways."

Shrinkage.—

For 100-lb. Rail in 33 Ft.

Am. Ry. Assn.	Mfrs.	A. S. C. E.	A. R. E. & M. W. A.	A. S. T. M.
6½ in.	6¾ in.	6 7/16 in.	6 7/16 in.	7 5/16 in.

The Manufacturers have made concessions on this point and their allowance of 6¾ in. is now practically within the permissible variation of ¼ in. in length, and it would seem as though 6⅝ in. should be satisfactory to all.

Drop Test.—The American Railway Association and the Manufacturers' specifications call for 18 ft. drop on 100-lb. rail. The American Society of Civil Engineers and the American Railway Engineering & Maintenance of Way Association call for 22 ft. on 100-lb. rail, and the American Society for Testing Materials for 19 ft.

The drop testing machine has been standardized, and it is claimed that the lower drop of 18 ft., called for under the new conditions, is equivalent to the higher drop of 22 ft. previously specified.

All the specifications, except the Manufacturers, provide for the test piece to be taken from the top of the ingot. The Manufacturers provide for the test piece to be selected from each blow of steel, which would permit the inspector to take it from the top of the ingot if he desired. All specifications provide for a drop test to be made from each heat of steel.

Section.—The American Railway Association specifies its own sections; Manufacturers specify A. S. C. E. sections; others say A. S. C. E. sections, unless otherwise specified.

Straightening.—Limits of variation out of line in 33-ft. rail before cold straightening:

The American Railway Association and the American Railway Engineering & Maintenance of Way Association specify 3 in., the others 5 in. Still being investigated.

The American Railway Association specifies that rails while on the hot beds shall be protected from coming in contact with water or snow. This provision will no doubt become universal, as its importance is self-apparent.

Branding.—The American Railway Association and the Manufacturers' specifications provide that the rails shall be marked consecutively "A," "B," "C," etc., to indicate position in the ingot, "A" being the top of the ingot.

Others do not have this requirement, but will no doubt adopt it, as it has come into general practice.

The American Railway Association provides that with a

discard of 20 per cent. or more, the letter "A," representing the top of the ingot, will be omitted.

No. 2 Rails.—The American Railway Association specifies the limit of depth of flaws ⅛ in. deep in head and ¼ in. in flange. The Manufacturers and the American Society of Civil Engineers specify ¼ in. deep in head and ½ in. in flange. The American Railway Engineering & Maintenance of Way Association and the American Society for Testing Materials specify that only such defects will be accepted which do not impair the strength of the rail. This would no doubt justly condemn many rails which would pass the other specifications.

The American Railway Association, the Manufacturers and the American Society of Civil Engineers specify that two center punch marks shall be put on each No. 2 rail.

The American Railway Association, the American Society of Civil Engineers, the American Railway Engineering & Maintenance of Way Association and the American Society for Testing Materials will not accept rails as No. 2 from heats which failed under drop test. Manufacturers have no such provision.

Inspection.—The American Railway Association and the Manufacturers provide that the drillings for analysis shall be taken ¼ in. beneath the surface. Would it not be desirable to have this requirement appear in all specifications?

OPEN-HEARTH STEEL RAILS.

Chemical Composition.—

Chemical Requirements for 100-lb. Rails.

	C.	Mn.	Si.	P.	S.
American Ry. Assn......	.70 to .80	.75 to 1.00	.10 to .20	.04	.06
Manufacturers'	.62 " .75	.60 " .90	.20 max.	.04	..
A. S. C. E..............	.65 " .75	.80 " 1.05	.20 max.	.05	.06
A. R. E. & M. W. Assn...	.75 " .85	.90 max.	.075 to .20	.03	.06
A. S. T. M...............	Considering open-hearth specification.				

Branding.—The American Railway Association and the Manufacturers' specifications provide that each rail shall be marked consecutively "A," "B," "C," etc., to indicate position in the ingot, "A" being the top of the ingot.

The other specifications have not this requirement, but will no doubt adopt it, as it has come into general practice.

The American Railway Association provides that with a discard of 20 per cent. or more, the letter "A," representing the top of the ingot, will be omitted.

The American Railway Association and the Manufacturers specify that each rail shall be marked O. H. to designate quality; this will no doubt be generally adopted.

Inspection.—The American Railway Association and the Manufacturers' specifications provide that the drillings for analysis shall be taken ¼ in. beneath the surface of the test ingot.

Would it not be desirable to have this requirement appear in all specifications?

The American Railway Association and the Manufacturers' specifications provide that the inspector shall be furnished with complete chemical determinations for each heat of steel. This requirement will no doubt become universally adopted.

The adoption and general use by the railways of the United States and Canada of the standard forms for reporting behavior and failures in service of rails from different parts of the ingot will result eventually in much valuable information and assist in reaching uniform specifications; but many of the differences referred to above can be harmonized at once, as they do not depend on information other than that already before us.

More attention is now being paid to the condition of the rolling stock and roadbed and their bearing on the life of the rail, and it is frankly admitted by all concerned that the question of service and life of a rail, or what constitutes a good rail, is not one-sided by any means.

Dr. P. H. Dudley, in the discussion of the report of the committee on Standard Rail & Wheel Sections, American Railway Association, stated that his new specification requires that the metal shall be recarburized in the converter in preference to the ladle and held there two and one-half minutes before being poured into the ladle. The nozzle for teeming the ingots to be 1½ in. instead of 2 in. and 2½ in., and in some instances 3 in. The ingots for 100-lb. rails to be only for three lengths instead of four lengths, as formerly. He claims by using this method that the percentage of second quality rails has been reduced from 10 per cent. and 15 per cent. down to 3 per cent. for a single week, the ingots bloom well without cracking, few checks are found in the base or head of the rails, and the metal is excedingly tough.

The Ordnance Department, United States Army, called in a committee of engineers and manufacturers to co-operate in an exhaustive investigation on the physical structure of ingots, blooms, rails from different passes, finished rails, etc. This work is being conducted at the Watertown Arsenal, and a preliminary report of the results obtained was made at the last annual convention of the American Society for Testing Materials. A further report will be presented at the approaching convention of this society, to be held at Atlantic City, June 29 to July 3, bringing the work up to date.

In this investigation, ingots have been selected from both Bessemer and open-hearth steel heats, and were given different heat treatments before rolling. Blooms from these ingots, with different amounts of work on them, were secured. In addition to this, lengths of unfinished rails from the different passes in rolling, and the finished rails, were obtained from ingots with the different heat treatment.

The ingots were cut into slices, lengthwise as well as crosswise; the same method was followed with the other sections and finished rails. The effect of rolling, on the internal structure, is being most carefully studied, starting with the well-known defects due to blow holes, piping, etc., in the ingot, and following the work of the blooming mill, roughing rolls and finishing rolls, in order to see if these defects are closed up or increased, also if internal defects are produced on portions of the ingot which were sound.

The results up to the present show that it is imperative to have additional heats of steel manufactured and rolled under such conditions as will tend to increase the internal defects already found, and also under such other conditions as will tend to eliminate these defects.

Particular attention will be given to the effect of work on ingots of different cross sections, as it is claimed that better results can be obtained from ingots of smaller cross sections than from those of larger cross sections in general use.

The manufacturers are equally interested in this work with the engineers, and will no doubt be willing to modify their methods in any way which may be proven to be necessary to produce better rails.

Under the direction of the American Railway Engineering & Maintenance of Way Association, the Watertown Arsenal is also making an exhaustive series of tests on completed rail joints. The results will no doubt be given out within the next year.

NEW PUBLICATIONS.

Accounts—Their Construction and Interpretation. By William Morse Cole, A.M., Assistant Professor of Accounting in Harvard University. 345 pages, 6 in. by 8¾ in.; cloth. Published by Houghton, Mifflin & Co., Cambridge, Mass.

Mr. Cole has prepared a thorough and philosophic treatise on the theory, construction and interpretation of accounts. He keeps well away from the idea, only too prevalent among accountants, that their profession is an abstruse one, and must be surrounded by mystery and high theory, and makes his discussion simple and practical. He also understands clearly that accounts are a means and not an end; a distinction that is often lost sight of in the profession.

The book is divided into two main parts, the first dealing with the principles of bookkeeping and the second with the principles of accounting. The first part has chapters on debit and credit, on the fundamental books, the significance of par-

ticular accounts, the trial balance, the statement and the balance sheet and all labor-saving devices. The second part of the book, covering the principles of accounting, occupies a considerably greater proportion of the total, and has chapters on the distinction between capital and revenue, the general principles of depreciation, cost accounting, capitalization, railway accounting, bank accounting, trust accounting, factory accounting, etc. The work has been well and thoroughly done, and is supplemented with a number of appendices and with a good index. We are inclined to think that certain parts of the discussion run a little too much to the abstruse, as, for example, in the compilation of bond yields, in the appendix on page 331. The yield of a bond selling above or below par, as complicated by amortization and reinvestment, has always been one of the pet problems of the accountant and the mathematician, and it can be made one of the most complicated and least satisfactory mathematical studies in the world. As a matter of fact, the practical banker or investor does not make his calculations that way. If a 4 per cent. bond maturing in six years is selling at 94, he calculates that the income yield from it is approximately 4¼ per cent., and that the additional yield accruing from the retirement of the bond at par is equal to about 1 per cent. a year besides. In quoting the yield of a bond at a given price, he takes a figure off his table already prepared; if he had to prepare it himself the chances are probably ten to one that he would get it wrong, according to the strict conventions of the art. This is the kind of computation that inebriates, but cheers not!

On the whole, however, Mr. Cole views his accounting very much from the outside and not from the inside, and his book is distinctly a useful one.

Annual Statistical Report of the American Iron and Steel Association, containing complete statistics of iron and steel industries of the United States for 1908 and immediately preceding years; also statistics of the coal, coke and shipbuilding industries of the United States, immigration, etc.; also statistics of the iron and steel industry of foreign countries. 92 pages, 6 in. by 9 in.; paper. Price $5. Published by the American Iron and Steel Association, 261 South Fourth street, Philadelphia.

The annual statistical report of the Iron & Steel Association is published in the usual form. It contains full statistics of the iron and steel trades and other collateral statistics as well, and has been prepared with scrupulous care and fidelity. It is one of the necessary statistical documents of the country.

Letters to the Editor.

MODERATE SUPERHEAT FOR LOCOMOTIVES.

Chicago, May 5, 1909.

To the Editor of the Railroad Age Gazette:

An article by Lawford H. Fry, in the March 5th issue of your journal, p. 459, has been adversely criticised by H. H. Vaughan in the issue of April 9th, p. 789.

While I am a firm believer in and an advocate of a moderate degree of superheat for locomotives in ordinary practice and would, therefore, defend Mr. Fry's side of the argument, yet I must first attack his article because of the inaccuracies contained therein.

To the reader who is not very familiar with the laws and principles of thermodynamics, the inaccuracies might be overlooked unless he began an investigation to check out the figures in the tables on p. 461.

The comparative expansion diagrams on p. 460 are wrong in general construction and also in the detail work of construction. Mr. Fry has two curves of the same family of the hyperbolic form; $p\,v^n =$ const., with different exponents starting from the same point and passing through another common point. Such a construction is impossible. A casual glance shows that the upper curve is drawn as a straight line from about 62 per cent. of the stroke to the back pressure line at the end of the stroke; the lower curve is drawn as a straight line from 67 per cent. of stroke to back pressure line at the end of the stroke. These curves may be well flattened out towards the end of the stroke, but should not be drawn to the back pressure line at end of stroke. Such construction involves complete expansion to back pressure, which is impractical.

The terminal pressures for these curves may be found as follows: The clearance being assumed as 8 per cent. of the stroke, the cut off as 25 per cent., the initial pressure as 155 pounds absolute, and the exponents taken as 1.3 and 1.1 for high and moderate degrees of superheat respectively, then the terminal pressures will be deduced. For upper curve, high superheat

$$p_1\,v_1^{\,1.3} = p_2\,v_2^{\,1.3}$$
$$p_1 = 155;\; v_1 = 8 + 25 = 33$$
$$v_2 = 8 + 100 = 108$$
$$p_2 = p_1\left(\frac{v_1}{v_2}\right)^{1.3};\; \left(\frac{v_1}{v_2}\right)^{1.3} = \left(\frac{33}{108}\right)^{1.3} = 0.305^{1.3}$$
$$= 0.214$$
$$p_2 = 155 \times 0.214$$
$$= 33.2 \text{ pounds.}$$

For lower curve, moderate superheat

$$p_1\,v_1^{\,1.1} = p_2\,v_2^{\,1.1}$$
$$p_1 = 155;\; v_1 = 8 + 25 = 33$$
$$v_2 = 8 + 100 = 108$$
$$p_2 = p_1\left(\frac{v_1}{v_2}\right)^{1.1} \quad \left(\frac{v_1}{v_2}\right)^{1.1} = 0.305^{1.1}$$
$$= 0.271$$
$$p_2 = 155 \times 0.271$$
$$= 42.0 \text{ pounds.}$$

The terminal pressures are 33.2 and 42.0 pounds respectively.

Extensive investigation to determine the exponent in the equation of the compression line reveals that this line was not constructed according to the laws governing the change of pressure and volume of steam when compressed. Since the portion under the compression curve is foreign to both cards alike, the error of construction may be neglected. The error is material, however, in the constructinon of the expansion curves.

Since the curves are wrong the computation is necessarily wrong and the conclusions made therefrom must be wrong.

Fortunately, however, an error in calculation does not involve that there will be an error in the results of the superheated steam in its action.

A consideration of the actual operation of steam in a cylinder does not involve two expansion curves. When heat is added to water the temperature and pressure increase. If some provision is made so that the pressure can not increase the added heat changes the water to steam. While the steam is in contact with the water no additional heat will be taken up by the steam, if, however, the steam is removed from the water chamber it will take up more and more heat. Steam in the latter state is called superheated steam.

When superheated steam comes in contact with colder metallic conductors it yields heat to the metal. The heat of superheat is first yielded, then the latent heat of the steam which involves the condensation of the steam. The same laws for giving up heat apply to steam when expanding and doing work. The work is done at the expense of the heat in the steam.

One great reason for lack of economy in a steam engine is due to cylinder condensation, or the transference of the heat of the steam to heat in the cylinder. As soon as moisture forms on the cylinder walls they become more susceptible to cylinder condensation.

The great gain due to superheat is from the fact that the heat of superheated steam is given to the cylinder walls with no resultant condensation of steam. Practice has shown that

the first few degrees of superheat are always the most beneficial, due to the fact that the condensation does not accumulate.

High superheat will prevent cylinder condensation and if high enough will prevent the natural condensation of steam due to the adiabatic expansion of steam. When such a condition is maintained the efficiency is lessened, due to a rejection of more heat in the exhaust steam than if there had been no superheat after cut-off.

If then there is to be an application of superheated steam to practical conditions, the aim must be not to get superheat after cut-off but to get it previous to cut-off; in which event the expansion curves will be identical, but the actual steam consumption will vary.

The relative advantages of superheaters will depend upon the type, design and method of operation. One type of superheater with moderate superheat may prove unsuited to practical conditions of operation when another type may prove very satisfactory. The trend of progress to-day is toward the efficient superheater with moderate superheat.

H. B. MAC FARLAND, M.M.E.

THE ECONOMICS OF GRADE REVISION.

New York, May 10, 1909.

To the Editor of the Railroad Age Gazette:

After discussing the economics of operation with a prominent superintendent of motive power, who has given both sides of the question close study, I submitted a profile of an existing line, without data showing the locality, and with it, in the form of a hypothetical question, sufficient information to enable him to answer from his viewpoint as to the best method of treating the line in order to obtain the maximum operating results.

The summary of his answer, conforming fully to my own views, was, "increase the unit capacity of your power."

There is, of course, a limit to the length and also to the weight, which can be handled with facility in one train. Up to that limit any train provided with the necessary power to haul it up grade and control it down grade may be handled over most of the existing grades with safety and promptness. Furthermore, it is entirely practicable for the motive power designer to produce engines that will accomplish this result.

A troublesome feature of the power in general use is that standard types of engines are furnished for indiscriminate use on all parts of a system.

The system may comprise all kinds of line from long stretches, even whole engine divisions, of practically level straight line, to heavy mountain grades with excessive curvature, yet we attempt to cover all these conditions with the same type of power. In the operation of the road this simply results in "breaking up" the freight trains at the end of almost every engine division in order to rearrange them for the changed physical conditions of the next engine division.

In considering schemes of revision it may be thought rather hard to determine when to stop power revision and begin grade revision, but in either case the point must be kept in mind that there is a limit to the weight and length of trains, beyond which they cannot be operated with facility. In other words, even though it were possible to revise an engine division to a straight level line, there is an operating limit to the size of train to be handled over it, and up to this limit trains may be handled over most of the grades on the existing lines.

If this position is tenable, then nothing is gained by grade revision that cannot be obtained from properly designed power, and the question as between power revision and grade revision is the old one of relative cost—now grade revision represents a fixed cost in the form of capital charges, maintenance charges and a part of the cost of operating that portion of the old line which cannot be abandoned, all of which, except the cost of wear of rails and ties are the same, regardless of tonnage handled. The cost of power, including shops, roundhouses, etc., consists of capital charges, maintenance charges (the latter in the case of engines varying nearly with the business) and the difference in the cost of power as used on the revised and the unrevised lines.

The cost of deterioration in the case of either the power or the line, is such an uncertain quantity as to be very hard to arrive at, but it is most certainly no greater for the maximum amount of power required for any given engine division than for deterioration of the road for the same line. Power deteriorates somewhat when out of service for a long time, but this cost may be reduced to a comparatively small amount by alternating the use of the stored and the active power, while on the other hand deterioration of most parts of the line is going on at all times, regardless of the business passing over it.

The saving effected by grade reductions is too often figured at an amount which cannot be obtained under the proposed or any other plan of operation.

Among those items which are commonly given greater weight than experience warrants may be mentioned that of balancing grades for difference in traffic. Where traffic in opposite directions does not differ in an amount exceeding 30 per cent. it is not at all safe to "balance," but at even a considerable additional cost it is well to make all the grades for the 100 per cent., or the heavier, traffic; and this is especially the case where the difference is made up largely of empty cars, the resistance of which is so much greater per ton than that of loaded cars.

Curvature is nothing like so expensive of operation as is generally assumed. A division of 9,000 deg. curvature of a well-known line is now doing so, and has for years past held its own in the matter of operating expenses generally charged to curvature, as compared with other divisions of the same grades, but with much less curvature.

The comparative resistance of two or more lines and the most economical way of overcoming it is, of course, the aim of all comparative figures.

But costs must be determined in terms of operating expenses, and operating expenses do not vary directly with the power exerted to overcome the resistance due grades. When the amount of power exerted is doubled the operating expenses are only increased about one-sixth. It would, therefore, seem that one must be pretty conservative in making allowances for the saving effected in grade and curve reductions as compared with the cost of motive power for effecting the same reduction in operating cost.

Wages of train and engine crews are sometimes misleading, especially so when their basis is not fully understood. It is not safe to figure at so much per train mile, based on apparent existing rates of wages for train and engine crews, as these rates are usually based on the principle that ten hours or less, or 100 miles or less constitute a day's work, and therefore will be the same, even though the line may be shortened considerably. Policy, not miles, makes wage rates.

Engines should be designed to haul the maximum train of a given engine division and be regularly assigned to that territory regardless of the other engine divisions of the system. Incidentally, it may not be amiss to mention the well-known fact that overpowered engines are wholly unnecessary and add greatly to the cost of operation. By designing power, with reference to a particular engine division and with track made up of good strain and wear-resisting rails and other good track materials, much can be done at a reasonable outlay of money to reduce the operating expenses of existing heavy grade lines.

Any scheme of grade revision for a given engine division should be undertaken with the view of completing the whole of an engine division at about the same time, rather than by "piecemeal," otherwise the revised parts will prove unduly expensive pending the completion of the balance, because the

remaining old conditions will not admit of only a part of a revision scheme being operated to its full capacity.

W. L. DERR.

NEGLECTED RAILWAY OPPORTUNITIES IN CHINA.

Pittsburgh, May 5, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The more I think about it, the more I wonder why American financiers and manufacturers are not heeding the present changing conditions in China. Are they aware that there is a vast field for railway material and equipment in that market, or, if they are, are there any special impediments that prevent their going into that market?

Continual complaints are now heard and written about the dull times the home makers are having and the idle money seeking propitious investment. Why do they not cast their eyes further into China and see how the events are kaleidoscopically turning? The expectation as to what result the present revision of tariff will bring in their future merely concerns the domestic market and will in no way hinder in the encouragement of the export trade.

The rapid pace with which American industries, particularly those pertaining to railways, have sprung up in the last decade should never be impaired, and in hoping so it is absolutely necessary to keep the exporting channels well drained so as to allow the overflow to take its easier course to foreign markets, such as when dull times overtake the American industries, as at the present.

Much is spoken about the "open door" or "equal opportunity" in this country by rank and file, but where is there evidence that the American manufacturers are trying earnestly to seek that end by actual deed?

Germans, French, English and other European interests are fiercely fighting the battle royal in trying to get the best of each other so as to enlarge their own influence in China, while none of the Americans are in it.

They are building the railways to suit their own ends, supplying engineers and forcing them to build with their own material and equipment. These supplies are not like those edible articles which are consumed daily in a matter-of-fact way and nothing thought of it afterward, but they remain and proceed as the standards for the future. When once they are standardized, however, no matter how the American manufacturers may try to recoup their lost ground, they will be permanently precluded in such an attempt and shut out with high walls for their products.

No far-sighted people can neglect to gage this evinced future, and yet why do they not act? Is it not now high time for the American capitalists and manufacturers to get together and seek some means seriously so as to till the soil and sow the seeds in China, aiming to gather the fruits in future, and simultaneously to relieve the stagnant situation of this country, if only to some degree?

Let us hope that the Americans be not themselves a party in guilt to infringe the "equal opportunity" doctrine in China by their non-action.

K. T. IWASHITA.

CONVERSION OF THE NEW CANAAN BRANCH OF THE N. Y., N. H. & H. RAILROAD.

The New Canaan branch of the New York, New Haven & Hartford Railroad, extending from Stamford, on the main line, to New Canaan, 7.66 miles, which was originally operated by steam, was, about ten years ago, equipped with a 500-volt d.c. overhead trolley for passenger service only. About a year ago it was converted into a 11,000-volt a.c. single-phase system. The New Canaan line was particularly suitable for such a change, the expense for overhead construction being comparatively small, as on about 25 per cent. of the route the wires were carried from the main line overhead bridges. This same construction has been extended over the branch tracks also. Power is supplied through the line from the Cos Cov station, about 11.27 miles from New Canaan.

Direct current operation of the New Canaan branch was discontinued in the latter part of 1907, and the results obtained since the installation of the 11,000-volt, 25-cycle, single-phase catenary has demonstrated the adaptability of this system for branch-line electrification. The overhead line between Glenbrook Junction and New Canaan is carried on wooden poles, 35 ft. high, set 10 ft. from the center line of the track, and spaced 150 ft. tangents. At curves the poles are guyed with plate anchors and ⅜-in. steel strand wire. The bracket is a small 3-in. steel I-beam turned up at the end end braced by a ½-in. wrought-iron tension rod, bolted through the pole. The messenger wire, 7/16-in. bare steel strand, is carried on glazed porcelain, double petticoat insulators. The insulators are 7½ in. in diameter, 5½ in. high, and protected from the blasts of steam locomotives by an under piece of sheet iron. An auxiliary, No. 0000, steel working conductor is clamped to the No. 0000 copper feeder wire, as on the main line. Hickory steady strands are used on every alternating pole at tangents in addition to their application on curves. The clearance between the trolley and track is 22 ft. The total weight of the catenary construction, which is carried between the I-beam brackets on the tangent bents or spans of 150 ft., is 280 lbs., or about 2 lbs. per foot. The line is anchored at 11 places between Glenbrook and New Canaan. No transformer stations or special transmission wires were necessary on this division, as the pantograph collectors on the cars take current at 11,000 volts.

Section insulators are located at Talmadge Hill, Springdale and the main line junction at Glenbrook. There are also other breakers at Talmadge Hill and Springdale. The sidings normally are dead, being cut in only when necessary. The trip between New Canaan and Stamford is made in from 17 to 20 minutes, and one train ordinarily carries out the schedule.

The overhead line is grounded by No. 0000 iron wire, swung from pole to pole and grounded to the rails at every fifth one. This ground wire constitutes the sole lightning protection. The rails are bonded with No. 0000 bonds.

There are two trains on this division, each composed of one motor car and one trailer. The trailers are of the standard New Haven steam coach design, weighing 35 tons, for ordinary passenger service, and seating 72 passengers. The motor cars are the combination passenger and baggage type, 63 ft. long overall, and seating 52 passengers. Each car is equipped with two American Locomotive Company B-592 trucks, having 36-in. diameter wheels, 6½-in. axle and 5½-in. x 10-in. journals. Each one carries two GE 603-A, 125 h.p., single-phase motors, operated at a maximum speed of 50 m.p.h. These motors are arranged for multiple unit control. A set of 11 contactors is used with each pair of motors, seven contactors being used for accelerating and four for reserving. The motors are grouped two pairs in parallel, the motors on each track being in series. They are reversed by changing the exciting field connections, and either pair of motors may be cut out in case of trouble. All of the auxiliary circuits are controlled from a switchboard located in the motorman's cab, and power for the control circuit may be taken from either one of the two transformers. These cars are equipped with Westinghouse air brakes and electric heaters, the latter supplied by the Consolidated Car Heating Company, New York.

The Chinese authorities announce the negotiation of a loan with the German-Asiatic Bank for the capital to build a railway over the route formerly conceded to an American syndicate; that is, from Wuchang, opposite Han-kow, southward to Canton, or rather to the border of the province of Kwangtung, where it will be met by a line now under construction which has termini both at Canton and at Kow-lun, in British territory opposite Hong-Kong.

COMPARATIVE RAIL SPECIFICATIONS.

The American Railway Association.

SPECIFICATIONS FOR BESSEMER STEEL RAILS.

The entire process of manufacture and testing shall be in accordance with the best current state of the art, and special care shall be taken to conform to the following instructions:

1. *Process of Manufacture—*

(*a*) Ingots shall be kept in a vertical position until ready to be rolled, or until the metal in the interior has had time to solidify.

(*b*) "Bled" ingots shall not be used. ("Bled ingot"—one from the interior of which the liquid steel has been permitted to escape.)

(*c*) There shall be sheared from the end of the bloom formed from the top of the ingot, sufficient "discard" to insure sound rails. (*All metal from the top of the ingot, whether cut from the bloom or the rail, is the "top discard."*)

2. *Chemical Composition—*

The chemical composition of the steel from which the rails are rolled shall be within the following limits:

Bessemer Steel Rails.

	60 lbs.	70 lbs.	80 lbs.
Carbon	0.37-0.47	0.40-0.50	0.43-0.53
Manganese	0.80-1.10	0.80-1.10	0.80-1.10
Silicon	0.10-0.20	0.10-0.20	0.10-0.20
Phosphorus, not to exceed	0.10	0.10	0.10
Sulphur, not to exceed	0.075	0.075	0.075

	90 lbs.	100 lbs.
Carbon	0.45-0.55	0.46-0.56
Manganese	0.85-1.15	0.90-1.20
Silicon	0.10-0.20	0.10-0.20
Phosphorus, not to exceed	0.10	0.10
Sulphur, not to exceed	0.075	0.075

(*When lower phosphorus can be secured, a proper proportionate increase in carbon should be made.*)

3. *Shrinkage—*

The number of passes and speed of train shall be so regulated that, on leaving the rolls at the final pass, the temperature of the rails will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100 lbs. section, of *6 1-2* in, and ⅛ in. less for each 10 lbs. decrease of section. No artificial means of cooling the steel shall be used between the "leading" and "finishing" passes, nor after the rails leave the finishing rolls; neither shall rails be held before sawing for the purpose of reducing their temperature.

4. *Drop Test—*

The drop testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of 5 inches.

The anvil block shall be adequately supported and shall weigh 20,000 lbs.

The supports shall be a part of or firmly secured to the anvil.

The test piece shall be placed head upward on solid supports, 5 in. top radius, 3 ft. between centers, and subjected to impact tests, the tup falling free from the following heights:

60, 70 and 80-lb. rail	16 ft.
90-lb. rail	17 ft.
100-lb. rail	18 ft.

One drop test shall be made on a piece of rail rolled from the top of the ingot, not less than 4 ft. and not more than 6 ft. long, selected by the inspector from each heat of steel.

(*Special or additional tests may be made at the discretion of the inspector.*)

The temperature of the test pieces shall be between *32* and *100* deg., Fahrenheit.

(*a*) If the test piece breaks without showing *"pipe," or physical defect,* all rails from that heat shall be rejected absolutely.

Steel Manufacturers of America.

SPECIFICATIONS FOR STANDARD BESSEMER STEEL RAILS FOR A. S. C. E. SECTIONS.
January 1, 1909.

1. *Chemical Composition—*

	50 lbs. up to 60 lbs.	61 lbs. up to 70 lbs.	71 lbs. up to 80 lbs.
Carbon	.35- .45	.35- .45	.40- .50
Phosphorus, not over	.10	.10	.10
Silicon, not over.	.20	.20	.20
Manganese	.70-1.00	.70-1.00	.75-1.05

	81 lbs. up to 90 lbs.	91 lbs. up to 100 lbs.
Carbon	.43- .53	.45- .55
Phosphorus, not over	.10	.10
Silicon, not over	.20	.20
Manganese	.80-1.10	.84-1.14

2. *Shrinkage—*

The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of rails of sections 75 lbs. per yard and heavier will not exceed that which requires a shrinkage allowance at the hot saws of *6 7-16 in.* for a 33-ft. 75-lb. rail, with an increase of 1/16 in. for each increase of 5 lbs. in the weight of the section.

No artificial means of cooling the steel shall be used after the rails leave the rolls, nor shall they be held before sawing for the purpose of reducing their temperature.

3. *Drop Test—*

One drop test *may* be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, *selected* from each blow of steel.

The rails shall be placed head upward on the supports and the various sections shall be subjected to the following impact tests under a free falling weight:

Weights of rail per yard.	Height of drop in feet.
50 to 60 lbs.	15
61 to 70 lbs.	16
71 to 80 lbs.	16
81 to 90 lbs.	17
91 to 100 lbs.	18

If any rail breaks when subjected to the drop test, two additional tests will be made of other rails from the same blow of steel, and if either of these latter tests fail, all the rails of the blow which they represent will be rejected; but if both of these additional test pieces meet the requirements all the rail of the blow which they represent will be accepted.

The drop-testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upward on solid supports 3 ft. apart. The anvil block

American Society of Civil Engineers.

"RECOMMENDED SPECIFICATIONS FOR BESSEMER STEEL RAILS.

"Process of Manufacture.—The entire process of manufacture and testing shall be in accordance with the best state of the art, and the following instructions shall be faithfully executed:

"Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled, or until the metal in the interior has had time to solidify.

"No bled ingots shall be used.

"There shall be sheared from the end of the blooms formed from the top of the ingots *not less than twenty-five per cent., and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does. If, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified.*

"*Chemical Composition.*—Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:

	Percentage 70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
Carbon	0.50-0.60	0.53-0.63	0.55-0.65
Phosphorus, shall not exceed	0.085	0.085	0.085
Silicon shall not exceed	0.20	0.20	0.20
Sulphur shall not exceed	0.075	0.075	0.075
Manganese	0.75-1.00	0.80-1.05	0.80-1.05

"The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a 33-ft. rail of 100-lb. section, of *6 7-16* in., and 1/16 in. less for each 5-lb. decrease of section. *These allowances to be decreased at the rate of 1-90 in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn.* No artificial means of cooling the steel shall be used after the rails leave the rolls, *nor shall they be held before sawing for the purpose of reducing their temperature.*"

"*Drop Test.*—One drop test shall be made on a piece of rail, not less than 4 ft. and not more than 6 ft. long, selected from each blow of steel. The test piece shall be taken from the top of the ingot. The rails shall be placed head upward on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

70 to 79-lb. rails	*18 ft.*
80 to 89-lb. rails	*20 ft.*
90 to 100-lb. rails	*22 ft.*

"If any rail breaks, when subjected to the drop test, two additional tests may be made of other rails from the same blow of steel, also taken from the top of the ingots, and if either of these latter rails fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

"The drop-testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upward on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lbs.,

American Railway Engineering and Maintenance of Way Association.

SPECIFICATIONS FOR BESSEMER STEEL RAILS.

STANDARD SPECIFICATIONS.

(1) (a) The entire process of manufacture and testing shall be in accordance with the best current practice, and special care shall be taken to conform to the following instructions:

(b) Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled, or until the metal in the interior has time to solidify.

(c) No bled ingots shall be used.

(d) There shall be sheared from the end of the blooms formed from the top of the ingots *not less than twenty-five (25) per cent.*, and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does. *If, by the use of any improvements in the process of making ingots, the defect known as piping shall be prevented, the above shearing requirements may be modified.*

(2) Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:

	Percentage		
	70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
*Carbon	0.50-0.60	0.53-0.63	0.55-0.65
Phosphorus shall not exceed	0.085	0.085	0.085
Silicon shall not exceed	0.20	0.20	0.20
Sulphur shall not exceed	0.075	0.075	0.075
Manganese	0.75-1.00	0.80-1.05	0.80-1.05

*Carbon may be reduced to suit local conditions.

(5) The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass, the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws for a 33-ft. rail of 100-lb. section of *6 7-16* in., and $\frac{1}{16}$ in. less for each 5-lb. decrease of section, *these allowances to be decreased at the rate of 1-90 in. for each second of time elapsed between the rail leaving the finishing rolls and being sawn.* No artificial means of cooling the steel shall be used after the rails leave the rolls, *nor shall they be held before sawing for the purpose of reducing their temperature.*

(3) One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, selected from each blow of steel. The test piece shall be taken from the top of the ingot. The rails shall be placed head upward on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

70 to 79-lb. rails	*18 ft.*
80 to 89-lb. rails	*20 ft.*
90 to 100-lb. rails	*22 ft.*

If any rail breaks when subjected to the drop test, two additional tests may be made of other rails from the same blow of steel, also taken from the top of the ingots, and if either of these latter rails fail, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

(4) The drop-testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upward on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lbs.,

American Society for Testing Materials

PROPOSED STANDARD SPECIFICATIONS.

1. (a) The entire process of manufacture and testing shall be in accordance with the best current practice, and special care shall be taken to conform to the following instructions:

(b) Ingots shall be kept in a vertical position in the pit heating furnaces until ready to be rolled or until the metal in the interior has time to solidify.

(c) No bled ingots shall be used.

(d) There shall be sheared from the end of the blooms formed from the top of the ingots not less than x %,† and if, from any cause, the steel does not then appear to be solid, the shearing shall continue until it does.

†The percentage of minimum discard in any case to be subject to agreement, and it should be recognized that the higher this percentage the greater will be the cost.

2. Rails of the various weights per yard specified below shall conform to the following limits in chemical composition:

	Percentage			
	Carbon.	Phosphorus, shall not exceed.	Silicon, shall not exceed.	Manganese.
50 to 59 lbs.	0.35-0.45	0.10	0.20	0.70-1.00
60 to 69 lbs.	0.38-0.48	0.10	0.20	0.70-1.00
70 to 79 lbs.	0.40-0.50	0.10	0.20	0.75-1.05
80 to 89 lbs.	0.43-0.53	0.10	0.20	0.80-1.10
90 to 100 lbs.	0.45-0.55	0.10	0.20	0.80-1.10

4. The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws for a 33-ft. rail of 100-lb. section of *7 5-16* in., and $\frac{1}{16}$ in. less for each 5-lb. decrease of section. These allowances to be decreased at the rate of *0.01* in. for each second of time elapsed between the rail leaving the finishing rolls and being sawed. No artificial means of cooling the rails shall be used between the finishing pass and the hot saws.

3. One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. long, selected from every fifth blow of steel. For rails weighing 85 to, and including, 100 lbs. per yard, one drop test shall be made from every blow of steel. The test shall be taken from the top of the ingot. The rail shall be placed head upwards on the supports, and the various sections shall be subjected to the following impact tests under a free falling weight:

Weight of rail, pounds per yard.	Height of drop, feet.
45 to and including 55	15
More than 55 to and including 65	16
More than 65 to and including 75	*17*
More than 75 to and including 85	*18*
More than 85 to and including 100	*19*

If any rail breaks when subjected to the drop test, two additional tests, taken from the top of the ingot, will be made of other rails from the same blow of steel, and if either of these latter tests fails, all the rails of the blow which they represent will be rejected, but if both of these additional test pieces meet the requirements, all the rails of the blow which they represent will be accepted.

Comments.

Process of Manufacture.—Omitted in Manufacturers' Specification; practically the same in other four except per cent. of discard to remove piping; is now in general practice, merely a matter of price when greater than the customary discard is required.

Chemical Composition.—Chemical requirements for 100-lb. rail:

	Carbon.	Manganese.
American Ry. Assn.	.46 to .56	.90 to 1.20
Manufacturers	.45 to .55	.84 to 1.14
A. S. C. E.	.55 to .65	.80 to 1.05
M. of W.	.55 to .65	.80 to 1.05
Am. Sy. T. M.	.45 to .55	.80 to 1.10

	Silicon.	Phosph.	Sulph.
American Ry. Assn.	.10 to .20	.10	.075
Manufacturers	.20 max.	.10	...
A. S. C. E.	.20 "	.085	.075
M. of W.	.20 "	.085	.075
Am. Sy. T. M.	.20 "	.10	...

Shrinkage.—Shrinkage for 100-lb. rail in 33 ft.:

A.R.A.	Mfrs.	A. S. C. E.	M. of W.	A. S. T. M.
6½ in.	6¾ in.	6 7/16 in.	6 7/16 in.	7 5/16 in.

The manufacturers have made concessions on this point, and their allowance of 6¾ in. is now practically within the permissible variation of ¼ in. in length, and it would seem as though 6⅝ in. should be satisfactory to all.

Drop Test.—The American Railway Association and Manufacturers' specifications call for 18 ft. drop on 100-lb. rail. The American Society of Civil Engineers and the American Railway Engineering and Maintenance of Way Association call for 22 ft. and the American Society for Testing Materials for 19 ft. The drop-testing machine has been standardized, and it is claimed that the lower drop of 18 ft. called for under the new conditions is equivalent to the higher drop of 22 ft. previously specified. All the specifications except the Manufacturers' provide for the test piece to be taken from the top of ingot. The Manufacturers provide for the test piece to be selected from each blow of steel, which would permit the inspector to take it from the top of ingot if he desired. All specifications provide for drop test to be made from each heat of steel.

The American Railway Association.

(*b*) If, however, the test piece broken *shows "pipe," or physical defect, the top rail from each ingot of that heat shall be rejected, and*

(*c*) *A second test shall then be made of a test piece selected by the inspector from a rail other than that from the top of the ingot. If this second piece breaks, the remainder of the rails of the heat shall also be rejected. If this second piece does not break, the remainder of the rails of the heat will be accepted.*

If the test piece does not break under the drop test, it shall then be tested to destruction, and

(*d*) *If, when so tested to destruction, the test piece shows "pipe," or physical defect, the top rail from each ingot shall be rejected; the remainder of the rails of the heat will be accepted.*

(*e*) *If, when so tested to destruction, the test piece does not show "pipe," or physical defect, all the rails of the heat will be accepted.*

5. *Section.*—The section of rail shall conform to the template furnished by the purchaser as accurately as possible consistent with the paragraph relative to specified weight.

An excess of $\frac{1}{32}$ inch in height of rails, and a variation of $\frac{1}{16}$ inch in width of flange will be permitted, but no variations will be allowed in dimensions affecting the fit of splice bars.

6. *Weight.*—The weight of the rail shall be maintained as nearly as possible, after complying with the preceding paragraph, to that specified in the contract.

A variation of one-half of one per cent. from the calculated weight of section, on an entire order, will be allowed.

Rails will be accepted and paid for according to actual weight.

7. *Length.*—The standard length of rails shall be 33 feet. Ten per cent. of the entire order will be accepted in shorter lengths varying as follows: 30 feet, 28 feet, 26 feet and 24 feet. A variation of ¼ inch from the specified length will be allowed.

All No. 1 rails less than 33 feet long shall be painted green on both ends.

8. *Drilling.*—Circular holes for splice bars shall be drilled in accordance with specifications of the purchaser. They shall in every respect conform accurately to drawing and dimensions furnished and must be free from burrs.

9. *Straightening.*—Care must be taken in hot-straightening rails, and it must result in their being left in such condition that they shall not vary throughout their entire length more than *three (3) in.* from a straight line in any direction when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so marked. *Rails while on the "hot" beds shall be protected from coming in contact with water or snow.* The distance between supports of rails in the gagging press shall not be less than forty-two (42) inches; supports to have flat surfaces. Rails shall be straight in line and surface and smooth on head when finished—final straightening being done while cold. They shall be sawed square at ends, variations to be not more than $\frac{1}{32}$ inch, and prior to shipment shall have the burr caused by the saw cutting removed and the ends made clean.

10. *Branding.*—The name of the maker, the weight of the rail, and the month and year of manufacture shall be rolled in raised letters and figures on the side of the web. The number of the heat and a letter indicating the portion of the ingot from which the rail was made shall be plainly stamped on the web of each rail, where it will not be covered by the splice bars. *Rails to be lettered con-*

Steel Manufacturers of America.

shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to the anvil. *The report of drop test shall state the atmospheric temperature at the time the test was made.* The temperature of the test pieces, when tested, shall be not less than *60* deg. F. or greater than *120* deg. F. *The testing shall proceed concurrently with the operation of the mill.*

(4) Section.—The section of rail shall be that recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the Railroad Company, consistent with Clause No. 5, relative to specified weight. An allowance in height of $^1/_{64}$ of an inch under, and $\frac{1}{32}$ of an inch over and in width of $\frac{1}{16}$ inch will be permitted. A perfect fit of the splice bars shall be maintained.

(5) Weight.—The weight of the rails shall be maintained as nearly as possible, after complying with clause No. 4, to that specified in contract. A variation of ½ of 1 per cent. for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

(6) Length.—The standard length of rails shall be 30 or 33 feet. Ten per cent, of the entire order will be accepted in shorter lengths, varying by even feet down to 24 feet. A variation of ¼ of an inch in length from that specified will be allowed.

Both ends of all short length No. 1 Rails shall be painted green.

(8) Drilling.—Circular holes for Splice Bars shall be drilled in accordance with specifications of purchaser. They shall in every respect accurately conform to drawing and dimensions furnished and shall be free from burrs.

(9) Finishing.—Rails shall be carefully hot-straightened so as not to vary, throughout their entire length, more than *5 inches* from a straight line in any direction when delivered to the cold straightening presses. Those which vary beyond that amount or have short kinks shall be classed as No. 2 Rails and shall be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 inches. Rails shall be straight in line and surface when finished—the final straightening being done while cold—smooth on head, sawed square at ends—variations therefrom to be not more than $\frac{1}{32}$ inch—and prior to shipment, shall have the burr caused by the saw cutting removed and the ends made clean.

(7) Branding.—The name of the maker, the weight of the rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of the heat shall be so stamped on each rail as not to be covered by the splice bars. A letter shall be stamped on the side of the web to indicate the portion of the ingot from which the rail was rolled.

American Society of Civil Engineers.

the supports shall be part of, or firmly secured to, the anvil. *The report of the drop test shall state the atmospheric temperature at the time the test was made."*

"*Section.*—The section of rail shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with the paragraph relative to specified weight. A variation in height of 1-64 in. less, or 1-32 in. greater than the specified height, and 1-16 in. in width will be permitted. The section of rail shall conform to the finishing dimensions.

"*Weight.*—The weight of the rails will be maintained as nearly as possible, after complying with the preceding paragraph, to that specified in contract. A variation of one-half of 1 per cent. for an entire order will be allowed. Rails will be accepted and paid for according to actual weights.

"*Length.*—The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths varying by even feet to 27 ft., and all No. 1 rails less than 33 ft. long shall be painted green on the ends. A variation of ¼ in. in length from that specified will be allowed.

"*Drilling.*—Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall conform accurately to the drawing and dimensions furnished, in every respect, and must be free from burrs.

"*Straightening.*—Care must be taken in hot-straightening the rails, and it must result in their being left in such condition that they shall not vary throughout their entire length more than *5 in.* from a straight line in any direction, when delivered to the cold straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second-quality rails and be so stamped.

"Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $\frac{1}{32}$ in., and, prior to shipment shall have the burr occasioned by the saw cutting removed, and the ends made clean.

"*Branding.*—The name of the maker, the weight of the rail, and the month and year of manufacture, shall be rolled in raised letters on the side of the web; and the number of the blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

American Railway Engineering and Maintenance of Way Association.

and the supports shall be part of, or firmly secured to, the anvil. *The report of the drop test shall state the atmospheric temperature at the time the test was made.*

American Society for Testing Materials

5. The drop-testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 in., and the test rail shall be placed head upwards on solid supports 3 ft. apart. The anvil block shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to, the anvil. *The report of the drop test shall state the atmospheric temperature at the time the test was made.*

Comments.

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(7) Unless otherwise specified, the section of rail shall be the American standard, recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with paragraph No. 8, relative to specified weight. A variation in height of one sixty-fourth (1-64) inch less, or one thirty-second (1-32) inch greater than the specified height, and one-sixteenth (1-16) inch in width, will be permitted. The section of rail shall conform perfectly to the finishing dimension.

(7) Unless otherwise specified, the section of rail shall be the American standard, recommended by the American Society of Civil Engineers, and shall conform, as accurately as possible, to the templet furnished by the railroad company, consistent with Paragraph No. 8, relative to specified weight. A variation in height of 1-64 of an inch less, or 1-32 of an inch greater than the specified height, and 1-16 in. in width will be permitted.

Section.—American Railway Association specify their own sections. Manufacturers specify A. S. C. E. sections. Others say A. S. C. E. sections unless otherwise specified. All other requirements the same.

(8) The weight of the rails will be maintained as nearly as possible, after complying with paragraph No. 7, to that specified in contract. A variation of one-half ($\frac{1}{2}$) of one per cent. for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

(8) The weight of the rails will be maintained as nearly as possible, after complying with Paragraph No. 7, to that specified in contract. A variation of one-half of 1 per cent. for an entire order will be allowed. Rails shall be accepted and paid for according to actual weights.

Weight.—Same requirements in all cases.

(9) The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying by even feet to *27 ft.*, and all No. 1 rails less than 33 ft. shall be painted green on the end. A variation of one-fourth of an inch in length from that specified will be allowed.

(9) The standard length of rails shall be 33 ft. Ten per cent. of the entire order will be accepted in shorter lengths, varying by even feet to *27 ft.*, and all No. 1 rails less than 33 ft. shall be painted green on the end. A variation of one-fourth of an inch in length from that specified will be allowed.

Length.—All provide for 33 ft. lengths and $\frac{1}{4}$ in. variation in length. Other requirements practically the same.

(10) Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall accurately conform to the drawings and dimensions furnished in every respect, and must be free from burrs.

(10) Circular holes for splice bars shall be drilled in accordance with the specifications of the purchaser. The holes shall accurately conform to the drawing and dimensions furnished in every respect, and must be free from burrs.

Drilling.—Same requirements in all cases.

(11) Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variation to be not more than $\frac{1}{8}$ in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed and the ends made clean.

(12) Care must be taken in hot-straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length of 33 ft. more than *3 in.* from a straight line in any direction, when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in.

(11) Care must be taken in hot-straightening the rails, and it must result in their being left in such a condition that they shall not vary throughout their entire length more than *5 in.* from a straight line in any direction when delivered to the cold-straightening presses. Those which vary beyond that amount, or have short kinks, shall be classed as second quality rails and be so stamped. The distance between supports of rails in the gagging press shall not be less than 42 in. Rails shall be straight in line and surface when finished—the straightening being done while cold—smooth on head, sawed square at ends, variations to be not more than $\frac{1}{8}$ in., and, prior to shipment, shall have the burr occasioned by the saw cutting removed and the ends made clean.

Straightening.—Limits of variation out of line in 33 ft. rail before cold straightening: American Ry. Assn. and American Ry. E. & M. W. Assn. specify 3 in., the others 5 in. Other requirements practically the same. American Railway Assn. specifies that rails while on the hot beds shall be protected from coming in contact with water or snow. This provision will no doubt become universal as its importance is self-apparent.

(13) The name of the maker, the weight of rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

(12) The name of the maker, the weight of rail and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of blow shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars.

Branding.—The American Railway Association and Manufacturers specifications provide that each rail shall be marked consecutively "A," "B," "C," etc., to indicate its position in the ingot. Others do not have this requirement but will adopt it as it has come into general practice. The American Railway Association provides that with discard of 20 per cent. or more, the letter "A"—representing the top of the ingot, will be omitted.

The American Railway Association.

secutively "A," "B," "C," etc., the rail from the top of the ingot being "A." In case of a top discard of twenty or more per cent., letter "A" will be omitted. All rails marked "A" shall be kept separate and be shipped in separate cars.

11. No. 1 Rails.—No. 1 rails shall be free from injurious defects and flaws of all kinds.

12. No. 2 Rails.—Rails which, by reason of surface imperfections, are not classed as No. 1 rails, shall be considered No. 2 rails, but No. 2 rails shall not be accepted for shipment which have flaws in the head of more than *1-8 inch*, or in the flange of more than *1-4 inch in depth*, and these shall not, in the judgment of the Inspector, be, in any individual rail, so numerous or of such a character as to render it unfit for recognized No. 2 rail uses.

Both ends of No. 2 rails shall be painted white, *and shall have two prick punch marks on the side of the web near the end of the rail, so placed as not to be covered by the splice bars. They must be kept separate from No. 1 rails and be shipped in separate cars.*

13. Inspection.—(*a*) Inspectors representing the purchaser shall have free entry to the works of the manufacturer at all times while the contract is being executed, and shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the rails have been made in accordance with the terms of the specifications.

(*b*) The manufacturer shall, before the rails are shipped, furnish the Inspector daily with carbon determinations for each heat, and a complete chemical analysis every 24 hours representing the average of the other elements contained in the steel for each day and night turn. These analyses shall be made on drillings taken from small test ingots. The drillings for analysis shall be taken from the ladle test ingot *at a distance of 1-4 inch beneath the surface.*

(*c*) All tests and inspection shall be made at the place of manufacture prior to shipment, and so conducted as not to interfere unnecessarily with the operation of the mill. *On request of the Inspector the manufacturer shall furnish drillings for check analysis.*

The American Railway Association.

SPECIFICATIONS FOR OPEN-HEARTH STEEL RAILS.

These specifications for Open-Hearth Steel Rails are exactly the same as those for Bessemer Steel Rails—given above—with the following exceptions:

2. Chemical Composition.—The chemical composition of the steel from which the rails are rolled shall be within the following limits:

Open-Hearth Steel Rails.

	60 lbs.	70 lbs.	80 lbs.
Carbon	0.50-0.60	0.55-0.65	0.60-0.70
Manganese	0.75-1.00	0.75-1.00	0.75-1.00
Silicon	0.10-0.20	0.10-0.20	0.10-0.20
Phosphorus, not to exceed	0.04	0.04	0.04
Sulphur, not to exceed	0.06	0.06	0.06

	90 lbs.	100 lbs.
Carbon	0.65-0.75	0.70-0.80
Manganese	0.75-1.00	0.75-1.00
Silicon	0.10-0.20	0.10-0.20
Phosphorus, not to exceed	0.04	0.04
Sulphur, not to exceed	0.06	0.06

(*When higher phosphorus is used, a proper proportionate reduction in carbon should be made.*)

10. Branding.—All open-hearth rails *must be marked O. H. to distinguish them* from Bessemer rails when in track. The name of the maker, the weight of the rail, and the month and year of manufacture shall be rolled in raised letters and figures on the side of the web. The number of the heat and a letter indicating the portion of the ingot

Steel Manufacturers of America.

No. 1 Rails shall be free from injurious defects and flaws of all kinds.

(11) No. 2 Rails.—Rails which by reason of surface imperfections are not classed as No. 1 Rails shall be considered No. 2 Rails; but No. 2 Rails shall not be accepted for shipment which have flaws in the head of more than *1-4 inch;* or in the flange of more than *1-2 inch* in depth; and these shall not, in the judgment of the inspector, be, in any individual rail, so numerous or of such a character as to render it unfit for recognized No. 2 Rail uses.

(12) Designation of No. 2 Rails.—Both ends of all No. 2 Rails shall be painted white.

(10) Inspection.—The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times while his contract is being executed, and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the rails are being made in accordance with the terms of the contract. All tests and inspection shall be made at the place of manufacture prior to shipment, and shall be so conducted as not to unnecessarily interfere with the operation of the mill. The manufacturer shall furnish the inspector, daily, with carbon determinations of each heat, and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel for each day and night turn. Analyses shall be made on drillings taken from small test ingots, the drillings being taken at a *distance of not less than 1-4 inch beneath the surface of said test ingots. On request of the inspector the manufacturer shall furnish drillings for check analysis.*

Steel Manufacturers of America.

SPECIFICATIONS FOR STANDARD OPEN-HEARTH STEEL RAILS FOR A. S. C. E. SECTIONS.

January 1, 1909.

These specifications for Open-Hearth Steel Rails are exactly the same as those for Bessemer Steel Rails,—given above,—with the following exceptions

(1) *Chemical Composition*—

	50 lbs. up to 60 lbs.	61 lbs. up to 70 lbs.	71 lbs. up to 80 lbs.
Carbon	0.46-0.59	0.46-0.59	0.52-0.65
Phosphorus, not over	0.04	0.04	0.04
Silicon, not over	0.20	0.20	0.20
Manganese	0.60-0.90	0.60-0.90	0.60-0.90

	81 lbs. up to 90 lbs.	91 lbs. up to 100 lbs.
Carbon	0.59-0.72	0.62-0.75
Phosphorus, not over	0.04	0.04
Silicon, not over	0.20	0.20
Manganese	0.60-0.90	0.60-0.90

(7) Branding.— The name of the maker, the weight of the rail, and the month and year of manufacture shall be rolled in raised letters on the side of the web, and the number of the heat and the letters *O. H. (to designate the grade of steel)* shall be so stamped on each rail as not to be covered by the splice bars. *If desired, a letter*

American Society of Civil Engineers.

No. 1 rails shall be free from injurious defects and flaws of all kinds.

"No. 2 rails shall be accepted up to 5 per cent. of the whole order. They shall not have flaws in their heads of more than *1-4 in.*, or the flange of more than *1-2 in.* in depth, and, in the judgment of the inspector, these shall not be so numerous or of such a character as to render them unfit for recognized second-quality rail uses. The ends of No. 2 rails shall be painted white, and shall have two prick-punch marks on the side of the web near the heat number brand, and placed so as not to be covered by the splice bars. *Rails from heats which failed under the drop-test shall not be accepted as No. 2 rails.*

"*Inspection.*—The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled, and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment.

"The manufacturer shall furnish the inspector, daily, with carbon determinations for each blow and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from small test ingots. *On the request of the inspector, the manufacturer shall furnish drillings for check analyses.*

American Society of Civil Engineers.

SPECIFICATIONS FOR BASIC OPEN-HEARTH STEEL RAILS.

The specifications for rails made by the Basic Open-Hearth process shall be the same as for Bessemer rails, excepting that a full chemical determination shall be furnished for each heat and two drop-tests from each. Their chemical composition shall be:

	Per cent.		
	70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
Carbon	0.53-0.63	0.58-0.68	0.65-0.75
Phosphorus, shall not exceed	0.05	0.05	0.05
Silicon, shall not exceed	0.20	0.20	0.20
Sulphur, shall not exceed	0.06	0.06	0.06
Manganese	0.75-1.00	0.80-1.05	0.80-1.05

American Railway Engineering and Maintenance of Way Association.

No. 1 rails shall be free from injurious defects and flaws of all kinds.

(15) No. 2 rails will be accepted up to *five (5) per cent.* of the whole order. Rails that possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain *any physical defects which impair their strength shall be rejected.* The ends of all No. 2 rails shall be painted white in order to distinguish them. *Rails rejected under the drop test will not be accepted as No. 2 rails.*

(14) The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment.

(6) The manufacturer shall furnish the inspector daily with carbon determinations for each blow, and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from small test ingots.

American Society for Testing Materials

No. 1 rails shall be free from injurious defects and flaws of all kinds.

(15) No. 2 rails will be accepted *to at least five (5) per cent.* of the whole order. Rails that possess any injurious defects, or which for any other cause are not suitable for first quality, or No. 1 rails, shall be considered as No. 2 rails; provided, however, that rails which contain *any physical defects which impair their strength shall be rejected.* The ends of all No. 2 rails shall be painted white in order to distinguish them. *Rails rejected under the drop test will not be accepted as No. 2 rails.*

13. The inspector representing the purchaser shall have free entry to the works of the manufacturer at all times when the contract is being filled and shall have all reasonable facilities afforded him by the manufacturer to satisfy him that the finished material is furnished in accordance with the terms of these specifications. All tests and inspections shall be made at the place of manufacture prior to shipment.

6. The manufacturer shall furnish the inspector, daily, with carbon determinations for each blow, and a complete chemical analysis every 24 hours, representing the average of the other elements contained in the steel, for each day and night turn. These analyses shall be made on drillings taken from a small test ingot.

Comments.

No. 1 Rails.—Same requirements in all cases.

No. 2 Rails.—The American Railway Association specifies the limit of flaws ⅛ in. deep in head and ¼ in. in flange. The Manufacturers and American Society of Civil Engineers specify flaws ¼ in. deep in head and ½ in. deep in flange. American Railway Engineering and Maintenance of Way Association and American Society for Testing Materials specify that only such defects will be accepted which do not impair the strength of the rail.

American Railway Association and the Manufacturers and A. S. C. E. specify that two center punch marks shall be put on each No. 2 rail.

American Railway Association, the American Society of Civil Engineers, the American Railway Engineering and Maintenance of Way Association and the American Society for Testing Materials will not accept rails as No. 2 from heats which failed under the drop test; Manufacturers have no such provision.

Inspection.—American Railway Association and Manufacturers' specifications provide that the drillings for analysis shall be taken ¼ in. beneath the surface. Would it not be desirable to have this requirement appear in all specifications?

American Railway Engineering and Maintenance of Way Association.

SPECIFICATIONS FOR BASIC OPEN-HEARTH RAILS.

The specifications for rails made by the basic open-hearth process shall be the same as for Bessemer rails, excepting that their chemical composition shall be:

	Per cent. 70 to 79 lbs.	80 to 89 lbs.	90 to 100 lbs.
Carbon	0.63-0.73	0.68-0.78	0.75-0.85
Phosphorus, shall not exceed	0.03	0.03	0.03
Silicon	.075-0.20	.075-0.20	.075-0.20
Sulphur, shall not exceed	0.06	0.06	0.06
Manganese, shall not exceed	0.90	0.90	0.90

The Committee on Rail has under consideration the matter of revised specifications.

American Society for Testing Materials.

Committee A on Standard Specifications for Iron and Steel has under consideration the matter of standard specifications for open-hearth steel rails.

Chemical Composition.—Chemical requirements for 100-lb. rails:

	Carbon.	Manganese.
American Ry. Assn.	.70 to .80	.75 to 1.00
Manufacturers	.59 to .72	.60 to .90
A. S. C. E.	.65 to .75	.80 to 1.05
A. R. E and M. W. A.	.75 to .85	.90 max.

	Silicon.	Phosp.	Sulph.
Amer. Ry. Assn.	.10 to .20	.04	.06
Manufacturers	.20 max.	.04	..
A. S. C. E.	.20 max.	.05	.06
A. R. E. & M. W. A.	.075 to .20	.03	.06

A. S. T. M.—Considering open-hearth specifications.

Branding.—The American Railway Association and Manufacturers' specifications provide that each rail shall be marked consecutively "A," "B," "C," etc., to indicate its position in the ingot. Others do not have this requirement, but will adopt it, as it has come into general practice.

The American Railway Association provides that with discard of 20 per cent. or more the letter "A," representing the top of the ingot, will be omitted.

The American Railway Association and Manufacturers call for each rail to be marked O. H. to designate quality.

Inspection.—American Railway Association and Manufacturers' specifications provide that the drilling for analysis shall be taken ¼ in. beneath the surface. Would it not be desirable to have this requirement appear in all specifications?

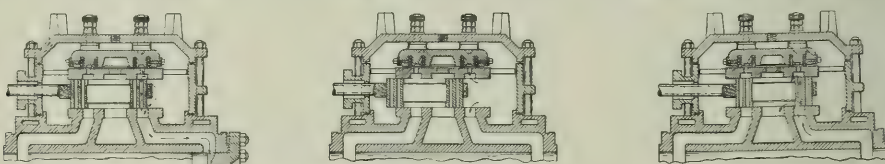
American Railway Association and Manufacturers' specifications provide that the inspector shall be furnished with complete chemical determinations for each heat of steel. This requirement will no doubt become universally adopted.

The American Railway Association.	Steel Manufacturers of America.
from which the rail was made, shall be plainly stamped on the web of each rail, where it will not be covered by the splice bars. Rails to be lettered consecutively "A," "B," "C," etc., the rail from the top of the ingot being "A." *In case of a top discard of twenty or more per cent., letter "A" will be omitted. All rails marked "A" shall be kept separate and be shipped in separate cars.*	*shall be stamped on the side of the web to indicate the portion of the ingot from which the rail was rolled.*
13. Inspection.—Requirements same as for Bessemer except—"The Manufacturer shall, before the rails are shipped, *furnish the inspector with a complete chemical determination for each heat.*	*Inspection.*—Requirements same as for Bessemer except—"The Manufacturer shall furnish the inspector *a chemical analysis of each heat of steel covering the elements specified.*

AMERICAN BALANCED VALVES.

The American Balanced Valve Co., of Jersey Shore, Pa., has put out two designs of balanced valves that possess a number of interesting features, from the standpoint both of technical and of practical efficiency. One is a flat slide and the other a piston valve.

The slide valve is a modification of the one that has been used for some time, but possesses the added advantage of an increase of balance ratio, which, through changing, is raised to the highest practicable when the valve is in its central position under a wide-open throttle. In order to show just what changes have been made, the older design is illustrated. In this, the upper face of the valve plate is divided into two parts by the packing strips above, and each of these has an opening down through the plate to the valve space beneath. They are so arranged as to be in communication with the proper steam space. As there is no packing between the valve and the plate the downward pressure of the latter is depended upon to keep the rubbing surfaces in contact and tight, and it must be kept balanced. Taking up the movement in detail when the valve is in the opening position as shown, the exhaust steam pressure passes up through the port at the right and acts on that end of the plate, thus balancing that, and live steam does the same at the left. This also holds during the balance of the stroke, as indicated by the engraving showing the valve in the wide-open position, and until the exhaust opens, when the pressure on top of the valve plate is relieved and drops to that of the exhausted steam.



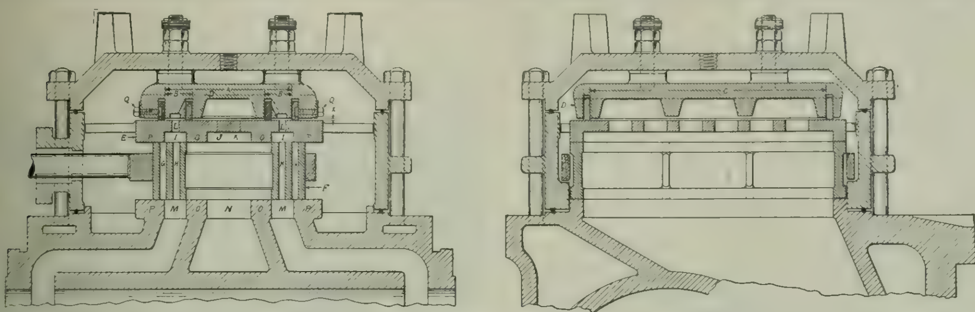
Older Design of American Slide Valve.

With the new arrangement the same principle is used with a variation in detail by which a better balance is obtained at maximum points. Instead of splitting the upper surface of the valve plate into two areas, it is divided into three, of which the central one is always in communication with the exhaust while the two a' the ends are alternately filled with live steam according to the movement of the valve and the necessities of the case. First, then, it will be seen that the balanced area is changeable, and that there is but one change with each stroke of the valve. By referring to the section of the valve in its central position, which is the heaviest, if there were no balance the valve would be subjected to a pressure on its back equivalent to the entire surface of its face multiplied by the steam chest pressure. The use of the balance strips enclosing the area A by C prevents the live steam of the steam chest from gaining access to this area, and thus reduces the pressure on the valve seat in proportion to the number of square inches so enclosed. This area is made as large as it is possible to use when the valve is in the central position and not cause it to leave its seat. The valve is, therefore, balanced to as great an extent as possible and still have load enough upon it to maintain a steam-tight joint at its face. If, now, the valve be moved to the position where it is just beginning to admit steam to the cylinder port, or just cutting off steam for expansion, there is a condition where the cylinder is full of steam at steam chest pressure which is exerting an upward thrust on the face of the valve equal to the area of the steam port. If this upward pressure on the face of the valve were not to be counteracted, the valve would, of course, be lifted from its seat, since the valve, being fully balanced in its central position, would not stand this increase of balance by the development of greater pressure in the port, and it would consequently be lifted from its seat. To meet this difficulty, it has, heretofore, been customary to leave a valve underbalanced in its central position.

In this valve, the pressure in the port is counteracted by allowing the steam to have access to the top of the valve through the ports in the same, so that the pressure is at all times the same on both faces of the valve. The port pressure does not, therefore, affect the valve, but since the valve plate lies loosely on the back of the valve, and the cylinder port pressure passes through the valve to the pocket port in the face of the valve plate, it would lift the latter away from the valve, unless there was an opening by which it could pass to the other side, and fill an equal area to that of the port. To permit of this the smaller space with a width of B and a length of C is enclosed by the packing strips at the back of the valve plate and is always open to the port pressure. It will now be clear that when the valve is unbalanced by the pressure in the cylinder port, the valve plate is simultaneously unbalanced by the same pressure entering the space between the packing strips. That the action should be automatic is insured by having one of these areas over each port, which acts with its own port only.

As the valve moves on in its travel and reaches the end of its stroke and the wide-open position, the change in balance that would be caused by the over-travel beyond the edge of the seat is neutralized by having the valve travel out from under the upper seat or valve plate at the same time and to the same extent that it travels over the lower seat, so that the over-travel is taken care of automatically in the balance. At the other end the steam is admitted to the space above and corresponding to the cylinder port, so that the conditions

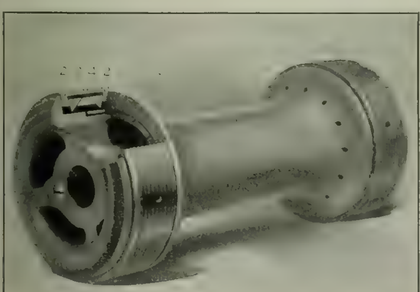
of balance of the valve plate remain unchanged from the time of the commencement of the opening of the port for steam admission. Furthermore, the valve seat is so proportioned that the valve will travel to the edge of the same when the engine is working at its shortest possible cut-off. With this proportion fixed, any desired valve travel can be used, and at the same time a uniform frictional contact of the valve and seat be maintained, and that with but one change in the balanced area, which will meet all of the requirements from the central position to the full limit of over-travel. To summarize the matter, the feature of the valve is that there is as large an area of balance as possible in the central position and two small areas in the interior of it, to which steam is admitted to counteract the lifting tendency of the steam beneath the valve in the steam ports.



American Flat Slide Valve.

A modification of the rigid automatic balanced piston valve has also been brought out by the same company. It is called a semi-plug valve, because, while it is without steam, it is a snap ring valve, that is, the packing rings are expansible and fit themselves to the valve chamber; but, when the throttle is opened, the steam is admitted to the chest to enter the space below the rings, and the action of this pressure is to lock the snap rings to a fixed diameter, practically making a plug of it during the time the pressure is on.

The outside walls of the snap rings (1) are straight and fit against the straight wall of the follower and spool. The inner walls of these snap rings are beveled, forming a cone. Next to the snap rings are the wall rings (2), the sides of which are beveled to fit the cones of the snap rings. These are called wall rings because they form the inner walls of the snap rings. They are uncut, non-expansible steel rings. Between these wall rings there is placed a double-coned expansible ring called a wedge ring (4), which, with the wide ring (3) interlocked into each snap ring, forms the complete packing.



American Semi-Plug Piston Valve.

The wide ring performs two important functions: First, it carries the snap ring across ports while drifting, and, second, the wide ring holds the snap rings parallel to each other.

The operation of the packing is as follows: The wedge ring (4) is put in place under tension, so that it has a tendency to crowd the two solid wall rings laterally against the coned sides of the snap rings. This prevents the lateral wear of all rings. It will be observed that the angle of taper of the cones is much greater on the wedge than on the snap rings, and this is so arranged that the leverage of the double-tapered wedge ring crowding the solid wall rings against the cones of the snap rings is just sufficient to prevent the snap rings from any further expansion, but not sufficient to reduce their diameter. As the frictional contact of the snap rings against the walls of the valve chamber depends on the angles of these cones, it is evident that it can be varied to meet the requirements of the case.

When steam is admitted to the valve it passes through a number of small holes around the spool and enters beneath the snap ring, insuring its fit in the chamber, and then, by pressing out against the wedge ring, puts it in position to lock the snap rings. As the packing is free to move up and down in the piston groove there is always a fit, regardless of the position of the spool.

It is, therefore, evident that the snap rings will remain at the diameter of the cage at which they happen to be locked, unless it occurs that they are locked at a large diameter, when they will be crowded back to the smallest by the movement of the valve, and then they will remain at that diameter. So that there is no tendency to wear the chamber unevenly.

The valves are made for both external and internal admission, and the valve is used as a reversing gear by changing the steam from external to internal admission.

It is not intended that these valves shall bear against the bottom of the valve chamber, as that would distort the position of the packing on the spool and tend to produce uneven wear, but that they should be carried by the valve rod or other means, so that all of the work demanded of the packing will be that of maintaining a steam-tight joint.

STORAGE GRAIN ELEVATOR.

A reinforced concrete storage grain elevator has just been built at Baltimore, Md., for the Baltimore & Ohio by James S. Stewart & Co., contractors. No wood whatever was used. The capacity is 250,000 bushels, divided up into 130 bins, varying in size from 1,000 to 3,000 bushels, but most of them are of the smaller capacity. The bins are rectangular and have concrete walls varying in thickness. The thickest ones are 8 in. and the thinnest are 6 in. All are reinforced, both horizontally and vertically, by open-hearth, round steel bars; the horizontal bars are placed 1½ in. from each side of the wall and are figured to resist the bending stresses of the grain pressure. The corners of the bins are reinforced with large fillets, which provide for the concentrated loads on the cupola. The bin bottoms are hoppered above the concrete slab, which,

in turn, rests upon the concrete girders, the larger ones being 3 ft. wide x 6 ft. deep. The main columns of the basement, first and second story, are 42-in. octagons and are reinforced by spiral steel hoops and vertical steel bars.

The concrete mixture was as follows: All walls, 1-3-5; floor slabs, 1-2.5-4; cornice and projections, 1-2-3. A Smith mixer No. 2½ was used, and Northampton, Dexter, Universal and Dragon cements were employed. The concrete was not waterproofed.

The foundation consists of a single, enormous concrete slab, extending over the entire area and projecting several feet beyond the building line of the elevator. To get on firm ground, which runs in strata on an incline, it was necessary to step the footings off from one corner to the diagonally opposite corner, increasing the thickness from about 6 ft. to nearly 15 ft. This footing is reinforced by steel bars running in both directions under the columns on the top and bottom planes.

Wooden forms were used in all the work, and these were very heavy and well braced, owing to the heavy monolithic construction throughout. They were wet well before the concrete was poured. A set of movable forms were used in molding the bins, and they formed an interesting feature of the construction. These forms were so constructed that they could be raised as the work progressed, and the four sides of each of the square bin forms, therefore, comprised four interior sides of one bin. A large number of these forms were employed, and as they were always placed at the same level they formed the walls of the bins.

Grain Elevator; Baltimore & Ohio.

The architectural effect of the outside of the elevator is improved over that of the usual plain elevator design by concrete pilasters, corners, gables and moldings. The enclosed wall of the cupola and train shed were made with Knapp Bros. Manufacturing Co.'s Trusset metal lath, plastered inside and out with a 2-in. coat of Portland cement. The framework of the cupola and train shed is of structural steel. The windows are galvanized-iron framed with ¼-in. wire-ribbed glass. The interior doors are kalsomined and the exterior doors are corrugated galvanized steel of the roller type, provided with chain mechanism.

The elevator machinery is driven by Westinghouse 60-cycle, 440-volt, a. c. motors, and the elevator is lighted by electricity. There is a dust-collecting system and complete lines of steel spouting.

The Baltimore & Ohio unloads the cars, elevates the grain, weighs it and deposits it in bins. These bins are leased to numerous local dealers in Baltimore, who operate the bins just as if they were their own, sending in their teams and loading them with grain sacked out from the bins.

Forms in Position for One Floor.

For receiving, there are two tracks, each having two unloading pits of carload size. The grain is unloaded by power shovels and then the operator pulls a lever opening a gate, which allows the grain to be discharged onto a 30-in. rubber-belt conveyor, below the car pits, and the conveyor belts transfer the grain to the bottom of the elevator legs, which lift it to the top of the cupola. From the head of the legs it is discharged into the garner and held until the weighman is ready. At the proper time he pulls a slide and allows the grain to drop into the scales from the garner. There are two hopper scales, each of 1,000 bushels capacity, with printing attachment on recording beams.

After the grain is weighed it is discharged into any one of the bins directly from the scales through spouts. Underneath the bins are two stories, the upper one being the less sacking floor, where the grain is drawn off from the bins and sacked by eight 3-bushel Richardson automatic bagging scales. These scales are arranged in a row on steel tracks which run under the bins. Using automatic scales, the operator may bag seven bags of three bushels each every minute.

On the sacking floor there are three 24-in. belt bag conveyors for carrying the sacks across the building and discharging to the teams underneath. There are three driveways under the elevator and one alongside under an awning to accommodate teams.

The contractors designed and made the plans under the supervision of M. A. Long, Architect of the Baltimore & Ohio, and the entire work was carried out under the general supervision of A. M. Kinsman, Engineer of Construction of the Baltimore & Ohio.

RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY,
Professor of Economics, Harvard University.

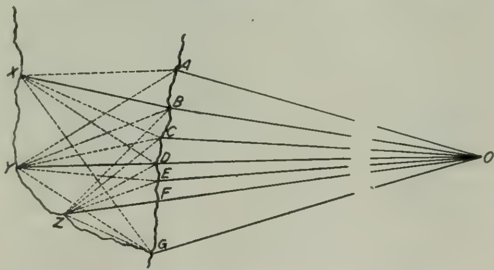
CHAPTER II—*Continued.*

The jobbing or wholesale business of the United States exemplifies the most highly involved and complex details of commercial competition. In this field it appears most clearly that, as is so often alleged, railway traffic managers hold the welfare of entire communities, as it were, in the palms of their hands. In all the cases heretofore cited, great natural forces outweighed the purely personal and human ones. Soil, climate and mineral resources more or less completely determined the final outcome of commercial competition. But the distributive business of a country is more largely artificial. It is more subject to human control, and may be influenced by personal considerations. Shall the economically dependent Southern planter be supplied with manufactures of all sorts,—from harnesses to tin dippers—from Mid-Western cities like Cincinnati and Chicago, or from Eastern centres, such as New York and Baltimore? This is the underlying economic issue raised in the celebrated Cincinnati Freight Bureau Case in 1894; in the course of whose determination the Supreme Court of the United States raised the more immediate and pressing question of the authority of the Interstate Commerce Commission to regulate rates at all. In the dust raised by the controversy over this purely legal question, the basic economic dispute was lost to view.* Shall the people of the Pacific slope be supplied with hardware and analogous products from their own large cities which buy at wholesale from the East, break bulk at San Francisco or Seattle and ship out to smaller towns in less than carload lots; or shall the distribution take place at the hands of jobbing houses located several thousand miles away at Chicago or St. Louis? This is the economic dispute raised in the St. Louis Business Mens' League case.† The very existence of San Francisco as a commercial center may depend upon it. For the primary and secondary operations of commerce are often complementary. At the large cities, concentration of raw staples moving inward entails naturally back loads outward at low rates for manufactured goods distributed by jobbers. Or taking the smaller places, the farmer will of necessity buy his cotton cloth, sugar and coal in the town to which he drives by wagon to deliver his cotton, corn or wheat.‡

The entire puzzling class of cases dealing with the southern basing point system are primarily concerned with such issues as these. Three distinct classes of cases arise. There is, first, the competition between cities of equal size, be they large or small, such as Memphis, Tenn., and Little Rock, Ark.; Danville, Va., and Lynchburg; or Cleveland, Ohio, and Cincinnati; secondly, the rivalries between large cities and what may be called secondary local centers in the same part of the country,—such as Seattle, Wash., vs. Spokane; Chicago vs. Burlington, or Dubuque, Iowa; or Atlanta, Ga., vs. Macon; and thirdly, the intense rivalries between the great first-class cities, like New York, Philadelphia, and Chicago, and the rest of the field, big and little.¶ The mail order houses, the express business and the parcels post intervene at this point. But in all of these issues, series of no less than three separate transportation costs have to be totalized and kept more or less on a parity. The intricacy is increased by reason of the fact that shipments must be made, first at wholesale to the jobbers, and thereafter usually in less-than-carload lots to retailers. If the carload rate be relatively too low, with reference to the rate on small lots, the jobbers near the market will be upbuilt and the jobbers at a distance cannot compete. If the opposite relation obtains, the jobber in a distant great city will be able to ship out small orders cheaper than the local dealer can obtain them by carload and, breaking bulk, peddle them from his own town. So narrow is the margin of profit on staple goods that a difference of a fraction of a cent per pound may exclude a dealer from the field entirely. This question of carload ratings is, however, treated elsewhere; impinging, as it does upon matters of freight classification.

The rivalries of jobbers and middlemen in different cities are inevitably borne into the offices of traffic managers. Were all railways equally interested in all cities alike, the matter need not go further, engendering railway rivalries. But such is seldom the case. Hardly a road can be named, whose interests are not more or less identified with some particular city. Commercial rivalry thus at once leads to railway competition. Four or five railways, like the Chicago and Northwestern, radiate out to the west from Chicago, and have no interest in St. Louis. Almost as many, like the Missouri Pacific, go out from St. Louis without entering Chicago. Others, like the old Union Pacific, and formerly the Atchison system, only come to the Missouri river, and consequently wish to upbuild their eastern termini, Omaha or Kansas City. Only a few, like the Illinois Central, reach them all. Such a road is usually called upon to act as a mediator in all disputes. "It is a continual struggle between the line from Kansas City to St. Louis, with no interest in Chicago, and the line from Kansas City to Chicago with no interest in St. Louis," as one witness before the Industrial Commission phrases it. Compromise is the only outcome. And in this manner an involved structure of differentials is built up, oftentimes top heavy and always susceptible of collapse on the defection of any party to the agreement. When a truce was patched up between the Trunk Lines and the Gulf roads after the sugar rate war of 1905, it is said to have taken twenty experts three entire days merely to "line up" rates on a parity between the competing jobbing centers.

The simplest compromise in any dispute over rates between competing centers is the concession of absolute equality or,



Traffic Conditions in Missouri River Territory.

as it is called, of flat rates between all points irrespective of distance. This shifts the burden from the carriers and places competition entirely upon the shoulders of the merchants. Oddly enough, also, this result of equal rates regardless of distançe between various competing centers, especially when they are secondary distributing or concentrating points rather than original sources of traffic, may sometimes evolve naturally out of commercial conditions imposed by tariffs built up upon the basis of distance. The accompanying theoretical diagram, based upon actual traffic conditions prevalent in Missouri river territory, serves to illustrate the way in which,

*Both cases are reprinted in Railway Problems, pp. 145 and 179.

†Reprinted in Railway Problems, pp. 405-441.

‡This is interestingly shown in Interstate Commerce Reports, No. 861, decided August 23, 1906.

¶ Thus, from testimony before the Senate Committee on Interstate Commerce, 1905, pp. 2538 and 2550: "What we claim is that we should not have our territory stopped at the Ohio river by any act of yours. It is not stopped, gentlemen, by any other river in America. It is not stopped by the greatest river, the Mississippi. It is not stopped by the far greater river, the Missouri. It is not stopped by the Arkansas; it is not stopped by the Rio Grande. It is not stopped even by the Columbia; and, even in the grocery business, it is not stopped by the Hudson. There are Chicago houses that are selling goods in New York City, groceries that they manufacture themselves. Mr. Sprague's own house sells goods in New York City, and Chicago is selling groceries in New England. As I say, even the Hudson river doesn't stop them."

under certain circumstances, such equalization of rates may take place. Two groups of cities are here represented as though lying respectively along two river valleys north of their separation at a point G. Let us call them the Mississippi and the Missouri for purposes of identification. The starting point is equality of rates from such a distant point as New York (O) to all places along the Mississippi from A to G. Such equality properly arises in theory from the substantially equal distance from New York. In practice also under the Trunk Line rate system* such equality prevails, inasmuch as the rates from New York to such a series of Mississippi river crossings is fixed at 125 per cent. of the rate from New York to Chicago. By a similar course of reasoning, namely, the approximately equal distance from New York (O), rates from that place to a second series of points along the Missouri river should be and are in effect made equal. From these two facts it logically follows that the balances of the rates from all points on the Mississippi river out along an extension of their lines from New York toward the west should also be equal. This is obviously in conformity with the mathematical principle that equals subtracted from equals leave equal balances. Thus the rates B X, D Y and F Z are compelled to equality. From this relationship in turn follows still another. All rates from any point on the inner series of towns to any point whatsoever on the outer western series of places along the Missouri river must remain equal regardless of distance. For each line from New York to A, B, C, D, etc., wishes of course, to participate in business not only on the direct extension of its own line but to as many other points as possible.† Without some agreement, however, it would normally enjoy traffic only on the direct extension of its own line. The point Y would most naturally be reached by way of C, D or E, over the shortest routes. Competitors on either side would similarly enjoy an advantage in more direct lines from New York to the places immediately beyond them. Thus for business from New York to Z, the more direct lines through E, F or G would obviously have an advantage over lines which passed around through A, B, C or D. An almost irresistible incentive to cut-throat competition would exist. The only way the lines east of the inner circle can peaceably partition business to the outermost western points is by an agreement to make *all* rates between the inner and outer circles the same. In this manner the rates from A to Z or from G to X are reduced to an equality with the rates offered by the shortest route between the two rivers, which, in this case, is E Z. The rate for this shortest line then becomes the basic one, upon which all the others depend.

The foregoing economic reasoning underlies the actual tariff system prevailing in what is known as Missouri river territory.‡ Two great streams separating at St. Louis form the eastern and western boundaries of Missouri and Iowa. All along the two edges of these states are located important river cities, each of which has more or less direct communication with every other crossing on the other river, over a complicated system of interlaced lines. There are no physical barriers, the country being plain and open. The starting point and basis of the whole scheme is the shortest direct distance between the two nearest points, namely Hannibal, on the Mississippi, and St. Joseph and Kansas City, on the Missouri. At these points the two rivers are approximately two hundred miles apart. For this distance the base rate of 60 cents per hundred pounds, first class, is fixed by common agreement. Were local business only to be considered and were the railways not competing, the rate between other points on the two rivers at greater distances apart, such as for instance, Burlington on the Mississippi, and Omaha on the Missouri, might be determined on a relative distance basis, as in Trunk Line territory. But the commercial fact is that a large proportion of the business between all these points consists of long distance traffic from the eastern seaboard which may cross the Mississippi at any one of these gateways between Dubuque and St. Louis on its way to the cities on the Missouri river. All of these through long distance shipments must, of course, enjoy the same competitive rate to the ultimate western destination on the Missouri river. And, inasmuch as the rate from the east to the Mississippi crossings is everywhere the same, namely 125 per cent. of the New York-Chicago rate, it follows that the balance of the rate from these points on to the Missouri river across Iowa and Missouri, irrespective of distance, must likewise be the same. In other words, the rates between all these Mississippi and Missouri river points must be equalized irrespective of the length of the intervening route, whether it be two hundred miles by the shortest direct line from Hannibal to Kansas City across Missouri, three hundred and fifty miles from Burlington to Omaha across Iowa, or even seven hundred miles by the roundabout line of the Illinois Central skirting both states. In brief, every railway which touches both rivers, however circuitous its route, is compelled to quote the same rate from every point on the Mississippi river to every other point on the Missouri. This rate must be the one fixed, as already described, for the shortest direct line, namely 60 cents per hundred pounds first class. Furthermore, in precisely the same way that these rates to Missouri river points from the eastern seaboard are built up and equalized, the rates from Chicago to the same Missouri river points must be kept even. The rate through from any one of the long chain of Mississipi gateways must be the same irrespective of distance. This figure, by common agreement, has for many years been 20 cents per hundred pounds higher than the rate across Illinois to the Mississippi river gateways from Chicago alone. The dominant note of this whole tariff is equalization of rates between all points in competition with one another over all possible routes. Freight thus moves freely in every direction and all markets are held on an absolute parity.* It is one of the most remarkable features of American commercial organization, this practical elimination of the element of distance from interstate trade over wide areas.

The possible evil lurking in too widespread an acceptance of the principle of the flat rate is clearly apparent in the reasoning of the Eau Claire, Wisconsin, lumber case.† This town complained of the disability under which it labored in shipping lumber to Missouri river points in camparison with other places round about. It appeared in the evidence that as early as 1884, under arbitration, all the rates from competing centers had been adjusted on the basis of differentials; and that, as interpreted by the carriers, the purpose of these differentials was to even up the differences between competing towns; to the end that all manufacturers should be put upon an equality in the consuming territory. But this necessarily involved the practise of penalizing or nullifying in a way the advantages of location. "If Eau Claire could produce lumber cheaper than Winona or La Crosse then the latter points were to have a lower rate in order to enable them to compete." This practise the Interstate Commerce Commission condemned at that time; and it has consistently adhered to the precedent then laid down. Obviously any other general course of action would be analogous to hobbling the fleetest horse in a race to bring him down to the rate of progress of the slowest laggard. The principle of the handicap applied within moderate limits makes for an exciting athletic contest; but if it be overdone, it eliminates all interest from

*Described in detail with a map showing trunk line percentages in Ripley, Railway Problems, pp. 309-333. This map was reproduced in the preceding issue of the *Railroad Age Gazette*.

†This process is described in detail in the chapter on Economic Wastes in Transportation, in Ripley, Railway Problems, p. 501.

‡This is exhaustively described in a paper by Robert Mather, President of the Rock Island Co.; published in *Annals American Academy of Political Science*, April 11, 1908; afterwards reprinted in the *Railroad Age Gazette*.

*Another illustration in the Southern States is given in the Savannah Fertilizer case reprinted in Ripley, Railway Problems, p. 293. *cf.* also the Eau Claire lumber case, in Ripley, Railway Problems, p. 216.

†Decided in 1892; reprinted in Ripley, Railway Problems, pp. 203-223. *Vide*, especially, p. 219.

the contest whatever. The race becomes one, not of skill or endurance in running, but of securing a sufficiently liberal handicap. Competition to be of advantage in the way of progress must always have in view the survival of the fittest and the elimination of the unfit.

The vast extent of the United States, the necessity of transporting commodities great distances at low cost and the progressiveness of railway managers, has led to an extraordinary development of the phase of rate making above-mentioned. The principle of the flat rate, based upon the theory that distance is a quite subordinate, if not indeed entirely negligible, element in the construction of freight tariffs under circumstances of competition, was fully accepted twenty-five years ago. J. C. Stubbs, traffic manager of the Harriman lines, speaking of transcontinental business in 1898, clearly expressed it as "the traditional policy of the American lines as between themselves to recognize and to practice equality of rates as the only reasonable and just rule....regardless of the characteristics of their respective lines, whether equal in length or widely different." It is the theory upon which the southern basing-point system is founded; and it is the common practice in making rates into and out of New England—being in fact vital to the continued prosperity of this out-of-the-way territory. President Tuttle, of the Boston & Maine, has most ably supported this principle of equality of rates irrespective of distance. "It is the duty of transportation agents," he says, "to so adjust their freight tariffs that, regardless of distance, producers and consumers in every part of this country shall, to the fullest extent possible, have equal access to the markets of all parts of this country and of the world, a result wholly impossible of attainment if freight rates must be constructed upon the scientific principle of tons and miles." This is the principle of the blanket rate attacked in the famous Milk Producers' Protective Association case in 1897; and it is the practice which has been so fully discussed of late, as generally applied to lumber rates from the various forest regions of the United States into the treeless tract of the Middle West. The principle, while applied thus generally in the construction of tariffs, is of far greater applicability in the making of special or commodity rates. Under such rates the bulk of the tonnage of American railways is at present moved. The essential principle of such special rates, constituting exceptions to the classified tariffs, is that of the flat rate; namely, a rate fixed in accordance with what the traffic will bear, without regard to the element of cost, that is to say, of distance.

(*To be continued.*)

In presenting his estimates for the coming year the Prussian Minister of Public Works named as one of the obstacles to reducing expenses the necessity of keeping all regular employees, however much traffic may fall off. The only reductions in this, the chief part of the force, is by leaving unfilled vacancies caused by death, resignations, etc. In this way, however, the force was reduced in number about 10,000 between December 1, 1907, and December 1, 1908. For the coming year the number of employees will be about 496,000, whose pay will amount to 801 million marks (an average of $384 per man).

WILLIAM A GARRETT.

William A. Garrett leaves the Seaboard Air Line on November 1 to become Vice-President of the T. H. Symington Co., Baltimore, Md. Mr. Garrett went to the Seaboard Air Line early in 1907 with a well-founded reputation as an organizer. This was what the road needed, but ready money was needed still more. It could not be raised and the road had to be put in the hands of receivers, Mr. Garrett continuing as chief executive officer for them. As far as can be judged from statements of current earnings, without detailed unit figures, the property is now on the way toward building up the sound credit which will be necessary before it can fully serve its territory.

William A. Garrett.

Mr. Garrett was born in 1862. He began railway work as a messenger boy in a ticket office on the Ohio & Mississippi, now part of the Baltimore & Southwestern. He worked in different departments in the St. Louis Union Depot until he became Assistant Superintendent. In 1893 he went to the Terminal Railroad Association of St. Louis as Superintendent, being also Terminal Superintendent of the Wabash, and after the first year also Superintendent of the St. Louis Merchants' Bridge Terminal. In 1896 he was made Superintendent of the Western division of the Wabash, and in 1897 he was transferred to the Middle division. He went to the Philadelphia & Reading in 1899 as Superintendent of the Philadelphia division. In 1900 he was made Superintendent of the New York division and in 1902 became General Superintendent. The next year he was appointed General Manager of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern. In the fall of 1906 he was elected First Vice-President of the Seaboard Air Line, and on the death of Alfred Walter, a few months later, was made President. He has been active in the American Railway Association and has served on a number of its committees.

His ability to straighten out and build up an operating department earned for him his rapid promotion on the Reading. He maintains strict discipline and brings out the best there is in his subordinates, being quick to notice and encourage those who show initiative and do not hesitate to take responsibility.

ELECTRIC TRAIN STAFF ON THE SOUTHERN PACIFIC.

The use of the electric train staff by the Southern Pacific in the snow shed district of California is of interest because this is the most extensive installation of this apparatus in America; and this and all installations of controlled manual apparatus on single track are of interest just now because the Northern Pacific,* in introducing the space interval on 1,000 miles of its road (single-track), has chosen to use no electric apparatus of any kind for controlling the mechanical operations which are performed by the signalman. We have therefore made somewhat full inquiry of the officers of the Southern Pacific as to their experience with the staff.

The fundamental principle of the electric train staff is well-known.†

It was first used on the London & North Western in 1889 by Webb and Thompson, but the functions of the apparatus are about the same as those of Tyler's tablet apparatus, which was in use ten years earlier. The staff, either from superior merit or by better commercial pushing, seems to have come into use more widely than the tablet, and it is to be found not only throughout Great Britain, but in Australia and other eastern countries. The principle is employed not only by the firms above mentioned, but by Sykes and other English firms, who have supplied apparatus for railways in Russia, Japan and elsewhere. The reason why these other countries have adopted the staff so much more extensively than have American railways is explained by some on the ground that these countries are slower than we are; and by others on the ground that we are the slower. Both explanations are in some degree right. English railways and those which follow the English pattern do not attempt to do a heavy traffic on single-track. If trains must be frequent, a second main track is built. The staff, therefore, is not called upon to perform lightning changes when trains meet. An American railway officer wants his trains to meet without wasting more than 15 seconds, and of course in such circumstances the staff cannot fill the bill without expensive additions which no railway financial board has yet seen fit to authorize.‡ On the other hand, those roads which do wish to use the staff with the least delay to trains put up apparatus for delivering the staff to engines at high speed and for receiving from engines at any speed. That is a simple appliance which American railroads thus far seem loath to take the pains to introduce. We are so enterprising and progressive that we change our locomotives or our clearance standards or some other feature so often that we cannot equip our locomotives so readily as can the conservatives of Scotland and New South Wales.

In this country, where every railway officer is acquainted with automatic block signals, the most obvious argument in favor of the staff is that in places where block sections are not required to be short it can be more cheaply and quickly installed than can any other system equally simple and safe. Assuming the cost of $500 a station, a line of 20 stations costs for apparatus $10,000; and if these 20 stations are six miles apart (114 miles of road) the cost is no greater than for the same number of stations on 19 miles, except for the 95 miles of additional telegraph wire.

But the officers of the Southern Pacific seem to have ample funds for automatic block signals, and they are erecting new automatics all the time. Their testimony in favor of safety, convenience and general satisfactoriness of the automatic system indicates that they would be satisfied with such signals on any single-track line in any situation. They have hundreds of miles of line where there is little need of having agents nearer together than 15 to 30 miles, while yet it is often desirable to run over these lines long, heavy and fast trains within 10 minutes of each other—a situation which gives the automatic system a great advantage. We must, therefore, give full weight to the declaration of the officers that, at the time the staff apparatus was put in, the necessity of having agents on duty at regular intervals on this line for the purpose of supervising the work of the fire patrol in the snow sheds was an important if not the ruling element in their decision to adopt the staff. It will not be surprising, therefore, if after the other important lines of the company are equipped with automatic signals, we shall hear that automatics have been substituted for the staff in the snow sheds.

As before intimated, the present account of the staff aims principally to enable the reader to intelligently compare it with the triparite manual blocking which has been introduced on the Northern Pacific.

The Southern Pacific line worked by the staff extends from Loomis, Cal., eastward to Truckee, Cal., 94 miles. The system was put in use in August, 1905. That part of the line west of Loomis, which for the last three years has been worked by the staff, is now double-track, and is equipped with automatic block signals. Of the 94 miles, a length of 29 miles (Tunnel 13 to Emigrant Gap) is covered almost continuously by snow sheds. The stations are from two to three miles apart, as shown in the table on following page.

The grade eastward for most of the distance is 2.2 per cent., ascending, or about 116 ft. to the mile. The eastbound trains are heavy and cannot run faster than about 15 to 25 miles an hour, while westbound the speeds are also rigidly held low on account of the steepness of the grade.

In the snow sheds every engineman receives notice by fixed signals of his approach to a block station, and these signals tell him whether or not he is to enter the side track. In entering a side track, the train is stopped before reaching the switch and the front brakeman goes forward to set it. After leaving a side track the train must stop and wait for the rear brakeman to set the switch straight. The distance from the switch, measured by freight-car lengths, is marked at intervals both ways from the switches—east from the east switch and

*See *Railroad Age Gazette*, February 19 and 26.

†The train staff in its original form was a stick of wood (or metal) about 20 in. long, to be given to the engineman of a train to signify that he had the right of track between two stations, the names of the stations being painted or engraved on the staff. This right is absolute, regardless of time or of any rules or conditions, making time-tables unnecessary, so far as safety is concerned. A train running from A to B would have a certain staff; and then from B to C another staff of different shape or color, and so on. If two (or more) trains were to be run from A to B before any train returned from B to A, the engineman of the leading train, having seen the staff, received his authority in the shape of a ticket; and the second or last train would take the staff, together with any remaining tickets belonging to that section. To obviate the inconvenience which was caused under this arrangement, whenever the staff and its tickets happened to be at the wrong end of the section, the electric train staff apparatus was devised. In this system each station has a pillar containing a mazagine of staffs, say from 10 to 35, and, by electric locks, properly connected from station to station, it is made possible to secure the right of the road at any time from either end of a section, yet never from but one end at the same time. That is to say, the withdrawal of a staff from a pillar at either station at once locks the pillars at both stations so that no other staff can be taken out until the one already out is replaced either at one station or the other. No staff can be withdrawn at any time except by the joint action of the operators at the two stations. To move a train, say, from A to B, the operator at A, closing an electric circuit, rings a bell at B; the operator at B closes a circuit to acknowledge the receipt of this bell signal; and, holding the circuit closed, deflects a needle at A, thus informing A that his instrument is energized by a current from B; and A then takes the staff out of the pillar. In this process of removal the operator at A displays a disk in the machine which gives a visible indication of what has been done, and he also reverses the polarity of the operating current, which throws the instruments at A and B out of synchrony. Whenever the staff is returned to the pillar, whether at A or B, the machines are again synchronized and another staff can be taken out. To take out a staff occupies a period of about five seconds, and to put one in, two seconds.

‡The ideal arrangement for controlled manual signaling on single-track would be to have a double-track for a half-mile through the station; switches at both ends, provided with home and starting signals suitably interlocked, and worked electrically from the office in the center; distant signals at the approaches; derails at each outlet to prevent a train from starting until the signalman, having assurance that the block is clear, has cleared the signal; and electrical means for checking the signalman from the other station. Being thus checked he can keep the staff in his office, instead of delivering it to the train. Having taken out a staff for a train, he can (using the staff as an instrument) clear the signal and close the derail. The clearing of the signal should lock the signal lever so that the signal cannot be cleared again till the train has reached the other end of the block. The controlled manual systems without continuous track circuit cannot protect against the danger of assuming that the whole of a train has arrived when a part has been accidentally detached, of course, unless the staff is carried through and unless, in whole or in part, it is carried on the rear car. And it cannot protect against broken rails unless the signals are controlled by a track circuit extending throughout the block.

west from the west switch—on the inner walls of the sheds, plainly visible to the enginemen, to enable them to stop at the right place for the rear brakeman to regain his place on the train.

On that part of the line which is in the sheds the staff stations are in a little building outside but opening into the shed. Throughout their length the sheds are open enough to let in some daylight and for passengers in the cars to see out; yet dark enough to make "light" signals available throughout; and no semaphores are used.*

A staff to be delivered to an engine is put into a rubber tube which is hung to an iron ring about 15 inches in diameter, and this the signalman hangs on a crane at the side of the shed, from which the engineman or fireman, according to which side of the road the staff is found, takes it by running his arm through the ring. Just before doing this he drops to the ground the staff which he has brought from the station in the rear.

Immediately on receiving the staff the engineman gives a whistle signal, one long and one short blast. The head brakeman is required to be on watch and to stop the train immediately if this signal is not given at once. This duty having

SOUTHERN PACIFIC CO. (*Pacific System*).
List of Staff Stations—Truckee to Loomis.

Stations.	Distance, miles, Between stations.	Distance, miles, From Truckee
DN Truckee	0.0	0.0
T Champion	3.56	3.56
DN *Tunnel 13....	4.08	7.64
T Eder	2.19	9.83
DN Lake View ...	1.80	11.63
DN Summit	2.70	14.33
T Soda Springs .	2.96	17.29
DN Spruce	2.81	20.10
T Troy	2.02	22.12
T Tamarack ...	2.00	24.12
DN Cisco	3.51	27.63
T Crystal Lake .	2.16	29.79
DN Yuba Pass ...	2.08	31.87
T Smart	2.76	34.63
DN *Emigrant Gap	1.50	36.13
T Fulda	2.05	38.18
DN Blue Canon ..	3.15	41.33
T Oral	2.64	43.97
DN Midas	2.08	46.05
T Gorge	2.29	48.34
DN Towle	1.80	50.14
DN Dutch Flat ...	2.63	52.77
DN Gold Run	2.12	54.89
T Magra	3.35	58.24
DN Caporn	2.61	60.85
T Wirt	2.26	63.11
DN Colfax	2.25	65.36
T Lander	3.08	68.44
DN N. Eng. Mills..	1.97	70.41
T Applegate	3.31	73.72
DN Clipper Gap...	2.97	76.69
T Bowman	3.41	80.10
DN Auburn	3.30	83.40
T Zeta	2.98	86.38
DN Newcastle	1.91	88.29
DN Penryn	3.18	91.47
DN Loomis	2.88	94.35

*All stations from Tunnel 13, to and including Emigrant Gap are in snow sheds.

DN—Day and night telegraph office.

T—Day and night telephone office.

been assigned to the front brakeman, the conductor and the rear brakeman have no specific duty in connection with the staff.

These operations being duly carried out there is, of course, no delay to make a stop if the block is clear. If a long train is waiting at a station on the siding, having arrived before the block in advance is clear, there may be delay in delivering the staff to the engineman, who perhaps may be several hundred feet from the office. With any system of this kind each station should have lap sidings and trains should always enter so that while waiting the engine will be near the office. This is not the case at all stations on the Southern Pacific. This dealing with waiting trains is the only serious cause of delay. If a staff, when thrown or dropped off the engine, should accidentally drop down into a gorge a thousand feet deep, as is possible in some places in the Sierra Nevada mountains, traffic would be out of gear on that block until the signal maintainer could be found, to restore equilibrium of the machines by taking out another staff. A staff lost where possibly a mischievous person may find it, produces, of course, an undesirable situation.

As with any system of electric signal apparatus, the wires must be so arranged that circuits formed by the crossing of wires or currents from any foreign or unauthorized source cannot so disturb the apparatus as to make possible the giving of a clear signal wrongfully. With the staff, for example, a cross must not close an electro magnet in such a way as to let B take out the staff without first asking C. On the Southern Pacific the wires from station to station have been put in a cable to guard against this.

With the staff as used on the Southern Pacific and the A. B. C. rules as used on the Northern Pacific, there are a number of interesting comparisons.

On both roads absolute blocking is the invariable rule. The signalmen do not have to trouble themselves with the complication of having two trains in a block at once.

On the Southern Pacific the staff is delivered to and taken from the engine alone and the signalman does not have to communicate with the conductor. On the Northern Pacific the block card has to be delivered in duplicate—to the engine and to the rear of the train. The conductor, however, does not have to surrender the card at the outgoing end of the block. The arrival of the rear part of the train there is certified in the usual way by the signalman as the markers pass his window; or, if the train is on the siding short of the office, by word of mouth or hand signal from the conductor.

On both roads at present trains must run slowly enough to permit the staff or card to be taken on by hand. On parts of the Northern Pacific, where speeds are not limited by the grades, there is in use a new and simple apparatus for taking on the cards at any speed. On other parts of the road cards are fixed in rattan hoops. These are frequently lost however. They can be delivered at twenty-five miles an hour readily enough, but for entire convenience every operation should be prepared for in such a way as to entirely eliminate the question of speed of trains.

On both roads all trains, so far as rights are concerned, are on an absolute equality. On the Northern Pacific an engineman or conductor receiving a card can often guess by the engine number shown in an "exception" on the card what train he is to meet at the next station; but on the Southern Pacific he has absolutely no information. Until he reaches the approach signal he does not know whether or not he will be required to meet any train, or even whether he must stop. This arrangement, it hardly need be said, is the antidote for one of the worst uncertainties of the train order system.

The two systems are alike in training enginemen to the habit of invariably getting something into their hands from the signalman at each station before leaving that station. The difference between the simplicity of this plan and the complexity of time tables and train orders is so great that it is difficult to make a comparison. The American railway trainman, who has always run by train orders, finds it hard to appreciate the simplicity of the staff; while the Englishman, who has always used the staff, is appalled when he hears of the mental task that is imposed on American freight conductors when they receive a half dozen poorly written tissue sheets at 2 o'clock in the morning.

On the Southern Pacific the staff always gives full right to

*The signal used was described in the *Railroad Gazette* of September 18, 1903. It is a lamp fixed to the side of the shed, having a single bull's-eye; and this is made to give either of two color indications by dividing it horizontally into halves of different colors, and by providing shutters by which the halves may be alternately blinded. The shutters are moved by a solenoid. Sufficient power for this is furnished by one cell of storage battery or five cells of gravity battery. The clear indication can be given in a little over one second of time. At the approach to a station having a side track, there are two signals, fixed one above the other, on the same post. The indications are as follows:

Upper signal red and lower yellow.—Train must stop and take passing track.

Upper green and lower yellow.—Train will proceed cautiously along main line prepared to stop at staff crane.

Both upper and lower green.—Train may proceed along main line expecting to secure staff and right of track through the next block.

The upper signal is made semi-automatic by means of a track circuit between the fouling points of the side track switches so that it cannot be cleared unless that section of track is unoccupied. Each signal is also provided with a distant signal of the same type, situated approximately 1,000 ft. for up-grade trains and 1,500 ft. for down-grade, in the rear of the home signal. This distant signal is also interlocked with the outside switch so that it shows yellow whenever the switch is out of position, or whenever the home signal is at red. Each station is also provided with an indicator, fixed over the operator's table, showing red when the track is occupied, or when any switch is set for the siding.

the next station, subject to no modification until the train reaches the approach signal at the next station. This signal has to be watched for, of course, like any fixed signal; and it modifies the authority of the staff to the extent of selecting the track which is to be entered and (if the main track) whether or not the train will be required to stop. On the Northern Pacific the right given may be qualified in a similar way, but the qualifying information is given not by an approach signal fixed in position, but by a written statement which is found on the card when it is received at the starting point (entrance of the block). It may also be qualified further by a direction written on the card to meet an opposing train or to be passed by another train moving in the same direction, or to pass another train headed in the same direction, at an intermediate siding which is not a block station.

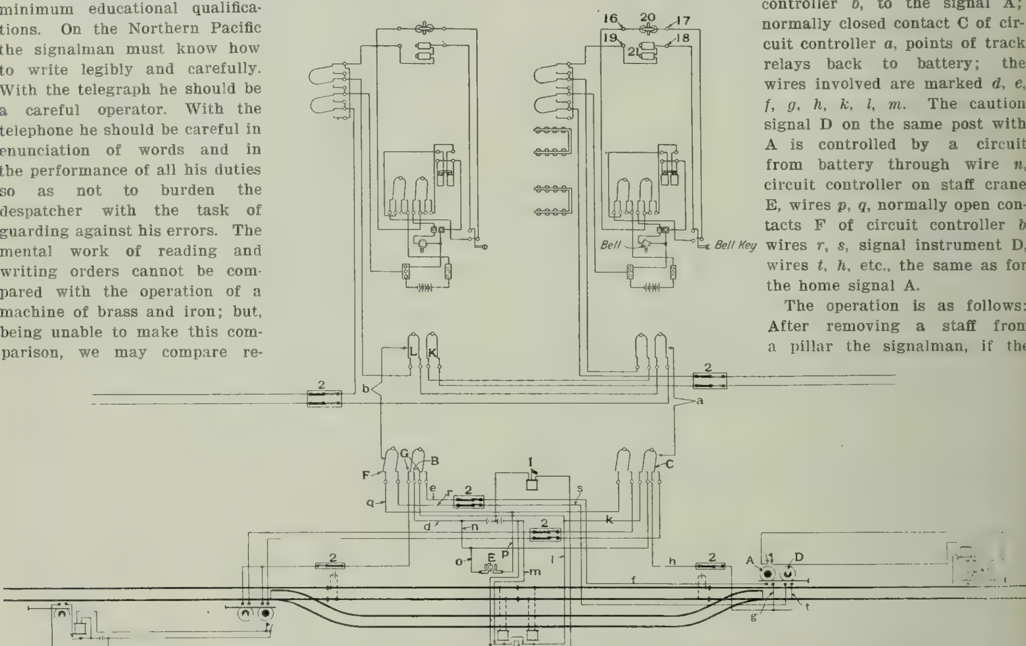
The operations of signal men are quite different as between the two systems. The staff could be worked by a man with minimum educational qualifications. On the Northern Pacific the signalman must know how to write legibly and carefully. With the telegraph he should be a careful operator. With the telephone he should be careful in enunciation of words and in the performance of all his duties so as not to burden the despatcher with the task of guarding against his errors. The mental work of reading and writing orders cannot be compared with the operation of a machine of brass and iron; but, being unable to make this comparison, we may compare results; and thus far the men have made a good record.

The despatcher has substantially the same work with either system, except that, naturally, or from force of habit, he will watch for any error on the part of a signalman to whom he is sending orders, whereas with the staff he has no orders to send, except those which are required to put the less important train on the siding where meets are to be made (which train is not always that one which is running in the inferior direction).

On the Southern Pacific the orders from the train despatcher to the signalman for the movement of a train are given verbally, no specified form being used. The despatcher usually says, for example, "Head No. 3 in," or "Put No. 4 on Siding." This is not recorded on the train sheet, nor is it repeated back to the despatcher. At all regular scheduled meeting points, or meets under normal conditions the signalmen, without directions from the despatcher, set the signals for the proper train to take the siding. That is to say, the signalman operates under the rules unless he is in doubt, in which case he asks the despatcher for instructions, or unless the despatcher wishes to modify the normal operation of the station by issuing special instructions for the meeting of trains.

The circuits used to control the signals at the Southern Pacific staff stations are shown in the drawing. The circuits for the staff instruments proper are shown in the upper part of the drawing and are in no way peculiar to the Southern Pacific, except for the circuit controllers *a* and *b*, which are repeated in the lower part of the diagram.

In order to expedite traffic the signals and circuits shown in the lower part of the drawing are used at all staff stations. These signals are controlled by the circuit controllers (*a* and *b*) and also by track circuits. The outer or distant signals merely repeat the indication of their respective home signals. Each home signal, A for example, is controlled by a circuit from the battery through a normally open contact, B of circuit controller *b*, to the signal A; normally closed contact C of circuit controller *a*, points of track relays back to battery; the wires involved are marked *d*, *e*, *f*, *g*, *h*, *k*, *l*, *m*. The caution signal D on the same post with A is controlled by a circuit from battery through wire *n*, circuit controller on staff crane E, wires *p*, *q*, normally open contacts F of circuit controller *b* wires *r*, *s*, signal instrument D, wires *t*, *h*, etc., the same as for the home signal A.



Circuits for Electric Train Staff and Approach Signals at Train Staff Station—Southern Pacific.

References: 1, Indicator; 2, Lightning arresters; 16, 17, 18, 19, Terminals; 20, Polarized indicator; 21, Neutral indicator.

The operation is as follows: After removing a staff from a pillar the signalman, if the train is to go through without stopping, inserts the staff in one of the staff-operated circuit controllers, say *b*. This unlocks the circuit controller and the operator turns the handle, thereby closing contacts B and F and opening contacts G, K, L. This clears signals A and M (provided there is no train on the station track circuit) and opens the line circuits of both staff instruments. The signalman now withdraws the staff from the circuit controller and suspends it from the staff crane, thereby closing circuit controller E and clearing signal D. When the staff has been caught by the passing train circuit controller E opens automatically, thereby setting signal D at caution. Before the signalman can again manipulate either of his instruments he must restore circuit controller *b* to its normal condition as the main line circuits for both staff instruments were opened by the reversal of this circuit controller, thereby setting signal A at stop and signal M at caution.

Should the signalman desire to stop the train before delivering the staff he would omit to put it in the crane, but would

reverse the circuit controller *b*. In this case signal A would show green and signal D yellow, which would inform the engineman that he was to proceed on the main line prepared to stop at the staff station. If signal A were to show red and signal D yellow it would constitute an order to enter the siding.

Seven maintainers are employed in the district between Roseville and Truckee in addition to a district foreman. These men, in addition to caring for the staff system, maintain the fire alarm system and the district telegraph system in use between Oral and Truckee, as well as telephones and crossing bells.

During the busy times of 1907 this line was worked to its full capacity and the train despatchers were often kept busy continuously for many hours arranging meeting points and giving the instructions to the station operators as to what trains should be held on the side tracks. In the last six months of 1907 the eastbound freight movement averaged 234½ cars a day, westbound 215 cars.

At the present time the line is not so crowded. A sample signalman's register, that made at Emigrant Gap, for the 24 hours ending at midnight, December 3, 1908, shows 11 trains eastbound and 17 westbound, seven of the westbound being empty engines. The leaving times of these trains at Emigrant Gap were as follows:

Eastbound.*	Westbound.*	Eastbound.*	Westbound.*
1:23 a.m.	E., 2:45 a.m.	P., 6:20 p.m.	L., 2:21 p.m.
3:52 "	4:08 "	P., 8:01 "	E., 3:40 "
P., 4:07 "	E., 5:35 "	....	P., 4:57 "
P., 6:08 "	P., 6:38 "	....	E., 6:01 "
7:50 "	P., 7:41 "	....	L., 8:03 "
9:20 "	E., 8:40 "	....	E., 8:27 "
12:09 p.m.	E., 12:10 p.m.	....	8:53 "
L., 2:22 "	12:47 "	....	P., 12:02 a.m.
P., 6:00 "	P., 12:58 "		

*P., passenger; L., local freight; E., empty engine.

NOTES ON RAILWAY ELECTRIFICATION.*

BY JOHN A. F. ASPINALL.

General Manager of the Lancashire & Yorkshire Railway.

III.

TRAIN RESISTANCE.

On account of the many difficulties of determining accurately the resistance of electrical trains, tests were taken by running a train up to full speed, shutting off the current, and allowing it to coast until it came to rest. Measurements of speed were taken at 5-second intervals, Fig. 5.

The mean curves of several tests for 2, 3, 4 and 7-car trains are plotted out on Fig. 6, and the chief figures are shown in the following table. In each case allowance has been made for the effect of gradients, and the tests were made in both directions to eliminate as far as possible the effects of head winds.

It may be noticed that curves 2 and 3 do not follow paths parallel to curves 1 and 4, but they are true representations of the figures obtained. They are probably due to sudden variations in the wind.

Of course curves 1-4, Fig. 5, give the train resistance, including the part used for locomotive purposes, but to compare with steam stock this part should be eliminated, and this has been done by taking the difference between two motor-cars

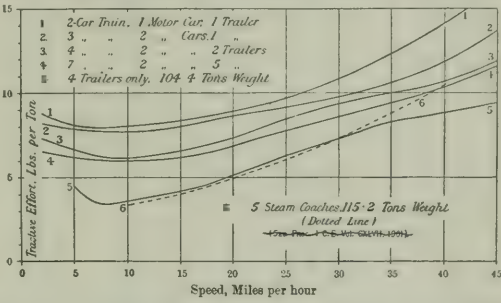


Fig. 5—Time Speed Curves for 2-,3-,4-,5-,6 and 7-Car Trains.

and one trailer, and two motor-cars and five trailers. Assuming the train resistance of the two motor-cars and one trailer to be the same in both cases, the train resistance in lb. per ton of the extra trailers is shown in curve 5, and the chief figures in the following table. Curve 5 gives figures which are comparable with steam practice, values of which are shown in curve 6, which is taken from the Proceedings of the Inst. Civil Engineers, vol. cxlvii, part 1, "Aspinall on Train Resistance," for a train of 5 coaches of similar weight.

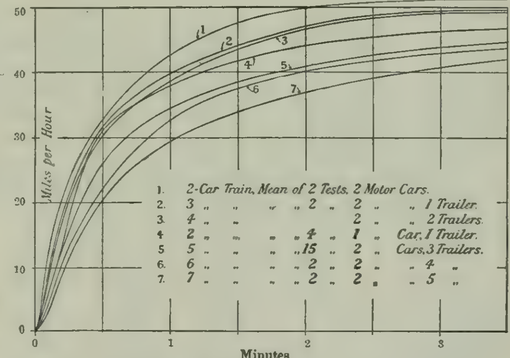


Fig. 6—Tractive Effort for 2-,3-,4 and 7-Car Trains.

PARTICULARS OF ACCELERATIONS FOR 2 TO 7-CAR TRAINS. (*See Fig. 5.*)

No. of cars in train.	Composition of train: Motor cars.	Trailer cars.	Max. speed in m.p.h.	Time in seconds to attain miles per hour: 10 miles.	20 miles.	30 miles.	40 miles.	50 miles.	Speed in miles per hour after minutes: ½.	1.	1½.	2.	2½.	3.	Mean acceleration up to— Minutes: ¼.	½.	1.	Miles pr hour: 10.	20.	30.
2	2	..	51.5	5	11.5	25.5	49.5	120	32.5	42.75	47.75	49.8	50.5	51.2	2.3	1.59	1.04	2.92	2.54	1.72
3	2	1	49.625	7	14	27.75	60	..	31.5	40.0	44.2	46.9	48.6	49.4	2.8	1.54	0.97	2.09	2.09	1.59
4	2	2	49.25	7.5	15	29	65	..	30.3	39.0	43.75	46.5	48.2	49.2	1.95	1.472	0.95	1.94	1.94	1.51
2	1	1	46.75	9.5	17.5	28	72	..	31.0	38.5	41.8	44.0	45.3	46.3	1.71	1.52	0.69	1.54	1.67	1.56
5	2	3	44.75	9.5	20.75	40	106	..	25.6	34.65	38.5	41.0	42.7	43.8	1.56	0.92	0.847	1.54	1.4	1.09
6	2	4	43.875	11.5	26	50	116	..	22.0	32.8	37.6	40.3	42.0	43.1	1.29	1.09	0.803	1.27	1.12	0.88
7	2	5	42.0	13.0	30	64	162	..	20.0	29.4	34.0	•37.0	39.3	40.9	1.14	0.978	0.72	1.12	0.95	0.68

PARTICULARS OF TRAIN RESISTANCE. (*See Figs. 5 and 6.*)

Curve No.	No. of cars.	Composition of trains: Motor cars.	Trailer cars.	Weight of train, tons.	Length of train: ft.	ins.	Train resistance at various miles per hour in pounds per ton: 5.	10.	15.	20.	25.	30.	35.	40.	45.
1	2	1	1	71.537	121	8	8.5	8.0	8.5	9.0	9.5	10.75	12.5	14.0	.....
2	3	2	1	117.175	183	4	7.75	7.75	8.0	8.6	9.0	9.75	10.5	12.0	13.75
3	4	2	2	143.275	248	6	6.5	6.0	6.5	7.25	8.5	9.25	10.0	11.0	12.0
4	7	2	5	221.575	430	0	6.25	5.75	6.25	7.0	7.75	8.5	9.5	10.5	11.5
5	4	Trailers only.		104.4	246	8	4.52	3.55	4.18	5.2	6.34	7.09	8.36	8.81	9.45
6	5	*Ord. bogie coaches.		115.2	285	0	....	3.3	...	5.0	....	7.4	.....	10.5	.....

*See *Proceedings*, Institution of Civil Engineers, Vol cxlvii, 1901.

Tests for acceleration were carried out by running the trains up to speed under service conditions, the speed being taken as

*From the Presidential address before the Institute of Mechanical Engineers, April 23, 1909.

before. In addition, readings were taken at 5-second intervals of current, line volts, and volts across the motor terminals.

From the speed curves thus obtained, the acceleration in feet per second per second was obtained.

Motor Miles and Motor-Car Miles.

Half-year ending:	Motor miles: 150-h.-p.	125-h.-p.	Total motor miles.	Motor-car miles.
June, 1906	4,649,334	153,642	4,802,976	1,261,154
December, 1906	4,957,064	413,409	5,370,473	1,467,970
June, 1907	4,712,348	575,440	5,287,788	1,483,095
December, 1907	4,884,060	710,066	5,594,126	1,585,227
June, 1908	4,861,612	618,862	5,480,474	1,539,671
December, 1908	4,788,910	699,206	5,488,206	1,554,518

The following table gives the cost for repairs, wages, repairs materials, stores, inspection, general maintenance of all electrical equipment and motor bogies, electrical equipment of trailers, but exclusive of trailers and the coach bodies of the motor cars, *i. e.*, it is a true representation of the cost of maintenance of the motive power portion of electric rolling stock:

Mileage Between Overhaul.

Half-year ending:	Standard bogies, miles.	Whls. bet. turning up of tires, miles.	150-h.-p. armature, miles.	All classes armature bear'gs, miles.	Life of Brushes, miles.	Life of Shoes, miles.	Life of Brake blocks, miles.
June, 1906.	17,750	.....	.....	.....	11,000	.....	1,683
Dec., 1906.	28,800	39,000	124,000	44,000	11,680	112,500	1,784
June, 1907.	32,700	38,000	115,000	41,700	12,640	127,300	1,915
Dec., 1907.	32,600	49,400	87,300	49,000	15,550	116,000	2,150
June, 1908.	32,800	42,300	128,000	63,000	13,300	78,500	2,320
Dec., 1908.	28,500	30,300	171,030	87,100	10,900	102,000	2,680

The original diameter of commutators was 17½ in., the present average diameter being 16⅝ in., representing a loss in diameter of ⅞ in., or about 0.175 in. per annum, 0.003 in. per 1,000 miles; about one-half of this being due to wear, and one-half to turning up. The commutators can be worn down at least to 15½ in. diameter, so that their total life will probably be about twelve years.

Half year ending:	No. of motor-cars, end of half-year.	No. of motors.	Wages: Total. £	Wages: Per motor-mile. d.	Materials: Total. £	Materials: Per motor-mile. d.	Wages & materials: Total. £	Wages & materials: Per motor-car. £	Wages & materials: Per motor. mile. d.	Total cost per motor. 125 or 150 h.-p. £	Oil—All classes, per 1,000 motor-miles, gals.	Average No. of miles per motor car per annum.
June, 1906	51	178	3,458	0.173	3,016	0.151	6,474	127	0.324	36.4	0.605	49,456
December, 1906	52	180	4,885	0.218	4,656	0.208	9,541	184	0.426	53.0	0.504	56,460
June, 1907	52	180	4,902	0.223	5,097	0.231	9,999	192	0.454	55.5	0.514	57,042
December, 1907	60	212	5,395	0.231	4,239	0.182	9,634	161	0.413	45.4	0.605	52,840
June, 1908	64	228	5,168	0.226	4,184	0.183	9,352	146	0.409	41.0	0.730	48,114
December, 1908	64	228	4,362	0.191	3,119	0.136	7,481	117	0.327	32.8	0.777	48,598

WEIGHT OF ELECTRICAL EQUIPMENT ON ELECTRIC TRAINS.

Composition of train.	System of control.	Weight of motors, lbs.	Weight of electrical equipment,† lbs.	Weight of electrical equipment,‡ lbs.	Total weight not including passengers, lbs.	Ratio weight electrical equipment to weight of motors.	Weight of electrical equipment to total weight, per cent.	Seating capacity.
Motor car	Direct	26,200	32,900	39,816	103,040	1 to 1.26	31.95	66 and 69 .
Motor car	Multiple unit	26,200	......	......	113,120	....	.....	68 and 80
Motor car	Multiple unit.*	8,680	15,008	16,212	49,280	1 to 1.73	32.85	70
Trail car	....	.....	644	.....	58,240	....	0.935	66, 80 and 90
2 motor cars, 1 trail car	Direct	52,400	64,960	80,276	264,320	1 to 1.27	25.20	204 and 218
2 motor cars, 2 trailers	Direct	52,400	66,988	80,864	322,560	1 " 1.28	20.80	270, 284 and 298
2 motor cars, 3 trailers	Direct	52,401	67,732	81,508	380,800	1 " 1.29	17.80	336, 350, 364 & 378

*For Liverpool overhead service.

† Including motors. The weight of auxiliary apparatus, such as vacuum pump motor, etc., is not included, since this does not form part of the electrical equipment for tractive purposes.

‡Including motors, auxiliaries, and part weight of motor bogies. Part weight of bogies is included, so as to make the weight of the electrical equipment compare with steam practice. The trailer-car bogies are taken as being sufficiently strong for running purposes, and the extra weight of the motor-car bogies as being required for locomotive purposes.

Tests to Show Relative Properties of Various Third-Rail Materials.

Rail.	Lancashire & Yorkshire Ry.	North Eastern Ry.	Piccadilly & Brompton.	Metropolitan.
Tensile tests:				
Tons per sq. in.	24.3	23.7	22.1	25.1
Pr ct. elongat'n on 3 in	40.0	35.0	37.0	34.0
Per cent. contraction	76.0	69.5	69.5	69.5
Impact test by Izod machine, ft.-lbs.	12.2	9.9	2.0	13.1
Abrasion tests, relative losses: (1)	1.0	0.703	0.414	0.958
(2)	1.0	0.66	0.96	0.706
(3)	1.0	0.6	0.98	0.5
Average	1.0	0.654	0.755	0.721
Corrosion—Relative loss:				
In distilled H_2O	1	1.71	1.57	1.71
In salt water	1	1.18	1.09	1
Resistance compared with copper	7.23	7.32	7.29	8.39

Resistance of 3d and 4th Rails.

Weight of rails ....70 lbs. per yd.
Area of cross-section. ....6.84 sq. in.
Electrical resistance (average, 69 tests), 7.23 times that of pure copper.

	C.	Si.	S.	P.	Mn.
Chemical analysis	0.045	Trace.	0.04	0.046	0.23

Resistance of 1 mile of unbonded main line track (single) with ordinary fishplate joints .... = 2.8 ohms.
Of solid rail, per mile .... = 0.043 ohm.
1,000 yds. of 3d rail, inc. joints and bonds (avge) = 0.02416 ohm.

Ratio of resistance of 1-ft. of solid rail to 1-ft. of rail containing a joint bonded with new bonds...... = 1 to 1.57
With all-web bond strands cut.......... = 1 to 2.4
With all strands cut except 6.......... = 1 to 7.26
With all strands cut, fishplates only .... = 1 to 1182
The three last values demonstrate the value of good maintenance on bonding.

WEAR AND CORROSION OF 3D AND 4TH RAILS.
(3d being Live Rail; 4th being Return Rail.)

Place.	Rail.	Position.	Date laid.	Present weight, per yard.	Percentage of loss of weight.	Present sectional area, sq. in.	Percentage of loss of area.	Loss of area By wear, sq. in.	Loss of area Per ct. by wear.	Loss, area by Corrosion, sq. in.	Percentage of loss of area by corrosion.	Percentage ratio of loss by Wear.	Percentage ratio of loss by Corrosion.
Liverpool	3d	Up main line.	Jan., '04	59.30	15.28	5.93	15.28	0.39	5.57	0.68	9.71	36.45	63.55
	3d	Turntable siding	" '04	61.90	11.57	6.30	10.00	....	....	0.70	10.00	.....	.....
	4th	Up main line.	" '04	58.50	16.43	5.92	15.43	....	....	1.08	15.43	.....	.....
Liverpool*	3d.	Down main line.	" '04	56.8	18.86	5.76	17.71	0.39	5.57	0.85	12.14	31.45	68.55
Waterloo	3d	Down main line.	" '04	65.00	7.14	6.50	7.14	0.24	3.43	0.26	3.71	48	52
	3d	Crossover road.	" '04	65.20	6.85	6.48	7.43	....	....	0.52	7.43	....	....
	4th	Down main line.	" '04	66.90	4.43	6.62	5.43	....	....	0.38	5.43	....	....
Crosby	3d	Down main line.	" '04	65.70	6.14	6.46	7.71	0.25	3.57	0.29	4.14	46.3	53.7
	3d	Crossover road.	" '04	67.60	3.43	6.75	3.57	....	....	0.25	3.57	....	....
	4th	Down main line.	" '04	67.80	3.14	6.70	4.28	....	....	0.30	4.28	....	....
Altcar Rifle Range	3d	Down main line.	" '04	67.00	4.28	6.62	5.43	0.15	2.14	0.23	3.29	39.47	60.53
	3d	Siding.	Aug., '04	66.50	5.00	6.67	4.71	....	....	0.33	4.71	....	....
	4th	Down main line.	Jan., '04	69.10	1.28	6.86	2.00	....	....	0.14	2.00	....	....
Formby	3d	Down main line.	" '04	66.40	5.14	6.62	5.43	0.13	1.86	0.25	3.57	34.2	65.8
	3d	Siding.	July, '05	69.30	1.00	6.85	2.14	....	....	0.15	2.14	....	....
	4th	Down main line.	Jan., '04	70.10	Nil.	7.00	Nil.	....	....	Nil.	Nil.	....	....
Ainsdale, 15 M. P.	3d	Down main line.	" '04	66.3	5.29	6.63	5.29	0.14	2	0.23	3.29	37.84	62.16
Southport	3d	Down main line.	" '04	62.30	11.00	6.35	9.28	0.13	1.86	0.52	7.42	20	80
	3d	Crossover road.	" '04	65.90	5.86	6.71	4.14	....	....	0.29	4.14	....	....
	4th	Down main line.	" '04	66.90	4.43	6.83	2.43	....	....	0.17	2.43	....	....

*Near Ex. Station Junction.

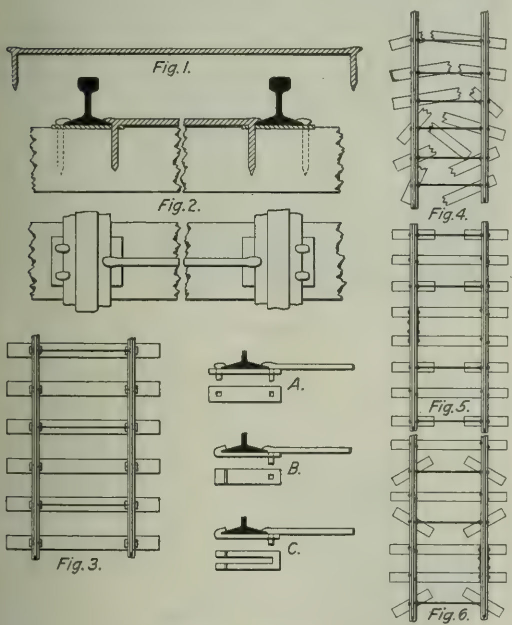
A SUGGESTION FOR TIE RODS.

BY H. HERDEN,

Chief Engineer, Buffalo & Susquehanna.

It seems that in spite of many devices to replace the wooden tie with one of steel, stone or concrete, the wooden tie will stay with us for a long time yet, but we may have to strengthen or reinforce it, as we reinforce a concrete beam.

A wooden tie, even when new and sound, is very flimsy material compared to the strength of rail and rail-fastenings. Placing a tie-plate under the rail was a great improvement, and yet we have thousands of miles of nothing but frail fibers of wood between the rails, which wood is supposed to determine the gage of the track, but does not, since the gage is principally dependent on the soundness and resisting quality of the tie at the particular spot where the rail is fastened to the tie. We know what happens when a rail is subjected to lateral pressure from a heavy and fast moving load and



Herden Tie Rod.

we will suppose, in this instance, that the outside rail in a curve is subjected to such action while the inside rail at the same time has only to resist a force acting in a vertical direction from the moving load. What happens then is that the outside rail has a tendency to move outwardly, being prevented by tie-plate and spikes, which in turn depend on the resisting quality of wood, which becomes weaker every day from age and service; while the vertical force acting on the inside rail is practically wasted so far as it might be applied in assisting the outside rail to resist that pressure. Either rail may be subjected to such lateral pressure and one might be pushed off entirely from the tie, tie-plate, spikes and all, without disturbing the opposite rail.

It follows, then, that if spikes and tie-plates offer a certain resistance to being moved laterally, this quality at both ends of the tie should be combined against either rail having a tendency to move outwardly. There is not much danger of rails moving towards center of track under traffic; all the difficulty is due to the flange of the wheel, and this unavoidable pressure against the rail increases with high speed, heavy loads and imperfect track.

To prevent a rail from moving outwardly or better, to increase the factor of resistance, the maximum or limit of which we should be able to express in pounds (which we cannot, if the resistance depends on the fibers of a half-decayed tie), and to prevent the spreading of rails or extension of gage-distance, it is suggested to hook opposite rails together by means of a rod as shown in Fig. 1. This tie-rod consists of a straight piece of steel of rectangular or other section with bent ends that are to all intents and purposes two inside spikes integrally attached to rod. The spike-ends of this rod are inserted in inside holes of tie-plates of any preferred type, or plates made especially for this purpose, and then driven into the tie like any other spikes, with the difference, however, that such spikes as shown in Fig. 1 would go home more true than is usually the case. If, now, both rails are loaded and one of them should be subjected to lateral pressure from the wheel, the gage could not widen without breaking the rod or tearing up a tie-plate, which would certainly make detection of track spreading very easy, if it ever should occur. The tie-plate shown in Figs. 2 and 3 does not represent any particular type of plate and therefore only the general outlines of a tie-plate are indicated. It is evident that if such a tie-rod were used all spikes and plates at both ends of a given tie would combine to resist the outward motion of either rail and prevent the spreading of track within the limit of strength of metal employed. Lateral motion of rails would be reduced to a minimum if all parts were made to fit closely, and the result would be a track with uniformly parallel rails and permanent gage distance. Fig. 2 shows the compactness and simplicity of the device.

Fig. 3 would represent this tie-rod applied in main track, spacing of which would depend on the given conditions. In sharp curvature where it is the practice to increase the gage distance, rods of proper length corresponding to the increased gage distance would be used.

This tie-rod having its position on top of tie could not interfere with track work and could be applied or removed conveniently with the usual track tools. While it might take less time to drive the tie-rod home than it takes to drive two common spikes, it is quite possible that it would be more difficult to remove it in the same time it takes to pull out two spikes.

Fig. 4 with the tie-rods left out would give a fair representation of a mix-up as it sometimes will occur on the best regulated railway. The purpose of the tie-rod here would be to repair a wrecked track temporarily for slow speed in the shortest time possible, especially when new ties are a long distance away from the scene of wreck. If rails have not been injured, or only slightly, they may be hooked together very rapidly by means of this rod, using plates as shown in A, B or C, which, of course, are not tie-plates, strictly speaking. Such plates need not be stronger or heavier for this purpose than enough to equal the tensile strength of the rod. With plates B or C no spikes would be required for a temporary expedient. Every section might be equipped with a certain number of tie-rods for wrecking purposes; they could be easily carried on the hand car. Of course, any form of tie-plate would answer for wrecking purposes, but plates A, B or C, or plates similar to these would be cheaper, lighter and more easily and quickly applied, being perfectly flat and conveniently driven under rail. The tie-rod, being a gage in itself, would space the rails properly. Such rods with plates could be carried on trains for emergency purposes.

Fig. 4 suggests using short ties in side tracks, temporary tracks or storage tracks where the roadbed is well-seasoned, to save tie material; such tracks are shown in Figs. 5 and 6. Here short ties alternate with long ties. In Fig. 6 short ties slant at an angle of about 30 degs. to long ties. In either case the resistance to moving two opposite short ties laterally

to track in the same direction would exceed the resistance of moving one long tie, and particularly so in short ties, Fig. 6. More short ties could be used in perfectly uniform solid roadbed for the tracks mentioned, and a great saving in tie timber should be effected by the plan, as renewal of ties would affect sometimes only one side of track, and instead of throwing away a long tie that is decayed or defective at one end only, timber equal to 33 per cent. of a long tie would be taken out.

There are many advantages this tie-rod would have over one with shoes or sleeves or one bolted to web of rail. A rod as shown in Fig. 1 may be used at any time and anywhere between rails in track where spikes at inside of rail can be driven. If not already provided with the usual tie-plate, any plate of approved pattern that has a hole at the inside of the rail intended for a spike may be used, while certain types of plates of improved pattern would further add to the efficiency of the tie-rod. If track, during certain seasons when ties cannot be removed conveniently, should show signs of spreading, or if other defects are discovered in ties, a few rods may be quickly applied in such spots to insure safety until ties can be renewed.

A tie-rod as described should not be expensive, and the cost of two inside spikes should be deducted from it, the labor saved in maintaining the gage of track and inspection of same should go far towards cost of material contained between the spike ends of the rod, without taking other advantages into consideration. The tie itself should last longer with this rod, for the lateral outward motion of the rail would be greatly checked by the load on the opposite rail, so that the widening out of spike holes in the tie should be prevented to a great extent. In connection with a properly constructed tie-plate closely fitting the flanges of the rail, this tie-rod would act to a certain extent as an anti-creeper device when ties have a tendency to assume oblique angles to rail.

As the labor of fastening this rod in track would be equal to labor of driving two spikes, which would have to be driven in any event, the cost of laying or driving the rod should not be considered.

The Russian Minister of Transportation, Schaufusz, has been succeeded by S. W. Ruchlov, a man who has spent his life in various government offices, of which that of marine and harbors is the most nearly related to his present duties.

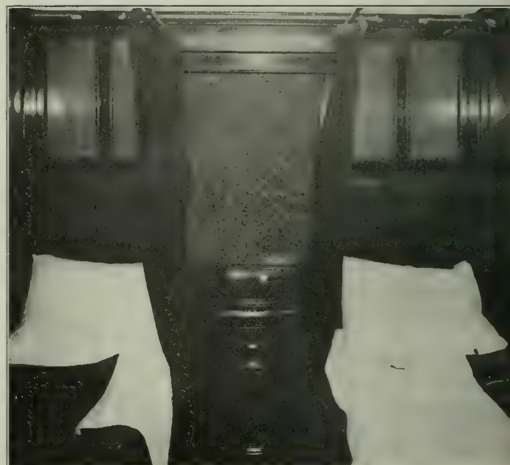
ENGLISH RAILWAYS.

BY WILLIAM WICKHAM TURLAY.

III.

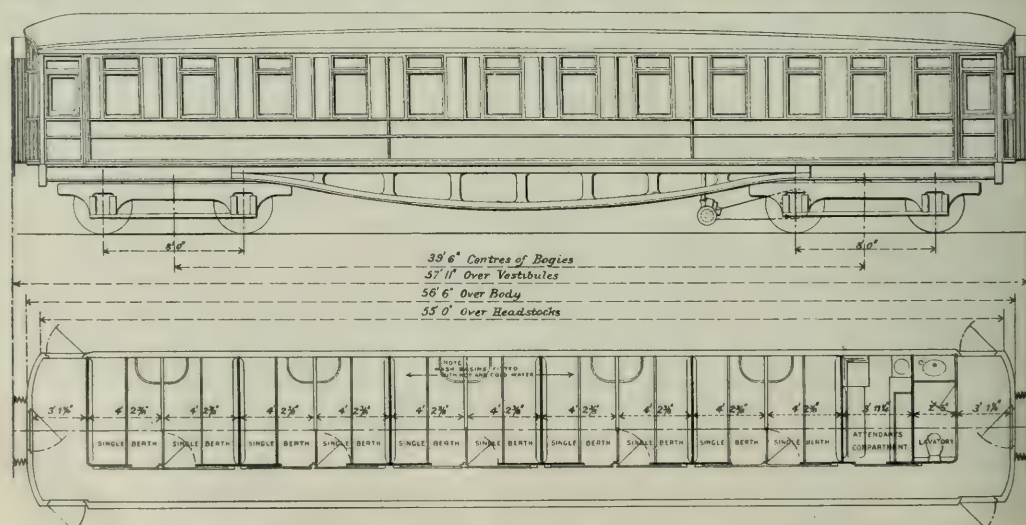
SLEEPING CARS.

English sleeping cars are all built with corridors and compartments, each compartment usually accommodating one person only, as there are no upper berths, though two adjoining



Two-Berth Compartment in Sleeping Car.

compartments can sometimes be connected by doors arranged for the purpose. There are toilet rooms at the ends of the cars and in addition each compartment has a wash-basin with hot and cold water. These cars are quite like the "Mann" sleeping cars, a few of which were built and introduced in America some years ago and afterwards bought by the Pullman Company, except that the Mann cars had an upper and



East Coast Joint Stock Sleeping Car. Built by the North Eastern Railway in 1906.

a lower berth in each compartment. The English sleeping cars are so much superior to the ordinary American sleeping cars, both in comfort and decency that no comparison need be made, but it must be remembered that the American cars each contain one or more staterooms, which afford privacy at a considerable advance over the usual charge. The charge per passenger for a night journey in an English sleeping car ranges from five shillings ($1.20) to 7½ shillings ($1.80), according to distance, and the passenger must also have a first class ticket, so that the actual cost of the compartment

Interior of Third Class Dining Car.

in the English sleeper for a traveler who would ordinarily ride on a second or third class ticket is greater than that of a berth in an American sleeper. Those who are unable or unwilling to pay so much are provided for by the railway companies in another way, as there is a system by which travelers of any class may rent pillows and rugs at six pence (12c. each) per night and may thus make themselves fairly comfortable at a small expense, especially if the ordinary compartments are not crowded. For this purpose the second and third class cars are really preferable, as the seats are not separated by arms and one can make himself very comfortable if able to lie down at full length on the seat cushions with his rug and pillow.*

Luncheon Basket.

It may be added that sleeping and dining cars in England are owned and manager by the railway companies themselves.

DINING CARS AND LUNCHES.

English dining cars are usually subdivided for pasengers of different classes and are clean and comfortable, though the interior decorations, which vary somewhat according to the class of the compartment, are not as elaborate as in American dining cars. The meals are served in courses and are good. The usual prices are:

Breakfast, 2s. 6d. = 60 cents.
Luncheon, 2s. 6d. = 60 cents.
Dinner, 3s. 0d. to 3s. 6d. = 72 to 84 cents.

The dining car waiter seems contented with a tip of three pence (6 cents) in place of the 25 cents which his colored brother in America looks for.

Basket luncheons are furnished at all important stations and can be ordered in advance by wire, without extra charge, by notifying the train conductor (or "guard," as he is called) or the station officials, and will be delivered on the train at any one of certain designated stopping places, so that the passenger is enabled to choose his meal hour. The scale of prices is as follows:

6d. = 12 cents.—Pot of tea or coffee, with bread and butter.
1s. = 24 cents.—Pot of tea or coffee, with bread and butter, cake, jam and cress or lettuce
2s. = 48 cents.—Cold roast beef, salad, fruit, bread and butter and cheese.
2s. 6d. = 60 cents. Hot roast meat—steak or chops—with vegetables (or one-half of a cold roast chicken, with ham or tongue, in place of the hot meat and vegetables, as desired), salad, ice (or fruit), bread and butter and cheese.

At an additional expense of sixpence (12 cents) a bottle of mineral water, ale or beer, or a small bottle of light wine will be added. The luncheons are packed in small partitioned wicker-work baskets or hampers, with covers, which contain also dishes, napkins, knives, forks and spoons, salt and pepper. These hampers may be left in the train or handed out to a porter at any stopping place. Between the dining cars and basket luncheons, besides the dining rooms and lunch counters at stations, the traveler has a considerable range of choice, and is enabled to consult both his appetite and his pocketbook. Like a good many other things which are done by English railway managers (whether from a wise policy of under pressure of public opinion) for the comfort of the ordinary traveler, the system of basket lunches must involve a good deal of troublesome detail, with little or no direct profit, and it may reduce the receipts of the dining cars. It was tried in a very small way on one of our New England railways some years ago, but discontinued, and it is not as easy or pleasant to eat in one of our open and often crowded American cars, under the observation of many people, as in the comparative privacy of a compartment.

(To be continued.)

THE ARICA-LA PAZ RAILWAY.*

Arica is the seaport town of Tacna, Chile, and has a population of about 3,000 inhabitants, communication being maintained between it through its port, with Valparaiso in the extreme south, and with Panama in the north.

Having already connected Arica with Tacna by railway, a distance of 39 miles, the Chilian government have long cherished the ambition of extending the line to La Paz in Bolivia, while the Bolovian government have been equally anxious, by this means, to get an outlet to the sea.

The enterprise to build this line, which has now been resolved on, will provide some engineering features of the greatest interest, since it will be necessary to drive it through or over the great mountain chain of the Andes, which shuts off Chile from the Argentine Republic and Bolivia. The first step in the general scheme of railway building in this territory was the Antofagasta and Bolivia Railway. The second was a connection with the Argentine system through the great spiral tunnel now being driven under the Uspallata pass, which will be opened to traffic in May of next year, admitting of the passage over the first trans-continental railway line in South America from the Atlantic to the Pacific. The third step will be the crossing of the Andes at one of the low passes above Copiapó to connect with the Argentine lines from Tucumán with the Bolivian system. Surveys have already been authorized, and work has been commenced upon this project. The fourth, and by far the greatest, engineering undertaking will be the Arica-La Paz line, the construction of which will cost the agreed sum of £2,334,395 ($11,671,975).

The route will follow the Valley of Lluta from Arica to the Inn of Incara, a distance of 104 miles. This latter station will mark the highest elevation in the passage of the Andes, and will also form the crossing point for the proposed Tacna

*The Editor's experience is that the arms separating the first-class seats can be raised at will, removing all obstructions.

*Abstract from an article in *The* (London) *Engineer*.

line. From the Inn of Incara the line will continue down to La Paz by a gradual decline a further distance of 188 miles, making the total 292 miles. The section between Arica and Incara will have an average gradient of 4.5 per cent., but at certain points, where a series of perpetual cascades of from 10 ft. to 15 ft. in height have to be followed, and measuring some hundreds of yards in length, the grade will be from 15 to 20 per cent. It has been found that by establishing a maximum gradient of 6 per cent. the greatest height of the line above the river will not exceed 160 ft.; and here the rack-rail system will be introduced. The minimum curve is 460 ft. radius, and there will be a considerable number of curves of about 500 ft. radius. In this section there will be 48 bridges and one viaduct, most of the former being built of stone arches of 15 ft. to 25 ft. span, while others will be of steel beams from 65 ft. to 100 ft. long. One bridge in particular will have to span a chasm of 150 ft. There will be 70 tunnels, with a total length of 5,000 yds., the longest being one of 175 yds.

The altitude of the Inn of Incara is 13,570 ft., and from here to La Paz there will be a down grade of some 1,660 ft. in 188 miles. It is expected that, taking the long steep climb and the subsequent descent into consideration, the 292 miles with passenger trains will take 14½ hours in transit. Beginning at a point 50 miles above Arica and ending at a point 71 miles still higher, there will be six locations of the rack rail, and in the section where the steepest gradients occur the total length of the rack rail will be 19 miles.

Mr. Josiah Harding, M. Inst. C. E., who made surveys of the whole route on behalf of the Chilian government, reports fluctuations of temperature on the elevated part of the line from 13 deg. below zero at sunrise to 100 above at noon, a range of 113 deg. in a few hours.

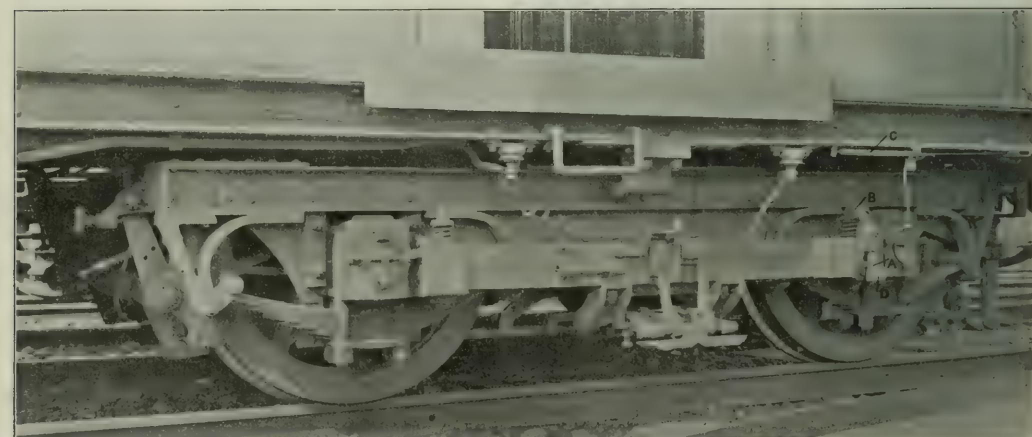
It is proposed to take the water of the Llula river about 60 miles above its mouth for a hydro-electric plant and convey it by pipe line to a point about 1,000 yds. below, within which distance there is a vertical drop of 250 ft. It is estimated that this will furnish sufficient power to run the trains from Arica to Umapalca, nearly 100 miles, and within seven miles of the summit, the Inn of Incara. Additionally it would serve to operate the yards and wharves in Arica, light the city and supply all the necessary motive power which might be needed for many years to come.

The contract for building this line has been secured by a British firm, Sir John Jackson, Limited. The company has joined with Griffiths & Co. (contractors), Limited.

The railway will be built at the same time from Arica, in Chile, and Viacha, near La Paz, in Bolivia, and the line will be divided into five sections, each section having been tendered and estimated for separately. By terms of agreement with the governments of Chile and Bolivia respectively, materials of every kind, machines and tools for the construction of the railway will be exempt from all import duties and all government and city taxes.

ELECTRIC SAFETY DEVICE ON THE BERLIN ELEVATED & UNDERGROUND RAILWAY.

An extremely simple but important safety device in connection with the supply of power to electric motor coaches is provided on the Berlin Elevated & Underground Electric Railway installed and equipped by Siemens & Halske, of Berlin. In case of any accident which might result in danger to the passengers or personnel of the railway by reason of electric shock from the third or live rail, the voltage of which is 750 volts above earth, it is of the utmost importance that there should be no delay in cutting off the current at the generating station. This can be secured either by telephonic communication or by short circuiting the live rail so that the automatic switch in the generating station will open and remain open. In the latter case it may not be easy to find suitable means for producing an effectual short circuit, and delay may be caused at a time when every moment is of importance.



Truck Equipped With Safety Device; Berlin Electric Railway.

Messrs. Siemens have therefore made provision for producing a short circuit at a moment's notice and without the slightest danger to the operator. The apparatus is shown in the accompanying illustration and consists of a substantial switch mounted on one of the axle-boxes which carry the shoe beam. This switch is marked *A*, and can be operated by means of a cord attached to the lever arm, *B*. A flexible wire ending in a spring, *C*, connects this cord with a suitable handle in the driver's compartment. In case of necessity the driver by means of his handle can pull the switch, *A*, so that the switch blade comes into contact with the block, *D*. This block is mounted on insulating material and is permanently connected to the collector shoe. As soon therefore as the switch is pulled over, the third or live rail is connected through the collector shoe to earth, the switch being mounted on the axle-box without any intermediate insulation, and the short circuit so formed will be maintained until removed.

General News Section.

The Pemigwasset House, the well-known hotel at the railway station at Plymouth, N. H., was destroyed by fire May 12, together with the station building. Loss $100,000. The hotel was owned by the Boston & Maine.

Certain railways of Georgia have instituted proceedings to test the constitutionality of the state law requiring engines on main lines to be equipped with electric headlights. The court has referred the matter to a special master who will give a hearing May 24.

A press despatch from Winnipeg says that a final agreement has been reached by the Canadian Pacific and the leaders of the shop men, who have been uneasy for many months, and that all of the men who have been out of work since the strike of last fall are to be reinstated at their former wages.

Representative Bowers, of Mississippi, has introduced in Congress a bill directing the Interstate Commerce Commission to make a valuation of the physical property of the railways of the country and embodying a number of amendments to the Interstate Commerce law. It is proposed to put telegraph, telephone, private car and dining car lines under the Act to Regulate Commerce, and to provide for the automatic suspension of new tariffs issued by railway companies in case a shipper protests against the rates.

A press despatch from Atlanta, May 17, says that all of the white firemen and hostlers employed on the Georgia Railroad have struck as a protest against the employment of negroes by the company. It is said that this is the opening of the campaign by labor unions to destroy the negro as an industrial factor. An officer of the road says that the plan has been smouldering for five years. General Manager Scott says the strike has not interfered with train service. The strikers say the road is badly crippled. The engineers will not aid the striking firemen.

The new train of the Chicago & North Western and the Union Pacific between Chicago and Denver, which began running this week, and which traverses the 1,059 miles between those cities in 29 hours 30 minutes, enables a passenger to travel from Denver to New York, 2,023 miles, in 48 hours 10 minutes. The train leaves Denver at 7.20 a.m. and arrives at Chicago the second day at 1.50 p.m. The passenger may leave Chicago by the 18-hour train over the Lake Shore at 2.30 and arrive in New York at 9.30 a.m. the third day. Westward the new train leaves Chicago at 5 p.m.

Acting under a law recently passed, the State Railroad Commission of Indiana is about to issue regulations for carrying medical supplies on railway trains. The law requires each train to have a case containing two gauze bandages, two triangular pieces of gauze 18 in. wide, and one pound of absorbent cotton. At a conference held by the Commission with railway surgeons, at which 100 representatives of the railways were present, the doctors presented several objections to the law. Dr. Ford, of the C., C., C. & St. L., said the law was not necessary, for the railways run through thickly settled territory and "surgeons are more plentiful than patients." Cotton is not always the best thing to use on wounds. If carried it should be put up in small packages, say 2 oz. or 4 oz.

Safety of Passenger Travel in 1908.

The Pennsylvania has published a summary of all accidents on the 11,235 miles of the Pennsylvania Railroad and controlled lines for the last calendar year, which shows that 141,659,543 passengers were carried and that not a passenger was killed as the result of an accident to a train. During the year the lines of the system carried 11,344,413 less passengers than in 1907—a loss of 7.4 per cent., but the total number of passengers injured in train accidents numbered only 102, a reduction of 452, or 81.6 per cent. from 1907; a striking illustration of the great increase in safety that has resulted from a moderate decrease in traffic. The figures suggest also how large a percentage of passenger-train mishaps is due primarily to troubles with freight trains, for it was in the freight traffic, not the passenger, that the shrinkage of 1908 principally occurred. Freight train mileage fell off about 25 per cent., and passenger train mileage about 5 per cent. Assuming 100 as the number of trains that can be run over a road under reasonable conditions—conditions for which the tracks, cars, engines, stations, facilities and personnel are by ordinary standards adequate, it would seem, from the experience of dull seasons, that 80 trains can be run with a great increase in safety while to run 120 trains involves a great increase in danger; the saving, on the one hand, and the loss, on the other, being all out of proportion to the difference in the number of trains.

The figures here given include every case requiring surgical or medical attention, however trivial; but they show that only one person out of every 1,388,819 passengers carried was injured. The passenger mileage during the year was 3,457,671,462, so that for each passenger carried one mile the proportion was 33,898,739 carried in safety to one injured. The passenger-train mileage was 58,440,449 miles. The fact that the millions of passengers carried were handled with such safety is made more significant by the fact that alongside the passenger trains, freight trains performed 60,293,996 train-miles. Of the subsidiary lines, independently operated (included in the foregoing) the record of the Long Island road is most striking. That line carried during the year 23,242,838 passengers and only 17 were injured in train accidents. Passengers carried one mile numbered 352,228,060. This line has now a record of 15 years without a fatality to a passenger due to a train wreck.

World's Largest Coal Company.

The Consolidation Coal Company, of Baltimore, has announced that negotiations have been completed for merging the Fairmont Coal Company, the Somerset Coal Co., the Clarksburg Fuel Co., the Pittsburgh & Fairmont Fuel Co. and their subsidiaries, all of which are now controlled by the Consolidation Co., including railways, floating equipment, docks and other property, thus creating one of the largest mining industries in the world. The companies own 200,000 acres of coal land in Maryland, West Virginia, Kentucky and Pennsylvania.

The capital stock of the combined companies is $37,650,000, exclusive of bonded debt and capital of subsidiaries. The company recently increased the stock from $10,000,000 to $20,000,000, of which increase $6,350,000 was disbursed as a 60 per cent. extra dividend and $3,400,000 was held in the treasury.

President Ripley on the Situation in the West.

On arriving in Chicago last week from California and other parts of the West where he had spent several months, E. P. Ripley, President of the Atchison, Topeka & Santa Fe, said:

"The western country is prosperous beyond all precedent so far as agriculture is concerned. Farmers have had a succession of big crops and big prices, and large areas of territory heretofore classified as arid are being profitably cultivated.

"The government irrigation work has also been immensely helpful and will be more so in the future in providing small farms of rich land. It is the only department of the government, by the way, that is conducted with some regard to business principles.

"The railways of the west have but one thing to fear—meddlesome and vicious interference in the conduct of their business by legislatures and commissions having no interest in the property and no knowledge of railway matters, elected not to do justice but for the sole purpose of getting as much as possible out of the corporations in increased service and reduced rates.

"As to the Santa Fe, it is making large improvements to

its existing lines and it is planning a few short branches in territories which are suffering for transportation, but is proceeding cautiously and will be ready to stop in case of further raids on it.

"I think that public sentiment has slightly changed and is less tolerant of persecutions of the railways, but there are some politicians who have not yet found this out."

Pennsylvania Railroad Forestry.

The Pennsylvania Railroad is planning to set out this spring more than 1,000,000 trees, making a total of 3,430,000 trees which have been planted in the last three years. Heretofore the company's forestry operations have been confined to a limited area between Philadelphia and Altoona. This year, however, 65,000 trees are being set out on tracts of land near Metuchen, N. J., and New Brunswick. There are to be planted within the next month 207,000 trees near Conewago, Pa., 186,000 in the vicinity of Van Dyke, 334,000 at Lewiston Junction, 7,000 at Pomeroy and 205,000 at Denholm.

Of the trees that are to be set out this spring 893,000 are red oak, 40,000 Scotch pine, 29,000 locust, 14,000 hardy catalpa, 14,000 pin oak, 5,000 European larch, 3,000 chestnut, 3,000 yellow poplar, 2,000 black walnut and 1,000 white pine. The bare places in the locust tree plantations, which were started some years ago, are being filled in with new seedlings, to follow as a second growth, after the older trees have been removed, for fence posts and other purposes.

The policy of encouraging reforestation on the part of the public has been actively pursued this spring. Some 151,000 trees have been furnished, practically at cost, to private corporations and individuals. In addition, 8,000 privet hedge plants have been supplied to private individuals. Privet hedge plants to the number of 7,000 are to be set out to ornament boundary lines along the company's right of way.

A special effort has been directed this season to growing ornamental shrubbery for use in parking the lawns around stations and unoccupied spaces along the roadway. To save the time required to grow these from seed, 6,000 plants have been imported from France. They will be placed in beds at the company's nursery at Morrisville, N. J. Part of them will be ready for transportation next year and the remainder in 1911.

At the Morrisville nursery alone approximately 1,250,000 trees have been dug, bundled and shipped to places along the railway. The area occupied by these trees has been plowed, fertilized and is to be replanted with about 200 bushels of acorns. Half a million coniferous seedlings, which were grown last year, are being set in transplant beds to remain for a year before being set out permanently. In addition to the above, there will be planted this spring about 100 lbs. of pine and spruce tree seed, which should produce about 1,000,000 plants. These in time will be transplanted to permanent locations.

United States Express Company.

Another suit has been brought against the officers of the United States Express Co. and against Thomas C. Platt, President, individually, to compel the opening of the books of the company for an inspection by representatives of certain stockholders. The articles of association, since this is not an incorporated company, provide that the officers need only call a meeting of stockholders in case two-thirds of the stockholders sign a request for such a meeting. At different times in the past there have been attempts made to get enough signatures of stockholders to compel a meeting but these attempts have been unsuccessful. The board of directors is a self-perpetuating body, and it is claimed that while the Platt family have been in control of the affairs and have received large salaries as officers, they have not held any large proportion of the stock, so that their interest in the earning power of the company is not of sufficient importance to outweigh advantages that they were able to obtain individually by giving business, for instance, to rival companies.

The original answer to the suit which is being brought by a Mr. Dudley says that James C. Fargo, President of the American Express Co., was made a director of the United States Express in 1901, but says he is no longer a director. L. C. Weir, President of the Adams Express, was also at one time a director of the United States Express. Mr. Fargo until recently represented 10,000 shares of stock of the United States Express, but both this stock and 9,060 shares of the stock held by Mr. Weir, as President of the Adams Express, were sold a short time ago to Frank H. Platt. The shares at present held by members of the Platt family, as shown by the books, amount to 21,340 shares, of which President Thomas C. Platt holds but 100 shares. The total number of shares outstanding is 100,000. The officers of the company deny any other object in the management of the company than the promotion of the best interests of the stockholders, and claim a perfect willingness to hold a meeting for the election of directors if two-thirds of the stockholders request it.

The report made by the company to the Interstate Commerce Commission showed gross earnings for the year ended June 30, 1908, of $16,983,638, and operating expenses of $16,945,904.

The question of granting a peremptory writ of mandamus to compel E. T. Platt to permit an examination of the company's books has been set for argument on May 20.

The Improvement in Business.

The *Wall Street Journal*, New York, reporting the result of a large number of inquiries, concludes that industrial conditions, as a whole, are now decidedly hopeful. Following are condensations of its more important reports:

W. E. Corey—The United States Steel corporation is operating about 70 per cent. of normal capacity, and indications are for a continued improvement in prices as well as production.

General Electric Co.—The corporation, since February, has been receiving orders at the rate of between $51,000,000 and $53,000,000 a year, and that orders in the current fiscal year are likely to reach $60,000,000, or equal to the boom year.

Republic Iron & Steel Co.—All the blast furnace capacity of the corporation is operating, and 75 per cent. of the finishing capacity.

Amalgamated Copper Co.—Sales of copper are large and at advancing prices.

Lackawanna Steel Co.—Operations close to 80 per cent. of capacity.

Westinghouse—More men at work than at any time since the panic.

American Smelting & Refining Co.—Big improvement in lead as well as copper, silver and other metals.

Allis-Chalmers Co.—Improving business.

American Steel & Wire Co.—Record-breaking orders have been received during the last two weeks.

Western Electric Co.—Large gain in business.

The International Harvester Co.—A normal business.

United States Cast Iron Pipe & Foundry Co.—Plants are running on a basis close to 85 per cent. of capacity.

Opening of the North Bank Line.

May 23 is the day announced for the opening of the Spokane, Portland & Seattle Railway from Portland, Ore., to Spokane, Wash. The line has been in operation from Portland to Pasco, on the Northern Pacific, about 240 miles, for several months, but now the remaining 150 miles into Spokane has been completed, and through Portland-Spokane trains will be installed for the entire distance on the new line, which is remarkably free from heavy grades and curves. At the same time the Northern Pacific's North Coast Limited, heretofore run from Portland via Tacoma to St. Paul in 72 hours, will be run direct from Portland to Spokane on the S., P. & S., or North Bank Line, thence to Chicago via the N. P. and the Burlington, making the first through service from the Pacific Northwest to Chicago over the N. P. The train will leave Portland at 9.15 a.m. and will reach Chicago at 11 a.m. on the third day, giving the same time as the Harriman lines. There will be two other through trains each way to St. Paul, and in addition one each way to Omaha and St. Louis, running over the Burlington east of Billings, Mont.

From Portland to Tacoma and Seattle there will be four local trains a day and four back. One of these will run solid

from Vancouver, B. C., through Seattle and Tacoma to Portland. This trip will take 12 hours.

The activity of the Hill lines both in giving through service to Chicago and also in running through trains into Vancouver follows the installation of the new "Soo-Spokane-Portland" train from St. Paul over the Soo, the Canadian Pacific and the Spokane & International to Spokane, and over the O., R. & N. into Portland. This new train runs from Portland to St. Paul in 65 hours, seven hours less than the present N. P. time. It is expected that heavy travel to the Seattle Exposition and Portland Rose Festival will justify the expense of running the new trains.

The Adams Express and the New Haven.

A question of considerable magnitude in the sum involved has arisen between the New York, New Haven & Hartford Railroad and the Adams Express Company which operates under contract throughout the whole New Haven system, where its gross business amounts to about $5,000,000 yearly. The question turns on the interpretation of the contract in a clause relating to the express company's pro-rating on shipments to and from other railways, and the proportion to which the New Haven company is entitled. It is understood that the New Haven claims that a large sum is due it by the express company which has accumulated during a period of not less than 15 years.

In connection with the controversy, a preliminary step has been taken by the New Haven Company to secure a Connecticut charter to do an express business. This action seems, however, to be mainly a diplomatic move, as the road probably has that power already under its "omnibus" Connecticut charter, taken over from the Consolidated Railroad Company. This provides that the company may do any business "directly or indirectly connected with the business of transportation" and acquire properties and instrumentalities therefor.

The contract between the Adams Express Company and the New Haven runs for 10 years, beginning in 1905, and is terminable on a year's notice by either party at the end of the ten-year period. It provides for payments by the express company of 40 per cent. of its gross receipts on the New Haven system, the express company guaranteeing, however, an annual payment of $1,250,000 as a minimum. If the gross business rises to $3,750,000 or above the percentage rises to 45 and it is there now. The New Haven's percentage during the last fiscal year (1907-8) amounted to $2,176,916. The "Adams Express" signs have been on the cars and stations of the New Haven road probably as long as any such signs have been on any railway in the country.

Increase of Street Car Fares in Philadelphia.

The Philadelphia Rapid Transit Co., on May 4, discontinued the sale of tickets giving six rides for 25 cents, the change having been found necessary because of the increase in the expense of running the lines. It is expected that, on the basis of the present business, the change will add $2,000,000 a year to the company's gross receipts. In connection with the order making the change, the directors issued a statement giving their reasons, in which they say:

"During the past nine months the average fare received by the company has been about 3.90 cents. This sum is the result of the following distribution of all riders: 48 per cent. paying the full fare of 5 cents; 8 per cent., riding on exchange tickets, pay 4 cents; 31 per cent., riding on package tickets, pay 4⅙ cents; 13 per cent. ride on free transfers.

"It is absolutely necessary that the company increase its revenues for four reasons:

"(1) With this average per passenger it is doubtful if the company during the current fiscal year could, with the strictest economy, meet its operating expenses and fixed charges. During the next year it assumes an additional fixed charge of interest on the last half of the $5,000,000 issue of bonds authorized last fall. This interest amounts to $125,000 a year. In 1912 the company must begin the accumulation of a sinking fund at the rate of $120,000 a year and steadily increasing. The payments to the city in lieu of street paving, increase each 10 years at the rate of $50,000 per year, and at a fixed amount per square yard of new streets occupied. The tendency of everything is to cost more, and if the company is to be operated without a deficit it must increase its revenues.

"(2) Economical operation means inferior service. With the additional revenue the company can and will give better service.

"(3) The directors of a corporation owe a duty to their own stockholders. They are the trustees for the $30,000,000 of capital which has been paid into this company during the past seven years and expended in order to give the people better transportation facilities. Not a dollar of return has been received by these stockholders, and at present market rates their capital has been depreciated upwards of 25 per cent. The lost interest on this fund to our stockholders will amount, on July 1, 1909, to $6,239,725.

"(4) Every public service corporation must grow with the city which it serves. The Rapid Transit system has raised on capital account and expended in this community in seven years $42,500,000. A company which is not making money has no credit.

"Under the contract with the city it is provided that the stockholders shall first receive in dividends, before any distribution is made to the city, 6 per cent. on the moneys paid in by them, dating from Jan. 1, 1907. Already there is accumulated under this provision of the contract over $6 per share, or (gross) $3,827,225. As an evidence of the good faith of this company, and as a proof that its purposes are not merely to enrich its stockholders, we will recommend to our stockholders that they shall surrender all accumulated dividends on their stock to which they are at present entitled up to July 1 of the current year; also that hereafter the dividends shall not be cumulative, but shall be paid and divided under the contract only from year to year as earned.

"This is the offer of the board of directors, subject to the consent of the City Councils on the one side and the stockholders on the other."

Changes in Train Service of Western Roads.

A number of the western lines have made, or soon will make, numerous changes in their passenger train service. Several new trains are being put in service on account of the Alaska-Yukon-Pacific Exposition, and this has made it necessary to make comprehensive changes in local schedules.

The changes on the Hill lines will become effective on May 23. The Burlington train No. 43 will continue to leave Kansas City at 6.05 p.m., will leave Lincoln at 1.45 a.m. instead of 2.05 as at present, and will leave Billings at 6.30 a.m instead of 9.20 a.m. as at present. It will run from Billings to Seattle over the Great Falls line of the Great Northern, reaching Seattle at 10.50 p.m. No. 44, eastbound, will leave Seattle at 10 p.m. over the Great Northern, leaving Billings at 6.30 p.m. of the next day and arriving at Kansas City at 8.15 a.m. The Oriental Limited of the Great Northern will be extended to Chicago over the Burlington. It will leave Chicago at 10.15 p.m. and reach Seattle at 8.15 p.m. of the third day. Eastbound, the Oriental Limited will leave Seattle at 7.10 p.m. and arrive at Chicago 9.10 p.m. of the third day. There will also be through trains between Chicago and Seattle over the Burlington and the Northern Pacific. No. 51, the Northern Pacific Express, will leave Chicago at 9.20 a.m. and St. Paul at 10.15 p.m., and will reach Seattle at 12.30 p.m. of the third day. No. 50, the North Coast Limited, will leave Seattle at 9 a.m., arriving at St. Paul at 10 p.m. of the second day, and reaching Chicago at 11 a.m. the third day. The Burlington's No. 13 will leave St. Louis at 2.15 p.m. as at present, but it will reach Denver at 4.15 p.m. instead of at 6.20 p.m. as at present. The Burlington is putting on its through trains many additional electric lighted cars.

The Harriman lines and their eastern connections, the Chicago & North Western and the Chicago, Milwaukee & St. Paul, are also making marked improvements in their passenger service. Parts of the Overland Limited of the Union Pacific run to and from Chicago both by the Chicago & North Western and the Chicago, Milwaukee & St. Paul. The Overland Limited's time of leaving Chicago has been changed from 6.05 p.m. to 5 p.m., and it will reach San Francisco an hour earlier. It will leave San Francisco at 11.50 a.m. instead of at 10 a.m.,

and will arrive in Chicago over both the North Western and St. Paul at 1.50 p.m. of the third day, instead of at 12.30 p.m. The Chicago & North Western and the Union Pacific have also put on a new train to be known as the Chicago-Portland Special. It will leave Chicago daily at 10.01 p.m., westbound, arriving in Portland the evening of the third day; eastbound it will arrive in Chicago at 11.59 a.m. The North Western has also put on a new train which will have through sleepers between Chicago and Omaha, Des Moines and Sioux City. It will leave Chicago at 6 p.m. and arrive at Des Moines at 6 a.m., at Omaha at 8.23 a.m., and Sioux City at 9.20 a.m.

The Chicago, Milwaukee & St. Paul, in addition to the changes already mentioned, has reduced by nearly an hour the running time of some of its trains between Chicago and St. Paul. The St. Paul has also put on a new fast mail train, which leaves Minneapolis at 9 p.m. and reaches Chicago at 10 a.m.

The new service over the Wabash and the Union Pacific, from St. Louis to the Pacific Coast, which has been heretofore mentioned in these columns, was installed on May 8.

Fast Life in New York.

The New York State Public Service Commission, First district, has ordered the Interborough Rapid Transit Co. to convert 50 cars into end side door or center side door cars, as the company may choose, by August 15, and thereafter to equip two eight-car trains each month, and to continue the reconstruction of the cars at this rate until all the express trains are so equipped. The company is also ordered to provide new cars with side doors prior to October 15, 1909, so that by that time it will have sufficient cars to run express trains each way every 90 seconds during the rush hours.

General Railway Signal Company.

The report of the General Railway Signal Co., Rochester, N. Y., for the year ended December 31, 1908, shows gross profits on sales and contracts of $260,663, as compared with $453,073 in the prosperous year of 1907. Net earnings, after all expenses and operating disbursements, were $47,344, a decrease of $165,529. Interest and depreciation charged to factory equipment amounted to $66,447, a decrease of $36,011. Dividends were $60,000, half of that paid in the previous year. The surplus on January 1, 1908, had been $48,083 and the reserve account on that date was $33,238. These sums, combined with the net earnings of the year 1908, enabled the company to pay the above interest, depreciation and dividends, leaving a surplus reserve on December 31, 1908, of $2,218.

The balance sheet as of December 31, 1909, shows cash on hand of $60,541, a decrease of $14,354, and bills and accounts receivable $262,115, a decrease of $376,912. The material in stock, in process and in course of installation on contracts and sales, is carried at $902,238, a decrease of $71,808. Machinery, tools and fixtures, together with factory buildings, land and improvements, aggregate $1,353,559, an increase of $2,411. Patents, including Young system, are carried at $3,269,350, an increase of $48,112. Under liabilities, bills and accounts payable are $352,169, a decrease of $350,728. The bonded debt is $623,000, the preferred stock $2,000,000 and the common $3,000,000. The company had on hand at the time of the annual meeting, not included in the business of 1908, contracts aggregating over $1,100,000, which had been, and were still, held in suspense until the railways were in a position to go ahead. The total yearly capacity of the company's plant is over $5,000,000.

Thirty-one students of the University of California, composing the university's Glee and Mandolin Club, are being taken over the lines of the Atchison, Topeka & Santa Fe to give entertainments to the employees of the roads at the clubs that the company maintains at its various division headquarters.

Near Mead, Wash., 14 miles from Spokane, on the night of May 15, the mail car on a train of the Great Northern was stopped and robbed, and the robbers caused a collision, injuring a dozen passengers. They detached the engine and mail car and ran them forward some distance, and, after completing their robberies, started the engine and car back, unattended, toward the other part of the train, which was struck at considerable speed. None of the injuries were fatal.

The supposedly conservative state of Massachusetts is emulating the wild west, and the lower house of the legislature, after a heated debate, has ordered to a third reading a drastic bill to penalize railway officers for breaking the state laws. This action was taken after the House, by a vote of 11 to 160, had rejected an amendment to strike out of the bill the imprisonment feature. The penalty for violation of the corporation laws is a fine of not more than $1,000 or imprisonment for not more than one year, or both fine and imprisonment.

American Association of Local Freight Agents' Associations.

The annual convention will be held at Albany, N. Y., June 22, 23, 24, 25, 1909. G. W. Dennison, Penna. Co., Toledo, Ohio, is Secretary.

Chief Joint Car Inspectors and Car Foremen's Association.

The annual convention will be held at Buffalo, N. Y., September 15 and 16. Stephen Skidmore, of the Cleveland, Cincinnati, Chicago & St. Louis, at Cincinnati, Ohio, is Secretary.

New York Railroad Club.

At the meeting on May 21 the paper for this occasion will be by Julius Kruttschnitt, Director of Maintenance and Operation of the Harriman Lines, on The Operating Organization of the Union Pacific and Southern Pacific Systems.

American Society of Civil Engineers.

At the meeting held on May 19, two papers, The Sewer System of San Francisco and a Solution of the Storm-Water Flow Problem, by C. E. Grunsky, M. Am. Soc. C. E., and Some Extensive Railway Surveys, and Their Cost per Mile, by W. S. McFetridge, M. Am. Soc. C. E., were presented.

Railroad Industrial Association.

The Railroad Industrial Association held its third annual convention at Cincinnati May 11. Memphis was chosen as the place for the next convention and the following officers were elected: President, R. E. Wilson, Atchison, Topeka & Santa Fe; Vice-President, C. J. Hupp, Michigan Central; Secretary, Guy L. Stewart, St. Louis South Western, St. Louis; Treasurer, L. L. Lawrence, Laurel, Miss.

After the business session the local committee escorted the delegates on a sight-seeing tour of the city, concluding at Chester Park, where dinner was served. It is expected that the membership will be largely increased during the coming year through the establishment of industrial and commercial development departments by a number of roads that have never maintained them.

The Railway Storekeepers' Association.

The sixth annual convention of the Railway Storekeepers' Association was held at the Auditorium Hotel, Chicago, on May 17, 18 and 19. The committee on "Recommended Practices," Chairman, N. M. Rice, General Storekeeper of the Santa Fe, reported on the most practical store department organization; on tools and supplies furnished locomotive and train crews; what can be done to reduce the expense; and the value of pricing requisitions before purchasing. The Committee on "Classification of Material," Chairman, F. D. Reed, General Storekeeper of the Rock Island, next reported. The papers presented related principally to lumber. Dr. Herman Von Schrenk, Supervisor of Timber Preservation of the Rock Island, read a paper on the "Treatment of Lumber and the Handling of Same before and after Treatment." This paper was illustrated by stereopticon views and was an interesting presentation of the subject by a well known authority. The author treated briefly on the cause of decay and methods of preventing it and the proper method of piling lumber of different sizes in order to prevent decaying. He presented illus-

trations of creosoted ties which had served as a fence 30 years in England, and gave directions as to proper method of handling ties and also lumber after being creosoted.

On Tuesday morning J. M. McCarthy, Purchasing Agent of the Rock Island, read a very interesting paper on "Uniform Grading and Inspection of Lumber." This paper gives in an appendix references to various rules for grading lumber and quite voluminous notes showing the different interpretations that are placed on the rules by different railways.

Another paper on the "Uniform Grading and Inspection of Lumber was read by J. W. Justis, of the Justis Lumber Company. These two papers led to a lively discussion. It was hoped that the lumber dealers could be induced to take an active part in it, but those present were not so disposed.

The papers were discussed more fully by J. W. Waterman, Storekeeper of the Burlington at Lincoln, Neb., and by G. G. Yoemans, Assistant to the President of the Wabash.

W. F. Goltra, of the New York Central, presented a paper on the "Comparative Cost of Ties and Lumber on the New York Central Lines West of Buffalo During the Past Twenty Years," including tables giving the cost of lumber in different years, and diagrams illustrating the variation in price of different grades of lumber for the period from 1888 to 1908.

Among the other subjects discussed were "Prompt and Safe Transportation of Company Materials Other Than in Supply Car," introduced by T. W. Flannagan, General Storekeeper of the Soo Line; and "Minimum Stock, How Influenced by Prompt Purchase and Delivery," introduced by J. R. Mulroy, General Storekeeper of the Frisco.

Various small supplies were on exhibition in the hotel, and the usual entertainments were furnished for the ladies by the Supply Men's Association.

Convention of Engineers at Harrisburg.

Arrangements are being made for a three days' convention of engineers in the state Capitol at Harrisburg, Pa., June 9, 10 and 11. There will be lectures on sewage, bridges, highways, mining engineering, explosives, forestry, water power, combustion, steel rails, application of electricity and other engineering subjects.

This movement is being carried out for the benefit of engineers throughout the state of Pennsylvania, and with a view to enlisting the interest of all such; but the operations are being carried on within the charter of the Engineers' Society of Pennsylvania, which has a club house in Harrisburg and has about 900 members. The President of this society is F. Herbert Snow, and the Secretary, J. H. Myers. It is proposed to organize and elect officers in the afternoon of the first day (Wednesday); on Thursday there will be lectures both morning and afternoon, and also in the forenoon of Friday. On Wednesday evening there will be an entertainment, and on Thursday evening an illustrated lecture on the Panama Canal by A. P. Davis or Colonel W. F. Hodges. There will be excursions in and about Harrisburg, and entertainment will be provided for ladies.

American Railway Association.

The spring meeting of the American Railway Association was held in New York City on Wednesday of this week, 158 delegates being present. The revised Articles of Organization and By-laws as recommended by the Executive Committee were adopted to take effect at once. The Committee on Train Rules presented a number of questions respecting practice under the Standard Code which have been submitted to it and the replies made thereto, which were approved by the association.

The Committee on Safety Appliances reported that its available time has been spent in connection with the work of the Joint Committee on Interlocking and Block Signals. Of a total of 2,182,476 freight cars 2,137,726, or 96.9 per cent., were equipped with air-brakes on January 1, 1909.

The Joint Committee on Interlocking and Block Signals presented a revision of the Block Signal and Interlocking Rules, which was adopted.

The Committee on Transportation of Explosives presented a revised code of rules for the transportation of explosives and inflammable articles and acids, which were approved. In the regulations for the transportation of inflammable articles and acids the labels are modified and the test flashpoint for inflammable liquids is reduced from 100 deg. to 80 deg. In connection with these changes certain incidental modifications in practices and language were made.

The Committee on Standard Location for Third Rail Working Conductors presented a report of progress.

The Committee on Car Service reported several changes in the code of demurrage and per diem rules, which were adopted. The McCrea commission, which has been considering the question of per diem rates on freight cars, was not ready to report.

F. A. Delano (Wabash) was re-elected President, and W. G. Besler (C. N. J.) Second Vice-President, and T. E. Clarke (D., L. & W.) and G. L. Peck (Penn. Lines) members of the Executive Committee. Members of the Committee on Train Rules elected were the Boston & Maine, Hocking Valley, Pennsylvania.

The next meeting will be held in Chicago on November 17.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.

AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penna. Co., Toledo, O.; June 22-25; Albany, N. Y.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice. 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 26-28, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St.Paul and Minn.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

The Missouri, Kansas & Texas, acting on the advice of its legal department, has announced that it will raise its passenger rates in Missouri to 3 cents a mile on May 25. The Atchison, Topeka & Santa Fe restored the 3-cent rate on May 17.

The Trunk Line Association has authorized merchants' reduced fares to New York City for the coming fall buying season. The special fares—one fare and a half for the round trip—will be in effect July 17-20, August 14-17, August 28-31 and September 11-14, with the usual 15 day return limit.

The Committee on Railroads of the Missouri Senate has reported adversely an anti-pass bill that is backed by the state administration. The Missouri legislators seem more anxious to pass measures to reduce the rates of the railways than they do to enact a law that will prevent the roads from giving the law-makers free rides.

A meeting of the Central Passenger Association was held in Chicago on May 4 to reconsider the decision to make reduced rates to eastern summer resorts and the announcement of the differential lines that they would make proportionate reductions to New York City. No decision was reached in regard to the matter and another meeting will be held.

One of the tariffs recently filed with the New York State Public Service Commission, Second district, by the New York Central, is one providing for second-class party fares, for ten or more persons traveling on one ticket, from New York City to various local stations at 1½ cents a mile; also to various stations on the Delaware & Hudson and certain Adirondack points.

In the federal court at New York City, May 12, the New York Central & Hudson River paid $136,000 in fines. These fines are those imposed in the sugar rebating cases, which were tried many months ago, on indictments found in 1906, but were appealed to the United States Supreme Court, where the decision of the lower court against the road was finally upheld.

In the city of Los Angeles there are more than 400 industries which have private tracks connecting with the railways, and the merchants of the city, proud of their enterprise, are claiming that in few or no other cities in the country are there so many industries possessing such facilities. The merchants have been complaining to the Interstate Commerce Commission that the switching charges made by the railways are too high, and the commission has been sending spies to the yards to find out what they can about the magnitude of the work and how much time it takes.

The Erie has filed notice with the Interstate Commerce Commission that from June 1 to September 30, it will sell round trip tickets from Chicago to New York for $25.50, a rate which is on the basis of a fare and a third, plus $1.50. The low eastbound rates noticed last week as announced for the month of June are thus extended over the whole summer. The other differential lines will undoubtedly follow the Erie. For the last few years there has been considerable of this class of business by reason of rate reductions made to the coast resorts direct. These rate reductions were often so extreme that a traveler from Chicago could reach New York via Atlantic City or Asbury Park for less money than if he had come direct; and this the Erie proposes to stop; though there may be conferences looking to a consideration.

Traffic Club of Chicago.

A party composed of members of the Traffic Club of Chicago and their friends made a trip on a special train on the Lake Shore & Michigan Southern from Chicago to Gary, Indiana, on May 18. The train left the La Salle street station in Chicago at 10.30 a.m. and arrived at Gary at 12.30 p.m. and luncheon was served at the Gary Hotel. The party then made a tour of the town and of the plants of the Indiana Steel Company and of other manufacturing concerns.

Proposed Uniform Code of Demurrage Rules

As announced in this paper last week, page 1041, the National Association of Railway Commissioners proposes to adopt or recommend demurrage rules applicable to all traffic throughout the country, and a hearing is to be given in Washington June 4 and 5. The code as tentatively adopted by the subcommittee is printed below. The full committee on this subject consists of Interstate Commerce Commissioner Lane and of one representative from each of 40 states. The sub-committee, which has drafted the code, consists of Mr. Lane, John Y. Boyd (Pa.), Andrew F. Gates (Conn.), John A. Webb (Miss.), William F. Rhea (Va.) and Halford Erickson (Wis.).

PROPOSED DEMURRAGE RULES.

RULE 1.—*Cars Subject to Rules.*

Cars held for or by consignors or consignees for loading, unloading, forwarding directions or for any other purpose, are subject to these demurrage rules, except as follows:

(A) Cars loaded with company material for use of and consigned to the railway company in whose possession the cars are held.

(B) Cars loaded with live stock.

(C) Empty cars placed for loading coal at mines or mine sidings, or coke at coke ovens.

(D) Empty cars held on carrier's or private tracks, provided such cars have not been placed for loading.

NOTE.—This will include private cars.

(The committee has not formulated rules governing demurrage on private cars.)

RULE 2.—*Free Time Allowed.*

(A) Forty-eight hours free time will be allowed for loading or unloading on all commodities.

(B) Twenty-four hours free time will be allowed:

1. When cars are held for reconsignment.
2. When cars destined for delivery to or for forwarding by a connecting line are held for final or amended instructions or for payment of freight charges.
3. When cars are held in transit and placed for inspection, grading, or change of destination.

(C) When cars are interchanged with industrial plants performing their own switching service, handling cars for themselves or other parties, an allowance of 24 hours will be made for switching in addition to the regular time allowed for loading and unloading. If cars are reloaded after being unloaded, an additional 48 hours free time will be allowed.

(D) Cars held in transit for milling, cleaning, bagging, compressing, completion or change of load, under a through rate from the original shipping point to the final destination, with or without a stop-over charge, and detained over 48 hours, will be subjected to the demurrage charge. If such shipments are transferred to other cars, demurrage will follow on the cars into which transfer is made.

(E) Cars containing freight in bond will be allowed 48 hours free time for unloading from first 7 a. m. after permit to receive goods is issued to consignees by United States collector of customs.

NOTE.—Cars containing freight consigned locally to ocean, gulf, or lake ports, for coastwise or export movement via vessel will be allowed such free time as may be provided in the tariffs of the carriers.

RULE 3.—*Computing Time.*

NOTE.—In computing time, Sundays and legal holidays will be excepted.

(A) Time will be computed from the first 7 a. m. after cars are placed on public delivery tracks for loading.

(B) Time will be computed from the first 7 a. m. after notice to consignee of arrival when cars are held for orders, or from the first 7 a. m. after notice and placing on public delivery tracks when cars are held for unloading.

NOTE.—When notice is given by mail, time shall be computed from the first 7 a. m. thereafter, provided notice is deposited in United States mail on or before 12 m. of the day it is so deposited. When notice is deposited after 12 m. time shall be computed from the second 7 a. m. thereafter.

(C) On cars to be delivered on any other than public delivery tracks time will be computed from the first 7 a. m. after actual or constructive placement on such tracks.

(D) On cars to be delivered on interchange tracks of industrial plants performing their own switching service, handling cars for themselves or other parties, the time will be computed from the first 7 a. m. following delivery on such interchange tracks until return thereto.

RULE 4.—*Notification.*

(A) Consignee shall be notified in writing by carrier's agent within 24 hours after arrival of cars and billing at destination, such notice to contain car initials and numbers and the contents, and, if transferred in transit, the initials and number of the original car.

(B) When cars are ordered stopped in transit consignee shall be notified upon arrival of cars at point of stoppage.

(C) Delivery of cars upon private or interchange tracks, or notice to

consignee of readiness to so deliver, will constitute notification thereof to consignee.

Rule 5.—*Placing Cars for Unloading.*

(A) When delivery of cars consigned or ordered to private tracks cannot be made on account of inability of consignee to receive, delivery will be considered to have been made when the car was tendered. The agents must give written notice of all cars they have been unable to deliver because of the condition of the private tracks, or because of other conditions attributable to consignee. This shall be considered constructive placement.

(B) When delivery cannot be made on specially designated public delivery tracks on account of such tracks being fully occupied, or from other cause beyond the control of the carrier, the delivery will be made at the nearest available point.

Rule 6.—*Cars for Loading.*

(A) Cars for loading will be considered placed when such cars are actually placed, or held on orders of the consignor. In the latter case, the agent must give written notice of all cars which he has been unable to place because of condition of the private track, or because of other conditions attributable to the consignor. This will be considered constructive placement.

(B) When cars are reloaded after unloading, each operation will be considered as independent of the other.

(C) When empty cars, placed for loading on orders, are not used, demurrage will be charged from the first 7 a. m. after placing or tender until released, with no time allowance.

Rule 7.—*Inability of Connection to Receive*

When a railway is unable to receive cars in switching service tendered by a connection to be placed for delivery, owing to the inability of the consignee to receive, it will promptly notify the line offering, in order that notice may be given the consignor or consignee and other disposition requested. Notice will be promptly given the consignee by the road offering the car and 24 hours allowed the consignee for its disposition.

Rule 8.—*Demurrage Charge.*

After the expiration of the free time allowed, a charge of $1 per car per day, or fraction of a day, will be made.

Rule 9.—*Claims.*

When demurrage charges accrue under these rules from causes named below, such charges shall be canceled or refunded.

Causes.

(A) When the condition of the weather during the time prescribed for loading or unloading cars is such as to render it impossible to place freight in cars or to move it from cars without serious damage to the freight, or when shipments are frozen so as to prevent unloading.

(B) When, because of high water or snowdrifts, it is impossible to get to cars for loading or unloading.

(C) When, as a direct result of the act or neglect of a carrier, cars for one consignee to be unloaded at the same point, and transported via the same line, are bunched in transit and delivered in accumulated numbers in excess of the total capacity of consignee to unload within prescribed free time, evidence to be presented to the carrier's agent before the expiration of the free time. The measure of the capacity of the consignee to unload will be the total number of cars he can unload in one day under normal conditions.

(D) Delayed or improper notice by carrier.

Note.—When notice has been given in substantial compliance with the legal requirements as specified by the rules, the consignee shall not thereafter have the right to call in question the sufficiency of such notice unless within 24 hours after receiving the same he shall serve upon the delivering carrier a full written statement of his objections to the sufficiency of said notice.

(E) Railroad errors or omissions.

Revision of Trans-Continental Freight Rates.

On May 14 traffic officers of the Hill and the Harriman lines appeared before the Interstate Commerce Commission at Washington to outline the plan of revising transcontinental freight rates which the roads propose to adopt. In its decision in the Spokane rate case the commission said that the carriers might if they wished present to it some scheme for the revision of their rates and if this were approved the commission would vacate its order in that case. However, when the officers of the Hill and Harriman lines appeared before it the commission declined to take any action because the shippers interested were not represented.

The railway officers do not believe that any adjustment can be made which will satisfy the various commercial interests, and they have therefore decided to go ahead and make a re-adjustment of rates along the line of the order issued by the commission in the Spokane case, and let the shippers then object if they see fit to do so. The result will be a general reduction of rates from the territory east of the Missouri River to the territory west of the Missouri River except that the existing rates to the Pacific Coast terminals will not be changed. It is understood that the basis of the re-adjustment will be the principle that rates to an intermediate point, such as Spokane, or Salt Lake City, shall not be higher than to the Pacific coast, except perhaps, in the case of rates on commodities on which water competition is especially severe. Not only will the rates to such points as Spokane and Salt Lake City be reduced to the basis of rates to the coast, but rates will be "scaled back," so that the rate will not be higher for a longer than for a shorter haul where this can be avoided.

The traffic officers of the Hill and Harriman lines have been in conference in Chicago this week working out the details of the readjustment. After the plan of readjustment has been agreed upon the specific rates will have to be figured by the rate clerks. It is thought that it may be possible to have the new tariffs ready for filing by July 1.

The reductions ordered by the commission in rates to Spokane amounted to about 16⅔ per cent. The reductions which the railways propose to make will average, it is believed, about 15 per cent., although in some instances they will be greater.

That there is going to be difficulty in getting shippers to assent to the readjustment is shown by the attitude that already is being assumed by the jobbers in California. W. R. Wheeler, Manager of the Traffic Bureau of the Merchants' Exchange of San Francisco, has telegraphed to the Interstate Commerce Commission asking that it withhold its approval of the new rates until the coast cities can be heard. The Commission has postponed its order in the Spokane case, as to the Union Pacific System and the Chicago & North Western.

Interurbans to Handle Baggage.

Representatives from twelve interurban railways in Indiana held a conference in Indianapolis, May 11, and agreed to handle and exchange baggage, and maintain such service on the same basis as is now in vogue on the steam roads of the state, in respect to free and excess baggage. Service to commence June 15.

An Eastbound Homeseekers' Special?

If the railways running to the East had as much enterprise as those running to the West, there would be a drift of farmers from the high-priced lands of the West eastward which would go far to equalize the value of lands of similar quality East and West. There are lands in some of the better portions of New York and the New England states, corresponding in value to the farms in the West and with better improvements, that sell for little more than half the money. —*Country Gentleman.*

Financial Depression in Korea.

A Seoul, Korea, paper says that, on account of decreased traffic, passengers as well as freight, the nightly express from Seoul to Fusan, where it connects with ferry service to Japan, will henceforth run only every second night, with a corresponding decrease in the ferry service. The Seoul newspaper attributes the drop to the effects of financial bad times. The through train between Fusan and New Wiju will continue to run to facilitate connection with the Manchurian railways.

INTERSTATE COMMERCE COMMISSION.

Because a delivering carrier sees fit to state that it will protect a rate made by its competitor, but fails to do so, the commission cannot hold that such lower rate is necessarily reasonable. (16 I. C. C. Rep. 144.)

Reparation awarded on account of imposition of an unreasonable freight charge on a shipment of corn from Bates, Ill., to Detroit, Mich., because of carrier's failure to supply a car of the size ordered by the complainant. (16 I. C. C. Rep. 208.)

Exaction of double merchandise rates for the transportation of small live animals in secure containers, and when such animals do not require feeding or watering en route, found to be unreasonable. Merchandise rates should apply. (16 I. C. C. Rep. 214.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1909.
(See also issues of May 7 and 14, 1909.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$196,086	$59,131	$285,049	$30,137	$43,610	$8,040	$92,261	$10,553	$184,601	$100,448	$412*	$11,778	$88,258	$47,009
Ann Arbor	301	126,472	32,187	167,085	16,808	19,174	3,124	60,210	3,997	103,313	63,772	1,502	11,369	53,905	31,577
Atlanta, Birmingham & Atlantic	642	164,966	29,013	204,824	29,745	30,695	12,431	85,170	8,567	166,608	38,216	.....	8,000	30,216	1,436
Central Vermont	411	217,620	58,568	298,265	20,800	34,617	6,980	145,351	8,991	216,739	81,526	360	12,500	69,387	30,185
Charleston & Western Carolina	339	128,370	19,893	154,636	22,947	12,808	2,456	45,196	3,869	87,276	67,360	.....	4,100	63,260	19,621
Chicago & Eastern Illinois	966	695,418	128,553	876,052	58,402	112,299	15,224	295,270	33,630	514,825	361,227	1,990*	26,500	332,738	‡40,183
Chicago & Erie	269	284,934	62,016	372,344	26,511	90,449	11,777	185,742	8,589	323,068	49,276	485	11,083	38,678	10,466
Chicago, Indianapolis & Louisville	616	300,388	102,128	441,159	51,065	75,993	13,308	159,851	13,970	314,187	126,972	.....	22,000	104,972	34,120
Chicago, Rock Island & Gulf	492	185,035	58,414	255,271	28,971	22,497	6,168	100,751	8,666	167,053	88,218	253*	6,261	81,704	‡37,766
Cincinnati, Hamilton & Dayton	1,036	461,880	113,265	642,893	78,425	114,843	21,398	275,504	20,027	510,197	132,696	.....	25,795	106,901	121,149
Cincinnati, New Orleans & Texas Pac	337	510,837	109,649	656,139	43,997	112,842	16,547	213,560	16,555	403,501	252,638	994	20,000	233,632	90,164
Detroit, Toledo & Ironton	438	99,488	9,791	117,881	25,677	20,409	2,590	57,676	3,838	110,190	7,691	.....	6,979	712	‡9,815
Duluth, South Shore & Atlantic	593	140,624	62,315	217,138	27,659	24,203	7,675	87,678	5,954	153,169	63,969	1,737*	16,000	46,232	1,205
Evansville & Terre Haute	310	107,301	46,985	171,963	15,173	20,730	4,431	56,471	6,652	103,457	68,506	220*	10,023	58,263	‡12,704
Florida East Coast	584	208,153	223,579	493,677	26,300	33,609	5,920	125,171	7,379	198,379	295,298	.....	11,700	283,598	113,118
Galveston, Harrisburg & San Antonio	1,338	592,609	189,843	826,888	121,704	138,528	33,566	347,791	28,142	669,731	147,157	911	28,179	129,889	‡45,307
Grand Rapids & Indiana	591	293,747	100,215	418,922	47,373	71,300	8,747	175,792	14,581	317,793	101,129	751*	21,138	79,239	23,494
Hocking Valley	347	336,784	59,839	412,220	43,205	95,750	7,320	142,098	11,615	299,988	112,232	5,624*	19,122	87,486	‡24,632
Houston & Texas Central	789	297,218	103,093	435,830	60,956	80,888	16,232	169,678	20,210	347,964	87,866	.....	19,632	68,234	22,123
International & Great Northern	1,159	458,587	130,149	630,284	143,538	107,060	16,024	297,845	20,924	585,391	44,893	.....	17,000	27,893	12,044
Iowa Central	558	253,816	39,400	304,445	29,753	54,556	8,020	130,466	9,145	231,940	72,505	.....	7,336	65,169	‡5,265
Louisiana Ry. & Nav. Co.	343	102,884	10,866	119,854	31,430	17,136	4,621	43,196	5,759	102,142	17,712	.....	3,750	13,962	16,307
Minneapolis & St. Louis	1,027	268,020	79,446	374,439	22,477	54,328	10,929	138,607	13,758	240,099	134,340	7*	18,087	116,246	19,003
Mobile & Ohio	1,098	627,741	92,441	836,141	90,200	137,278	26,928	294,099	30,669	579,174	256,967	3,397*	24,000	229,570	‡37,789
Northwestern Pacific	373	79,654	97,891	198,160	37,146	39,320	1,985	79,362	9,052	166,865	31,295	.....	8,955	22,340	19,943
Peoria & Eastern	351	177,421	48,473	246,056	30,800	48,845	5,343	93,852	4,636	183,476	62,580	.....	8,800	53,780	37,442
Rutland	468	131,890	64,848	223,596	35,663	38,897	7,575	86,016	5,862	174,013	49,583	.....	8,612	40,971	3,424
St. Louis Southwestern	773	455,219	96,801	577,537	81,999	100,950	22,736	134,196	21,477	361,358	216,179	421*	15,118	200,640	24,882
St. Louis Southwestern of Texas	697	196,900	53,288	268,586	101,501	69,180	8,766	126,335	15,516	321,298	52,712*	247*	4,466	57,425†	14,311
San Antonio & Aransas Pass	727	187,829	74,005	276,951	46,727	45,377	4,489	121,721	8,741	227,055	49,896	.....	8,500	41,396	‡132
San Pedro, Los Angeles & Salt Lake	1,099	392,158	208,515	638,390	65,198	91,576	29,495	207,802	15,241	409,312	229,078	3,313*	23,303	202,462	170,123
Southern Pacific Co.—Pacific System	5,598	4,231,267	2,179,442	6,857,716	854,022	943,319	111,127	1,785,341	195,715	3,889,524	2,968,192	6,409	245,039	2,729,562	409,242
Texas & New Orleans	450	216,742	72,751	308,174	58,446	51,951	6,873	108,543	8,150	233,963	74,211	591*	11,600	62,020	‡19,706
Toledo & Ohio Central	441	210,147	40,317	259,939	30,634	54,275	5,750	101,307	5,215	197,181	62,758	1,511	13,599	50,670	‡89,127
Toledo, St. Louis & Western	451	239,574	31,185	288,901	25,233	31,917	6,096	102,916	8,380	174,542	114,359	.....	11,500	102,859	30,568
Wheeling & Lake Erie	442	384,235	37,079	446,665	29,174	117,054	6,506	166,998	15,558	335,290	111,375	6,971	21,466	96,880	44,910
NINE MONTHS OF FISCAL YEAR.															
Alabama Great Southern	309	$1,698,754	$726,603	$2,688,767	$340,868	$506,256	$68,015	$893,118	$76,945	$1,885,202	$803,565	$5,882*	$103,574	$694,109	$310,187
Ann Arbor	301	885,087	347,500	1,318,177	181,077	177,402	27,311	522,965	36,669	945,423	372,754	18,327	102,319	288,762	13,329
Atlanta, Birmingham & Atlantic	642	1,126,376	341,287	1,561,648	199,909	272,899	89,295	602,791	63,694	1,228,588	333,060	.....	63,000	270,060	8,726
Central Vermont	411	1,671,686	742,851	2,615,711	351,330	418,118	66,866	1,136,006	63,954	2,136,274	479,437	7,155	88,175	398,417	‡21,532
Charleston & Western Carolina	339	817,620	202,245	1,085,010	207,072	132,552	22,228	392,082	31,625	785,559	299,451	.....	36,900	262,551	43,595
Chicago & Eastern Illinois	966	6,129,785	1,289,162	7,878,366	822,427	1,374,346	145,445	2,790,461	312,642	5,445,321	2,433,045	14,269*	194,614	2,224,162	‡228,069
Chicago & Erie	269	2,357,552	581,496	3,205,776	299,795	743,832	103,622	1,534,939	70,375	2,752,563	453,213	2,745	101,330	354,628	239,981
Chicago, Indianapolis & Louisville	616	2,565,474	993,897	3,923,940	590,801	630,839	112,230	1,329,471	122,306	2,785,647	1,138,293	.....	194,000	944,293	28,183
Chicago, Rock Island & Gulf	492	1,612,858	559,883	2,283,643	463,275	181,889	54,609	866,098	77,257	1,643,128	640,515	1,422*	34,816	*604,277	‡126,922
Cincinnati, Hamilton & Dayton	1,036	4,133,453	1,245,880	5,996,062	710,305	1,135,018	192,662	2,584,266	187,656	4,809,907	1,186,155	.....	227,356	958,799	373,643
Cincinnati, New Orleans & Texas Pac	337	4,424,309	1,076,966	5,802,758	591,781	1,129,110	150,592	1,789,045	156,762	3,817,290	1,985,468	11,571*	177,756	1,796,140	689,361
Detroit, Toledo & Ironton	438	987,451	119,028	1,183,184	215,821	242,872	22,005	535,428	39,400	1,055,526	127,658	97	62,809	64,946	120,265
Duluth, South Shore & Atlantic	593	1,192,909	674,830	1,993,583	305,827	243,020	77,619	771,466	58,863	1,456,795	536,788	6,497	149,783	393,502	‡66,354
Evansville & Terre Haute	310	1,006,496	446,407	1,614,980	212,979	217,815	33,208	509,707	56,773	1,030,482	584,498	2,770*	82,303	499,425	‡16,852
Florida East Coast	584	1,029,905	887,496	2,241,828	346,343	348,690	50,725	828,228	75,253	1,649,239	592,589	.....	100,400	492,189	234,503
Galveston, Harrisburg & San Antonio	1,338	5,671,209	1,633,989	7,694,250	1,002,501	972,893	206,761	3,020,607	242,119	5,444,882	2,259,368	14,496*	177,223	2,057,649	713,600
Grand Rapids & Indiana	591	2,086,089	1,174,047	3,505,893	390,792	514,423	90,133	1,384,192	122,420	2,501,960	1,003,933	2,246*	189,663	812,024	142,923
Hocking Valley	347	3,836,154	639,160	4,621,841	472,475	1,087,374	67,616	1,403,247	108,070	3,138,782	1,483,059	39,898	177,218	1,345,739	128,321
Houston & Texas Central	789	3,271,998	1,074,129	4,630,097	612,587	645,357	138,995	1,700,280	175,729	3,272,948	1,357,149	.....	114,535	1,242,614	88,492
International & Great Northern	1,159	4,568,128	1,299,768	6,261,194	1,052,242	979,215	143,481	2,509,565	185,049	4,869,552	1,391,642	.....	191,000	1,200,642	947,095
Iowa Central	558	1,798,474	391,265	2,298,835	205,644	426,515	79,423	1,019,904	78,170	1,809,656	489,179	.....	66,403	422,776	‡318,143
Louisiana Ry. & Nav. Co.	343	673,821	98,246	828,817	219,054	111,354	30,274	360,614	47,763	769,059	59,758	.....	30,150	29,008	71,188
Minneapolis & St. Louis	1,027	2,164,283	818,690	3,210,302	276,192	425,801	90,216	1,176,623	109,022	2,077,854	1,132,448	299*	141,880	990,268	55,989
Mobile & Ohio	1,098	5,418,945	921,087	7,365,553	808,823	1,187,026	249,254	2,531,576	263,828	5,040,507	2,325,046	19,795*	164,500	2,140,751	83,440
Northwestern Pacific	373	879,626	1,159,000	2,219,813	460,570	324,894	20,067	804,275	84,010	1,693,816	525,997	.....	81,695	444,302	69,482
Peoria & Eastern	351	1,448,777	505,439	2,131,562	257,466	350,817	46,400	835,573	41,057	1,531,313	600,249	.....	80,212	520,036	‡43,751
Rutland	468	1,135,266	757,810	2,131,296	308,169	295,369	56,301	818,456	55,042	1,533,337	597,959	.....	82,472	515,487	112,507
St. Louis Southwestern	773	4,053,043	909,986	5,182,031	703,340	850,703	191,488	1,266,419	181,202	3,193,152	1,988,879	4,965*	135,378	1,848,536	47,645
St. Louis Southwestern of Texas	697	1,995,112	674,318	2,860,255	772,912	597,653	78,865	1,238,066	138,498	2,825,994	34,261	2,256*	63,263	31,258†	145,630
San Antonio & Aransas Pass	727	2,102,972	652,745	2,909,136	424,480	327,276	38,631	1,109,265	78,098	1,977,750	931,386	.....	78,700	852,686	222,503
San Pedro, Los Angeles & Salt Lake	1,099	3,082,305	1,847,066	5,275,747	791,946	726,153	222,415	1,740,792	152,547	3,633,853	1,641,894	23,124*	215,188	1,403,581	667,283
Southern Pacific Co.—Pacific System	5,598	36,769,749	19,604,775	60,378,671	7,412,406	7,690,010	999,116	16,210,174	1,773,589	34,085,295	26,293,376	62,586*	2,113,982	24,116,805	3,312,466
Texas & New Orleans	450	1,901,898	625,576	2,700,765	486,560	392,071	53,933	1,113,032	74,726	2,120,322	580,443	5,836‡	84,645	489,962	‡11,319
Toledo & Ohio Central	441	2,654,105	468,022	3,228,944	434,560	525,210	48,678	1,057,546	47,950	2,113,944	1,115,000	24,515	124,505	1,015,010	‡32,631
Toledo, St. Louis & Western	451	2,044,489	352,992	2,575,344	283,054	337,755	51,539	884,654	71,216	1,628,218	947,126	.....	103,500	843,626	‡47,366
Wheeling & Lake Erie	442	3,583,953	373,195	4,212,860	465,078	994,014	51,576	1,474,391	132,319	3,117,378	1,095,482	14,994	195,138	915,348	183,511

*Deficit. †Loss. ‡Decrease.

Refusal to Meet Competition.

La Salle Paper Company v. Michigan Central. Opinion by Commissioner Cockrell.

Defendants' rate on paper stock from Chicago, Ill., to South Bend, Ind., not found unreasonable as compared with their rate on manufactured paper between the same points. The commission cannot order a reduction on paper stock in order to meet market competition, as railways are authorized to meet or not to meet competition, as to them seems to their interest.

A Specified Route.

O. W. Counsil v. St. Louis & San Francisco et al. Opinion by Commissioner Clark.

Complainant specifically directed that shipment of live stock be forwarded via a certain route in order that he might have the advantage of trying a market so reached. Shipment moved in accordance with his directions. He now claims reparation on the ground that a lower rate applied via another and more direct route than the one which he selected, but via which he could not have reached the market which he desired to try. Complaint dismissed.

Free Transportation to Express Companies.

In the matter of contracts of express companies for free transportation of their men and material over railways. Opinion by Commissioner Prouty.

A railway company may lawfully transport the men and supplies of an express company without reference to any tariff provision when employed or used in the business of the express company on the line of the railway itself, and in the same manner an express company may lawfully transport the packages of a railway company between points on that line of railway without reference to its tariff rates.

A railway company may not lawfully transport men and supplies of an express company when employed or used in the business of that company at points not on the line of railway, and an express company may not lawfully transport for a railway packages between points on its route but not on that particular line of railway.

Through Routes Within a City.

Enterprise Fuel Co. v. the Pennsylvania et al. Opinion by Commissioner Lane.

A city which embraces a wide area within its limits may, because of physical or business conditions, comprise one or more shipping communities to and from which through routes should be established, but a shipper is not entitled to a through route merely because he may not be as conveniently served by one railway as by another.

On complaint asking for establishment of a through route and joint rate via defendants' lines from Alden, Pa., to the Hillen and Walbrook stations of the Western Maryland in Baltimore, Md., it is held that (1) the through route at present existing to the terminals of the Pennsylvania in Baltimore is a satisfactory through route to Baltimore proper, in which the Hillen station of the Western Maryland is located; and that (2) Walbrook, although lying within the limits of Baltimore, is a distinct transportation point to which no satisfactory through route exists. Defendants ordered to establish a through route and joint rate to that point.

Substitution of Tonnage.

C. H. Rodehaver v. Missouri, Kansas & Texas. Opinion by Commissioner Cockrell.

The Missouri Commission Co. received 82,000 lbs. of hay shipped over defendant's line from a station in Kansas to St. Louis, Mo.; paid 19 cents per 100 lbs., and sold the hay to its customer; the Bartlett Commission Co. received 82,000 lbs. of hay shipped from points in Illinois, Iowa and Missouri over lines other than defendant's at St. Louis, Mo., and reconsigned the same to points east of the Mississippi river and south of the Ohio river. The complainant obtained the expense bills of the Missouri Commission Co. and the duplicate bills of lading of the Bartlett company, presented them to the defendant and demanded refund to an amount to reduce the rate to 13½ cents by reason of defendant's tariff, which "applies on hay, c. l., from stations in Missouri, Kansas and Indian territory on the M., K. & T. to St. Louis for reconsignment to points south of the Ohio river and east of the Mississippi river." Held that the complainant was not entitled to any refund or reparation in such a case, and that such substitution of tonnage could not be sanctioned.

Discrimination Against Cincinnati Territory.

Indiana Steel & Wire Co. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Cockrell.

For a number of years prior to May 25, 1907, the defendants had maintained identical joint rates on steel and wire products from what was known as Chicago-Cincinnati territory when destined to Arkansas common points. Beginning on that date the carriers divided the territory along the Illinois-Indiana state line, and by tariffs in which they all participated or concurred established rates applying to Chicago territory and other rates applying to Cincinnati territory, particularly to Muncie, Ind., and Kokomo, which rates were higher from the last-mentioned points to Arkansas common points than from points of origin within Chicago territory. Manufacturers and shippers located at Muncie and Kokomo were therefore discriminated against in favor of the manufacturers and shippers in Chicago territory. The discriminations thus wrought between the two territories excluded the manufacturers at Muncie and Kokomo from competition in Arkansas common points with the manufacturers and shippers located in Chicago territory. The different rates, rules and regulations made to apply to Chicago territory and to Cincinnati territory beginning in May, 1907, are found to be undue and unjust and are therefore condemned.

Discrimination Against Kansas City.

Kansas City Transportation Bureau of the Commercial Club v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Clark.

Proportional rates on grain coming from beyond the Missouri river are the same to Mississippi river crossings from Omaha, Neb., and from Kansas City via all lines. Proportional rates on grain from Omaha to Cairo, Mo., and other Ohio river crossings, to Memphis, Tenn., to Carolina territory, and to New Orleans, La., Galveston, Tex., and other Gulf ports, for export, are 1 cent per 100 lbs. higher than from Kansas City. Complainant, representing grain dealers at Kansas City, alleges that this adjustment is unjustly discriminatory against Kansas City in that it does not give full recognition to the shorter distance from Kansas City to St. Louis and points southeast thereof.

In a case of this kind, there must be an examination and consideration of the entire rate from point of production to ultimate destination. It is not sufficient to consider the rates to an intermediate market, nor alone the rates from such market, if the question of discrimination between such markets is to be determined. Adoption of distance alone as a measure of the rates from points of origin to the primary market would necessarily result in a clear division of the territory between the markets and would be destructive of competition in most of that territory. It would destroy the long-established adjustment which places Missouri river crossings on a parity in both inbound and outbound rates on traffic generally. Giving to Kansas City all the advantage that could come to it from a mileage adjustment would give it a monopoly of territory in which Omaha now freely competes with Kansas City, and the application of the same rule to Omaha would give it exclusive purchasing power in territory in which Kansas City now competes with Omaha on equal terms. Complaint is dismissed.

STATE COMMISSIONS.

The Missouri Railroad Commission has suspended until June 10 its schedule fixing coal rates in Missouri. This schedule was first announced to go into effect on May 1 and was then suspended until May 15.

The Mississippi State Railroad Commission has decided unanimously to dismiss the petition for an order reducing passenger fares throughout the state. The result of the action is to leave the present passenger rate of 3 cents a mile undisturbed. Hundreds of business men aided the roads in their opposition to the proposed reduction.

Headlights in Indiana.

The Railroad Commission of Indiana has called a conference for May 27 to consider what shall be done under the recent law giving the commission power to investigate and determine as to the efficiency of headlights in use on locomotives, and to prescribe efficient and practicable headlights.

New Hampshire Express Rates Prescribed by Railway Commission.

State Board of Trade v. the American Express Co. et al.

The Canadian Express Company operates a short line on the Grand Trunk across the narrow northern portion of the state, and in the more populous southern portion there are several small express companies, but except these the American has a monopoly. Formerly the minimum charge was 15 cents a package, but last year this was advanced to 25 cents. Chairman Henry M. Putney, of the railway commissioners, being a stockholder in the express company, did not sit upon the case, and his place was filled, according to law, by Judge Oscar L. Young, of the Superior Court, the highest trial court in the state. The decision, issued May 13, says "the board is of the opinion that the charges * * * are excessive and unreasonable, and that the public good requires the same should be changed." The order contains a complete distance tariff, ordered to go into effect June 1. Following are typical rates:

One-Line Scale (Per 100 lbs.). Miles.	Rate.	*Two-Line Scale* (Per 100 lbs.). Miles.	Rate.	*Three-Line Scale* (Per 100 lbs.). Miles.	Rate.
40 and under	$0.40	25 and under	$0.40	1 to 20	$0.40
40 to 70	.50	25 to 50	.50	20 " 40	.50
70 " 90	.60	50 " 75	.60	40 " 60	.60
90 " 120	.75	75 " 100	.75	60 " 75	.75
210 " 250	1.50			200 " 250	1.50

Shipments weighing less than 100 lbs., and not exceeding $50 in value:

	Where rate per 100 lbs. is 40c.	50c.	60c.	75c.	90c.	$1.00
Packages not over 1 lb....	$0.15	$0.15	$0.15	$0.20	$0.25	$0.25
Over 1 lb., not over 2 lbs..	.15	.15	.15	.20	.25	.25
" 2 lbs., " " 3 " ..	.15	.15	.15	.20	.25	.25
" 3 " " " 4 " ..	.15	.15	.15	.20	.25	.25
" 4 " " " 5 " ..	.15	.15	.15	.20	.25	.30
" 5 " " " 7 " ..	.15	.20	.20	.25	.30	.30
" 7 " " " 10 " ..	.15	.20	.20	.25	.30	.35
" 10 " " " 15 " ..	.20	.25	.30	.30	.35	.35
" 15 " " " 20 " ..	.25	.25	.30	.35	.35	.40
" 20 " " " 25 " ..	.25	.30	.30	.35	.40	.45
" 75 " " " 80 " ..	.40	.50	.55	.75	.80	.90

These figures are somewhat in excess of the old rates that prevailed before the raise in 1908, but are nearer the old rates than the new ones established by the express company. They differ only slightly from the rates prevailing along the Canadian Express Company's route. This is believed to be the first general fixing of rates for a whole state ever made by a railway commission in New England.

Indiana Full Crew Law.

In compliance with a call issued May 5 by the Indiana Commission about 60 superintendents and attorneys representing 39 railways met at the State House May 11. Several cases now pending in the courts are based on the fact that porters and brakemen have been assigned to the duty of flagmen when they have not had the required experience of one year in the train service. The Pennsylvania gave notice that it would carry the question as to the constitutionality of the law to the Supreme Court of the United States. It was the unanimous sentiment that the requirements of the law were unreasonable but so long as it was the law they purposed to comply with it where possible; but in many instances unforeseen conditions make it impossible to send a train out with a full crew. The limitation of a freight train to 50 cars was criticized. A freight train of 50 cars and a full crew of five men would not dare add a car of stock to the train without securing the sixth man; and this was impossible at small stations. To go by and leave the car of stock on the siding subjected the company to damages. The conference was harmonious and the commission assured the roads that it would not advise or assist in the prosecution of cases when the companies had done the best they could under the circumstances to comply with the law.

COURT NEWS.

Hearings in the government investigation of the anthracite coal roads were continued at Philadelphia this week. W. J. Richards, First Vice-President of the Philadelphia & Reading Coal & Iron Co., gave detailed testimony concerning the area and ownership of coal fields in Pennsylvania, and described the process of mining.

The Supreme Court of the United States on May 17 decided against the railway in the case of the Texas & Pacific and others v. Easton and Knox and others involving the right to collect damages from a carrier in case of its failure to ship live stock from one point to another over the most direct route. The lower court awarded the shippers $3,600, and that decision was affirmed by the Supreme Court of Texas and the Supreme Court of the United States.

The Supreme Court of the United States declines to grant writs of certiorari for the review of the judgments of the Federal Court of Appeals dissolving the injunctions against the Alabama Railroad Commission and thus leaves undisturbed the decision, against the railways, handed down by the lower court. The suit of the roads was to enjoin the enforcement of the rates on passengers and commodities enacted by the commission and the legislature. The ground taken by the Court of Appeals was that under the Supreme Court's decisions in the cases of the Knoxville Water Company and the Consolidated Gas Company of New York injunctions would not lie against the enforcement of rates enacted by the legislature unless it had been shown by an actual test of the rates that they were confiscatory.

Santa Fe Compelled to Lend Its Cars.

The Fourth Court of Civil Appeals of Texas has decided that a railway may not refuse to let its cars go to another road with through carload shipments, and may not require a transfer of a shipment from one car to another when the shipment passes to a connecting line. The decision was rendered in a case that was brought at the instance of the State Railroad Commission against the Gulf, Colorado & Santa Fe. During the car shortage in 1907 the G. C. & S. F. notified the Lumpkin Mills Company, at Meriden, that it would not transfer a car, loaded with products of this concern, from its tracks to those of the Houston & Texas Central, at Navasota, for transportation to Millican, 10 miles further on, the Santa Fe having declared an embargo in order to keep all of its available cars on its own rails for the use of shippers at its own stations. The shipper nevertheless consigned the shipment through, and the Santa Fe stopped the car at Navasota, the junction point, about 200 miles from Meriden, offering, however, to transfer the goods to the other company's car at its own expense. The shipper refused this offer and appealed to the railroad commission, which in 1896 had issued an order requiring railways to transfer cars containing carload shipments to the tracks of connecting lines, and the commission imposed a fine of $5,000. The district court, to which the case was appealed, sustained the commission's ruling, but reduced the fine to $500. The Santa Fe then appealed to the Court of Appeals, arguing that to force it to send its cars off its own rails was to deprive it of its property without due process of law. The Court of Civil Appeals said that the position of the Santa Fe was opposed to established transportation practice. If the Houston & Texas Central had kept the car longer than it should the Santa Fe could have recovered damages against it under the laws of the state; therefore, its plea that it was deprived of its property without due process was not valid. The court held that to compel such transfer en route as the Santa Fe insisted on would work injustice to shippers and injury to the public.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. M. Schoonmaker, Vice-President of the Monongahela, has been elected President, succeeding Joseph Wood, resigned.

H. E. Byram, Superintendent of the Nebraska district of the Chicago, Burlington & Quincy, has been appointed Assistant to the Second Vice-President, with office at Chicago. He will give special attention to matters of discipline and perform such other duties as may be assigned to him.

The following have been elected officers of the Alaska Central, which is in the hands of a receiver: R. D. Miller, President; G. R. Sanborn, Vice-President; James A. Haight, Secretary and Treasurer, succeeding, respectively, A. C. Frost, President; H. C. Osborn, Vice-President; G. L. Francis, Treasurer.

Alfred H. Bright, General Counsel of the Minneapolis, St. Paul & Sault Ste. Marie, as formerly announced in these columns, has been appointed also Vice-President and General Counsel of the Wisconsin Central, with office at Minneapolis, Minn. Mr. Bright was born on October 29, 1850, at Adams Center, N. Y., and was educated in the common schools and at the University of Wisconsin, from which he graduated in 1874. On January 1, 1888, he became General Solicitor of the Milwaukee & Northern. From Jan. 1, 1891, to March 1, 1908, he was General Solicitor of the Minneapolis, St. Paul & Sault Ste. Marie, and since March 1, 1908, he has been General Counsel, which office he continues to hold.

Operating Officers.

James B. Sparks, recently appointed Superintendent of the Southern Pacific Lines in Mexico at Guadalajara, Jal., was born October 23, 1872, at Murfreesboro, Tenn. He graduated from the Union University at Murfreesboro in June, 1890, and began railway work almost immediately on the Nashville, Chattanooga & St. Louis as agent's clerk at Murfreesboro. In November, 1890, he was transferred to Nashville and later worked in the local freight office. Two years later he became a clerk in the claims office of the Mexican International under J. E. Dennison, now General Auditor of the National Railways of Mexico. In 1893 he was made chief rate clerk in the traffic department, and the next year was made chief clerk and car accountant in the transportation department. From 1900 to 1902 he was engaged in business not connected with railways. In October, 1902, he became chief clerk in the store department of the Los Angeles & Pacific Electric and for a while was Acting Storekeeper. In 1903 he became a Chief Despatcher's clerk and clerk to the District Freight and Passenger Agent of the Southern Pacific at Tucson, Ariz. In June the next year he was appointed Auditor of the Consolidated Telephone, Telegraph & Electric Co., and in November, 1906, returned to railway work as chief clerk and cashier to the Division Engineer of the Southern Pacific at Guadalajara. In 1907 he was appointed the General Agent of the construction and engineering departments, with office at Guadalajara, taking care of the adjustment of right of way matters between the company and the government. He held this position until his recent appointment.

J. B. Sparks.

T. M. Flynn has been appointed the Trainmaster of the Third and Fourth districts of the Northern Pacific, with office at Forsythe, Mont., succeeding G. T. Ross, promoted.

J. P. Rogers, Superintendent of Construction of the Hanford Irrigation & Power Company, has been appointed the Superintendent of the Spokane, Portland & Seattle at Vancouver, Wash.

W. B. Throop, General Superintendent of the Iowa district of the Chicago, Burlington & Quincy, has been appointed the General Superintendent of the Nebraska district, with office at Lincoln, Neb., succeeding H. E. Byram, promoted to Assistant to the Second Vice-President. L. B. Allen, General Superintendent of the Wyoming district, succeeds Mr. Throop, with office at Burlington, Iowa. E. P. Bracken, Superintendent of the Galesburg division, succeeds Mr. Allen, with office at Alliance, Neb. S. H. Shults, Superintendent of the Brookfield division, succeeds Mr. Bracken, with office at Galesburg, Ill. W. C. Welch succeeds Mr. Shults, with office at Brookfield, Mo.

Traffic Officers.

A. L. Ruff has been appointed the General Agent of the Spokane, Portland & Seattle at Seattle, Wash.

E. G. Vestal has been appointed a Traveling Passenger Agent of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal.

W. J. Sheridan, Soliciting Freight Agent of the Lehigh Valley at Sayre, Pa., has been transferred as Soliciting Freight Agent to Geneva, N. Y., succeeding A. T. Stark, transferred. W. H. Spencer succeeds Mr. Sheridan.

G. H. Kelland, Secretary of the Official Classification Committee, succeeds F. S. Holbrook as Representative of the Trunk Line Association on the Uniform Classification Committee. Oscar Levenberg succeeds Mr. Kelland.

F. J. Wheeler, General Agent of the freight department of the San Pedro, Los Angeles & Salt Lake, has been appointed General Agent of both the freight and passenger departments, with jurisdiction extending from San Diego, Cal., to San Francisco.

H. G. Elliott, whose appointment as Assistant General Passenger Agent of the Grand Trunk, succeeding Mr. Bell, promoted, has been previously announced, was born in Chambly, Que., in 1860. He began railway work in 1882 as city ticket agent of the Central Vermont at the Montreal office of the company. In May, 1897, he became ticket agent of the Grand Trunk at Montreal, and in July was made excursion clerk in the General Passenger and Ticket department. In August, 1899, he was appointed chief clerk in the General Passenger and Ticket department, and in May of the next year was made Assistant General Passenger and Ticket Agent, holding this position until May 1.

H. G. Elliott.

E. R. Reynolds has been appointed the General Baggage Agent of the Chicago Great Western, with office at Chicago, succeeding G. T. Spilman, and D. Menzie has been appointed Superintendent of Dining Cars, with office at Chicago, succeeding Mr. Spilman.

U. L. Truitt, whose resignation as General Eastern Pas-

senger Agent of the Chesapeake & Ohio has been announced in these columns, has become associated with the New York Stock Exchange firm of W. L. Lyons & Co., and will act as manager of the firm's branch office at 309 Broadway, New York.

G. T. Bell, recently appointed Assistant Passenger Traffic Manager of the Grand Trunk and the Grand Trunk Pacific, was born in 1861 and began railway work on the Grand Trunk in 1878. In November, 1880, he was made Secretary to the General Passenger Agent, and in 1882 was appointed chief clerk to the Assistant General Passenger Agent at Toronto, three years later being transferred as chief clerk to the General Passenger office at Montreal. By 1892 he had become Assistant General Passenger Agent, and in 1899 was made First Assistant General Passenger Agent. A year later he was appointed General Passenger Agent, holding this position until his appointment as Assistant Passenger Traffic Manager.

G. T. Bell.

C. E. Smith has been appointed a General Agent of the Erie Despatch, with office at Los Angeles, Cal. His territory includes Arizona and the southern section of California. C. E. Baker has been appointed a General Agent, with office at Portland, Ore. His territory includes Oregon and that part of Washington south of Snake river. H. J. Steeple has been appointed a General Agent, with office at Seattle, Wash. His territory includes Alaska, British Columbia and that part of Washington north of Snake river.

Engineering and Rolling Stock Officers.

D. Fairchild has been appointed the Roadmaster of the Second district of the Yellowstone division of the Northern Pacific, succeeding J. H. Daly, resigned.

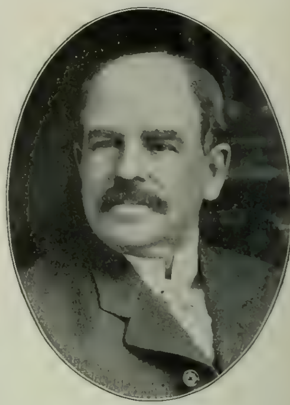
Robert P. Madill, Division Engineer of the Erie, with office at Rochester, N. Y., has been transferred as Division Engineer to Buffalo, N. Y., succeeding W. C. Hebard, resigned to engage in other business.

F. L. Nicholson, Engineer Maintenance of Way of the Norfolk & Southern, has been appointed Chief Engineer in charge of Construction and Maintenance of Way and Structures, with office at Norfolk, Va., and his former position has been abolished.

M. L. Newton, Chief Engineer of the Waterloo, Cedar Falls & Northern, has been appointed Consulting Engineer, with office at Waterloo, Iowa, and will perform such duties as may be assigned to him. T. E. Rust, Assistant Engineer of the Chicago Great Western, succeeds Mr. Newton, with office at Waterloo, and all employees heretofore reporting to Mr. Newton will hereafter report to Mr. Rust.

C. B. Keiser, recently appointed Master Mechanic of the Pennsylvania Tunnel & Terminal, was born in 1874 at West Milton, Pa. He is a graduate of the Pennsylvania State College of the class of 1898, having taken the electrical engineering course. He began railway work on the Pennsylvania as machinist at the Wellington shop in 1898, and two years later became draftsman in the Motive Power department at Altoona. In 1902 he became an inspector of motive power in the office of the Superintendent of Motive Power of the Philadelphia, Baltimore & Washington, and in 1905 was appointed Assistant Master Mechanic in the Wellington shop of the P., B. & W. A year later he was made Assistant Electrical Engineer in charge of electric operation of the West Jersey & Seashore, which position he held until his recent appointment.

J. J. Ellis, for a number of years in the Motive Power and Mechanical department of the Chicago, St. Paul, Minneapolis & Omaha, and until the early part of this year Superintendent of Motive Power, has retired from railway service. He served an apprenticeship with Knowles & Houghton, of Leeds, Yorkshire, England. After seven years with this firm he became foreman of the shops of H. Cook & Co., of Leeds. After some years service with them he began railway work on the London & North Western, remaining with that road for eight years. He was then appointed foreman of the Manchester shops of Sir William Fairburn, and was later sent to Scotland to erect machinery and buildings for the manufacture of patent fuel, and on the completion of this work was made Manager of the plant that he had built. He later came to America and was made foreman of the Hudson shops of the Chicago, St. Paul, Minneapolis & Omaha, and in 1892 was made Master Mechanic, the shops having in the meantime been moved to St. Paul. He was later appointed Superintendent of Motive Power and Machinery, holding this position until his retirement.



J. J. Ellis.

OBITUARY.

Fred C. Mater, Yardmaster of the Chicago Great Western at Mason City, Iowa, was accidentally killed at Mason City on May 4.

A. H. McLeod, formerly Freight Traffic Manager of the Cincinnati, Hamilton & Dayton and the Chicago, Cincinnati & Louisville, died at his home in Wyoming on May 10. Mr. McLeod was: from 1861 to 1871 a clerk in the General Freight department of the Baltimore & Ohio; from 1871 to 1873, Assistant General Freight Agent of the Pittsburgh, Washington & Baltimore; from 1873 to 1874, confidential clerk in the General Freight department of the Erie; from 1874 to 1875, General Manager of the Diamond Fast Freight Line; from 1875 to 1896, General Freight Agent of the Cincinnati, Hamilton & Dayton; from 1896 to 1905, Freight Traffic Manager of the same road; from 1904 to 1905 also Freight Traffic Manager of the Chicago, Cincinnati & Louisville, and from 1905 until the time he retired from railway service, Freight Traffic Manager of the Cincinnati, Hamilton & Dayton at Cincinnati.

H. H. Rogers, Vice-President of the Standard Oil Co. and President of the Virginian Railway, died at his home, 3 East Seventy-eighth street, New York, early Wednesday morning, May 19. He was born in 1840 at Mattapoisett, Mass. He was a director in more than 20 corporations, many of them of first importance, and was up to about two years ago the dominating personality in the Standard Oil Co., having taken this position after John D. Rockefeller withdrew from active participation in the affairs of the company some eight years ago. The Virginian Railway, recently opened for traffic, was the last great undertaking of Mr. Rogers, and was one of the most remarkable railway projects ever carried out. The line is 442 miles long, extending from Kanawha river coal fields in West Virginia to tidewater. It embodies the principles of the best standard low-grade railway practice. It cost in the neighborhood of $40,000,000. The larger part of this money was supplied by Mr. Rogers personally, and while there are $17,000,000 tidewater notes and $3,750,000 equipment trust certificates outstanding, they bear the personal guarantee of Mr. Rogers.

Railroad Construction.

New Incorporations, Surveys, Etc.

ARKANSAS ROADS.—A business men's league has been organized in Stuttgart, Ark., which will prepare a plan for a new 20-mile railway from Stuttgart to a connection with the Rock Island system. G. W. Fagan, Pres.; J. I. Ingram, Secy.

ALGOMA CENTRAL & HUDSON BAY.—The Manitoulin & North Shore will, during the present year, build between mile 13 and Little Current, Ont., about 70 miles. This work includes a bridge over the Vermillion river; a through girder bridge, 183 ft. long, over the Spanish river, and one of two 50-ft. spans, on concrete piers in abutments, over the Spanish River Paper & Pulp Company's power canal. The two latter bridges are completed, also part of the grading. There will be a swing bridge at Little Current, details of which are now under consideration. Surveys have been made between Sudbury, Ont., and Little Current. It is probable that this line will be built on a one-per-cent. grade, with a curvature of from 8 to 10 deg. Bids will be asked for the construction of the first section, 10 miles, about the end of May. (April 23, p. 918.)

ATCHISON, TOPEKA & SANTA FE.—An officer writes that contracts have been let for the extension of the Pecos & Northern Texas from Plainview, Tex., to Lubbock, about 47 miles. Moore & Harris, contractors. G. W. Harris, Amarillo, Texas, Ch. Engr. of Construction. (March 19, p. 61.)

CALIFORNIA NORTHEASTERN.—See Southern Pacific.

CANADIAN & NORTHERN.—This company will spend about $1,000,000 on construction during the remainder of the present year. The work is to include relaying, with heavier rails, 200 miles of the main line between Winnipeg, Man., and Port Arthur, Ont.

No work will be done this summer on the Hudson Bay branch north of Le Pas, but the roadbed south of that point will be reballasted.

Bids are being received for construction of 40 miles on the Shelbourne line in the vicinity of Prince Albert, Sask.

CANADIAN PACIFIC.—The plans for the extension of the Esquimalt & Nanaimo branch from French Creek, B. C., to Alberni, have been accepted by the Railroad Commission, and Construction will be started at once. (March 19, p. 660.)

CHICAGO, WEATHERFORD & BRAZOS VALLEY.—According to press reports, Colonel R. E. Bell and J. W. Hicks, of Weatherford, are interested in a project to build from Gainesville, Tex., southwest to Kerrville, about 300 miles.

CUBA RAILROAD.—The plans submitted by this company for building a line from Marti, in the province of Camaguey, on the main line, southeast via Bayamo, Santa Rita, Jiguani, Baire and Palma Soriano, and also a branch from Bayamo via Veguita and Yara to Manzanillo, were approved by President Gomez on March 25. The new extension will be about 175 miles long, to be completed about May, 1911. The company will receive a subsidy of $9,600 per mile.

CUBAN RAILWAYS.—Consul R. E. Holaday at Santiago, Cuba, writes that railways are constantly being planned in Cuba and it is probable that in the next two years several new roads and important extensions of old lines will be built.

DULUTH, WINNIPEG & PACIFIC.—This company is said to have filed a mortgage to secure $1,250,000 bonds, covering the proposed line from Virginia, Minn., south to Duluth. (April 2, p. 774.)

FARMERS & STOCKGROWERS.—An officer writes that this company was incorporated in Kansas with $100,000 capital to build about 200 miles. The projected route is from a point in Pratt county west through Edwards, Kiowa, Ford, Gray, Haskell, Grant and Stanton counties to the Colorado state line. G. C. Brown, Pres., Plains, Kan.; J. N. Brown, J. H. Collingwood, J. R. Bolin and J. R. George are incorporators.

GARDEN CITY, GULF & NORTHERN.—An officer writes that construction work is now under way. The projected route is from Plains, Kan., on the Chicago, Rock Island & Pacific, north via Garden City and Scott to St. Francis in Cheyenne county, about 225 miles. The company was recently incorporated with $5,000,000 capital and expects to have the section from Garden City north to Scott City, about 40 miles, in operation by December. B. M. McCue, Pres.; E. A. Tennis, V.-Pres.; J. W. Hope, Secy., and F. C. Avery, Treas., Garden City. (May 7, p. 1007.)

GULF, COLORADO & SANTA FE.—According to press reports, track-laying is now under way by the Texas & Gulf on the line from Center, Tex., northwest via Tenaha to Zuber, 21.3 miles. It is expected the line will be opened for traffic early in June. (March 19, p. 654.)

INTERNATIONAL & GREAT NORTHERN.—According to press reports, this company is filling in a large section adjoining its present yards, at the foot of Caroline and Austin streets, in Houston, Tex. When finished, the site will be used for storage and loading yards. A number of wharves may also be built along the channel. The plans include a large outbound freight warehouse on Commerce street. Heavy rails are now on the way to replace the light sections from Houston north to Spring, 23 miles, and about 200 miles additional will be relaid with heavy rails when this work is finished.

KANSAS CITY SOUTHERN.—An officer writes that grade reduction work on a moderate scale will be begun in the near future. (March 19, p. 655.)

LAKE SHORE & MICHIGAN SOUTHERN.—An officer writes that it is the intention to place 100-lb. rails on the line between Youngstown, Ohio, and Ashtabula, this year, and ultimately to ballast it with stone to bring it up to the main line standard. This line now has double track from Ashtabula to Carson, five miles, single track from Carson to Brookfield, 47 miles, and double track from Brookfield to Youngstown, 11 miles. It is also the intention to grade for a third, or a slow speed, track over the route from Brookfield to Youngstown, this year, and complete the line next year.

An officer writes that the Franklin & Clearfield will probably be completed to a connection with the Pennsylvania, near Brookville, Pa., by about July 5. (March 19, p. 655.)

MISSOURI, KANSAS & TEXAS.—According to press reports, recent orders have been given to rebuild the line between Denison, Tex., and Atoka, Okla. (Oct. 2, p. 1076.)

MONTANA WESTERN.—An officer of the Conrad Land & Water Co. writes that the proposed route is from Conrad, Mont., on the Great Northern, northwest to the new town of Valier, about 20 miles, traversing an extensive irrigation district. The project is being carried out by the Conrad Land & Water Co., of which W. S. Cargill is Pres.; A. M. Tortellotte, Vice-Pres.; W. W. Withee, Secy. and Treas., and J. B. Bond, Ch. Engr., Conrad.

PECOS & NORTHERN TEXAS.—See Atchison, Topeka & Santa Fe.

SACRAMENTO SOUTHERN.—See Southern Pacific.

SAN DIEGO & ARIZONA.—An officer writes that contracts were to be let about May 15 for the grading and masonry work on the first section of 15 miles from San Diego, Cal., south to Tia Juana in lower California. The line is projected from Tia Juana, east through Mexico, thence into California, continuing east to the Colorado river. E. J. Kallright, Ch. Engr., Union building, San Diego, Cal. (April 30, p. 961.)

SOUTH DAKOTA INTERURBAN.—Incorporated in South Dakota, with $1,000,000 capital and headquarters at Centerville, to build about 160 miles from Sioux City, Iowa, northwest to Bijou Hills, S. Dak.

SOUTHERN PACIFIC.—Press reports say that Southern Pacific lines will be open for traffic about June 1 as follows:

California Northeastern.—Building from Weed, Cal., north to Klamath Falls, Ore., 89 miles.

Sacramento Southern.—Building from Sacramento, Cal., south to Antioch, 54 miles.

SPOKANE, PORTLAND & SEATTLE.—See item in another column regarding opening of this line.

TEXAS & GULF.—See Gulf, Colorado & Santa Fe.

TOPPENISH, SIMCOE & WESTERN.—Incorporated in Washington, with $500,000 capital, to build from Toppenish, Wash., on the Northern Pacific, west to Fort Simcoe, about 30 miles. F. A. Williams, J. D. Cornett, W. S. Shearer, C. F. Meyer and Z. Y. Coleman, all of Toppenish, are interested.

Railroad Financial News.

ALABAMA GREAT SOUTHERN.—An initial dividend of 2 per cent. on the $7,830,000 ordinary stock outstanding has been declared, payable June 26. The Alabama Great Southern is controlled through the ownership of $4,540,050 ordinary stock and $1,725,000 preferred stock by the Southern Railway, and it in turn controls jointly with the Cincinnati, Hamilton & Dayton, the Cincinnati, New Orleans & Texas Pacific. The Southern Railway will receive as its share of the present dividend $90,801.

BOSTON & MAINE.—Governor Draper, of Massachusetts, in speaking of the proposed bill which provides for a company to be formed under the auspices of the legislature of Massachusetts to take over the $11,000,000 stock of the Boston & Maine, held by John L. Billard, says: "It is evident that I have consulted with various people in regard to this matter, and that if a company is created on lines indicated in this bill the transaction can be carried through." (April 23, page 919.)

CANADIAN NORTHERN.—See Duluth, Winnipeg & Pacific under Railroad Construction.

CENTRAL TERMINAL CO. (CHICAGO).—A committee consisting of I. M. Cobe, E. K. Boisot and Samuel Insull has prepared a plan for the consolidation of the elevated lines in Chicago. The committee suggests the organization of the Central Terminal Co., with at least $4,000,000 stock, to take over the Union Consolidated Elevated (downtown loop), and to lease the South Side Elevated, the Northwestern, the Metropolitan West Side and the Chicago & Oak Park, the rentals under the lease to be paid on a sliding scale of dividends on the stock of the leased companies.

CHICAGO & NORTH WESTERN.—The $769,000 7 per cent. Cedar Rapids & Missouri River bonds of 1884-June 1, 1909, will be paid at maturity at the office of the treasurer of the Chicago & North Western, 111 Broadway, New York.

CHICAGO & OAK PARK.—See Central Terminal Co.

CHICAGO, MILWAUKEE & PUGET SOUND.—A mortgage securing an authorized issue of $100,000,000 4 per cent. bonds of 1909-1939 has been filed with the Secretary of State of South Dakota. The $100,000,000 stock of the company is all owned by the Chicago, Milwaukee & St. Paul. (Jan. 15, 1909, page 140.)

See Union Pacific.

DELAWARE, LACKAWANNA & WESTERN.—There have been three plans suggested by which the company can legally comply with the commodities clause as interpreted by the Supreme Court of the United States, which forbids a railway company to transport coal or other commodities, with the exception of lumber, in which it has a legal interest. The first plan would provide for a holding company to take over the coal lands, the stock of the holding company to be distributed among the D., L. & W. stockholders; the second plan would provide that the coal lands be leased to an operating company; the third plan would provide for a selling company, whose stock should be owned by the Delaware, Lackawanna & Western.

CHICAGO, MILWAUKEE & ST. PAUL.—See Chicago, Milwaukee & Puget Sound.

DULUTH, RAINY LAKE & WINNIPEG.—See Duluth, Winnipeg & Pacific under Railroad Construction.

FLORIDA EAST COAST.—A mortgage has been filed securing $12,000,000 4½ per cent. bonds and $28,000,000 5 per cent. bonds. There are $7,258,000 first mortgage 5 per cent. bonds and $8,742,000 second mortgage 5 per cent. bonds outstanding it is understood, and $16,000,000 new bonds are to be used to refund these two issues, while the remainder of the new bonds are reserved for future purposes.

GRAND RIVER.—See Michigan Central.

GRAND TRUNK.—See Grand Trunk Pacific.

GRAND TRUNK PACIFIC.—The Canadian House of Commons has passed a bill authorizing the government to advance $10,000,000 as a loan to the Grand Trunk Pacific to aid the company to complete the building of the prairie section. The loan is to bear interest at 4 per cent. and to be repaid in 10 years. It will be secured by an issue of $10,000,000 4 per cent. bonds maturing in 1919. New bonds which are to be issued will be secured by a new mortgage covering the prairie section, subject to prior liens and guaranteed principal and interest by the Grand Trunk.

HOUSTON BELT & TERMINAL.—G. H. Walker & Co., St. Louis, Mo., have bought and resold $2,246,000 Houston Belt & Terminal first mortgage sinking fund 5 per cent. bonds of 1907-1937. (April 9, page 821.)

HUDSON & MANHATTAN.—The board of directors has been increased from 9 to 11. Richard W. Meirs and United States Senator F. O. Briggs have been elected new directors. There is now one vacancy in the board.

KANSAS CITY SOUTHERN.—W. H. Williams, Third Vice-President of the Delaware & Hudson, and E. R. Bacon, Vice-President of the Baltimore & Ohio Southwestern, have been elected directors of the Kansas City Southern, succeeding H. Blumenthal and H. R. Duval.

LOUISVILLE & NASHVILLE.—Kissel, Kinnicutt & Co., N. W. Harris & Co., Moffat & White and the National City Bank, all of New York, are offering $4,500,000 Paducah & Memphis division first mortgage 4 per cent. bonds of 1896-1946 of the Louisville & Nashville at 98. The bonds formed part of the collateral securing $23,000,000 notes which were called for payment April 1, 1909.

METROPOLITAN WEST SIDE.—See Central Terminal Co.

MICHIGAN CENTRAL.—Stockholders of the Grand River, a subsidiary of the Michigan Central, the line of which runs from Rivers Junction, Mich., to Grand Rapids, 84 miles, have authorized a mortgage to be made jointly with the Michigan Central to secure $4,500,000 4 per cent. bonds of September 1, 1909-1959. Of these bonds, $1,500,000 are to be issued to retire a like amount of first mortgage 6 per cent. bonds due September 1, and $1,500,000 are to be issued to furnish funds for double-tracking and other improvements.

NEW YORK, NEW HAVEN & HARTFORD.—See an item in regard to this company under General News.

NORTHWESTERN (CHICAGO).—See Central Terminal Co

PENNSYLVANIA.—Kuhn, Loeb & Co., New York, have bought and resold $8,100,000 4 per cent. general first mortgage equipment trust certificates, maturing in instalments from 1911 to 1917.

ST. LOUIS, BROWNSVILLE & MEXICO.—Official denial is made of reports that there is to be a change in the control of this road. It is stated that there is no deal on foot at the present time for a sale to the Chicago, Rock Island & Pacific interests or to any other interests.

SOUTHERN RAILWAY.—See Alabama Great Southern.

SOUTH SIDE ELEVATED.—See Central Terminal Co.

THIRD AVENUE.—The property of this company, which is in the hands of F. W. Whitridge, as receiver, is to be sold at public auction September 2 under foreclosure proceedings brought by the Central Trust Co., New York, as trustee for the $37,560,000 first consolidated mortgage 4 per cent. bonds on which interest is in default. The sale will be subject to the prior lien of the $5,000,000 first mortgage 5 per cent. bonds. Besides the physical property the company owns stock of other companies, included in which is $2,000,000 stock of the Union Pacific. The Third Avenue operates 34 track miles of street railway in New York City and controls 235 miles, and has been in the hands of a receiver since September, 1907.

UNION CONSOLIDATED ELEVATED.—See Central Terminal Co.

UNION PACIFIC.—A deed conveying to the Union Pacific an undivided one-half interest in the line of the Chicago, Milwaukee & Puget Sound extending from Puyallup river bridge, just outside Tacoma, to Black River junction, 26 miles, has been filed.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago, Burlington & Quincy will order a number of locomotives, probably 40.

The Aliquippa & Southern is said to be figuring on locomotives. This is not yet confirmed.

The Bessemer & Lake Erie is said to be about to order locomotives. This is not yet confirmed.

The Buffalo, Rochester & Pittsburgh has ordered from the American Locomotive Co. the 15 locomotives mentioned in the *Railroad Age Gazette* of April 2.

The Charlotte Harbor & Northern is in the market for 5 locomotives. L. M. Fouts, 2nd Vice-Pres. and Gen. Mgr., 317 Duval building, Jacksonville, Fla.

The Kansas City Belt has ordered 2 simple switch engines from the Baldwin Locomotive Works for delivery in 60 days.

General Dimensions.

Weight on drivers	121,000 lbs.
Weight, total	121,000 lbs
Cylinders	19 in. x 24 in.
Diameter of drivers	51 "
Boiler, type	Straight top
Boiler, working steam pressure	180 lbs.
Heating surface, tubes	1,372 sq. ft.
" " firebox	123 "
" " total	1,495 "
Tubes, number	240
" outside diameter	2 in.
" length	11 ft.
Firebox, length	8 ft. 8 1/8 in.
Grate area	25 sq. ft.
Tank capacity	4,500 gals.
Coal capacity	9 tons
Tractive effort	28,158 lbs.

Special Equipment.

Axles	Steel
Bell-ringer	Golmar
Boiler lagging	B. L. W.
Brakes	Westinghouse E. T.
Couplers	Climax
Driving boxes	Steel
Headlight	Star
Injector	Ohio
Piston and valve rod packing	United States
Safety valve	Crosby
Sanding devices	Leach
Sight-feed lubricators	Chicago
Tires	Standard
Wheel centers	Steel

The Chesapeake & Ohio, as reported in the *Railroad Age Gazette* of April 30, has ordered from the American Locomotive Co., for delivery on or before November 1, 35 simple consolidation locomotives.

General Dimensions.

Weight on drivers	173,000 lbs.
Total weight	195,000 lbs.
Cylinders	22 in. x 28 in.
Diameter of drivers	56 "
Type of boiler	Extended wagon top
Working steam pressure	200 lbs.
Heating surface, tubes	2,526 sq. ft.
" " firebox	157 "
" " total	2,709 "
Tubes, number	329
" outside diameter	2 in.
" length	14 ft. 9 "
Firebox, type	Wide
" length	90 in.
" width	75 "
Grate area	46.87 sq. ft.
Water capacity	7,000 gals.
Coal capacity	10 tons

Special Equipment.

Bell ringer	Western
Boiler lagging	Standard and Ehret
Brakes	Westinghouse
Brake-beams	Metal to C. & O. specifications
Brake-shoes	Drivers, National B. S Co.
Brake-shoes	Tenders, Columbia B. S. Co.
Brick arch	Newton Fire Brick Co.
Couplers	Tower
Driving boxes	Cast steel with Elvin lubricators
Headlight	Dressel
Injector	Hancock inspirator
Journal bearings	Brady Brass Co.
Piston and valve-rod packings	Jerome & Elliott
Safety valve	Consolidated
Sanding devices	Waters
Sight-feed lubricators	Nathan bulls-eye
Springs	Union Spring & Mfg. Co.
Staying	Brown, U. S. and Old Dominion I. & N. Co.
Steam gages	Star
Tires	Latrobe
Tubes	Detroit Seamless Steel Tube Co
Valve gear	Walschaert
Wheel centers	Cast steel

CAR BUILDING.

The Lehigh Valley is in the market for 15 coaches.

The Hastings Express Co. has ordered 4 cars from the Pullman Company.

The Baltimore & Ohio will have 500 box cars rebuilt by the Ryan Car Co.

The Pennsylvania Lines West have been figuring on 121 steel passenger cars.

The Western Maryland has ordered one parlor car from the Barney & Smith Car Co.

The Bessemer & Lake Erie is said to be about to order cars. This is not yet confirmed.

The Aliquippa & Southern is said to be figuring on cars. This is not yet confirmed.

The South Manchurian has ordered fifty 50-ton steel drop-bottom cars from the Ralston Steel Car Co.

The Maine Central has ordered fifty 50-ton gondolas and fifty 40-ton gondolas from the Standard Steel Car Co.

The Oregon Railroad & Navigation Co. has ordered two McKeen motor cars, each to seat about 70 passengers.

The Interborough Rapid Transit is in the market for 150 steel side door subway cars and 100 elevated railway cars.

The Baltimore & Ohio, which has been considering the purchase of equipment for some time, will soon buy freight and passenger cars.

The Chesapeake & Ohio has ordered 500 hopper cars from the Standard Steel Car Co. and 500 hopper cars from the Pressed Steel Car Co.

The Cincinnati, New Orleans & Texas Pacific and the *Alabama Great Southern* have ordered 226 car bodies from the Mount Vernon Car Co.

The Temiskaming & Northern Ontario is said to have ordered seven steel underframe passenger train cars from the Silliker Car Co. This is not yet confirmed.

The Great Northern, reported in the *Railroad Age Gazette* of April 16 as being in the market for 500 refrigerator cars, has placed this order with the American Car & Foundry Co.

The Illinois Central Electric Ry., Canton, Ill., has ordered one double-truck combination baggage and passenger car and two double-truck motor passenger cars from the McGuire-Cummings Co.

The Louisville & Nashville is said to have ordered material for 300 freight cars, to be built at its own shops, in addition to the 1,000 cars mentioned in the *Railroad Age Gazette* of January 15. This latter item is not yet confirmed.

The United States Government has ordered 22 dirt cars and a mile of portable track from the Youngstown Car Manufacturing Co., Youngstown, Ohio, to be used in Honolulu, where the government is doing a large amount of cement work.

The Western Pacific is in the market for 1,500 steel underframe box cars of 80,000 lbs. capacity, 250 flat cars of 100,000 lbs. capacity, 50 caboose cars of 60,000 lbs. capacity and 750 steel superstructure, steel underframe stock cars of 80,000 lbs. capacity.

The Minneapolis & St. Louis has ordered 250 thirty-ton box cars from the Mt. Vernon Car Manufacturing Co., for July delivery. Specifications are to be the same as on the last lot ordered, reported in the *Railroad Age Gazette* of April 2, 1909.

The Iowa Central has ordered 250 forty-ton gondola cars from the Mt. Vernon Car Manufacturing Co., for June delivery. Specifications are to be the same as on the last lot ordered, reported in the *Railroad Age Gazette* of October 2, 1908.

The Charlotte Harbor & Northern is in the market for 6

passenger coaches, 2 baggage and express, 2 postal and 150 freight cars for its Plant City extension, which is now under construction. L. M. Fouts, 2nd Vice-Pres. and Gen. Mgr., 317 Duval building, Jacksonville, Fla.

The Missouri, Kansas & Texas, reported in the *Railroad Age Gazette* of March 26 as asking prices on passenger and freight cars, has divided this equipment among the American Car & Foundry Co., Ralston Steel Car Co., and Mt. Vernon Car Manufacturing Co.

The Pennsylvania, as reported in the *Railroad Age Gazette* of April 30, is to build at Altoona 15 all-steel dining cars, class D 70, with capacity for 30 passengers. They will weigh 147,000 lbs., and will measure 9 ft. 1 in. wide and 9 ft. 4½ in. high, inside, and 80 ft. 9¾ in. long, 10 ft. 1 in. wide and 14 ft. ½ in. high, over all. The special equipment includes:

Bolsters, body	None
Bolsters, truck	Steel plate
Brakes	Westinghouse
Brake-beams	Channel
Brake-shoes	Cast iron
Brasses	Penn. R.R. type
Couplers	Polar, Penn. R.R. type
Curtain fixtures	Curtain Supply Co.
Curtain material	Mercerized cotton, Pantasote backing
Door checks	Blount checks, Yale & Towne
Draft gear	Westinghouse friction
Dust guards	Penn. R.R. type
Heating system	Penn. R.R. type
Journal boxes	Penn. R.R. type
Lighting system	Electric
Paint	Penn. R.R. standard
Platforms	Penn. R.R.
Roofs	Penn. R.R.
Seats	Penn. R.R., mahogany
Seat covering	None
Side bearings	Flat, 4 per truck
Springs	Penn. R.R. standard
Trucks	6-wheel, steel
Ventilators	Globe
Vestibules	Penn. R.R.
Vestibule diaphragms	Ajax
Vestibule trap doors	P. R.R., O. M. Edwards' fixtures
Wheels	Rolled steel
Window fixtures	O. M. Edwards

IRON AND STEEL.

The Wabash has ordered 300 tons of structural steel from the American Bridge Co.

The Missouri, Oklahoma & Gulf has ordered 10,000 tons of rails from the Illinois Steel Co.

The Missouri, Kansas & Texas is said to have ordered 15,000 tons of rails from the Illinois Steel Co.

The Great Northern of England has ordered 5,000 tons of 85-lb. rails from the Dominion Iron & Steel Co.

The Missouri Pacific is said to have ordered about 6,000 tons of structural steel for bridge work from the McClintic-Marshall Construction Co.

The Chicago, Milwaukee & St. Paul, reported in the *Railroad Age Gazette* of May 14 as being in the market for structural steel for bridge building, has ordered 675 tons from the American Bridge Co. and 900 tons from the Wisconsin Bridge & Iron Co.

General Conditions in Steel.—Probably the most convincing indication of substantial improvement in the steel situation lies in the fact that the United States Steel Corporation is said to have decided upon maintaining its wage scale and that the independent companies will restore wages to their former level. A prediction comes from one of the largest steel companies that the various mills will be operating on a normal basis by the end of this year. Steel manufacturers are reported to be antagonistic to any sharp upward movement in prices. A slow, moderate improvement will undoubtedly be of more permanent benefit to the industry. An attempt at any sharp increases would tend to cause consumers, who have lately made encouraging inquiries, to withdraw from the market.

RAILROAD STRUCTURES.

Andrews, Ind.—The Wabash is building a concrete bridge at an estimated cost of about $3,000.

Calvin, Okla.—The Missouri, Oklahoma & Gulf has given the contract for bridging and grading to J. W. Hoffman & Co., Kansas City, Mo. Contracts for depots, section houses and miscellaneous structures will be let shortly.

Dallas, Tex.—Press reports indicate that the Railroad Commission of Texas, acting under authority of the bill recently signed by Governor Campbell, will order the construction of union passenger stations at Dallas, Sherman, Denison, Tyler and Jacksonville.

Detroit, Mich.—According to press reports the Michigan Central has bought four city blocks in Detroit as sites for yards in connection with the tunnel under the Detroit river and a union passenger station. (Sept. 4, p. 883.)

Fort William, Ont.—The Canadian Pacific will build a plant for creosoting railway ties, and will also build other smaller plants throughout the West.

Kansas City, Mo.—An agreement has been reached by a committee of the City Council, H. L. Harmon, President of the Kansas City Terminal Railway, and attorneys representing the city and the railways, regarding the matter of damages to land, which, it is believed, clears away the last formidable obstacle in the way of the building of a new passenger station and new freight and passenger terminals. It is proposed to insert in the ordinance conferring the necessary franchises a provision that the Kansas City Terminal Railway shall pay into the city all the money, plus 10 per cent., that a commission composed of W. M. Sloan, for the city, and John A. Moore, for the railways, shall estimate as the probable damages to property caused by the building of proposed viaducts and subways. The railways have agreed to spend $450,000 for park purposes. If the money they pay in for estimated damages proves inadequate, the city may provide for the payment of excess damages from this park fund, or it may provide for it by levying assessments on districts that will be benefited by the proposed improvements. In no case shall the city be responsible for any damages. Messrs. Sloan and Moore have secured options from various property owners which indicate that if a four-track passenger line is built the damages here provided for will aggregate $225,000, and if a six-track line $375,000. (Dec. 4, p. 1503.)

An officer writes that the Kansas City Southern will soon begin the construction of the new freight house in the West Bottoms and also new tracks. The office portion of the building will be of reinforced concrete, two stories high and cover a space 36 ft. x 60 ft. The freight warehouse, 36 ft. x 440 ft., will be of ordinary mill construction.

Macon, Ga.—An officer writes that the oil house, roundhouse and other terminal facilities are now under construction and that the erecting shop and other engine repair buildings have not yet been commenced.

Texas City, Tex.—The Texas City Terminal Co. has announced that it will expend during the present year $1,000,000 in enlarging its facilities. The improvements will consist of several miles of additional yard tracks and seven fireproof warehouses connected with the docks by electric conveyors.

Tulsa, Okla.—The St. Louis & San Francisco will build a viaduct, estimated to cost $19,000.

Winchester, Ky.—The Lexington & Eastern has given the contract for the building of a $15,000 brick passenger station to George Baker Long, Chattanooga, Tenn.

SIGNALING.

The General Railway Signal Co. has installed, experimentally, at Spuyten Duyvil, on the New York Central, a new jointless and bondless a.c. track circuit. The signal company this week took a party of signal engineers to inspect the installation.

The New York, Ontario & Western is to install automatic block signals on its line between Fulton, N. Y., and Oswego, 12 miles, single track. Distant signals will in most cases be fixed on the same post with a home signal. In all there will be 24 signals, style B, made by the Union Switch & Signal Company. There will be switch indicators of the semaphore

type. The circuits will be so arranged that a train will always have two home signals ahead of it to indicate stop against opposing trains.

The Cincinnati, Hamilton & Dayton is putting up automatic block signals on its line from Southside, Ohio, to Wyoming, 7½ miles. These signals will take the place of the telegraph block system, which has been in use on this part of the road for many years. The signals are three-position with the semaphore arms moving in the upper quadrant. Twelve highway crossings in this territory have automatic electric crossing bells, which will be controlled by means of the track circuits. These bells, which were made by the Railroad Supply Company, Chicago, were put up about a year ago. The C., H. & D. has just completed a new mechanical interlocking at New River, Ohio. In this plant the machine has 32 levers, with approach and route locking. The distant signals are worked by electric motors.

The Rock Island is to install a mechanical interlocking plant at the crossing of the Wabash at Gallatin, Mo. There will be a 40-lever Saxby & Farmer machine with 34 working levers for 54 functions. Approach and detector and electric locking with indications will be provided on both roads. On the Rock Island the semaphores will give indications in two positions in the upper right-hand quadrant; but they are power-operated and can easily be arranged to work in three positions when the block system is extended to include the plant. Dwarf signals on the Rock Island will be wire-connected and give two indications in the upper right-hand quadrant. On the Wabash the signals will give indications in the lower right-hand quadrant; the high hand signals will be pipe-connected and dwarf signals wire-connected. Distant signals will be power operated.

The Rock Island will install with its own forces a 24-lever Saxby & Farmer interlocking machine and plant at White City, Kan., where the M., K. & T. crosses its Kansas division. There will be 20 working levers. The high signals on the Rock Island will be power-operated, semi-automatic, three position, giving indications in the upper right-hand quadrant. Dwarf signals will give indication in the upper right-hand quadrant also, but will be wire-connected and operate from 0 deg. to 45 deg. only. On the M., K. & T. the high home signals will be pipe-connected and the distant and dwarf signals wire-connected. These will give indications in the lower right-hand quadrant, 60 deg. inclination. On the Rock Island automatic block signals are already in service through White City and the plant will be taken into the block system. Approach, detector and indication electric locking will be provided on both roads.

British Patents Law.

An abstract from the *Sheffield Daily Independent* of March 15 gives the following figures showing the extent to which England claims to have benefited by the new patents law: "Since this act came into operation, in August, 1907, the country has benefited by foreign capital to the extent of $1,518,978, made up as follows: Value of rent and premises acquired by foreign manufacturers in England, $570,690; amount expended on erection of buildings, housing of work people, etc., $522,450; amount expended on plant, machinery and equipment of factories, $425,838. The value of the annual asssessment on which local authorities will receive taxes will be $86,309 per annum.

Up to the present time nine patents in all have been revoked by the comptroller-general, the last one just announced being Patent No. 14,948, of 1900, concerning steam generators, which has been revoked on the application of the S. M. Car Syndicate. The districts which have so far benefited most by the advent of new industries from abroad are Enfield, Flintshire, Hayes, Leicester, Liverpool, London, Manchester and Warrington. At all of the factories English workmen for the most part are employed. In one or two instances the firms have brought over their own overseers to instruct the work people, and in some cases they have taken English hands abroad so as to initiate them into their methods."

Supply Trade News.

The Marion Steam Shovel Co., Marion, Ohio, has increased its capital stock from $1,000,000 to $1,500,000.

The Chicago office of the Ernst Wiener Co., New York, has been moved to 1540 First National Bank building.

T. E. Drohan, Minneapolis sales manager of the Northern Electric Works, Madison, Wis., has resigned to take a position with the General Electric Co., Schenectady, N. Y.

The Harriman Lines have specified Bettendorf single center sill underframes, made by the Bettendorf Axle Co., Davenport, Iowa, for the 1,500 refrigerator cars ordered from the Pullman Company.

The Great Northern has specified the Farlow draft gear, made by the Farlow Draft Gear Co., Baltimore, Md., for the 500 refrigerator cars ordered by it from the American Car & Foundry Co.

The Homestead Valve Manufacturing Co., Pittsburgh, Pa., has appointed Woodward Wight & Co., New Orleans, La., to represent it in that territory. The firm will carry a stock of Homestead valves.

The Isthmian Canal Commission asks bids up to June 10 on valves, pipe fittings, etc.; bolts, screws and other hardware; wire rope, wood boring machine, drill chucks, drills, etc. (Circular No. 511.)

The Southern Railway has specified for the 114 passenger cars recently ordered, heating equipment made by the Gold Car Heating & Lighting Co., New York, and journal boxes made by the F. H. Symington Co., Baltimore, Md.

The Chicago, Milwaukee & St. Paul has specified National trap-doors, made by the General Railway Supply Co., Chicago, for the passenger cars ordered from the Pullman Company and from the Barney & Smith Car Co., reported in the *Railroad Age Gazette* of April 9.

The business of the laboratory of engineering chemistry, 93 Broad street, at Boston, Mass., established in 1886, has been incorporated under the name Arthur D. Little, Inc. The company is prepared to undertake any work involving the application of chemistry to industry.

The Indiana Engineering Co., Indianapolis, Ind., has been incorporated with a capital stock of $30,000. The company proposes to construct steam and interurban railways, etc., and to carry on a general construction business. The incorporators are Henry T. Wilkerson, Albert K. Roweswell and Gilbert Helm.

Alfred Noble, Chief Engineer, East River division, of the Pennsylvania Tunnel & Terminal Railroad, which is the name under which the Pennsylvania tunnels on the New York extension are being built, and Silas H. Woodard, a Resident Engineer on this work, have opened an office as Civil and Consulting Engineers under the name Noble & Woodard at 7 East Forty-second street, New York.

E. D. Giberson and Frank E. Olin, formerly connected with the New York sales agency of the National Tube Co., Pittsburgh, Pa., have been appointed Eastern Sales Agents of the Ohio Seamless Tube Co., Shelby, Ohio, with offices at 2 Rector street, New York. The eastern territory will be handled by the New York office, and all inquiries originating in this territory should be addressed to that office.

Among the orders recently booked by the Crocker-Wheeler Co., Ampere, N. J., is one for a motor-generator set consisting of a 3-phase, 60-cycle, 2,300-volt, synchronous motor and a 575-volt direct-current dynamo, having a capacity of 300 kilowatts, for the Boise Valley Railway. The National Tube Co., McKeesport, Pa., has added to its 22,800 horse-power of Crocker-Wheeler motors 275 horse-power for the operation of saws and various rolling-mill machinery.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, has just established an agency in Canada for the sale of its product in the territory west of Lake Superior, with the Brydges Engineering & Supply Co., 249 Notre Dame avenue, Winnipeg, Man., and with Mussens Limited, 299 St. James street, for the sale of staybolt material in the territory east of Lake Superior.

It has also appointed H. J. Skelton & Co., London, England, sole representatives for the British Isles and India.

The Davis-Bournonville Co., New York, will have at the M. C. B. and M. M. convention at Atlantic City a working exhibit of its oxy-acetylene welding and cutting apparatus. As it may be possible that some of the members of the associations have about their shops broken parts of machinery that require particularly skilful welding, the company wishes to announce that it will be glad to do any welding necessary on work sent to them express paid, Atlantic City.

The partnership which, under varying names has for about 75 years owned the Baldwin Locomotive Works, is expected to terminate in June and be succeeded by a stock corporation. The two weeks' legal notice has been given and application for a charter from the state of Pennsylvania will be made on June 3. No change in personnel is indicated by this change in form of organization, which has become desirable, primarily, because of Mr. Henszey's death and the age of the senior partner.

The Pittsburgh office of the Darley Engineering Co., New York, has been abolished, and the engineering, purchasing and sales departments hitherto located there have been transferred to New York, where all communications should be sent. The Chicago office will remain, as at present, in the Monadnock building. The general officers of the company are now as follows: W. A. Stadelman, President and General Manager; C. L. Inslee, Vice-President; W. G. Hudson, Vice-President; W. W. Ricker, Treasurer; M. D. Chapman, Secretary.

It is officially announced that the Pullman Company will make additions to its works at Chicago which will involve an expenditure of about $1,750,000. An extension of the shop in which passenger cars are made is now in progress which will increase the capacity of this shop about two-thirds, enabling it to turn out 150 cars a month. The company will later build a plant for the manufacture of steel freight cars which it is expected will have a capacity of 1,500 to 2,000 cars a month. The total capacity of the works when the contemplated improvements are completed will be about 30,000 cars a year. Detailed plans for the new freight car shop have not been finished.

Thomas A. Weston died in New York on May 3. He was 77 years old. He was born in England, but came to this country when quite young, and for a time was a clerk in the old hardware house of Pratt & Co., Buffalo, N. Y. He had an inventive mind and a natural aptitude for mechanics. His first and most widely known invention was the differential pulley block. The invention was patented in Great Britain and the United States, the licensees in the former being Tangye Bros., Ltd., Birmingham, England, and in the latter the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. Weston's next notable invention was the multiple disc brake, and his third and last important invention was the Triplex chain block. He made numerous minor inventions, and all of the latter part of his life was occupied in the study of mechanical problems.

TRADE PUBLICATIONS.

Graphite Products.—The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a pocket edition general catalogue, which contains lists of their principal products, such as crucibles, facings, lubricating graphite, greases, pencils, protective paint, etc.

Air Cylinder Lubricator.—The Detroit Lubricator Co., Detroit, Mich., has just issued a circular in reference to its Detroit sight feed air cylinder lubricator. This lubricator was illustrated and described in the *Railroad Age Gazette* of October 23, 1908.

Distributing Transformers.—Circular 1,502, just issued by the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., describes the Westinghouse distributing transformers, 5 to 50 k.w. capacity. This is one of the standard Westinghouse publications for use in a loose leaf cover.

Amatite Roofing.—The Barrett Manufacturing Co., New York, will send samples of its Amatite roofing to interested parties. These samples show the roofing complete with the mineral surface, which replaces paint. From these samples it will be easy to obtain a very good idea of just what this roofing is.

Circuits for Power Distant Signals and Route Locking.—The Union Switch & Signal Co., Swissvale, Pa., has issued bulletin No. 40 containing 21 diagrams, with explanatory text, showing the principal plans used by the company in arranging the wiring for power distant signals, indicators, approach locking, semi-automatic control, etc.

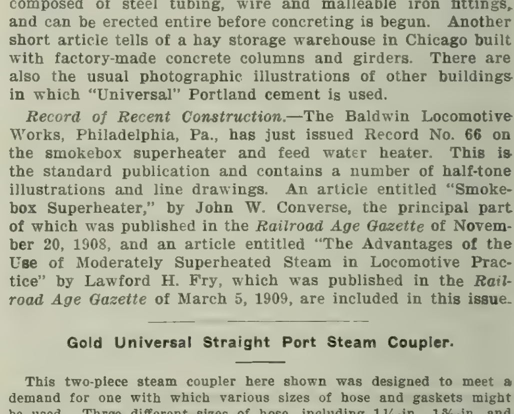
Blow-Off System.—The Horace L. Winslow Co., Chicago, successors to Julian L. Yale & Co., in an attractive catalogue, describes and illustrates the Clark blow-off system for use on locomotives. This system is designed to stop foaming, remove sludge and prevent scale formation. An inset shows a sectional elevation of a locomotive equipped with this blow off system.

Reinforced Concrete Construction.—The May number of the Bulletin of the Universal Portland Cement Co., Chicago, has for its leading article a description of a novel system for building a reinforced concrete dwelling house. The frame is composed of steel tubing, wire and malleable iron fittings, and can be erected entire before concreting is begun. Another short article tells of a hay storage warehouse in Chicago built with factory-made concrete columns and girders. There are also the usual photographic illustrations of other buildings in which "Universal" Portland cement is used.

Record of Recent Construction.—The Baldwin Locomotive Works, Philadelphia, Pa., has just issued Record No. 66 on the smokebox superheater and feed water heater. This is the standard publication and contains a number of half-tone illustrations and line drawings. An article entitled "Smokebox Superheater," by John W. Converse, the principal part of which was published in the *Railroad Age Gazette* of November 20, 1908, and an article entitled "The Advantages of the Use of Moderately Superheated Steam in Locomotive Practice" by Lawford H. Fry, which was published in the *Railroad Age Gazette* of March 5, 1909, are included in this issue.

Gold Universal Straight Port Steam Coupler.

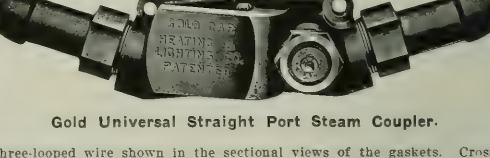
This two-piece steam coupler here shown was designed to meet a demand for one with which various sizes of hose and gaskets might be used. Three different sizes of hose, including $1\frac{1}{4}$-in., $1\frac{3}{8}$-in. and $1\frac{5}{8}$-in., inside diameter, may be used with the same coupler, the nipples having the same sized thread connection. It is only necessary to change the gasket according to the size of the hose used. This, however, is a simple matter, using a small hook in the upper part of the



Gold Universal Straight Port Steam Coupler.

three-looped wire shown in the sectional views of the gaskets. Cross sections of the three gaskets here illustrated have $1\frac{1}{4}$-in., $1\frac{3}{8}$-in. and $1\frac{1}{2}$-in. openings and have areas 1.2272 sq. in., 1.4849 sq. in. and 1.7671 sq. in. respectively.

This coupler is also designed to connect with the Gold No. 105 and No. 400 coupler, and with the medium sized ones of other makes. It is fitted with the Gold latest design of improved gravity relief trap, and may be used with or without the Gold lever lock. This coupler



Interchangeable Gaskets for Gold Steam Coupler.

has a $1\frac{1}{2}$-in. bore; therefore by using the gasket with $1\frac{1}{2}$-in. opening it has the same passageway for steam as the larger couplers now in use on a number of trunk lines.

This coupler is made by the Gold Car Heating & Lighting Co., New York.

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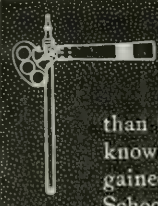

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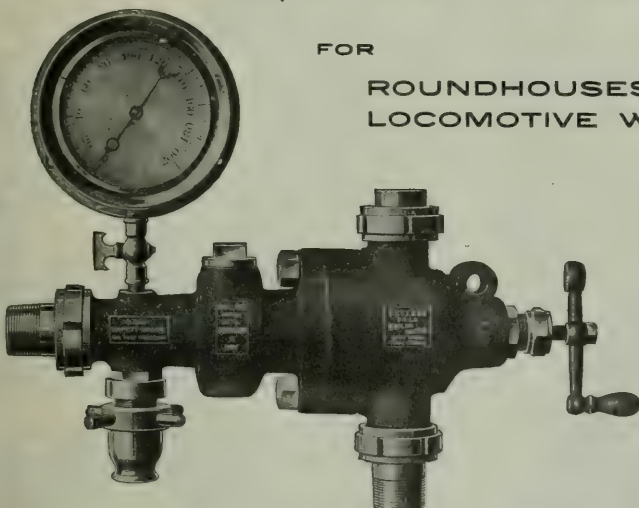

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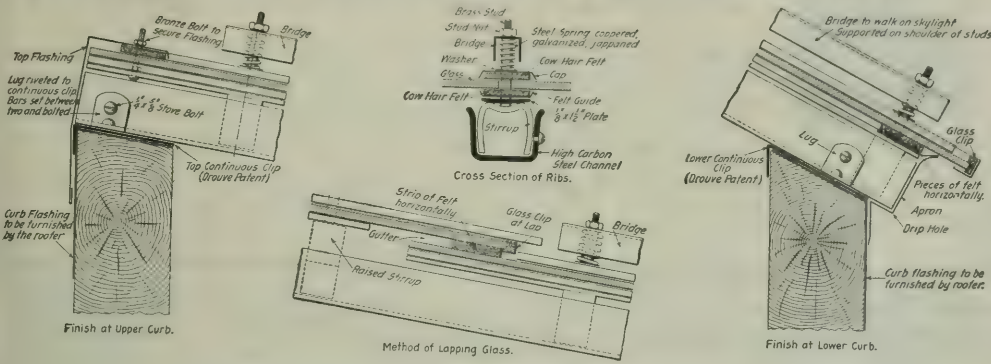

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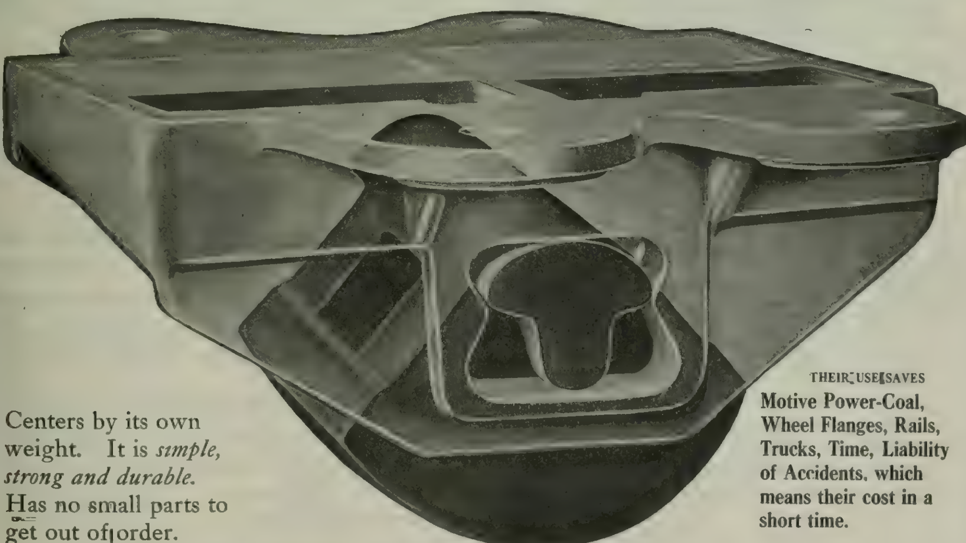

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CONTENTS

A strike of firemen on the Georgia Railroad, which was begun last week Monday, resulted, on Sunday, in the complete suspension of traffic throughout the 300 miles of the company's lines, and up to Tuesday night traffic had not been resumed. The strikers are the white firemen of the road who, according to the despatches, complain that ten of their number have been discharged and supplanted by negroes, and they claim that the negro firemen—there are both whites and blacks in this service—are allowed to keep so many good places that their own chances of promotion are impaired; though the negroes are never made runners. The specific demand appears to be that the "oldest white firemen shall stand first for passenger runs, and that passenger, through and local freight, and yard engines be not blocked by non-promotable men;" in other words, that, ultimately, no negro firemen shall be employed on passenger trains. The company insists that its faithful negro firemen shall be protected in their jobs, and has secured men to take the places of the strikers; but these new men were not set to work because of the lawlessness at numerous points along the road. Negroes were pulled off from engines and otherwise maltreated. In some towns "citizens" declared that engines on which there were negro firemen should not pass through. The final cessation of traffic appears to have been due to the refusal of enginemen to start out because of the alleged danger from the lawbreakers. Outsiders, not strikers, are said to be responsible for this violence, and it seems quite clear that the strike has become important, in the newspapers and in the public mind, simply because it is a race question. That question, with all its rancor, has suddenly flared up as though the whole community were endangered—whereas the Georgia Railroad is not a great establishment. It is said that there are only 80 strikers. Federal Commissioner Neill has gone to Augusta, and he may be joined there by Mr. Knapp, his fellow member of the Federal arbitration board; and quite likely some compromise will be reached before these lines are in print. The governor of Georgia, appealed to by the road for militia, replied that he had not a sufficiently large force to protect so long a railway! The governor made some attempt at a recommendation of arbitration by citizens of Georgia, but General Manager Scott, of the railway, rejected this proposition on the ground that the Federal arbitrators had already taken up the matter. Business has suffered considerably and the mails have been badly delayed; but the situation is different from that in any former case of total suspension of railway traffic by reason of the considerable numbers of automobiles available. These have made many 40-mile trips and longer, carrying passengers and mails.

"Railway detectives are having a hard time to get the officials of the counties in Pennsylvania to take care of the hoboes whom they arrest for train riding. County commissioners of Beaver, Lawrence and Mercer counties have all decided that the county treasuries shall not pay for the keep of the men whom the railways want punished for train riding. The commissioners say that train riders have committed no crime to warrant the county paying the expense of keeping them and that the railways should meet the board bills of the hoboes, as the railways and not the taxpayers get the benefit of arresting them for trespassing."

The foregoing is from the Youngstown (Ohio) *Vindicator*. It states a fact familiar to railway officers everywhere. Tramps endanger the safety of trains and thereby imperil the lives of passengers; do not these county commissioners care? A tramp who applies the air brakes on a freight train to enable him to disembark may thereby easily throw a car off the track and by this wreck, a passenger train on the adjoining track. Tramps who are thwarted in their purposes will beat a trainman or even shoot him; is this none of the county's business? The laws say that county courts shall punish law-breakers, and that county commissioners shall enforce the statutes. Assuming, however, that a county wishes to abdicate and leave its functions to be performed by the railway, what right has a railway to punish a law-breaker? Or to pay his board? It looks as though these Pennsylvania counties—like many other counties in that and other states—were in need of a workhouse, with vigorous officers to make petty criminals earn what they eat.

In ordering the Northern Pacific to make a joint rate and establish a through route with the Union Pacific for passengers traveling from Chicago via the Union Pacific through Portland to Tacoma, the Interstate Commerce Commission makes a distinction between passenger business and freight business that has not to our knowledge been so clearly brought out by the commission before. In the Pacific Coast Lumber Mfrs.' Assoc. v. Northern Pacific, 14 I. C. C., Rep. 51, the commission held that since lumber could be shipped from points east of Colorado via the Northern Pacific or via lines affiliated in interest with it to Tacoma, that therefore a satisfactory through route already existed and it was not necessary to order the opening of the Portland gateway. In the case, an abstract of which is given in another column, the commission points out that what might be a satisfactory route for a log is not necessarily satisfactory for a person. In other words, if 8,000 people, as the evidence showed, cared enough about going over the Union Pacific rather than the Northern Pacific as far as Portland to put up with certain inconveniences, such as the rechecking of baggage at Portland,

to arrive at Tacoma, they had a right to a through rate and a right to have the inconveniences of a break in the trip at Portland removed. Chairman Knapp and Commissioner Clark dissented from the majority opinion holding that a satisfactory through route to Tacoma already existed, and that the Northern Pacific had a perfect right to try by all legitimate means to induce passengers to take the 1,000-mile or 1,900-mile trip over its lines rather than the 140-mile trip over its lines and the rest of the trip over a competitor's line. Further, they said that the refusal to grant a through rate with the Union Pacific was a legitimate means of doing this. The whole question is not very important in itself, but as an example of the continual attempt of the commission to go behind the act to regulate commerce and to take into its own hands the management of business which is most obviously the private affair of the management of the railway company, the majority opinion of the commission is discouraging.

THE RAILWAYS OF THE WORLD.

Again the *Archiv für Eisenbahnwesen*, published by the Prussian Ministry of Public Works, issues its statistics of the railways of the world, covering the year 1907, and the nearest year for which statistics are available for the United States and Canada, the year ending with June, 1907. It finds in the grand divisions of the world the following mileages, street railway and some other light railways not being included:

Old World.	Miles	New World.	Miles.
Europe	199,385	North America	268,058
Asia	56,294	South America	34,911
Africa	18,519	Australasia	17,700
	274,198		320,669

or 594,867 miles in the whole world.

In this division the West Indies are given to South America. All except the island of Trinidad belongs perhaps more properly to North America. They have 2,745 miles. As the figures stand, North America has 34 per cent. more railway than Europe, and nearly as much as the whole of the old world.

Compared with the previous year, Europe increased its railways by 2,917 miles (1½ per cent), Asia by 1,628 miles (3 per cent.), Africa by 998 miles (5.7 per cent.), North America by 7,637 miles (3 per cent.), South America by 1,380 miles (4 per cent.), and Australasia by 51 miles, or ¼ of 1 per cent. Australasia, besides Australia and New Zealand, includes the Hawaiian Islands with 90 miles of railway. Of European countries, Russia built most railway in spite of its special difficulties, 1,625 miles, as it is likely to do hereafter, because it needs them; France was next with 431 miles, followed by Germany with 411 miles. In Asia British India led with 909 miles, followed by China, 464. In Africa nearly all the progress was in British South Africa, where the addition was 352 miles (5¼ per cent.), the French possessions (including Madagascar) 461 miles (6 per cent.), and Egypt, 183 miles (5¼ per cent.) The *Archiv* gives the increase from 1903 to 1907, which is 6.8 per cent. for Europe, 21.5 per cent. for Asia, 24.4 for Africa, 12.4 for the two Americas and 7 per cent. for Australia.

The growth in Asia and Africa is notable, and the indications are that, in Asia especially, and in China particularly, it will continue. The Chinese now insist in building their own railways, and they are making very clumsy work of it, the art of combination, beyond a certain degree, seeming to be beyond their present grasp, but they at last want the railways, and in one way or another they are likely to get them. In South America, of the 1,380 miles opened in 1907, 894 were in Argentina, 192 in the West Indies, 115 in Peru and 114 in Brazil.

Since 1897 the world's railway mileage has increased 140,137 miles, or 23½ per cent. Asia has nearly doubled its mileage and Africa has gained 65 per cent. Much the largest gain has been in North America, however. The *Archiv's* statistics of the capital invested in railways cover about 85 per cent. of this mileage and show a total of $41,774,000,000, and if the other 15 per cent. have cost at the same rate, the world has put over 49,000 millions of dollars into these instruments since George Stephenson was a youth. As the population of the earth is estimated by the best authorities at 1,555 millions, this gives an investment of $31.50 per inhabitant.

THE FUTURE OF THE HOLDING COMPANY.

It remains to determine the nature and character of the interest embraced in the words: "In which it is interested directly or indirectly. . . . If the words in question are to be taken as embracing only a *legal* interest in the commodities they cannot be held to include commodities mined or owned by a distinct corporation merely because of stock ownership in the carrier.

In the foregoing few words of the commodities decision of the United States Supreme Court—the italics of the word "legal" being our own—is set forth one of the most important if not the most important of the court's findings. It should be added that, a little later in its opinion, the court finds specifically that the word "legal" does *not* hit stock ownership by the railway carrier in the owning company. The railway company may, in fact, control the owning corporation, but such control is not a direct or indirect interest, though the owning company must be a *bona fide* one. It may seem odd to the laical reader, but it is law as interpreted by the highest tribunal in the land. And, as bearing on the future of the many "holding" corporations of the country, the ruling may have great scope unless—a thing not unknown in the outworkings of law—later decisions modify it.

In another part of the finding the court itself refers to "the ambiguity of the statute" and in such matters the layman must of course walk with hesitant tread. Yet one may call attention to the wording of the Massachusetts statute where almost the precise prohibitory words of the federal act are used. The Massachusetts law prohibits a railway company from holding directly or indirectly the stock or bonds of any other corporation and the courts of the state have compelled the New York, New Haven & Hartford to take steps to divest itself—directly and indirectly through a holding corporation—of its Massachusetts trolleys. The long and involved litigation in that state is not ended and there may be a difference in both the application and interpretation of the state act as contrasted with the federal statute. But it looks as though the same principle ran in both and it is no wonder that a high officer of the New Haven company, who probably reflects the opinion of his legal adviser, takes that view, as stated in a press despatch.

But quite apart from the particular case, the commodities decision directs attention to the future of the holding companies and their legal status where an immense field of legal discussion is now opened, including the definition of the words *bona fide*. The holding corporation takes manifold shapes. Sometimes it is a mere agent, at other times a trustee, sometimes—indeed often—a mixture of both. The holding agencies may be in form or effect corporate, or they may not. They may be transitory—like the voting "trust" with its time limit—or permanent. They may be organized to check competition—as in the Northern Securities instance—or for checking speculation. On the other hand they may promote speculation by releasing to the markets the securities of the properties controlled and thrusting them into the limbo of "high" finance—a phase too common with railway properties a few years ago. Holding companies may be responsible or irresponsible, good or bad, and their charters have wide range both in scope and intent. But, in general, they represent the idea of indirection in control and management—for control ultimately spells management as well as the broader and bigger noun, policy.

Upon the word indirection, as the layman reads it, the Supreme Court has now set the hall mark of legality and a railway corporation can control properties by the stock of an intermediary corporate interest and still be inside the law. Certainly such seems, at least, the direct trend of the decision

—and its application is not limited to transportation companies. In this connection also attention may be called to Judge Brewer's opinion in the Northern Securities case, where he emphasized the freedom of investment and characterized it as an "inalienable" right.

We are greatly mistaken if this part of the commodities decision, which bears on outside stockholdings of corporations, and especially on the future of the holding companies, does not reach vast and early import. Its reach and sweep, if taken in its fullness, can lead to no other conclusion. So momentous are they, indeed, that we are not unlikely to see a certain reaction in the courts and legal qualifications and restraints saying nothing of what Congress may enact in the way of modifying statutes—themselves subject to new interpretation by the courts. In its more solemn aspects the regretful feature of the whole situation in regard to both the Hepburn and the Sherman act is its lax of fixity. The Sugar Refining case, the Northern Securities case, the Tobacco case, the Hatters case and now the Commodities case, with their divergent opinions, their confusion of principles, their weakness in the application of the theory of *stare decisis*, while they assert much settle little. The material interests at stake are vast as are the principles of competition and combination involved. But divergent and limited interpretations of courts which themselves not only imply but assert the ambiguities of law, plus the incertitudes of future legislation, leave the situation perplexing, confused, and, for the railway corporations—in the long look ahead—painful. Out of it, of course, must come at last the crystallized law, but not yet, and, we fear, not soon. Meanwhile, such specific episodes as the effect of the commodities decision on the future of holding corporations will be edifying alike for jurists and laymen.

THE JACOBS-SHUPERT LOCOMOTIVE FIREBOX.

Considering the short life of the locomotive firebox with the usual flat plates and stayed surfaces, the expensive repairs necessary on it, its constant leakage and the difficulty of keeping it free from incrustation, it is surprising that so few successful attempts have been made to design a firebox of a different plan. A radical departure from such construction is illustrated in this issue; and Messrs. Jacobs and Shupert, of the Mechanical department of the Santa Fe, should be given credit for their courage and enterprise in working out to successful completion their new sectional firebox. In its design the principal object was to dispense with staybolts, to prevent the destruction of side sheets by expansion, to protect the riveted joints by submerging them, and, by the use of the sectional construction, to prevent the disastrous effects of boiler explosions.

Attempts to dispense with staybolts in locomotive fireboxes have been heretofore in the direction of water tube construction, several forms of such fireboxes have been designed, and some of them used in regular service. In the Roberts water tube locomotive boiler, illustrated in *The Railway Age*, November 23, 1906, the heating surface of firebox and shell is made almost entirely of water tubes. The Brotan locomotive boiler with a water tube firebox, illustrated in *The Railway Age*, May 4, 1906, has been used on the railways of Austria, Prussia and Russia. It is interesting to note that although the drawing of the Jacobs-Shupert firebox shows a comparatively small boiler, the headers along the bottom of the firebox are supplied with water by two 6-in. pipes leading directly to the bottom of the boiler shell, and in the design of these headers, provision is made so that the water shall find as little resistance as possible in passing through. Designs for water tube fireboxes have also been made in this country, and one was patented in 1906 by S. S. Riegel, Chief Draftsman of the Southern Railway, which is somewhat on the plan of the Yarrow boiler as used for torpedo boats.

Other improvements in the locomotive firebox have resorted to the corrugation of the side sheets. The Cour-Castle corrugated side sheet, illustrated in *The Railway Age*, October 25, 1907, has been used on a number of Western roads. The corrugated firebox patented by W. H. Wood, illustrated in the *Railroad Age Gazette*, October 23, 1908, has deep corrugations extending down the sides and over the crown sheet, and in it the side and crown are in one sheet without any seams. The front and back tube sheets are also corrugated around the outer rim beyond the tubes. One of these corrugated fireboxes has been in service on the New York Central for the past six months. In addition to the benefit derived from reduced expansion, it dispenses with 250 to 300 staybolts. Other designs for reducing the number of staybolts are seen in the corrugated tube used in the Vanderbilt boiler and in the Lentz boiler, as used in Germany.

The Jacobs-Shupert firebox was designed particularly for the use of fuel oil, and an important feature is the use of submerged seams, as the ordinary lap seam has a short life when subjected to the intense heat of the oil flame. The corrugated sections have deep curves so that they should have an accordion action and be free from the troubles found with the expansion of the plain plate when rigidly stayed. This flexibility should also be of advantage in allowing the tubes to expand more freely, thus preventing tube leakage. The sectional feature of this firebox will add to its safety and prevent the disastrous explosions which occur when the plain plate is overheated and the water is low.

The principal criticism which has been urged against this firebox relates mainly to the formation of scale and to circulation. In regard to the former, much, of course, depends on the character of the water where it is used. If good water is used, of course, there will be little difficulty from this source. If the engine is run in a bad water district, time alone will determine whether the troubles from incrustation will be serious. A space large enough for a man to crawl through along on top of the crown sheet has been provided by leaving a large opening between the diaphragms at this point and by making the adjacent stayplates pin-connected, so that they can be removed in order to provide a wide space for inspection. Provision is also made for wash-out plugs along the side of each section and by a large open space along the mud-ring at the bottom. This latter space at the mud-ring is in the form of a rectangle 4 in. x 7 in. with the corner cut off with a 3-in. radius. The area of this space is about 25 sq. ft., and through this will be the principal flow of water to the side sheets. This area may be compared with that of the 6-in. pipe supplying the side header in the Brotan boiler, which has an area of 29.4 sq. in. The maximum width of the water space near the mud-ring is about 7 in., and this increases to 8½ in. at the center line of the boiler.

It is supposed that the bulk of the water evaporated by the firebox will circulate vertically, will have an independent flow in each channel and will be supplied from the large opening along the mud-ring. It is also assumed that the flow of water through this opening will be so rapid that the vertical circulation will be amply supplied. The length of life of the channel section will depend on how well these assumptions are sustained in actual practice. The forces tending to produce circulation in the water legs of locomotive fireboxes are comparatively feeble, and the counter currents make the resultant flow of still lower velocity. The velocity of this circulation cannot be compared with that of the water from the boiler check, for there the flow is impelled by the steam in the injector. The numerous diaphragms placed crosswise must also interfere with the longitudinal flow of water at all points above the main opening at the mud-ring. It is not certain what direction the main water currents will take in this firebox nor what their ve-

locity will be. For this reason we have said that in the absence of any definite knowledge on the subject the inventors deserve much credit for the boldness and originality of the design. It seems desirable that some attempt should be made to investigate this feature of the performance of the improved firebox, and it may be done while the experiments relating to the fuel and water economy are being conducted. Such an investigation would throw some new light on the general subject of water circulation in fireboxes. The large volume of water surrounding the channel sections should contribute to the rapid local supply where steam is being generated with unusual intensity, and this may be sufficient for proper circulation.

The initial performance of the locomotive 917, one of the large tandem compounds of the Santa Fe, to which this firebox has been applied, shows that the boiler steams freely and the circulation over the channel sections is sufficient to keep them cool. The more severe test will come when the heating surfaces become incrusted and the resistance to heat transmission is greater. The experiment with this new type of locomotive firebox is an interesting one and deserves to be successful. We hope to publish further information as to its performance, based on the results obtained from the tests which are now being conducted by Prof. H. B. MacFarland, Consulting Engineer, in the mountain region about Needles, Cal.

"TRAFFIC AND TRANSPORTATION."

The original Interstate Commerce Act was really only half a law. It provided that rates should be equal to all, but it did not provide that the service should be equal to all. As long as the persons or the freight were moved between the same points at the same rates the law was obeyed, but a railway could give one person better service than another.

The Hepburn act changed all this; not only must the rates be the same, but everyone is assured the same "privileges and facilities." The change is most important. In railway language, it puts the transportation department under the commerce law. The traffic department had been put under the law by the original act in 1888.

For on American railways there is a division between the men who make the rates," the traffic men, and the men who "run the trains," the transportation men. All through the world these branches of railway work are separated from the engineering edpartments which build and maintain the roadway and the rolling stock, but only in North America it is usual to make two departments of those in charge of the personnel—separating the "running the trains" or "doing the work"—from the department which "makes the rates."

And it is significant that this purely American department—the traffic department—should rank well up with the others, and indeed often claim the leadership. It makes the rates. Now, outside of America the rates are generally made by the government, and it is no business of mere administration either. This making of railway rates is a legislative function, the Supreme Court tells us, and when a legislature deputes it the deputy commission or court, as it may be, is still a lawmaker. Thus it is held by some who do not think the American way is right that our traffic departments are lawmakers. To this question there are two sides. One may legally be a law to one's self and to others so long as the law of the land is supreme.

This omission in the original act was doubtless intentional. Certainly it was understood, and a good deal was said about the act leaving open competition in facilities, for at that time there were more than there are now who felt that competition was compatible with regulation. They believed, indeed, that competition could be compelled by law.

There was, too, an impression that the traffic department was the only one responsible for undue discrimination. It was certainly the department which did the rate-cutting, the rebating and the making of midnight tariffs. The transportation department, indeed, was rather apt to play the virtuous brother, especially during the period when the original act was still in the twilight zone, and the courts had not fully decided what it meant.

As the meaning of the law gradually appeared from the haze of legal conflict, the traffic departments found that there were many things which they could not do to secure business, and the transportation departments began to feel more and more pressure to do this, and that to secure new trade or keep old trade. They were asked to hurry up such and such shipments when consignees were in a hurry, to hold back when consignees were not ready, and more especially were they asked to hold goods free in storage and in cars to suit the views of shippers or consignees.

It took some of us ten years and more to realize the change. The Old Timer tells this story: A certain exporter on his line had the choice of two ports at equal rates. He preferred the first of the ports, but there was a car surplus at the first port and a shortage at the second. The railway, of course, preferred to have the shipments made to the second port where the cars were needed, and requested the exporter to use it, which he did. He had forwarded several hundred cars, when it developed that one of the port charges was higher at the second port and his expenses were increased two or three thousand dollars. It was obvious that the railway should make it up, as it had been benefited by the increased car supply, and the Old Timer took it for granted that the traffic department had some device by which this money could be refunded. He found, however, that the law was being interpreted so stringently that the traffic department could not refund in such a case, while the transportation department was quite free to use its best judgment in the collection and refund of moneys due.

"Do you mean," said he, "that the transportation department is the only one which can cut a rate?" And the answer was, "Yes."

It must not be supposed that this situation resulted in any sudden and eager granting of extra facilities, equal or unequal, to the public. Normally, traffic men prefer to make high rates and transportation men prefer to handle business economically, and know well that improved service means increased expense.

The shipping public, however, when it found that concessions could not be secured in rates became most avid of concessions in facilities. Each shipper tried to buy privileges and facilities from railways by the offer of more business or the threat of the transfer of business to rival lines. Such pressure is hard to withstand and in the pressure some people were hurt, or thought they were hurt. As a result the law was changed.

Every carrier is now compelled to file with the Interstate Commerce Commission, in Washington, tariffs showing not only rates but all "privileges and facilities" covered by the rates. Further, the Commission may forbid such arrangements if they are unfair or unreasonable and prescribe reasonable arrangements.

This is an immense subject and its working out will involve an immense amount of time and work. There are no decisions by the courts as yet to tell us just where the line is to be drawn, but the railways have made an effort to get into print all of their "privileges and facilities" which are of importance, and the Commission has considered some of them formally and many others informally. Better yet, in recording these privileges and facilities the railways have done their best to provide them to all alike without undue discrimination.

These privileges do not largely apply to passenger service. They do apply to freight, and generally to freight in large lots. A few of these privileges apply to freight in transit. The right of "reconsignment" is one and "milling in transit" another.

The right of reconsignment is exercised when a shipper with a number of markets ships freight before it is sold with the right of naming the destination when the freight reaches some intermediate point. "Milling in transit" originally applied to grain shipped to the seaboard. It is exercised when the grain is stopped at a mill en route and ground into flour. It was followed by a brood of privileges; "compressing in transit" for cotton; "planing in transit" for lumber, and the like.

It must be confessed that privileges of this sort do not flourish in the light. It may seem advisable to give such a privilege in return for important shipments, but when it becomes an open matter of course it is usually recognized as a service for which payment should be made.

Most of these privileges and facilities, however, are in some way connected with terminals and concern the freight before it starts on its journey or after it arrives. For this reason it is urged that they are local privileges and can only be regulated by the states. This point has not been fully decided by the courts, but so far the Hepburn act has been upheld and the railways are submitting to it. They have found, indeed, that the Interstate Commission can handle such matters better than 46 states can.

These local privileges in some localities involve even the draying of freight—store door delivery, as it is called. At some seaboard points they involve the delivery of freight in boats. At many others methods of loading, unloading and transhipment are involved, but everywhere are present the questions of storage and car demurrage.

The carrying out of the law would be hard enough if it undertook only to prevent undue discrimination between people similarly situated, but it undertakes to forbid any undue preference to any locality by any railway. Our railway systems are so great and so interlaced that the enforcement of this provision should bring about a tendency to uniformity in all such privileges throughout the country.

And here is a difficulty which may make the law very unpopular in some parts of the country. It will be impossible to make these privileges uniform without hurting some one. The privileges are much more liberal in some places than others. The railways would like the liberal privileges withdrawn. The public would like the liberal privileges extended over the whole country. Compromises will have to be made and compromises which involve the giving up of privileges are unpopular.

The car demurrage question, for instance, which has been taken up seriously involves compromises of this kind. It is quite usual throughout the country to allow two days for the loading or unloading of a freight car. In certain localities more time is allowed. The compromise which is finally made will be popular in the localities that gain something, but unpopular where the time is reduced.

The Commission has, therefore, a tremendous task ahead of it in investigating these privileges and facilities reported to it by the railways and determining whether or not they are fair to the different localities. It will be under the great disadvantage that no locality will want to give up its pet privileges. It is conceivable, indeed, that certain small localities with peculiar privileges will seek to conceal them. It will take the determined effort of years to bring into line the "privileges and facilities"—perhaps as many as it took to line up the rates.

NEW PUBLICATIONS.

Official List of Open and Prepay Stations, No. 2. A complete list of freight stations on approximately 450 railways, showing stations having agents in charge, stations at which freight charges must be paid and their geographical location, together with full notes.

The volume at hand contains 321 pages of statistical matter divided into two parts, the first part treating of stations in alphabetical order, and the second part of stations alphabetically arranged under the name of the railway company on which they are located. The name of each station is accompanied with full notes, giving particulars of value to shippers. The book is issued as of May 1, 1909, under special permission of the Interstate Commerce Commission by F. A. Leland, agent of the lines covered at St. Louis, Mo. It contains much information which it would be troublesome for a shipper to get in any other way.

How to Use Slide Rules. By D. Petri-Palmedo, second revised edition. Price, 50 cents. Kolesch & Co., 138 Fulton street, New York; 65 pages, 7 in. x 4 in.

The second edition of this concise little book on the use of the slide rule, besides containing the information given in the first edition, has an amplified chapter on the triplex slide rule, and chapters have been added describing the Nestler Precision rule and the Stadia rule. These rules are modifications of the Mannheim rule, which is fully described. The book, while not going into nearly as much detail in describing the manipulation of the slide rule, gives sufficient examples of its use for the principal calculations for which it is ordinarily used. The descriptions and examples are in a particularly concise form, which necessitates close attention in studying them, but if this attention is given it will be found that the necessary information is all there.

Laboratory Experiments in Metallurgy. By Albert Sauveur and H. M. Boylston. Published by the authors: Cambridge, Mass. 73 pages, 8 in. by 10 in.; 17 illustrations; cloth.

This book consists of a series of notes giving rather minute directions for the performance of certain experiments in metallurgy, and is intended for the laboratory use and guidance of students. It was written for those of Harvard University who are taking courses in general metallurgy and in iron and steel.

For the student these notes ought to be invaluable, because they are so full and complete that by following them the desired results can surely be attained. The first part, dealing with general metallurgy takes up the work of coking and the proximate analysis of coal, calorimetry, pyrometry, the determination of melting points, and the reduction of lead, copper and iron oxides. In the second part, the work is somewhat more elaborate and enters into the determination of the influence of carbon on iron, the thermal critical points of steel and the relation between the critical points and the hardening properties, and this work is extended to embrace the influence of the quenching bath in the tempering of steel and the effect of annealing.

Each item is handled separately and with fulness of detail. Thus: in the proximate analysis of coal, with which the book opens, a complete and concise description of the apparatus is followed by instructions for each step in the process until the final results are obtained, and this is done in such a way that any intelligent person should be able to do the work without difficulty. The same holds true of the balance of the work. After each experiment one or more pages of blank forms are given for laboratory reports, so that not only will be instructions, but the results be contained between the same covers.

The book also contains a number of tables, such as typical analyses, thermochemical data, hardness factors, and the like, so that it is of value not only to the student, but to engineers who wish to gain an idea of the general methods used in metallurgical work of this character.

The Application of Highly Superheated Steam to Locomotives. By Robert Garbe. Edited by Leslie S. Robertson. New York: Norman W. Henley Publishing Co. 70 pages; 6 in. by 9½ in.; 22 illustrations. Cloth. Price, $2.50.

This book is a reprint of a series of articles that appeared in *The Engineer* of London, and is an important contribution to the literature of the use of superheated steam on locomotives, not only because of the clear statement of the case but from the position and experience of the author, whose work on the state railways of Prussia is well-known. The ground is taken that a moderate amount of superheat is useless and the reasons therefore are set forth. The work that has been

done is outlined, and the special troubles that have to be guarded against are given in some detail. There is an outline description of the several typical superheaters in use, and their individual advantages are stated.

The book is characterized by its plain speaking and the author does not hesitate to name names and to commend or condemn as he thinks the case may require. For example, in dealing with the Pielock superheater he calls marked attention to the weaknesses of the design; to the dangers of overheating the tubes; to the difficulties of removal, renewal and cleaning; to the lowering of the tensile strength and the consequent liability to fracture when at a blue heat, and the loss of superheat by the passage of the steam through the steam space of the boiler, so that "only a very moderate degree of superheat can be obtained." He also objects to the smokebox superheater because of the blocking up of the tube-sheet on the smokebox side.

The book closes with a description of some of the details of the valve and driving mechanisms that must be especially adapted to the use of superheated steam. The standing of the author is such and the position which he takes is so important that a further discussion of the matter will be presented in a later issue.

Letters to the Editor.

TRANSCONTINENTAL RATES.

New York, May 18, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

I have read with a great deal of interest your article reviewing the matter of transcontinental rates, particularly with regard to rates to points on the line, such as Spokane, and I must say in response that while you have presented the matter in good form, I am not altogether convinced of the practical advantage of such a rate basis as is in force. The idea may be theoretically correct, but is it a wise policy?

I enclose a clipping from a recent number of your paper, in which it is pointed out that freight can be shipped from a point in Utah to Los Angeles and back over the same rails to an eastern destination cheaper than it can be shipped East direct. Is not such a circumstance a constant incentive to anti-railway agitation, and so is not the theoretical advantage to the railway companies of some extremely wise pieces of rate-making nullified?

You know we do not all do all that we have a right to do. There has to be some recognition of "policy," of cause and effect, and some medium course, conciliatory, if you please, generally brings a better result than a strict adherence to our rights or to a theoretical policy. It seems to me that absurd rates, or apparently absurd rates, have had a very detrimental effect upon sentiment, and that popular impressions should be taken into consideration in a matter of this sort, for few of the public at large have the opportunity to study the matter along the lines set forth in your article.

You would be clearly within your rights should you establish a subscription rate of $1 per annum for some selected class of the community, and no doubt could justify, theoretically, such a rate; but would it not be a constant thorn in the side of these who were paying the regular rate, and so be an unwise course?

Perhaps these random thoughts upon a large subject may suggest to you something in the way of "testimony in rebuttal."

F. W. SAWARD,
General Manager, *The Coal Trade Journal.*

[If rates had been kept on an out-and-out distance basis, there wouldn't be much of any United States west of the Mississippi river. If they were based on ocean competition levels as a maximum, the transcontinental lines, with their hundreds of miles of bridge-like traffic across non-productive regions, would all have been starved to death long ago. The rate fabric is immensely complex, and in its present form it represents the best thought of many able men. Yet we suppose it can never be made wholly satisfactory to all the people that have to do business under it.—EDITOR.]

SOUTHERN PACIFIC MALLET COMPOUNDS.

Wellington, Kan., May 14, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to the Southern Pacific Mallet articulated compound locomotives as described in your issue of April 30, you say on page 937:

"The track ahead is entirely out of sight and cannot be seen at all on a tangent from inside the cab; by leaning well out of the window it may be possible to see it, etc."

You also say later on, in referring to the engine in general, that "It is a bold piece of work and well worthy of all the attention that it will receive." Why not make the design a little more bold, covering the smoke arch with asbestos lagging and steel jacket, and put the cab over and alongside of same, giving the engine crew a chance to see where they are going? I can see no good reason why the cab should not have been built over the low-pressure cylinders. The injectors can be located at the smoke-box just as well as at the rear end of the engine, and the oil-burning apparatus can be controlled from the cab so located without any difficulty. Water glass and gage cocks can be arranged each side of the smoke arch by means of pipes, so that both engineer and fireman can see the water level, as in steamships, where the water glasses are in the engine room in plain sight of the water tender. The fireman might have to go to the rear of the boiler occasionally, to sand out the flues when necessary. The throttle and reversing gear can be operated from a cab so located, as well as from a cab in the old orthodox location. I don't think there is any excuse for locating engineers on locomotives so they cannot see the track at all times unobstructed by the engine itself.

HUGO SCHAEFER,
Master Mechanic, Atchison, Topeka & Santa Fe.

A TRACK-WALKER-STATION-AGENT.

Albany, N. Y., May 20, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In your issue of May 7, under title of "How to Discontinue a Station," you discuss editorially, with some irony, the order of the Public Service Commission, Second District, in the matter of the petition of the New Jersey & New York Railroad Company, which was, as you put it, "to discontinue its station at Union, Rockland county." Irony should be based on facts, and as you appear to have been misinformed, allow me to set you right in some particulars. The application was not to discontinue the station, but was as follows (I quote from the petition):

"Wherefore your petitioner prays that the commission grant its consent . . . to the discontinuance of said station for the reception or delivery of freight; . . . your petitioner intends to discontinue the station agency, but to maintain said station as a flag stop for passengers, providing sufficient accommodations for the protection of passengers awaiting trains."

The application was opposed and a counter-petition placed before the commission signed by some thirty residents of the vicinity, asking that the petition be denied. On the hearing the station supervisor of the railway stated in answer to questions "that if the stop at Union for the receipt and delivery of freight is discontinued as requested in this petition, the local freight will be billed to Spring Valley, while the carload freight would be billed to Spring Valley, Union Switch. In fact, it would be the same, as far as carload lots are concerned, as at the present time, and if the petition in the present proceeding is granted and the station stop at Union is allowed to be discontinued, it is proposed to stop the trains

at Union the same as at the present time. So far as the passenger traffic is concerned there will be no difference; the only thing is there would not be tickets sold at that point, but trains will be stopped on signal at that point. Practically the only difference in handling of the freight business would be in the local freight at Spring Valley. The agent at Spring Valley would make the collections."

Q.—Do you propose to keep the waiting-room open for the accommodation of passengers?

A.—Yes, sir; the waiting-room open.

Q.—Keep it warm?

A.—Yes, sir.

Q.—Who will do that?

A.—The track-walker.

Q.—How would the freight be delivered in less than carload lots if requested?

A.—It would be unloaded at Spring Valley.

Q.—Would it ever be sent if requested if it were household property or something of that kind?

A.—It would if it were a half carload of lumber, or something like that which would not be stolen, but any feed or such stuff like that would be unloaded in the freight house at Spring Valley.

You will therefore see that the restrictions upon which you comment were imposed by the railroad itself as conditions upon which it should be allowed to discontinue the use of the station as a shipping and receiving point for freight and as a selling point for tickets; in other words, that the services of a regular agent at Union could be dispensed with. The company has another station—Spring Valley—located seven-tenths of a mile from Union.

The commission welcomes at all times criticisms from a journal of the standing of the *Railroad Age Gazette*, but I think you will agree that such criticism should in all cases be based upon the facts.

JOHN B. OLMSTED,
Commissioner.

ARTIFICIAL COOLING OF RAILS.

Crafton, Pittsburgh, Pa., May 25, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

"No artificial means of cooling the steel shall be used after the rails leave the rolls" is a requirement embodied in the rail specifications published in the *Railroad Age Gazette*, May 21.

To be valuable as an aid to prove that the distribution of metal in the proposed sections will obviate the necessity of artificial means, and simultaneously serve as a safeguard against misleading mill practices—to get out the section, this specification should state that no artificial means of cooling the steel shall be used *before, during conformation* and *after* the rails leave the rolls. Nor is this the only requirement absolutely necessary, in view of new methods intended for rolling rail in the future.

A. W. HEINLE,
Metal Rolling Engineer.

FLANGE WEAR ON SIX-WHEEL TRUCKS.

Chicago, May 21, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

There seems to be a rather general impression among those who have not specialized on the subject that the middle wheels of a six-wheel truck develop less flange wear than the other wheels in the same truck. Investigations of tire templets of 44 middle wheels and 91 outside wheels show that the relative flange wear on the middle wheels is somewhat in excess of that on the outside wheels. These results were obtained from cars in similar service on a large road running into Chicago. The tire templets were taken with great care, wear areas measured with planimeter and reduced to a common basis of area worn per 1,000 miles.

Some reasons for the condition of wear cited are apparent upon consideration.

On curves of short radius the outer extreme wheels of each truck tend to force the flanges of the inner middle wheels against the rail. Two flanges act against one. This condition exists regardless of speed, and would seem to become manifest when the curve radius approaches 700 ft., which corresponds roughly to an 8-deg. curve. As the radius decreases, the binding becomes more marked until a point is reached where the wedges of the middle wheels on the inside of the curve will jump out of position.

It would also seem that the flanges of the middle inside wheels would suffer even on a curve of comparatively large radius if the outer rail were elevated too much for the speed.

Some relief will undoubtedly be experienced by allowing increased lateral movement between the brass and the axle, either on the middle wheels or on all of the wheels. This arrangement was not in force on the cars above referred to. Inquiry of one large road where the practice is to use brasses slightly shorter than M. C. B. standard elicits the information that it thereby does away with excessive flange wear on the center pair of wheels in a six-wheel truck.

EDWIN S. WOODS.

SAVINGS BANK INVESTMENTS IN RAILWAY SECURITIES.

New York, May 11, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to the article on savings bank investments in railway securities, which appeared in your issue of April 30, the whole theory on which this legislation has been based appears to me to be radically wrong.

Most of the states require that only the bonds of railway corporations can be purchased which have paid dividends of not less than 4 per cent. for a series of years. If a corporation should happen to be earning 10 per cent. on its stock and puts all of this back into the property and thus improves the value of the security, the bonds are not considered as safe as if the company distributed this money among the stockholders.

Another peculiarity of this dividend theory is the minimum of 4 per cent., which in most states is required to be paid on an amount of stock which shall be not less than one-third of the bonded debt. The bonds of a company like the New York, Ontario & Western, for instance, which pays 2 per cent. dividends on a capital stock which is equal to more than twice of its total funded debt, are not legal, although this company disburses in dividend payments about three times the amount necessary if its capitalization were differently arranged, and on a basis which would make them legal.

More examples of this crude legislation are the cases of companies which pay dividends on their preferred stock, and where the preferred stock equals more than one-third of the bonded debt, but whose bonds are excluded because there happens to be an additional equity consisting of common stock which does not receive any dividends. Reference is made to the type of such cases as is represented by the Alabama Great Southern.

At the request of a number of banking and insurance people I prepared a bill on this subject, which was introduced at the last session of the Connecticut legislature. In that state there has been a great deal of dissatisfaction not only with the existing law, but with the method which has been pursued for the last few years of enacting special legislation, admitting such specifically named issues, which has led to bad results and charges about undue influence, etc.

It was my aim to frame a law which would absolutely exclude all inferior or doubtful securities and would admit as many absolutely safe bonds as possible. The essential features of this proposed law were that no railway bonds would be admitted, secured on lines less than 100 miles long, or earning less than $1,000,000. Furthermore, the fixed charges of the company should not exceed 20 per cent. of its gross earnings. There were further provisions that, as is now customary in mortgages which provide for additional bonds for improvements and extensions, the company must have earned the interest, not only on all the bonds which

have been issued and 50 per cent. in excess thereof, but also on all the bonds which were to become issuable thereafter. The companies had to pass through this test for five years.

The purport of this provision is, of course, to exclude small companies, whose earnings would be largely derived from lumber or some mineral product, where the business might fall off.

The provision which excludes the bonds of companies which have fixed charges greater than 20 per cent. of their gross earnings is intended to cover the case of over bonding, where the earnings might be only temporary. The equivalent of this provision is the exclusion of companies whose bonded debt is more than five times the annual gross earnings, capitalized at 4 per cent.

The act in question also admitted equipment bonds of corporations which met with the previously mentioned requirements, if there was an equity of 20 per cent. paid in on such equipment. The act deals separately with large corporations whose annual gross earnings exceed $25,000,000 and whose annual net surplus is in excess of $5,000,000, and admits debenture bonds which contain the mortgage clause; that is, a provision that such debentures are to be co-equally secured with any future mortgage.

This latter provision was a little ahead of the times, but was inserted because it is the writer's view that most of the financing done by the large corporations hereafter will be done on such debentures which have no specific lien. This method is popular in Europe; it is almost exclusively employed in Great Britain and is becoming customary in the New England states and is gradually spreading over the country.

Public prejudice to the contrary notwithstanding, collateral trust bonds, which are secured by the deposit of first mortgage bonds, are just as good as direct first mortgage bonds; no better and no worse, and if the bonds which form the security should comply with the requirements of an act, the fact that they are deposited against some other issue should not be a bar to the collateral trust bonds themselves. As a matter of fact, a collateral trust bond has a great many features which from the investor's point of view make it more attractive than first mortgage bonds. Take for instance, in the case of Texas: There the law requires that a railway company must be incorporated under the laws of the state. It has become customary in the case of Texas corporations to issue all the bonds and stock of a company and deposit same with some trustee in the East, and issue against these securities a series of collateral trust bonds. In case of default the bondholders have the whole corporation and can reduce the collateral to possession by putting it up at auction in New York or Pittsburgh, etc., and do not have to submit themselves to the irksome law, delays and legal expenses of a foreclosure suit in a distant state. They can keep the collateral intact and issue a new series of securities at a minimum of expense. This method was pursued in the case of the Denver & Southwestern Railroad a few years ago, and worked very satisfactorily.

In view of the fact that the state of Connecticut admitted several issues of terminal bonds by special legislation, the provision was inserted to cover terminal bonds in general, with the restriction, however, that they must cover property in cities of not less than 100,000 people, and must be guaranteed or its facilities leased to some strong railway corporation, whose own bonds are admissible under the law. This provision was intended to cover the emergency, where some comparatively small corporation might attempt to carry the burden of a big terminal, as for instance in the case of the Wheeling & Lake Erie and Wabash-Pittsburgh Terminal and the old Chicago & Northern Pacific Terminal, etc.

The matter of street railways has aroused considerable discussion on part of investors as well as bankers, as many people believe that the business of street railways in large cities is about as permanent as possible. Undoubtedly the business is permanent, but whether the profit on same at a fixed rate of fare is likewise permanent is quite another question. For this reason the requirements for street railway bonds were much more tightly drawn, it being necessary for a street railway to show an earning ability of twice its interest charges on all the bonds issued and issuable thereafter.

In order to avoid the question of doubtful franchises no street railway bonds are admissible under the act, unless the company files a statement from the Mayor or other proper officials of the city in which the company operates, that the finances and that legislation shall be based on the sounder the maturity of the bonds.

No action was taken by the Connecticut legislature on this subject, but presumably it will come up again two years hence. In the meanwhile it is to be hoped that there shall be a more general understanding on the subject of railway finances and that legislation shall be based on the sounder principles of surplus earnings rather than on surplus disbursements. "Private credit is based on the borrower's earning capacity and character and not on his spending powers. Why should this rule be reversed when applied to corporations?"

F. J. LISMAN.

Contributed Papers.

TRAIN ACCIDENTS IN APRIL.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of April, 1909. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

TRAIN ACCIDENTS IN THE UNITED STATES IN APRIL, 1909.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	No. persons reported Inj'd.
8.	Bess. & Lake E.	Houston Jnctn.	rc.	Ft. & Ft.	1	3
19.	Cent. of N. J...	Com'paw Ave.	rc.	P. & P.	0	9
19.	Cent. of N. J...	Com'paw Ave.	rc.	Ft. & P.	0	1
20.	Nor. & Westn..	Roanoke.	xc.	P. & Ft.	1	7
21.	Tex. & N. Or...	Mahl.	bc	P. & Ft.	0	7

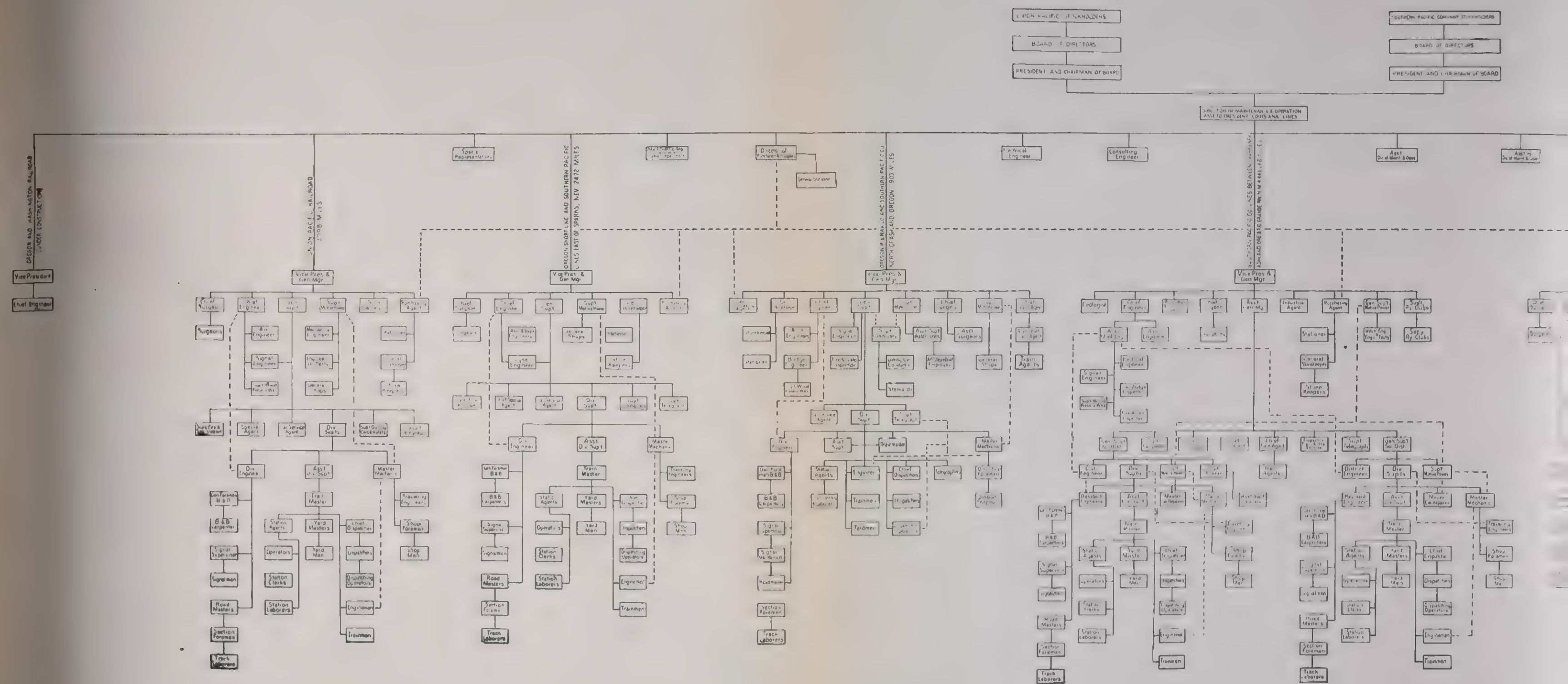
Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	No. persons reported Inj'd.
5.	Den. & Rio G..	Colorado Spgs.	d. switch.	Pass.	0	13
9.	Central Ohio...	Nashport.	unx.	Ft.	1	0
10.	Seaboard A. L..	Hick's. S. C.	ms.	Pass.	0	8
10.	Nor. Pac.......	Bristol. Wash.	unx.	Pass.	2	9
12.	Chic. & Alton..	Mayview.	wind.	Pass.	0	0
15.	Phila. & Rdg...	Harrisburg.	d. brake.	Pass.	2	4
17.	Den. & Rio G...	Dolores.	d. bridge.	Ft.	1	0
19.	Grand Trunk ..	Grand Rapids.	washout.	Ft.	4	0
22.	D., L. & W.....	Craigs.	d. rail.	Pass.	1	2
29.	Bost. & Albany.	Palmer.	b. rail.	Pass.	0	6

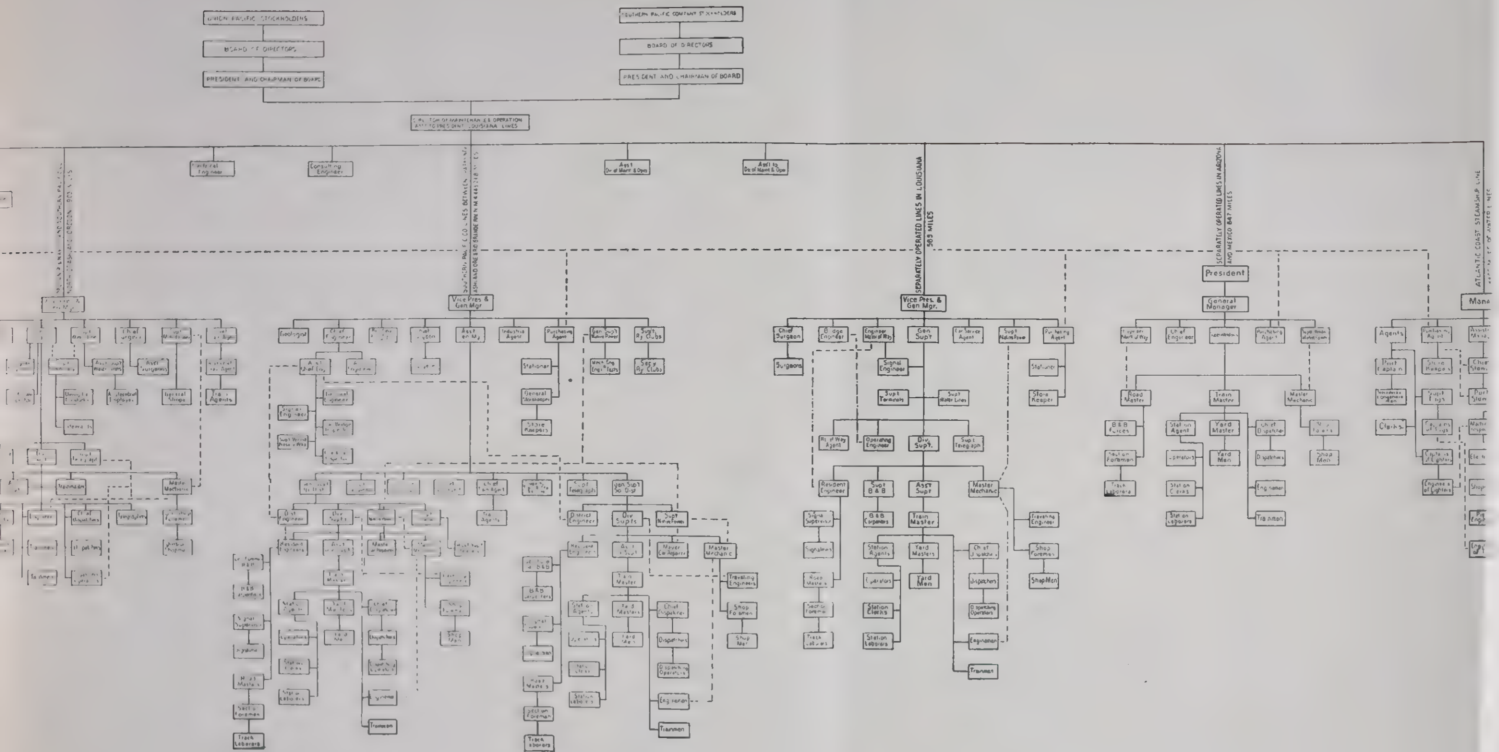
The derailment near Bristol, Wash., on the 10th, is reported as due probably to some defect in the engine or the tender, as the track was in perfect order; but the case has to be classed as unexplained, as no evidence was discovered of anything having been wrong before the engine left the track. The engine was completely overturned and the mail car slid down the bank at the side of the track and lodged near the edge of a river. The train had just entered a sharp curve at full speed. All of the cars in the train, except one, were derailed, yet only two passengers were injured seriously.

Of the half dozen electric car accidents reported in the newspapers in the month of April, one, a derailment, reported from Canton, Ohio, resulted in one fatal injury.

[1] Abbreviations and marks used in Accident List: rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.



OPERATING ORGANIZATION OF THE UNION PACIFIC AND SOUTHERN PACIFIC SYSTEM.



OPERATING ORGANIZATION OF THE UNION PACIFIC AND SOUTHERN PACIFIC SYSTEM.

THE OPERATING ORGANIZATION OF THE UNION PACIFIC AND SOUTHERN PACIFIC SYSTEMS.*

[WITH AN INSET.]

BY JULIUS KRUTTSCHNITT.

Upon assuming the presidency of practically all the corporations comprising the Union Pacific and Southern Pacific systems, E. H. Harriman was confronted with the problem of designing an organization that would economically and efficiently supervise their operations. The mileage of the various rail and water lines is as follows:

Rail Lines.

	Miles of road.	Second track.	Yards and sidings	Miles of track.
Union Pacific	3,338	437	1,187	4,962
St. Joseph & Grand Island	258	...	56	314
Oregon Short Line	1,454	5	421	1,879
Oregon R. R. & Nav. Co	1,427	...	250	1,677
S. P. Co.—Pacific System	6,015	191	2,094	8,299
Sonora Railway	263	...	28	291
Sunset-Central Lines	3 442	45	990	4,478
Mexican and Arizona Lines	319	...	47	365
Mexican Extensions	528	...	87	615
Total	17,044	678	5,159	22,880

Rail Lines Owned Jointly.

	Miles of road.	Second track.	Yards and sidings	Miles of track.
U. L.—Leav. & Topeka Ry	47	...	3	50
U. P.—Miscellaneous	...	...	14	14
U. P—San Pedro, L. A. & S. L. R. R	1,066	...	279	1,345
S. P.—Sunset and Sunset Western R. R's	48	...	7	55
S. P.—Northwestern Pac. Ry.	406	10	107	522
Total	1,567	10	410	1,986
Grand total, rail lines	18,610	687	5,569	24,867

Water Lines.

	Miles.
Atlantic steamship lines	4,400
Pacific steamship lines	31,200
Total, water lines	35,600
Grand total, rail and water transportation lines	54,210

One can leave New York on a Southern Pacific Company steamship, transfer to the Sunset Lines at New Orleans, board a Pacific Mail steamer at San Francisco and land at Hong Kong, a total journey of 9,902 miles, without leaving Harriman lines. On the completion of the lines now under construction between Seattle and Portland, and between Culiacan and Guadalajara, Mexico, a traveler will be able to make a continuous trip on Harriman rails from Seattle, in latitude 47 deg. 30 min., to Guadalajara, in latitude 22 deg., a distance of 3,169 miles; or from Seattle to New Orleans, a distance of 3,441 miles.

In reconstructing the Union Pacific to make it not simply a good line but the best that could be built from the Missouri river to the Salt Lake valley, and later in making the Southern Pacific the best line that could be built from the Salt Lake valley to the Pacific coast, Mr. Harriman was a pioneer. In designing an organization to meet the extraordinary conditions then confronting these great systems he was likewise a pioneer. Mr. Harriman solved his problem of organization by the creation of two unique positions, Traffic Director and Director of Maintenance and Operation, located in adjoining offices in Chicago and both reporting to himself as president in New York. To these two staff officers, each within his defined sphere of duty, he delegated the administrative control and supervision of the Atlantic Steamship Lines and of all *completely* owned rail lines save those in Texas where the law requires a local vice-president to report directly to the president. Mr. Harriman is a firm believer in team work, and in turning over the management of the properties to his two co-ordinate representatives in Chicago, with the injunction that on them rested the responsibility for net results, he struck the keynote of the entire organization. From the Chicago office down to the division offices, the traffic officers co-operate as loyally to secure low operating results as the operating officers do to promote business and secure new traffic.

The accompanying chart shows in detail the operating organization under the director of maintenance and operation, who acts as assistant to the president for the Louisiana lines. In the traffic department the organization is analogous, there being for each unit and reporting to the traffic director traffic officials co-ordinate with the vice-president and general manager, and under them division traffic officers co-ordinate with the superintendent.

The theory of the organization is that the different properties must be brought into close relationship with each other, yet preserve a full measure of autonomy. It is intended that a superintendent shall be the general manager of his division; and the general manager, in turn, be the responsible operating head for the property. The director of maintenance and operation has charge of all new construction. The general managers are responsible for new construction in their respective territories. In the building of new branch lines, location and grading are usually under the immediate direction of the respective chief engineers. The superintendents do not become responsible until the track-laying stage is reached, and sometimes not until the track is completed.

In the opinion of competent, disinterested critics, the results obtained by this unique organization in its five years of existence have vindicated the wisdom of its creation. The organization of the various component operating units is not essentially dissimilar from that of other railways which follow the divisional plan. This paper deals with the functions of the office of the director of maintenance and operation, which standardizes and correlates, supervises and investigates, commends and criticises, equalizes and differentiates as among different properties, but leaves each to work out its own problems of administration. Its non-interference with details is shown by the fact that comparatively few positive instructions have to be given.

STANDARDIZATION.

The management of the properties is vested in seven operating vice-presidents, each of whom, with his corps of assistants, is working out solutions of problems on his lines which are common to all. A study of seven solutions of the same problem must necessarily demonstrate that one of the solutions is the best.

Sometime, somewhere, was written by an Arabian sage:

"He that knows not, and knows not that he knows not, is a fool—shun him:
He that knows not, and knows that he knows not, is simple—teach him:
He that knows, and knows not that he knows, is asleep—rouse him:
He that knows, and knows that he knows, is a wise man—follow him."

Our theory of standardization is simply, by frequent conference, to find the wise man "that knows, and knows that he knows," and having found him, to "follow him."

W. V. S. Thorne, our director of purchases, outlined at your meeting in February, 1908, our general policy of standardization and its economical effect upon his branch of the work. With a view to systematic working out of details for standard practices and uniform devices, the general superintendents, the superintendents of motive power, the chief engineers and the signal engineers meet in semi-annual conferences. These meetings, whilst separately organized for each branch of work, occur simultaneously in the same city, so that some joint sessions may be held to discuss overlapping subjects of common interest. Appropriate committees are appointed to initiate or consider details. The minutes of the various parent bodies have the force of recommendations and contain a recorded vote of the members whenever action is not unanimous. These minutes are forwarded through the various general managers, who append their own frank comments and criticisms. The director of maintenance and operation approves these minutes wholly or in part. Recommendations so approved become the standard and remain the standard until

*From a paper read before the New York Railroad Club, May 21.

otherwise ordered. After a fair trial, any officer or employee is at liberty to re-open the subject and to suggest through the proper channels a substitute or modification. Initiative is preserved by leaving the meetings untrammeled. They are legislative bodies assisted by the individual general managers as expert advisers and subject to the approval or veto of the director of maintenance and operation. A very large percentage of such action of the director is confirmatory; only a slight portion is nugatory. Still another part consists in referring back for further consideration questions on which there is too marked a divergence of opinion. When time does not permit awaiting the semi-annual meeting, a mail vote is taken through the general managers.

In this way, the general superintendents have, among other things, formulated a book of rules to supplement the standard code of train rules of the American Railway Association. The maintenance of way engineers and general superintendents have produced a book of maintenance of way rules. The signal engineers have standardized their work in accordance with the most approved American practice. On the superintendents of motive power has fallen a heavy burden in standardizing machinery, methods, designs, cars and the countless details of construction and repair. Where the Master Mechanics' and Master Car Builders' Associations necessarily leave discretion to individual roads, our superintendents of motive power necessarily co-ordinate individual preferences. The chief engineers and maintenance of way engineers have standardized all plans for bridges, trestles, culverts, track structure and buildings. Regardless of convenience, the commercial value of standard metal spans is estimated to save 10 per cent. in original cost, to which must be added the elimination of unnecessary metal. One of the roads in the system was using a form of truss much older and complicated than our standard, which required 20 per cent. more material with the same unit stresses, for its construction to carry the same load. The various meetings, either separately or concurrently, are standardizing and reducing the number of reports and printed blanks.

It must not be understood that the standards are so inflexibly maintained as to check improvement and initiative. Every officer and employee concerned knows that suggestions and criticisms are welcome, and as soon as proof can be offered that a new device or practice is better than the old its adoption quickly follows. Our plan requiring all officers concerned to vote on the adoption of a new device certainly curbs costly and ill-considered experiments. Nothing in our policy forbids experimenting with new devices, but it does forbid their adoption and use on a large scale until their merit has been thoroughly demonstrated to the satisfaction of all the general officers interested. Our officers appreciate that they are working out an experiment in railway operation, and the knowledge that a new idea or successful device of any sort, if proven successful, will be adopted as standard practice on all of the Associated Lines acts as a powerful stimulus to originality and initiative.

The practical benefits of standardization are apparent in many ways. The ability to order in large quantities standard articles, free from a capricious variety of details, makes possible a reduction ranging from perhaps 10 per cent. to 30 per cent. in the purchase price of many staple items of construction, maintenance and operation. Again, if a washout or other emergency occurs, a standard bridge, water tank, turntable, etc., etc., can be ordered from the manufacturers in a ten-word telegram, and, pending delivery, a standard foundation can be built in full confidence that the structure will fit. Standard devices, signs and equipment make it possible in emergencies to balance forces and resources by transferring men or material from one property to another with a minimum of inconvenience to the service and to individuals in orienting themselves to strange localities.

STATISTICS.

The co-ordination of so many units in so great a variety of territory, the maintenance of discipline among an army averaging over 80,000 officers and employees, the conduct of affairs which of necessity overlap jurisdictions of general managers, the duty of reporting conditions and results to the president in New York, all demand the utmost possible legitimate information promptly reaching the responsible head, the director of maintenance and operation. His office is administered upon the theory of a minimum of direct action made possible by a maximum of information, he assisting each one of the units below from the bounteous lessons of experience furnished by all.

Statistics are considered of sufficient importance to warrant a small bureau in the Chicago office under the charge of the assistant to director of maintenance and operation. The same principle is extended downward so that each division superintendent has in his office under his direct supervision a small force compiling the accounts whose expenditures he in any wise controls. The division accountants are carried on the superintendent's payroll, work under his direction, but are subject to supervision and check by the accounting department, which prescribes methods and forms. The results obtained from these statistical bureaus, and especially from the system of division accounting, have been so gratifying as to warrant extended reference to the forms and methods evolved.

UNION PACIFIC RAILROAD COMPANY.

STATEMENT OF LARGE INCREASES AND DECREASES IN AMOUNT OF TRAFFIC, AND IN OPERATING EXPENSES, FOR THE MONTH OF JANUARY, 1909, COMPARED WITH CORRESPONDING MONTH OF THE PREVIOUS YEAR.

Account	Explanation (Increases in light type; decreases in heavy)	January, 1909 Total	%
	TRAFFIC		
	Freight		
	Freight Revenue	$97,346.30	4.58
	Tons one mile (conductors)	71,957,319	28.56
	Gross tons per engine mile	142	13.51
	Average distance hauled—miles	**2.63**	**.84**
	Gross tons one mile	66,397.017	9.23
	Freight train mileage	**37,668**	**5.93**
	Passenger:		
	Passenger revenue	$26,095.76	3.68
	Passengers carried one mile	704,614	2.04
	Gross tons one mile	4,326.882	1.54
	Gross tons per engine mile	3	.64
	Passenger train mileage	4,077	.61

MAINTENANCE OF WAY AND STRUCTURES

Account	Explanation	Total	%
1-C-Superintendence. Miscellaneous Expenses. Decrease, **$899.94**	Nebraska Division	**155.15**	
	Wyoming "	**63.82**	
	Utah "	**564.96**	
	Kansas "	**306.79**	
	Colorado "	143.02	
		47.76	
	Total,	**899.94**	**29.64**
2. Ballast. Increase, $1,283.21.	Nebraska Division	**$330.23**	
	Wyoming "	**237.04**	
	Utah "	171.08	
	Kansas " *	1,874.80	
	Colorado "	**195.40**	
	Total,	$1,283.21	64.45
	* Due to charge of $1,885.20 account of Leavenworth Western Branch. No similar charge in January, 1908.		

Fig. 1.

With a view to watching expenses more in detail, the 116 operating accounts of the Interstate Commerce Commission have been increased to 161 for our own purposes. The subdivisions of accounts thus affected are shown in the table on the following page and the *resulting* advantages are apparent.

Receipts and Expenditures.—Monthly balance sheets showing for each system total receipts and total expenditures are drawn up, show for the period ending with each month of the

CLASSIFICATION OF OPERATING EXPENSES.

SCHEDULE OF PRIMARY ACCOUNTS PROMULGATED BY THE INTERSTATE COMMERCE COMMISSION AND SUB-ACCOUNTS SUPPLEMENTAL IN RESPECT THEREOF.

Primary Accounts.	*Sub-Accounts.*
(I)—Maintenance of Way and Structures:	
1. Superintendence.	1a. *Salaries of officers.*
	1b. *Salaries of clerks and attendants.*
	1c. *Miscellaneous expenses.*
2. Ballast.	
3. Ties	
4. Rails.	
5. Other track material.	5a. *Frogs and switches.*
	5b. *Rail joints.*
	5c. *Tie plates.*
	5d. *Other track material.*
6. Roadway and track.	6a. *Applying ballast.*
	6b. *Applying ties and tie plates.*
	6c. *Applying rails, fastenings, frogs and switches.*
	6d. *Maint. and care of track.*
	6e. " *and care of roadbed.*
	6f. *Extraordinary repairs of roadway and track.*
	6g. *Removing grass and weeds.*
7. Removal of snow, sand and ice.	
8. Tunnels.	
9. Bridges, trestles and culverts.	9a. *Bridges.*
	9b. *Trestles.*
	9c. *Culverts.*
10. Over and under grade crossings.	
11. Grade crossings, fences, cattle guards and signs.	11a. *Grade crossings, cattle guards and signs.*
	11b. *Right of way fences.*
12. Snow and sand fences and snow sheds.	
13. Signals and interlocking plants.	13a. *Signals.*
	13b. *Interlocking plants.*
14. Telegraph and telephone lines.	
15. Electric power transmission.	
16. Buildings, fixtures and grounds.	16a. *Roadway buildings.*
	16b. *Engine houses and shops.*
	16c. *Fuel stations.*
	16d. *Water stations and pipe lines.*
	16e. *Station buildings and appurtenances.*
	16f. *General offices.*
17. Docks and wharves.	
18. Roadway tools and supplies.	
19. Injuries to persons.	
20. Stationery and printing.	
21. Other expenses.	
22. Maintaining joint tracks, yards and other facilities—Dr.	
23. Maintaining joint tracks, yards and other facilities—Cr.	
(II)—Maintenance of Equipment:	
24. Superintendence.	24a. *Salaries of officers.*
	24b. *Salaries of clerks and attendants.*
	24c. *Miscellaneous expenses.*
25. Steam locomotives—repairs.	
26. Steam locomotives—renewals.	
27. Steam locomotives—depreciation.	
28. Electric locomotives—repairs.	
29. Electric locomotives—renewals	
30. Electric locomotives—depreciation.	
31. Passenger-train cars—repairs.	
32. Passenger-train cars—renewals.	
33. Passenger-train cars—depreciation.	
34. Freight train cars—repairs.	
35. Freight-train cars—renewals.	
36. Freight-train cars—depreciation.	
37. Elect. equip. of cars—repairs.	
38. Elect. equip. of cars—renewals.	
39. Elect. equip. of cars—depreciation.	
40. Floating equipment—repairs.	
41. Floating equipment—renewals.	
42. Floating equipment—depreciation.	
43. Work equipment—repairs.	
44. Work equipment—renewals.	
45. Work equipment—depreciation.	
46. Shop machinery and tools.	
47. Power plant equipment.	
48. Injuries to persons.	
49. Stationery and printing.	
50. Other expenses.	
51. Maint. joint equip. at trmnls—Dr.	
52. Maint. joint equip. at trmnls—Cr.	
(III)—Traffic Expenses:	
53. Superintendence.	53a. *Salaries of officers.*
	53b. *Salaries of clerks and attendants.*
	53c. *Miscellaneous expenses.*
54. Outside agencies.	54a. *Outside agencies on line—salaries.*
	54b. *Outside agencies on line—expenses.*
	54c. *Outside agencies other cities—salaries.*
	54d. *Outside agencies other cities—expenses.*
(III) Traffic Expenses (continued).	
55. Advertising.	
56. Traffic associations.	
57. Fast freight lines.	
58. Industrial and immigration bureaus.	
59. Stationery and printing.	59a. *Tariffs.*
	59b *Other stationery and ptg.*
60. Other expenses	
(IV) Transportation Expenses:	
61. Superintendence.	61a. *Salaries of officers.*
	61b. *Salaries of clerks and attendants.*
	61c. *Miscellaneous expenses.*
62. Despatching trains.	
63. Station employees.	63a. *Agents, clerks and attendants.*
	63b. *Labor at stations.*
64. Weighing and car-service assns.	
65. Coal and ore docks.	
66. Station supplies and expenses.	66a. *Stations — heating and lighting.*
	66b. *Stations—other expenses.*
67. Yard masters and their clerks.	
68. Yard conductors and brakemen.	
69. Yard switch and signal tenders.	
70. Yard supplies and expenses.	
71. Yard enginemen.	
72. Enginehouse expenses—yard	
73. Fuel for yard locomotives.	
74. Water for yard locomotives.	
75. Lubricants for yard locomotives.	
76. Other supplies, yard locomotives.	
77. Op. joint yards and terminals—Dr.	
78. Op. joint yards and terminals—Cr.	
79. Motormen.	
80. Road enginemen.	80a. *Road enginemen—passenger.*
	80b. *Road enginemen—freight and mixed.*
81. Enginehouse expenses—road.	
82. Fuel for road locomotives.	82a. *Fuel for road locomotives—passenger.*
	82b. *Fuel for road locomotives—freight and mixed.*
83. Water for road locomotives.	
84. Lubricants for road locomotives.	
85. Other supplies, road locomotives.	
86. Operating power plants.	
87. Purchased power.	
88. Road trainmen.	88a. *Road trainmen—passenger.*
	88b. *Road trainmen—freight and mixed.*
89. Train supplies and expenses.	89a. *Cleaning cars.*
	89b. *Heating and lighting cars.*
	89c. *Lubricating cars.*
	89d. *Icing and watering cars.*
	89e. *Other train expenses.*
90. Interlockers, block and other signals—operation.	
91. Crossing flagmen and gatemen.	
92. Drawbridge operation.	
93. Clearing wrecks.	
94. Telegraph and teleph.—operation.	
95. Operating floating equipment.	
96. Express service.	
97. Stationery and printing.	
98. Other expenses.	
99. Loss and damage—freight.	
100. Loss and damage—baggage.	
101. Damage to property.	
102. Damage to stock on right of way.	
103. Injuries to persons	
104. Operating joint tracks—Dr.	
105. Operating joint tracks—Cr.	
(V)—General Expenses:	
106. Salaries and expenses of general officers.	106a. *Sal. of officers—general.*
	106b. *Sal. of officers—treas.*
	106c. *Sal. of officers—acct'g*
	106d. *Other exp. gen. officers.*
107. Salaries and expenses of clerks and attendants	107a. *Sal. and exp. of clerks and attendants—gen.*
	107b. *Sal. and exp. of clerks and attendants—treas.*
	107c. *Sal. and exp. of clerks and attendants—acct'g.*
108. General office supplies and expenses.	108a. *Gen. offices—rents*
	108b. *Gen. offices—misc. exp.*
109. Law expenses.	
110. Insurance.	
111. Relief department expenses.	
112. Pensions.	
113. Stationery and printing.	
114. Other expenses.	
115. Gen. administration joint tracks, yards and terminals—Dr.	
116. Gen. administration joint tracks, yards and terminals—Cr.	

fiscal year to date disposition of the revenues of the system under the following general heads: Operating Expenses, Expenses of Outside Operations, Taxes, Hire of Equipment, Additions, Betterments, Construction, Equipment, Remittances, Miscellaneous, Capital Expenditure Carried on Operating Office Books; Current, Deferred and Contingent Assets and Liabilities.

This latter heading shows the balance for each item at the close of the preceding year and at the close of the month to date. This exhibit furnishes in clear, comprehensive form the sources of revenue and the uses to which it has been put up to date, and the June form is the balance sheet for the fiscal year.

Full details of the expenditures, the totals of which appear on this statement, are given on appropriate blanks, operating expenses on the usual monthly statements of earnings and expenses, additions, betterments and construction on special forms.

TRANSPORTATION EXPENSES (Cont'd)

Account	Explanation	Total	%
73. Fuel for Yard Locomotives. Decrease. **$6,255.74.**	*Nebraska Division.*		
	Decreased engine mileage,	**$ 1,503.25**	
	Increased consumption per engine mile, *	1,555.08	
	Decreased cost per ton,	**3,706.44**	
	* Due to increase in number of cars handled.		
	Wyoming Division.		
	Increased engine mileage,	251.12	
	Increased consumption per engine mile,	393.14	
	Decreased cost per ton,	**889.97**	
	Utah Division.		
	Decreased engine mileage,	**1,125.32**	
	Increased consumption per engine mile, *	1,273.13	
	Decreased cost per ton,	**941.28**	
	* Due to increase in number of cars handled.		
	Kansas Division.		
	Increased engine mileage,	651.94	
	Increased consumption per engine mile,	71.89	
	Decreased cost per ton,	**170.00**	
	Colorado Division.		
	Decreased engine mileage,	**545.26**	
	Increased consumption per engine mile, *	1,246.75	
	Decreased cost per ton,	**2,827.74**	
	* Due to increase in number of cars handled,		
	Miscellaneous,	10.47	
	Total,	**$ 6,255.74**	**20.06**
74. Water for Yard Locomotives. Increase, $1,789.91.	*Mileage.*		
	Nebraska Division,	**$ 45.91**	
	Wyoming "	29.65	
	Utah "	**57.30**	
	Kansas "	**34.59**	
	Colorado "	**34.94**	
	Cost of Operating of Pumping Stations.		
	Nebraska Division, *	367:79	
	Wyoming "	**91.19**	
	Utah " †	840.59	
	Kansas "	28.93	
	Colorado " ‡	786.88	
	Total,	$ 1,789.91	98.11
	* Due to charge covering proportion of amount paid Omaha Water Co. for water furnished at Omaha and So. Omaha. Similar expenses in Jan.,		

Fig. 2.

Operating Expenses.—The largest deduction from the revenue is, of course, for operating expenses. As soon as possible after the close of each month's accounts the division superintendents forward to the auditor, with explanations, a statement of operating expenses on their respective divisions which they control or partially control. These statements are consolidated by the auditor for the system, and in a few days after the receipt of comparative statement of earnings and operating expenses the director of maintenance and operation receives the explanations in the form, a few sample pages of which are shown herewith (Figs. 1 and 2). From these forms such explanations of fluctuations of expenses as may seen necessary are made to the president.

The division superintendent makes up forms which enable him, within about 15 days after the close of the month, to know just what the operations entrusted to him have cost segregated as to labor and material, and as to main line and branches, for the current month and for fiscal year up to date compared with the preceding fiscal year.

One of the beneficial results of the panic of 1907, when earnings were rapidly falling and expenses were slow to respond, was to prove the comparative worthlessness of statistics unless they closely follow the operations they record. With the co-operation of the accounting department, methods were devised and instituted whereby the superintendent has at hand at all times the vital information as to the expenses of his

C S. Form 2218

————R. R.————DIVISION

————190—

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General Superintendent.

Dear Sir:

I transmit herewith explanations of fluctuations in operating expenses for 190 compared with same period of previous year, having personally reviewed the month's exhibit.

The fluctuations shown in the following accounts are regarded by me as unsatisfactory and I have taken action indicated to improve results in future periods.

ACCOUNT NO	INCREASE	DECREASE	ACTION TAKEN

Fig. 3.

division, accounts for them within 15 days after the close of the month, and has complete statistics of division traffic and equipment performance within 23 days after the close of each month. Formerly he had to wait 40 to 50 days for this information.

By the 23d of the following month the division superintendent receives back copy of form made up by him with the statistical matter that has been added in the auditor's office. Each division superintendent is, therefore, within approximately three weeks after the close of any month able to know exactly what results have been obtained by him; and these operating sheets forwarded to the general superintendent, general manager and director of maintenance and operation, enable each one of these officers to intelligently pass upon the results obtained by their subordinates.

C S Form 2219.

————R. R.————DIVISION

————190—

————

Director Maint. & Oper. or General Manager

————

Dear Sir:

I transmit herewith Superintendents' explanations of fluctuations in operating expenses on lines under my jurisdiction for 190 compared with same period of previous year, with their letters indicating action taken. I have personally reviewed the month's operations as reflected by these exhibits which are unsatisfactory to me in the following respects, as to which I have taken action indicated to improve results supplemental to that of Superintendents.

ACCOUNT NO.	INCREASE	DECREASE	ACTION TAKEN

Fig. 4.

The superintendent is required to analyze and explain operations shown on Forms 4,913 and 4,914 on Form 2,218 (Fig. 3), showing the general superintendent what action he has taken to improve unsatisfactory results. A similar Form, 2,219 (Fig. 4), is required of the general superintendents by the general managers, and of the general managers by the director of maintenance and operation when transmitting the division explanations of expenses. This requires officers to closely study operating results and insures the application of necessary corrections. It has also largely reduced letters and telegrams of inquiry and explanation.

To further analyze operating expenses and results, the Chicago office avails itself of copies of statistical forms and reports made for the use of the officers in active charge of operations on each system. For maintenance of way officers, Statistical Form 231 shows in 48 columns the average mileage operated, cost per mile of main and additional main track for year up to date, and for various items, followed by statistics showing the number of ties and tie plates used up to date, and the percentage of those used to the allotment for the year; the physical characteristics of track as to weight of rail, ballast, tie-plating, density of locomotive mileage, and, finally, a comparison of principal items with corresponding ones of previous year. General and division officials, with this first hand information, are robbed of excuses for failure to keep within their respective periodic labor and material allowances for maintenance expenditures.

CARS UNDERGOING AND AWAITING REPAIRS
MARCH 1ST, 1909

	March 1st, 1909					Feb. 1, 1909		Mar. 1, 1908		Bad Order Cars per Mi. of Rd. Mar. 1, 1909
	System & Home	Pct. of Total Equip.	Foreign	Total	Pct. of Total Equip.	Total	Pct. +Inc. −Dec.	Total	Pct. +Inc. −Dec.	
Union Pacific Railroad	594	3 9	82	676	4 5	787	−14%	855	−21%	20
Oregon Short Line R. R.	408	5 5	66	474	6 4	496	− 5%	702	−32%	19
Oregon R. R. & Nav. Co.	78	2 5	8	86	2 8	94	− 8%	190	−55%	05
Sou. Pac. Co.—Pacific Sys.	1,912	7 1	136	2,048*	7 6	1,215	+69%	1,374	+49%	48
Louisiana Lines	716	4 2	42	758	4 4	905	−16%	1,558	−51%	23
Total...... ...	3,708	5 3	334	4,042	5 8	3,497	+15%	4,679	−14%	26

* Increase due to reduction working hours in shops

Fig. 5.

Maintenance of Equipment.—A close watch is kept on the condition of freight equipment, and reports of number of bad order cars made every 10 days (Fig. 5), and of condition of locomotives every month (Fig. 6). Copy of consolidation of these division statements, made in the general managers' offices at the close of the month, is sent to the director of maintenance and operation.

CONDITION OF LOCOMOTIVES
JANUARY 1ST, 1909

Road	Good Order				Needing Repairs		In Shop		Spare
	Number	Per cent 1909	Per cent 1908	Per cent 1907	Number	Per cent	Number	Per cent	
Union Pacific Railroad	[illegible]	74%	67%	67%	92	14%	78	12%	55
Oregon Short Line R. R.	515	86%	79%	84%	53	13%	41	7%	63
Oregon Railroad & N. Co.	201	77%	74%	78%	44	17%	14	6%	20
Sou. Pac. Co.—Pacific Sys.	703	70%	70%	71%	176	17%	131	15%	45
Louisiana Lines	582	73%	80%	81%	73	14%	70	13%	32
Total	2,711	74%	7[illegible]%	75%	438	15%	324	11%	215

Locomotives Owned	January	1st	2,874	Spare	215
	Dec.	1st	2,890		190
	Nov.	1st	2,884		183
	Oct.	1st	2,891		210
	Sept.	1st	2,896		245
	Aug.	1st	2,904		350
	July	1st	2,917		343

Fig. 6.

Form 512-A (Fig. 7), one of the few forms compiled by the general auditor especially for the Chicago office, copies of which, however, are sent to all interested, gives a check of cost of handling freight at important stations, one of the largest items of operating expense.

Passenger and freight train statistics are shown on Forms 622 (Fig. 8) and 544. The only cost items given are those controllable by the superintendent. Weekly and monthly tonnage statement, which we think our most useful and important form, not only for the Chicago office

FORM 512-A.

OREGON SHORT LINE R. R. CO. THE OREGON R. R. & NAVIGATION

OPERATIONS OF IMPORTANT FREIGHT STATIONS

FOR THE MONTH OF OCTOBER, 1908 AND 1907.

M

Kansas City 1908	Kansas City 1907	Salt Lake 1908	Salt Lake 1907	Spokane 1908	Spokane 1907	Portland 1908	Portland 1907	Item	Ogden 1908	Ogden 1907	Reno 1908	Reno 1907	Sacramento 1908	Sacramento 1907	Oakla[nd] 1908
1,232	1,287	1,094	1,063	276	292	801	887	1 Number of freight cars originating at station, loaded by stationmen 1	1,302	1,598	187	165	1,537	1,650	4,537
23,911	26,696	16,808	21,898	2,825	3,430	15,790	17,041	2 Number of freight cars handled in station yard 2	44,438	56,041	3,567	4,319	27,714	30,571	[illegible]
9,598	11,739	8,533	8,972	1,661	2,102	9,737	10,743	3 Tons of freight loaded by stationmen into cars originating at station 3	16,841	26,038	1,999	1,552	13,838	14,739	56,[illegible]
......	....	......	....	......	......	.....	.....	4 Tons of freight loaded by stationmen into cars passing station 4	......	....	137	168	......	....	33
4,731	6,963	6,726	7,566	1,069	1,340	9,408	14,625	5 Tons of freight unloaded by stationmen 5	17,440	26,600	2,232	1,889	9,141	11,579	4[illegible]
10,473	12,689	12,475	13,510	2,343	3,007	19,145	25,368	6 Total tons of freight handled by stationmen... 6	23,476	33,659	4,138	3,325	16,873	20,950	78,514
93,705	99,343	69,209	78,534	13,943	16,343	185,871	200,376	7 Total tons of freight handled by stationmen, shippers, etc......... 7	57,943	61,154	29,612	26,740	105,012	133,099	213,15[illegible]
7.8	9.1	7.8	8.4	6.0	7.2	12 2	12 1	8 Average tons of freight loaded per car by stationmen into cars originating at station... 8	12.9	16.3	10.7	9.4	9.0	8.9	12.5
4,347	4,505	3,052	3,554	1,676	2,383	5,068	6,797	9 AGENCY EXPENSES FOR FREIGHT SERVICE. (Dollars) Agents and clerks 9	3,167	3,150	2,071	2,246	5,394	9,154	8,146
3,504	4,021	3,250	4,270	1,050	1,398	7,800	12,544	10 " Station Labor......... 10	4,762	8,711	848	2,469	5,717	6,977	14,6[illegible]
7,851	8,526	6,302	7,824	2,726	3,781	12,868	19,341	11 " Total 11	7,929	11,861	2,919	4,715	11,111	16,131	22,75
4,842	6,579	4,827	8,393	774	1,132	3,898	4,633	12 Expenses Yardmen and Switchmen in Freight Service (dollars).... 12	5,968	10,267	745	1,425	6,654	11,542	11,947
12,693	15,105	11,129	16,217	3,500	4,913	16,766	23,974	13 Total Agency and Yard Expenses for Freight Service (dollars).. 13	13,897	22,128	3,664	6,140	17,765	27,673	34,69[illegible]
0.20	0.25	0.29	0.38	0.27	0.33	0.25	0.27	14 Yard Expenses per freight car handled (dollars) 14	0.13	0.18	0.21	0.33	0.24	0.35	0.20
41.5	35.5	24.5	26.3	71.5	79.2	26.5	26.8	15 Cost of Agents and clerks per ton handled by stationmen (cents) 15	13.4	9.3	50.0	67.5	31.9	43.6	10.4
33.5	31.7	26.1	31.6	44.8	46.5	40.7	49.4	16 Cost of station labor per ton handled by stationmen (cents) 16	20.2	25.9	20.5	74.2	33.9	33.2	18.[illegible]
18,389	26,539	13,574	23,529	5,079	7,512	16,752	20,849	17 Miles run by switch locomotives 17	18,750	34,208	3,060	6,678	22,359	35,156	52,32[illegible]
								NUMBER OF CARS INTERCHANGED WITH CONNECTIONS							
6,241	7,288	1,986	2,089	1,278	1,635	2,809	2,923	18 Received from 18	5,952	6,923	275	318	......	......	......
5,945	6,611	2,466	3,052	1,311	1,452	2,780	3,154	19 Delivered to 19	6,313	9,169	265	357	......	......	......
12,186	13,899	4,452	5,141	2,589	3,087	5,589	6,077	20 Total....	12,265	16,092	540	675	......	......	......

Fig. 7.

but for every superintendent and division officer, shows in great detail the tonnage moved by the locomotives both east and west bound, so that the effect of preponderance of traffic on train load may be watched. As it appears seven to eight days after the train movements it records, transportation officers have early means to check the most efficient use of power—the foundation of economical management. It deprives the subordinate of the usual excuse that traffic preponderating in one direction prevented efficient train loading, by showing what was done in that direction as well as in that of lesser traffic. Form 1,245, a companion sheet, shows efficiency of use made of motive power. In third column, under heading "Potential Ton-Miles," it shows how many ton-miles could have been actually given the locomotive on the run in question. This compared with the actual ton-miles moved, gives at once a check on the power wasted. The money value of this wasted power is computed for each division by the auditor and is shown as the last item in the statistics on Form 4,914.

To stimulate most efficient use of car capacity, Forms 1,290 are issued as promptly after the first of the month as possible. They are usually in the hands of the superintendents in from 15 to 18 days after close of month, and show exactly how cars have been loaded with principal commodities.

Form 164 shows statement of expenses incurred in maintenance and operation of interlocking plants, and Form 165 the expenditures incurred on account of maintenance of automatic block signaling. These two forms have recently been devised on account of the very large mileage of automatic signals and increasing number of interlocking plants.

Accidents in train service and casualties resulting therefrom are consolidated by each general manager on Form 2 800, and transmitted to Chicago with computations showing number of accidents and property damage per million locomotive-miles run. For comparative and competitive purposes, these reports are consolidated in the office of the director of maintenance and operation and issued monthly, so that each general manager may know exactly what his associates are doing. A detailed monthly statement of serious train accidents comes to the Chicago office and its lessons are disseminated to the several operating units.

The operations of the rolling mills at Laramie, Wyoming, and Sacramento, California, in which scrap is reworked, are shown in detail on Form 2,341. The operation of the brass, iron and wheel foundries is shown in detail on Forms E-21, 2,462 and 2,305.

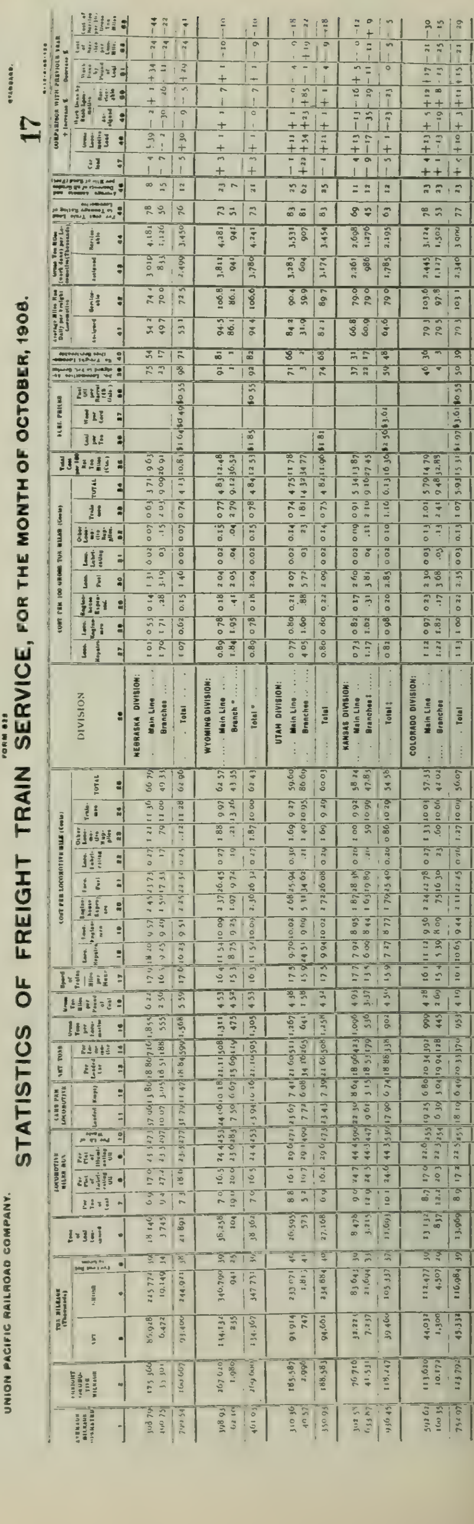
Earnings and expenses of dining-car and hotel service are shown on Form 160.

For ready reference by the director of maintenance and operation and his staff, the principal operating statistics for each property are shown in graphical condensed form in a pocket memorandum book about 4 x 6 in. Pasted in this book is a folded condensed statement showing certain important operating statistics for expired months of current and corresponding period of previous fiscal year with percentage of increase or decrease. This small sheet gives a comprehensive view of the operation of all the properties up to date. It is very useful and convenient.

In addition to these forms, which are regularly rendered, it is customary to select some one item of expense from time to time and make it the subject of special study, this stimulating attention and thought on this particular item, further study being given when deemed necessary.

The small table on the following page gives some idea of the results of the system in the face of a steady rise in the prices of labor and material.

Had the 1909 business been moved at the 1904 train loading rate, about 10,000,000 more freight train miles would be required for the year than will actually be the case. For the period shown, 34 per cent. more passengers and 24 per cent. more tons of freight were moved one mile with only 10 per


UNION PACIFIC RAILROAD COMPANY. FORM 828 STATISTICS OF FREIGHT TRAIN SERVICE, FOR THE MONTH OF OCTOBER, 1908. STANDARD. 17

DIVISION
NEBRASKA DIVISION: Main Line; Branches; Total
WYOMING DIVISION: Main Line; Branch; Total
UTAH DIVISION: Main Line; Branches; Total
KANSAS DIVISION: Main Line; Branches; Total
COLORADO DIVISION: Main Line; Branches; Total

Fig. 8.

cent. more train miles. The efficiency based upon traffic handled per employee also increased.

All expenditures for additions and betterments require an "Authority for Expenditure," approved by the Chicago office and passed upon by the executive committee of the board of directors in New York. These authorities, involving necessarily an immense amount of detail, add largely to the volume of important business of the Chicago office. Their tabulation each month, showing amounts authorized, spent and unexpended, enables the board to properly finance operations. All authorities expire with the fiscal year, and if the work is not completed the unfinished part must be covered by a new authority.

Total, All Associated Lines.

	6 months end'g Dec., 1908.	Year ending June, 1908.	Year ending June, 1904.
Passengers one mile, excluding ferry passengers	1,175,960,857	2,212,680,362	1,604,272,671
Passenger train miles	16,430,395	33,022,772	26,805,518
Passengers per train	71.7	67.0	59.8
Ton miles freight, including company freight	7,253,756,237	14,127,148,337	11,396,231,734
Freight train miles	14,496,698	31,691,620	30,822,000
Tons, freight per train	500.26	445.65	370.01
Loaded car miles	339,833,050	644,695,870	579,389,550
Tons per loaded car	21.34	21.90	19.68
Total operating expenses, rail lines	$52,383,070	$116,183,010	$86,243,263
Per cent. operating expenses to earnings	52.49	61.79	61.17
Total train miles	29,537,367	61,679,427	56,147,089
Operating expenses per train mile	$1.78	$1.88	$1.54
Operating expenses per ton mile (mills)	3.5	4.2	4.2
Number of employees at close of period	80,006	72,765	75,258

REPORTS.

Crops.—A weekly report of crop conditions in contiguous territory is made by the Chicago office on Form 2,616 for the information of the president and the board of directors. The railway administrative machinery is employed without the aid of specialists. The primary data, showing conditions and prospects, originate with the station agents after consultation with the farmers and other local persons. These station reports are consolidated and edited first in the offices of the division superintendents and for the divisions in the offices of the general managers. After final consolidating and editing in the Chicago office, the weekly report of perhaps 2,000 to 3,000 words is ready for New York. Each report is made complete in itself. A weekly and much briefer telegraphic report is made showing traffic possibilities as reflected by the condition of staple crops. In preparing these crop reports, the general methods of the United States Department of Agriculture are followed. Based upon local information, supplemented by all available government and state statistics, an estimate is made of the acreage, condition and probable yield, compared with a "normal" which is usually the average of the preceding five years.

Press.—Each general manager receives current issues of practically all newspapers and periodicals published in his territory. A competent person in his office, after careful scrutiny of editorial and other matters, tabulates and compiles a record showing the general attitude toward railways and other corporations of each publication. Twice a month each general manager telegraphs the director of maintenance and operation a brief fortnightly synopsis of public sentiment as reflected in the press, showing number of publications examined, percentage favorable, neutral and antagonistic, quoting criticisms, complaints and expressions of special interest, and commenting upon the general trend of opinion as voiced from political and commercial centers. The Chicago office briefs and consolidates these reports for telegraphic transmission to New York. These reports are of great benefit in detecting causes of friction and enabling the application of prompt corrective measures.

The regular reports are supplemented by special telegrams covering items or incidents of more than usual importance or significance. In addition, numerous newspaper clippings are currently forwarded by mail through the Chicago office.

The equipment of the associated lines is pooled, and to get the maximum use of the equipment some directing office must have arbitrary authority to order movement of equipment from one point to another in emergency and to adjust balances at system interchange points. Form 1,335 was devised for the purpose of showing the general manager and his important assistant, the car service agent, from the morning report the location of entire equipment on each system. Data for each division are transmitted by wire each morning on the usual 7 a.m. report. The results are compiled daily for the use of the car service agent and general manager and copy of compilation for the 10th, 20th and 30th of the month are forwarded to the director of maintenance and operation. The footings show him at a glance the condition of car balances at interchange points between lines over which his jurisdiction extends, indicating how many foreign cars are on associated line roads, how many associated line cars are on foreign roads, and locate generally to within 1 or 2 per cent. the entire associated line equipment of some 75,000 freight cars.

The assistant director of maintenance and operation, among other duties, handles these larger movements of equipment. It will be observed that no detailed car record is kept in the Chicago office. To do so would destroy the policy of local autonomy; the director of maintenance and operation would become general manager of some 18,000 miles of railways—an impossible task for any one individual.

The Harriman freight car pool is not unlike those of the Pennsylvania and of the New York Central. When the principle is extended to the pooling of car pools, the car efficiency and traffic capacity of American railways will be appreciably increased. The same methods that brought about a reduction of 54,000,000 miles movement of empty cars on the Harriman lines in the two years after their inauguration would make a proportionate reduction of 477,000,000 annually on the railways of the United States. Anything that tends to strengthen the service of a railway redounds to the reciprocal advantage of the public it serves. The patrons of the Harriman lines are better off because the same refrigerator car which moves melons from the Mexican border to the Atlantic seaboard in June can handle Oregon peaches in August, Colorado potatoes in October and California oranges in December, besides hauling merchandise west on each return trip. So it is the country over. Combination into large units is demanded by the bigness of modern conditions. It is the duty of the railways to help educate the people in right thinking and to avoid suspicion of unwillingness to disclose actual conditions.

PUBLICITY.

The policy of the Harriman lines is to be frank with the public in company matters. When a serious accident occurs, an open board of inquiry is promptly convened by the division superintendent, consisting of himself, the master mechanic, the division engineer and two or more prominent representative citizens. This board, a high class jury, hears evidence and publishes its findings in the local press. Not infrequently a newspaper man is a member of the board. If this board does not get to bottom facts, a second is convened, composed of general officials and of prominent citizens of the state; for example, an ex-governor, a well-known banker, a leading editor, a retired general officer of the army, etc., etc. This policy has greatly improved discipline and educated public sentiment. The men are eager to avoid the published censure of their fellow citizens. The public are pleased with the frankness of the companies and sympathize with their difficulties. Personal injury settlements are no heavier—if anything, are lighter—under this policy. It is idle to argue that liability can be avoided by a suppression of information.

INSPECTION.

The adoption of standards implies seeing that they are maintained. Each general manager and the members of his

staff may in the utmost good faith report that a standard practice or device has been installed. Investigation may disclose the fact that due to honest differences in interpretation two adjacent properties have in reality widely varying practices. Such non-standard conditions can only be ascertained and corrected by open and above board inspection from the Chicago office.

The director of maintenance and operation and the members of his personal staff spend much of their time on the road, seldom traveling together, and seldom all being in Chicago at once. They cannot, however, do all of the inspecting necessary for proper co-ordination. To avoid dwarfing the general managers by building up a large permanent staff in Chicago, the condition is met by detailing for temporary special duty as inspectors or special representatives various officials of the associated lines. This serves a double purpose. It secures not only proper information of actual conditions for the Chicago office, but it broadens the individual selected. He returus to his own property with the viewpoint of the Chicago office, some knowledge of the other properties and a better appreciation of the problems of correlation. During his absence, an understudy in his own position has been tried out for future advancement. The effort is to develop all-around men. For example, a general superintendent was detailed to act as chairman of a committee which traveled over the associated lines and other railways to recommend the best practices in handling brakes on heavy grades. In addition to a valuable report on this subject he also, among other things, made useful recommendations as to standardization of trainmen's uniforms.

The effort is to use intelligent, high class inspection as a means of disseminating education to officials. The financial depression of 1907 caused drastic reductions in maintenance expenses. To make certain that the point of safety was not passed, and to assist in meeting the exceptional state of affairs, a maintenance of way inspector traveled over the lines for several months conferring freely with local officials. When it became manifest that the desired result had been reached, this inspection work was discontinued. Frequently, a prescribed report can be made to answer certain purposes of inspection without sending out an inspector. When the effect has been produced, when the lesson has been learned, the report is withdrawn. Examples of current reports to the Chicago office which have been discontinued are, cast iron wheels removed per 100,000 car-miles run; hot boxes per 100,000 car-miles run; engine failures; comparative cost of repairs as between steel and wooden cars.

The inspectors and special representatives are forbidden to exercise authority. They can observe, inquire, investigate, confer, advise, suggest and report, but must not order or interfere with local administration.

EDUCATION.

A prime function of the Chicago office, by virtue of its broader viewpoint, is to act as a bureau of education. Most of the effect is produced by analyzing and comparing statistics and reports, communicating conclusions by correspondence or by personal interviews on the ground. This work is supplemented by one or more special representatives, chief among whom is the consulting engineer, a permanent member of the Chicago staff. The consulting engineer, among his many advisory activities, takes young civil engineers from the lines for service in his office, and with this supplementary training returns them to their properties better qualified for official positions. A student course of practical training for division officials and sub-officials is being worked out on the various properties.

The other representatives are detailed from time to time, being selected for their experience and tact, and sometimes to develop and try out some meritorious idea originating with the man himself.

As a further means of education, division officials are sent—a few at a time and usually in a business car—on a 15-day trip once a year over other railways to observe methods and appliances.

The semi-annual meetings of general officials are held in different cities on the associated lines in order that the participants may gain an idea of conditions on all parts of the system.

The Chicago office endeavors to spread among all the properties or to cause them to send to each other from every available source all possible information that may have an educational value.

Every consistent effort is made to impress upon all concerned the necessity for carrying out both the spirit and the letter of requirements—to avoid the perfunctory performance of duty. An officer is expected to take the same personal interest in crop reports, in traffic possibilities and in press bulletins that he does in the movement of his trains or his unit costs of production and performance.

CONCLUSION.

Countless details of daily routine have been purposely omitted from this summary. To the professional they are superfluous. To the layman they are unnecessary. An effort has been made to show the general practical methods of obtaining those satisfactory results which first existed as a bold conception in the brain of one man, E. H. Harriman.

RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY,
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CHAPTER III.

THE INTRICACIES OF FREIGHT RATE ADJUSTMENT.

The intricacy of freight rate adjustment in response to the subtleties of commercial competition depends only in small measure upon the absolute freight rate imposed. The main problem is that of relativity of rates. But this does not mean mere relativity of rates as between competing commodities or places. A strict relativity based upon commercial conditions must often obtain as well between the rates on raw materials and their own finished products; between all the various by-products in an industry; and, of course, always as between goods capable of substitution one for another. A few illustrations will serve to make these details clear.

The matter of properly correlating the freight rate on raw materials and the finished products made from them is more far-reaching than it seems. The location and development of manufacturing depends upon it. The country may be broadly divided into agricultural and manufacturing sections. The first of these is ambitious to develop its resources; not only to feed, but to clothe itself and make other provision for its needs. No sooner does it seek to develop local manufacturing than it finds itself exposed to competition from the older established manufacturers at a distance. Sometimes, even, these remote manufacturers draw their supplies of raw material from its own fields and forests. These supplies are then shipped long distances as raw material; manufactured and thereafter returned to sell in competition with the local product. The local market in relatively undeveloped areas is probably insufficient to provide support for manufactures on a profitable scale. It is essential to dispose of the surplus product over a wider area. Thus there arise two classes of manufacturers: one "next the stump," manufacturing at the source of the raw material and desiring to ship the finished product; the other, remote perhaps from supplies of raw material, but favored by long experience, by abundant supplies of capital and of skilled labor and by other advantages.* Neither class of producers can prosper without overflowing into the

*Vide chapter on Localization of Industry in the Federal Census of Manufacturers, I, pp. cxc-ccxiv.

domain of the other. The outcome of this competition depends in part upon the policy of the carriers. If the rate on the raw material be relatively low, the remote manufacturer is aided. Cotton mills and shoe factories in New England prosper in competition with establishments in the South or the Middle West. If on the other hand the rate on raw materials be inordinately high while at the same time low on outward-bound shipment of manufactures from the seat of the raw materials, the tendency is in favor of the upbuilding of manufactures, not near the historic centres of population and consumption, but near the sources of natural wealth, which are the potential homes of manufacturing.

The long-standing controversy over relative rates on wheat and flour for export affords an interesting illustration of the difficulties of properly correlating charges of this sort.* Originally the rates on wheat and flour—the raw material and the manufactured product—were the same. In 1890 the railways leading to the Gulf ports began to discriminate by giving lower rates on wheat, but the Trunk lines until 1899 held to the original equality between the two. Finally, however, the struggle between the Trunk lines and the Gulf roads for business forced the former to lower their rates on wheat, leaving the flour rates, not subject to Gulf competition, undisturbed. At times the rate on wheat for export was as much as 9 cents per hundred pounds lower than the rate on flour. Thus the rate on wheat for export from the Mississippi river to the seaboard was frequently 12 cents, while the rate on wheat from the same points to Chicago added to the rate on flour there manufactured and sent on in barrels or bags to New York was 22 cents—a clear discrimination against the domestic manufacturer in this instance of 10 cents per hundred pounds. For his American-made flour sent abroad in competition with flour made in Liverpool from American wheat would evidently cost that much more at delivery. In other words, wheat could be transported to England and there ground much cheaper than it could be ground here and then shipped. This bore with particular severity upon small millers, partly because their costs of manufacture are relatively high, and also because any limitation of export business forced the large millers to bid more keenly for local domestic trade. Inasmuch as a fair margin of profit to the American manufacturer would not exceed 2 cents per hundredweight, it is apparent that this discrimination operated severely against the American miller. Minneapolis fortunately was unaffected by this discrimination, much of its exports going out by Canadian lines to the Lakes. The carriers defended this difference in rates on the ground of water competition by the Lakes or combined rail and water routes which were alone open to wheat, and which thereby unduly lowered the rate on that commodity; and also on the basis of the lower cost of service in moving the raw material as compared with the finished product. It is apparent that issue was really raised in such a case between the interests of the farmer and of the manufacturer. The United States, producing a surplus of wheat the price of which is made on the Liverpool market in competition with the world, is compelled to find an outlet for this product. It is obvious that any reduction of the freight rate—the prices in Liverpool remaining fixed—would inure to the benefit of the farmer, who would thereby receive a higher price for his product. Viewed in this way the railways by discriminating in favor of the rate on wheat were helping the farmers. But at the same time by moving this wheat more cheaply than flour the railways were encouraging the location of flour milling abroad and rendering it impossible to manufacture flour for export at a profit in the cities of the Middle West. In these export cases it does not appear clearly why the rate on flour for export might not have been reduced somewhat. The Interstate Commerce Commission finally rendered a decision to the effect that the existing difference in rates constituted an undue preference in favor of the foreign manufacturer, adding at the same time that these discriminations seemed to be due primarily not to a desire of the railways to aid the American farmer in disposing of this surplus wheat, but to the bitterness of competition between the Gulf and Trunk Line railways. They decided that any discrimination greater than 2 cents per hundred pounds in favor of wheat for export as against flour was unreasonable. This difference was permitted, however, on account of the greater cost of handling the manufactured product. It is significant of the then state of the law that the railways paid no attention to this order, and although conditions improved somewhat, there is still great complaint.

*The leading case is reprinted in Ripley, Railway Problems, pp. 441-475.

The relative rates on wheat and flour, even when for domestic consumption, illustrate the same difficulty of commercial competition—the necessity of adjusting the rate on raw materials to that on the finished product.* The rate on wheat from Wichita, Kan., for example, to California is 55 cents per hundred pounds, while the rate on flour between the same points is 65 cents. Is this difference in rates economically justifiable? California wheat is soft, so that flour produced from it is much improved by the admixture of hard wheat, such as may be obtained in Kansas. California, formerly a large wheat exporting state, has of late years relied to a considerable degree upon the Middle West for part of its supplies. Kansas flour sells for 75 cents a barrel more than California wheat flour. Shall this Kansas wheat to be consumed in California be ground in Wichita or in California? Here is material for controversy, not between one particular railway and another, but in reality between the millers in Kansas and the millers in California. It is quite analogous to the issue raised over export wheat and flour between the miller in Chicago and his rival in Liverpool. In this instance, if milled in Kansas, the railways enjoy the carriage of flour; while if ground in California the railways carry the commodity in the form of wheat. Owing to certain practical conditions, such as the percentage of waste and relative differences in labor costs, the Kansas miller appears to enjoy a certain advantage over his far western competitors. At this point the interest of particular railway companies appears. The Rock Island, if the milling industry in Kansas develops, obtains the haul not only of the flour, but also of the fuel and of supplies for the communities engaged in the business. On the other hand the Southern Pacific is more largely interested in the local development of manufactures in California. The Rock Island, by maintaining a higher rate on flour than on wheat, would tend to hold its clients in the field. The Southern Pacific, on the other hand, by securing the reduced rate on the wheat from Kansas would materially advance the welfare of its constituents. Thus the rivalries of the competing localities immediately become the direct and immediate concern of rival railways.

Cases precisely analogous in principle to those concerning the relativity of rates on grain and grain products have troubled the carriers for years in respect to the rates upon cattle and packing house products. A low rate on cattle as compared with beef favors Chicago to-day as against Missouri river points, the latter being nearer the cattle ranges; just as a generation ago it enabled cattle to be brought to New York and Boston to be there slaughtered and sold on the spot. The history of this controversy throws much light upon the difficulties of rate-making in practice. Originally the railways encouraged cattle raising by a rate which was only about one-third of the rate charged for beef. Slaughtering was carried on in the East adjacent to the great markets. To this policy the Western packers objected strenuously. They demanded a relatively low rate on their finished product in order to enable them to bid against the local eastern slaughter houses. The stockmen, on the other hand, naturally desired a continuance of the low rate on cattle, as it perpetuated com-

*Interstate Commerce Reports, No. 917, decided June 24, 1907.

petition between eastern and western buyers. The controversy between the stock raisers and the packers was thus shifted onto the shoulders of the traffic managers of the railways. The dispute culminated in 1883 when the Trunk Line Association appointed a special committee to consider what the proper adjustment should be. This committee in turn referred the matter to Commissioner Albert Fink, "Seeking a relativity of rates so as to make the charges for transportation, including the expenses incident to the transportation of dressed beef, the same per pound as the charges per pound of dressed beef transported to the East in the shape of live stock." A difficult task this, considering the variety of by-products emerging into value year by year. Cattle rates had been for some time 52 per cent., and then later 60 per cent. of the dressed beef rates. This was relatively higher for cattle than had been charged during the seventies. But the packers demanded that the relativity in favor of the finished product be still further advanced until cattle rates should equal 75 per cent. of the rates on beef. This would effectually discourage the shipment of cattle to eastern centers, and would tend to upbuild Kansas City and Chicago at their expense. In 1884, the matter being still in dispute, was referred to Hon. T. M. Cooley, afterward chairman of the Interstate Commerce Commission. He decided that a fair compromise would be 40 cents on cattle from Chicago to New York with coincident rates of 70 cents on beef. This would make the cattle rate about 57 per cent. of the beef rate. It was a victory for the stockmen as against the Western packers, who raised a great outcry.

It would have been difficult to predict the final outcome had not an entirely new factor appeared which transformed the conduct of the beef packing industry. Specially constructed stock cars owned by private companies began to be built. These favored the perpetuation of competition between eastern and western packers. To checkmate this the western packers had already embarked in 1879 upon the ownership of privately owned refrigerator cars for the carriage of their finished products. The custom was adopted by the railways of paying for the use of these cars by making an allowance of so much a mile as a deduction from the established tariffs. This at once opened the way to secret rebates of all sorts. The refrigerator traffic in these private cars was large in volume, very regular and highly concentrated as to source. A large tonnage could be diverted at any time to that road which could best show its appreciation of the favor. The Grank Trunk, for instance, in 1887 swept the board, monopolizing this entire business for a brief time, obtaining it by secret and discriminating rates. The railways jointly sought to free themselves from the domination of the large packers; but the phenomenal growth of their business, both domestic and export, rendered them too powerful to resist. According to expert data, during nine months to May 1, 1889, three shippers alone received from one line of road $72,945 for the use of their cars. This about equalled the initial cost of eighty new cars. For the year ended 1895, $8,744,000 was paid by the railways of the United States for the use of these cars—about $4,000,000 of this being in the form of rental. At this rate profits of from 25 to 50 per cent. upon the investment accrued to the great packers. These virtual rebates of course drove all competitors from the field. The story of the gradual extension of this system of private cars to include fruit and produce business belongs in another place Suffice it to say that the bondage was broken only by the passage of the Hepburn Act of 1906. The growth of these private refrigerator car lines caused the disappearance of live stock shipments. Packing and slaughtering on a large scale at the seaboard, either for domestic consumption or export, was doomed. Meantime, however, the controversy over the relative rates on beef and cattle continued just as if anything really depended upon it. The issue was again submitted to the commissioner of the Trunk Line Association in 1887. In the following year a select committee of the United States Senate was appointed at the urgent request of the cattle raisers. Testimony before this committee showed in detail how eastern packers were striving to build up establishments near the points of consumption, but were driven out of the business by the relatively high costs of shipping cattle as compared with the rates at which dressed beef could be actually delivered from Chicago and Missouri river points. This entire history, aside from its significance as a study of personal discrimination, illustrates the effect of a relatively increasing differential rate, partly open and partly secret, against the raw material of an industry as compared with the finished product. The result at all events has been to concentrate the packing industry in the Middle West. Nor is the controversy closed even yet. But this time it is a question, not between the seaboard and Chicago, but between Chicago and the Missouri river points. Always and everywhere the manufacturer seeks to develop at or near the source of the raw material. Whenever this tendency does not appear in an industry it is pertinent to inquire how far the relative adjustment of rates is responsible for the phenomenon.

Complexities in rate adjustment often arise from the fact that in the manufacture of many commodities the marketing of by-products is of increasing importance. The rate on the whole series of related commodities must be taken into account at once. Thus in lumbering a large amount of waste or very low-grade lumber is necessarily produced. This common lumber cannot bear long transportation; it must be utilized locally, if at all. On the other hand the choicest specialties will command a price even in remote markets. A monopoly price is enjoyed in such a case. The Pacific coast lumbermen can market their long timbers anywhere in the United States; but the demand for the common lumber, restricted to a sparsely populated region, tends to be exceeded by the supply. The real competition between the Southern, the Michigan, the Wisconsin, and the Pacific coast manufacturers thus narrows down to the sale of the medium grade product. And the cost of production of this is, of course, in part dependent upon the profit made upon the other two sorts, each of which, in its own field, appears to be a monopoly. A wide market and a good price for medium-grade lumber may so lessen the cost of the cheapest by-products that they in turn may be so reduced in price as to widen their reach to the consumer. Each rate reacts upon the others. The situation can be successfully controlled only by adjusting them all at once.

Not only are rates competitive as between raw materials and the finished product made from them, but the circle of competition immediately widens to include all commodities capable of substitution one for another. Coal rates, of course, are partly determined by rates on cordwood, and vice versa. During the great coal strike in Pennsylvania in 1903 soft coal rates and hard coal rates were sadly disturbed. Such substitutions are always likely to occur. But the conditions are not always so simple as this. An instance in point is given by a witness before the Senate Committee on Interstate Commerce in 1905.* This shows how a reduction in the rate for transportation of corn from Kansas to Texas brought about a corresponding reduction in the rate on flour from Minneapolis to Chicago. There was a large crop of corn in Kansas; and the Chicago lines anticipated brisk business in the carriage of this product. The traffic managers of lines from Kansas to Texas, however, discovered a large demand for corn in Texas at a price higher than then prevailed in Kansas. Any rate less than the difference in prices betwen the two districts would cause shipments of corn to flow from Kansas to Texas, just as inevitably as water flows down hill. This rate would needs be low; but the corn could be loaded on empty southbound cars which had been used to haul cotton out of Texas to the north. This, of course, entailed a diversion of corn from the Chicago railways, which promptly reduced their

*Testimony, volume II, pp. 1676.

rates in order to hold their traffic. For years the rates upon wheat and corn had been fixed in a definite relation to one another, based upon commercial experience. Any reduction of the corn rate compelled a reduction of the wheat rate. A fall in the wheat rate brought about a drop in the rate on flour. These reductions in corn started in southern Kansas; but parallel lines in northern Kansas were compelled to follow suit. Grain in the territory between the two roads could be hauled by wagon either north or south corresponding to a fraction of a cent per bushel difference in the price. Thus the reduction in rates spread from one line to another all over Kansas, throughout Nebraska up into Dakota and finally to Minnesota. It not only affected the corn rate everywhere, but it caused a reduction in the rate on flour from Minneapolis to Chicago.

The reliance of Texas for a portion of its corn supply upon the surplus product of Kansas sometimes leads to odd results. This commodity is sometimes shipped as corn meal and sometimes transported as corn to be afterward ground in Texas. The Texas millers at one time demanded a relative reduction of the rate on grain as compared with corn meal, and the railway commission of that state upheld them in that demand. For 10 years down to 1905 the differential in favor of the raw product had been 3 cents a hundred pounds. Then the railways, in connection with a general advance of rates, increased the charge on corn meal until it amounted to about 9 cents per hundred pounds more than the rate on corn. One cent a hundred pounds being a good profit in grinding corn meal, this change shut the Kansas millers out of Texas business. Application was made to the Interstate Commerce Commission for relief. It then appeared on investigation that the carriers had made use of the Texas millers in order to prevent a general reduction of *both* grain rates and rates on grain products. The Texas millers on general principles had favored both these reductions. What happened is best described in the evidence before the Senate Committee on Interstate Commerce of 1905. "The railways went to the millers of Texas and they said to them, 'Is there anything you want here?' 'Why,' said the millers, 'yes; we would like to have that differential between corn and corn meal increased; we think you ought to put the rate on corn meal up.' The railway said, 'All right; you just stay away from that meeting down at Austin so that there will not be any excuse for the Texas commission, and if it undertakes to reduce these rates we will raise this differential; we will raise the rate on corn meal to the rate on flour.' The millers kept away from Austin—they kept their part of the bargain—and they stayed away, and the Texas commission was left without any support for their proposition to reduce the corn rates, and the railways kept their part of the bargain and lifted up the rate on corn meal so that the differential was from 9 to 7½ cents, and that put the Kansas mills out of business."

Apparently insignificant details often determine the outcome of commercial competition. Thus in the milling business where the margin of profit in the manufacture of flour may not be over 3 cents per barrel, an infinitesimal charge in the freight rate may mean success or failure to long-established industries. And the conditions vary indefinitely. Thus as between flour milling in Duluth and Buffalo, Duluth can buy its wheat from the farmer direct during the entire winter, but must ship its product mainly during the period of open water navigation on the lakes. The reverse is true with the Buffalo miller who can ship out his flour during the entire season, but who must accumulate his entire stock of wheat before navigation closes. And then Minneapolis as a milling center has to be taken into account. Eighty per cent. of the spring wheat grown in the United States is in territory from which the freight rate to Minneapolis and Duluth is the same. But the basic rate to the East and Europe, fixing the all-rail rates, is the combined lake and rail. By this route Duluth is 150 miles nearer the market than is Minneapolis, and consequently enjoys a lower rate on its flour shipped out. A three-cornered competitive problem exists, in which any change at one point entirely upsets the commercial equilibrium.

The obligation on the part of one railway to protect its constituency, not only in respect to particular rates, but in general conditions as well, introduces still further complications. The freight business of New England, for example, consists, first, of the carriage of raw materials and supplies inwards; and, secondly, thereafter of the transportation of the finished product out to the consuming markets. Narrowly considered it may seem expedient to crowd the rate on coal as high as the value of service probably will permit; but viewed in a large way it may prove to be a far better business policy to maintain the rate on coal, cotton and other staple supplies so low that the growth of population and production may in the long run yield far greater returns on the high-grade manufactures which the territory produces. Turning to the Southern field, where the economic conditions are reversed, it may be the better policy to hold down the rate on raw cotton in order thereby to stimulate this great basic industry and thereby enhance the demand for the merchandise and foodstuffs which depend upon general prosperity. A free hand afforded for the suitable adjustment of such apparently independent services may contribute far more to the general welfare than an insistence upon a petty and near-sighted policy of extorting from each individual service all the rate it can possibly endure. American railway managers are gradually but surely coming to take a more liberal view of these great possibilities and to consider the economic development of their teritories, not narrowly, but in a generous way.

(*To be continued.*)

THE JACOBS-SHUPERT LOCOMOTIVE FIREBOX.

Locomotive boiler design has not changed materially since the locomotive attained its present general arrangement. Certain modifications have been introduced from time to time, but in the main, locomotive boilers are built according to the same general design followed in the earliest type of horizontal fire-tube boilers. A radical departure from this general form is the Jacobs-Shupert type of locomotive firebox, here illustrated. In this, the usual flat firebox sheets and outer shell are replaced by sets of channel sections riveted together and the usual form, with troublesome staybolts, is replaced by stay sheets, except at the front and door sheets.

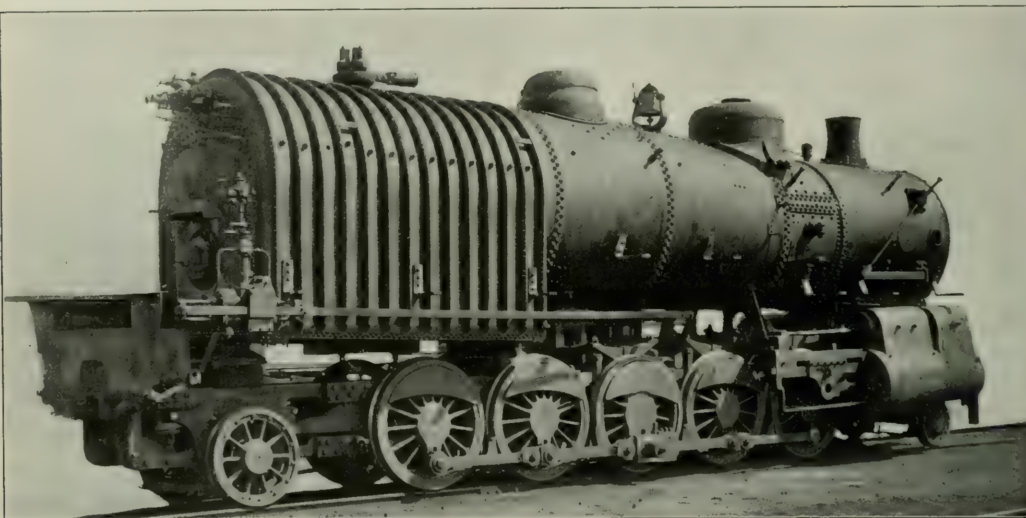
The Jacobs-Shupert firebox, as applied to the boiler of engine 917 of the Atchison, Topeka & Santa Fe, is composed of 13 built-up sections securely riveted together. These sections are connected by rectangular shaped openings through the stay sheets, which provide for horizontal circulation. Each section is built up of an inner and outer channel tied together by two perforated radial stay sheets, each stay sheet serving two adjacent sections. The lower portions of the sections terminate at a mud ring of ordinary form and the channel shapes are so modified at the mud ring as to make a smooth, continuous joint. The flue sheet and forward stay sheet are in one piece, extending from the mud ring at the bottom to the outside shell at the top; the inside door sheet and the back stay sheet also are in one piece. The firebox, formed by the assemblage of these sections, is connected to the barrel of the boiler by a throat sheet pressed from a single piece and flanged to conform to the flange of the outer shell channel. The back head is pressed to shape and flanged to conform to the flange of the outer channel also.

The channel sections forming the outer shell and the firebox proper are made from long narrow strips of steel. Each channel section is formed by pressing hot informers under the hydraulic press. The straight channel is then bent by

formers also operated by the hydraulic press to conform to the contour of the outer shell or of the firebox as required. As shown by the accompanying drawing of the horizontal section of the boiler and firebox, the webs of these channels are unlike in contour. The curvatures of the webs are so formed as to assume the natural curvature when under pressure and the arches formed by the inner and outer channels represent a construction that insures against undue and enormous local stresses resulting either from pressure or sudden changes in temperature. The channel sections are applied with their flanges away from the fire, thoroughly submerging all seams of the firebox proper and facilitating the work of riveting. The rivet heads are all submerged and there are no bolt heads exposed to the heat of the fire and hot gases.

The radial stay sheets are interposed between the flanges of adjacent channels of both the inner and outer sets and are secured by the same rivets that hold the channels. They thus serve to stay the firebox and the outer shell and also serve as calking strips. To provide for horizontal circulation of water around the firebox, the stay sheets are partially cut away, an opening of 16 sq. in. being made through each sheet at the mud ring, in addition to the other holes through the sheet.

The mud ring is of the ordinary form as applied to the usual type of flat sheet firebox. The application of the mud ring is one of the clever pieces of boiler making that characterizes the design and construction of the Jacobs-Shupert firebox and is really a remarkable achievement. Near the mud ring the flanges of the channels are partially straightened and reverse lapped. By flattening the flanges at the bottom of the channels, a continuous smooth surface is provided to which it is as simple a matter to apply a mud ring as to the usual sheets of an ordinary firebox. The reverse lap of the flange of one section fits snugly into the lap of the adjacent section and is secured by three patch bolts. To still further insure a tight joint, the lapped portions are welded by the autogenous process. As evidence of the effectiveness of forming and calking this connection to the mud ring, it is interesting to note that the joint successfully withstood a water test of 300 lbs. pressure as well as a steam test of 270 lbs. before being put into service and this joint has since given no trouble on the road or in the roundhouse.

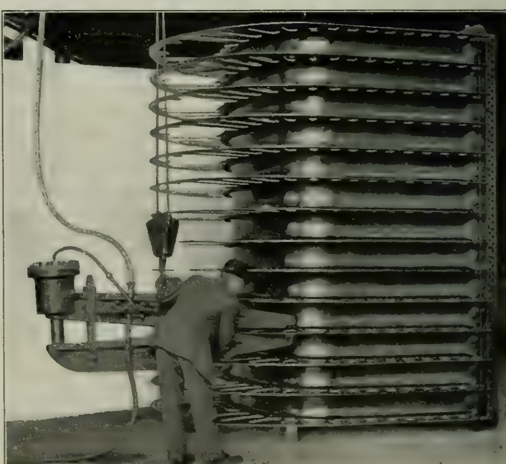


A. T. & S. F. Tandem Compound Locomotive, No. 917, with Jacobs-Shupert Firebox.

All parts entering into the construction of this firebox are made by standard forms, dies and jigs. All similar parts are duplicates and perfectly interchangeable. It is therefore unnecessary to designate any part as any similar unit may be selected for any given place.

The straight channel sections are planed on the edges to the proper dimensions and beveled, a process much cheaper than the slow and expensive process of chipping. The finished straight sections are then reheated and are bent to the proper contour by special formers.

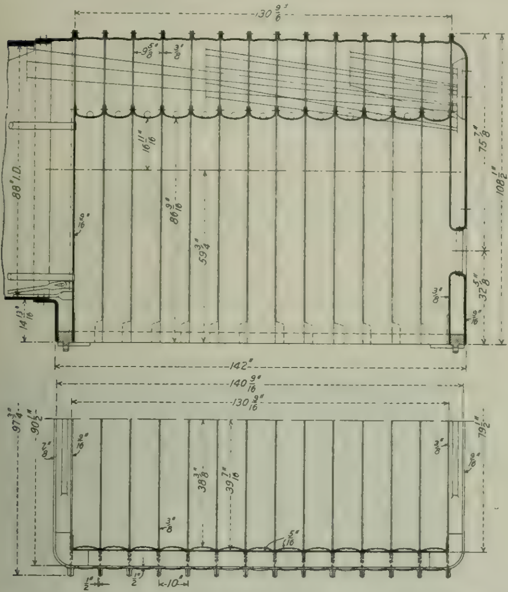
The radial stay sheets are cut from rectangular sheets of steel and for simplicity in construction and economy of material, each radial sheet is made in three pieces, all being cut from the single steel sheet. The pieces forming the water leg stays are cut from the waste material within the arch of the



Method of Riveting Through Channel Flanges and Stay Sheets.

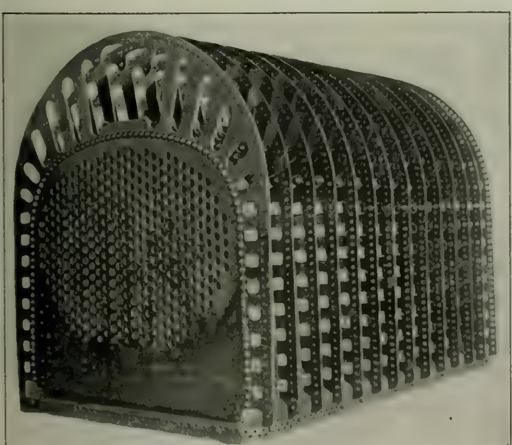
crown stay. The contour of each radial stay sheet is made to conform to the contour of the inner and outer channels. The back head and throat sheets are formed by special formers on the hydraulic flanging press. The firebox door sheet may have the door hole flanged by special formers operated by the hydraulic flanging press or by hand in the usual manner.

All rivet holes through the channel flanges and the corre-



Sectional Elevation and Half Plan of Jacobs-Shupert Firebox.

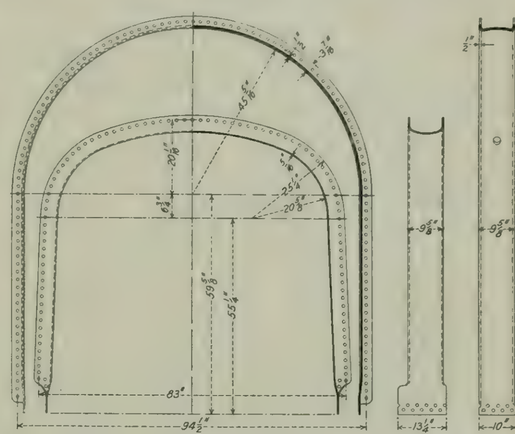
sponding holes through the edges of the stay sheets are drilled. No preliminary laying out is necessary, as the holes are drilled according to standard jigs or templets. Holes through the templets are bushed with case-hardened bushings made from soft steel. The jig for drilling the stay sheets, including the flue and firebox door sheets, represents a combination of the two jigs for drilling the inner and outer channels and it is thoroughly checked by these two. By the use of these three templets, the rivet holes through the component parts of the firebox are in perfect alinement, a feature by which the difficulty of assembling is reduced to a minimum. So perfect is the alinement of these holes, that when the firebox is assembled and bolted temporarily before riveting, it is possible to sight through any row of holes.



Jacobs-Shupert Firebox Partially Assembled.

Showing openings in radial stay sheets for horizontal circulation of water.

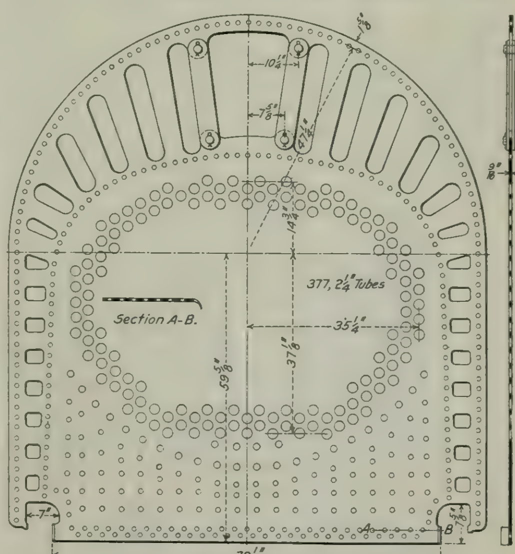
In assembling the Jacobs-Shupert firebox, the channels of the firebox proper and the stay sheets are riveted together and



Elevations of Outside-Shell and Firebox Sections of Jacobs-Shupert Firebox.

the fire door and flue sheets are next riveted to the end sections. This completes the shell of the firebox proper and the seams are then calked both inside and out. The mud ring is next bolted in place and the mud ring rivet holes are drilled in the firebox shell.

The next operation is to lay up and rivet the channel sections of the outer shell and this is done preferably by begin-

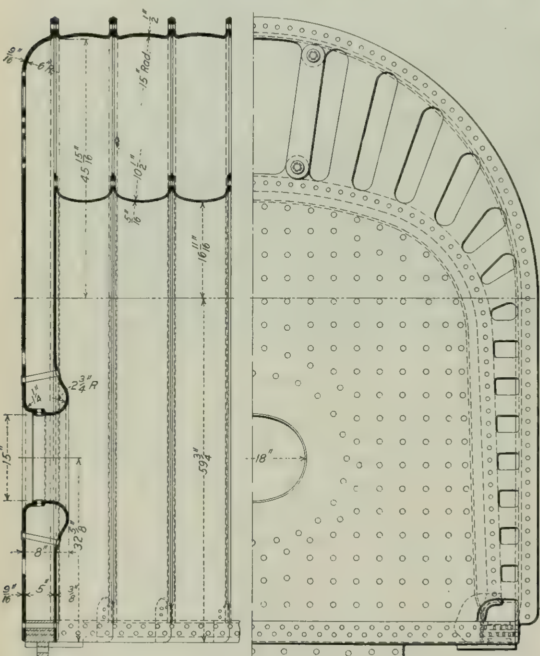


Back Flue Sheet.

ning at one end and riveting up section on section throughout the length of the firebox. The outer shell is completed by laying up and riveting the back head, together with the stays that brace it. The mud ring is next laid up with the outer shell, the mud ring rivet holes are drilled through the outer shell section and the mud ring is riveted and calked. The throat sheet is laid up and riveted to the barrel of the boiler after which the flange of the end section of the firebox is riveted to the flange of the throat sheet.

To facilitate the work of riveting the sections of this firebox, a special hydraulic jaw riveter, capable of working in close quarters, has been devised. This riveter was designed and built at the Topeka shops of the Santa Fe and is here shown in operation. The water supply and discharge are conducted by flexible metallic hose allowing freedom in the movement; the riveter is suspended at a point immediately above the center of gravity.

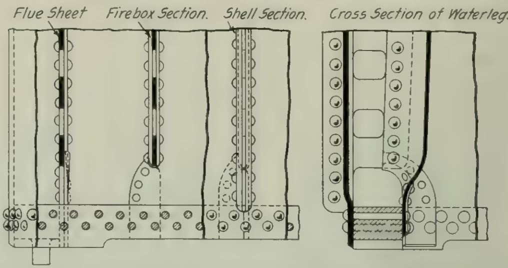
By forming all of the component parts of this firebox with



Half Elevation and Section Through Back Head and Door Sheet.

standard formers and dies and by drilling all rivet holes according to standard templets, all units are alike in their essential features. By assembling the parts and riveting them with a specially designed riveter the work is done in a uniform and efficient manner. The design and construction of this firebox have not been prompted by a sudden impulse. On the contrary, the firebox is a development from several years of continuous study and investigation by men in position to observe locomotive operation closely, one of them a practical boiler maker foreman. Certain definite results have been sought and the Jacobs-Shupert firebox has been built with the idea of accomplishing these results.

The peculiar construction of this boiler provides a number of advantages not obtained by the usual form of firebox and produces economies which represent a decided improvement over the former type. While much investigation has been made during recent years to improve steam distribution and to develop devices for securing economy in the use of steam, comparatively little has been accomplished in the development of the locomotive boiler itself. Attempts at improvement have included a decided increase in size, a slight alteration of the general form, the occasional introduction of water tubes, or the combustion chamber, and the widening of the water leg.



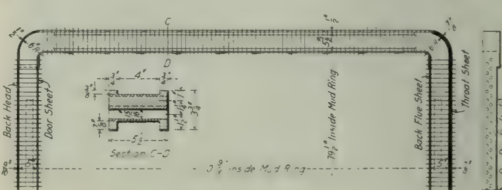
Method of Reverse Lapping of Sections to Fit Mud-Ring.

The demand for greater tractive power has caused the enlargement of grate areas and the shape of firebox sheets and outside shells has been somewhat modified. In general, however, the same old method of forming fireboxes and staying the sheets has been adhered to until the present.

Considering the essential difference between the ordinary form of flat sheet firebox and the Jacobs-Shupert type, it is readily apparent that the latter has been designed and developed according to principles for securing economy in the generation of steam and for relieving strains due to temperature stresses.

The deep corrugation in the sections of which the firebox shell is made increases the available firebox heating surface without enlarging the grate area. About 44 per cent. of the total evaporation in a locomotive takes place around the firebox and any increase in the firebox heating surface produces a greater increase in the efficiency of the boiler than is produced by an increase of flue heating surface. A further improvement in the heating surface provided by the introduction of corrugated sections results from placing the heating surface as nearly as possible at right angles to the currents of hot gases. This construction causes a turbulent motion among the currents of gases passing the surface and increases the amount of available heat absorbed.

The continuous corrugated or rolling surface is most effective in interrupting and disturbing the flow of hot gases. The rotation, or whirl, given to the gases as they pass or come in contact with the irregular surface of the firebox, gives them the necessary motion to bring successive portions of the gases in contact with the metal. It has long been recognized by the highest authorities in heat transmission that such a whirling, scouring action of the gases is necessary for highest



Details of Mud-Ring.

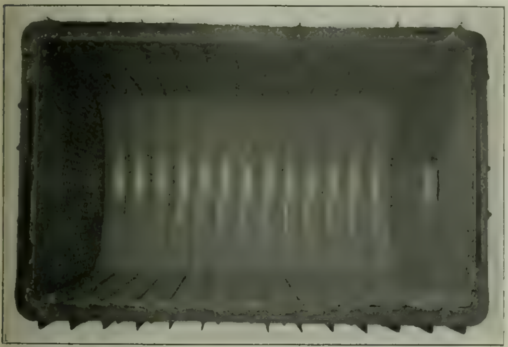
efficiency in transmitting heat from the gases themselves as well as in causing them to break through the film on the surface of the metal to the body of the metal itself.

The effect upon evaporation and water circulation produced by the corrugated sectional construction is decidedly bene-

ficial. The space between stay sheets is $9\frac{5}{8}$ in. wide and the stay sheets are but $\frac{3}{8}$-in. thick. Compared with the vertical rows of staybolts $1\frac{1}{16}$ in. in diameter, and spaced on 4-in. centers, the obstruction to vertical circulation is largely reduced. The greatest circulation around any firebox is vertical and the removal of impediment to vertical circulation tends to keep the water in rapid motion, accelerating the scouring action of the water against the metal of the firebox and increasing the rate of heat transmission through the metal.

By producing a scrubbing action of the gases on the fire side of the metal and by accelerating the scrubbing action of the water against the hot surface of the metal, the evaporative value of the heating surface is largely increased and the evaporation per square foot of heating surface of the sectional form of firebox is more rapid than that of the ordinary flat sheet firebox.

The holes for horizontal circulation through the stay sheets are of ample area to replace the water evaporated. The direction followed by water replacing that water which has risen as a result of being heated, depends upon the source of supply. The barrel of the boiler constitutes the source of supply for the water legs and the demand upon this supply is caused only by evaporation. As the water around the firebox is evaporated it is replaced by water from the barrel of the



Interior of Firebox.

boiler and the function of horizontal circulation is to supply this water only.

Less than 50 per cent. of the water delivered to a locomotive boiler reaches the firebox, the remainder being evaporated by the tubes. When it is considered that the area of a check valve is $2\frac{1}{2}$ sq. in., or less, and that less than one-half of the water reaches the firebox, there can be no doubt that the holes through the stay sheets are of ample size.

Expansion and contraction of metal due to changes in temperature invariably set up forces in the metal that are practically irresistible. In the usual form of locomotive firebox there is no provision against the excessive strains due to temperature stresses. The entire structure of the flat sheet firebox is rigid and these temperature stresses cause cracked side sheets and broken staybolts.

The arched, sectional form of construction provides for the expansion and contraction due to variations in temperature and each section is free to expand or contract without producing excessive local stresses or transmitting undue stress to adjacent sections. The entire structure is flexible and while expansion and contraction occur, the form and construction of each section allows it to expand without straining the next section, thus relieving any stresses induced by temperature variations.

The sectional form of construction provides an unusual element of safety. Due to the sectional form, the firebox is less liable to violent explosion than a firebox built of the usual large sheets. A possible rupture is confined to a single section and cannot extend to adjacent sections. It is the sudden tearing away of a large area in cases of failure in the ordinary crown sheet, that causes a violent explosion and consequent disastrous results. In the sectional firebox this area is restricted and the destructive effects of an explosion would be confined to the simple escape of the contents of the boiler.

THE PASSENGER RATE OF THE AMERICAN RAILWAY.*

BY WILLIAM S. BRONSON,
Assistant General Passenger Agent, Chesapeake & Ohio.

When the first railways were built the necessities of travel required but one rate of fare, covered by a simple local ticket. As soon as connecting railways were built, however, public needs and conveniences demanded through ticket and baggage arrangements by which the traveler could obtain at his starting point at a price equal to the sum of the combined local fares of the two connecting railways a ticket that would carry him and his personal baggage to his destination on the connecting railway. From this public demand grew the coupon, now designated the interline ticket, which, at that time, consisted of two parts, providing one passage token or coupon of record for each line making up the through route.

Beginning with the forties the tide of immigration surged westward and lines of railway were built, first southwest from Lake Erie and convenient for steamer connections, and then to the Mississippi and Missouri rivers. In order to share in competitive traffic the longer line or route was necessarily compelled to make the same charge for the same service as the more direct line or route, and as competition extended through routes, consisting of two or more lines of railway, were formed, and in turn were compelled to meet the charges of the more direct routes. Thus appeared through rates of fare of a less amount than the sum of the local rates of the connecting railways forming the through route covered by a ticket limited in time to practically a continuous trip, and as each railway forming a part of the through route must necessarily share in the through rate the simple mileage prorating system was devised.

As the lines of railway expanded so did the rate and ticket systems develop, until to-day there exists on the railways of the United States a most elaborate and comprehensive system of through rates and tickets by which the traveler is enabled to purchase at any point on any railway a through ticket, with through baggage privileges, to any point located in the United States, Canada or Mexico, and, in fact, to any principal point in the world reached by rail or steamship. This privilege is not confined to the shorter or more direct route, which, thanks to competition, does not necessarily afford the better service, but is available at the same cost *via* many routes.

When railways were first established the people, trained by horse, stage coach and canal experience, looked upon a journey as a bugbear never to be undertaken save from sheer necessity, and so the ancient passenger tariff, or book of rates, included only the one-way local fare, at a fixed price in cents per mile. But as the country's population grew and wealth increased new causes for travel developed, and the railways, quick to recognize the "bargain feature," conspicuous as a source of to-day's passenger revenue, rapidly established for various travel causes additional reduced rates of fare predicated on business and social conditions designed to create travel. To-day we find the following rates of fare generally in use:

MAXIMUM RATES OF FARE.

Local One-Way Fares.—These are the established rates of fare available at all times for tickets covering the trans-

portation of an individual one way between two points on the same railway, designed to meet the wants of the one-way traveler and produce the bulk of local revenue.

Interline One-Way Fares.—These are the established rates of fare for tickets covering the transportation of an individual one way from a point on one railway to a point on another railway, designed to meet the wants of the one-way traveler and produce the bulk of interline revenue.

LESSER RATES OF FARE.

Local Round Trip Fares.—These are the established reduced rates of fare available at all times for tickets covering the transportation of an individual from a point on a railway to another point on the same railway and back to the starting point, designed to meet the wants of the round-trip traveler and to minimize the payment of cash fares on trains.

Interline Round-Trip Fares.—These are the established reduced rates of fare for tickets covering the transportation of an individual both ways from a point on one railway to a point on another railway and back to the starting point.

Mileage Fares.—These are established reduced rates of fare for tickets covering 500, 1,000, 2,000 or 5,000 miles of travel annually by an individual between points on one line of railway and often interchangeable over several lines of railway. They are designed to meet the wants of the wholesale traveler or the person whose business requires a considerable travel. In some cases these tickets are now good for the travel of bearer or one or more persons, and in some few instances their time as to use is unlimited. The mileage ticket, while it produces but a small percentage of railway earnings, is, nevertheless, a most important rate factor, constituting practically a wholesale maximum rate as against the one-way rate of fare, which might be termed a retail maximum rate. The mileage ticket is generally considered the pendulum of the entire rate adjustment on lines whose maximum one-way rates of fare exceed their mileage rate.

Commutation Fares.—These are established reduced rates, payable weekly, monthly and qarterly, and available at all times for tickets covering 10, 48, 60 or 120 one-way trips of an individual, and in some cases of a member of his family, between cities and adjacent towns and places. They are designed to build up the suburb and to accommodate the many persons who work in the city but reside outside. Commutation fares are generally fixed for reasons of policy and not as a direct source of revenue for the railway, though no doubt this traffic is directly profitable to certain railways at the greater cities.

Local Party Fares.—These are established reduced rate *per capita* fares covering the transportation one way of parties consisting of not less than a given number of persons traveling together between points on the same railway and designed to meet the wants of theatrical companies, baseball and football clubs, bands and kindred organizations. On many railways these fares are open to parties comprising the required number of persons without regard to their occupations, while on other roads the fares are confined to the use of organized parties only.

Interline Party Fares.—These provide for interline traffic an equivalent fare to the local party rates for traffic between points on the same road.

Local All-Year Tourist Fares.—These are the established reduced rates of fare available throughout the year for tickets covering transportation to local tourist resorts and return.

Interline All-Year Tourist Fares.—These perform the same function for the interline tourist that local tourist fares do for the traveler whose journey is confined to a single road.

Local Summer Tourist Fares.—These are temporarily established reduced rates of fare, available only during the summer season, for transportation of an individual to summer resorts located on the originating railway and return. Interline summer tourist fares are also issued.

Local Winter Tourist Fares.—These are the temporarily reduced rates of fare available only during the winter season for transportation of an individual to winter resorts located on the originating railway and return. Interline winter tourist fares are also issued.

Local Excursion Fares.—These are the temporarily established reduced rates of fare available only at a given time, on a given day, or during a limited period for local excursion tickets, designed to meet the wants of the pleasure seeker, the visitor to meetings and gatherings, and the attendants of conventions of business, religious or social organizations, thus to encourage travel and create local revenue. Interline excursion fares are also issued.

SECOND CLASS ONE WAY FARES.

This classification covers only immigrant fares, which are not in general use, and are only available under certain circumstances.

PASSENGER RATE ADJUSTMENT.

If we except those states where low maximum rates of fare have been forced upon the railways by state legislation, and those few eastern states where the density of population is so great that passenger business can be profitably conducted on the street car principle of one rate of fare under all circumstances, we can very justly term the United States a sparsely settled country as yet. It has not the requisite population located along its railway lines to impel a consistent travel sufficient to produce fairly remunerative returns without recognition of the bargain feature. Therefore, in dealing with the subject of passenger rate adjustment, we are applying our theory to the United States in general, sparsely settled as a whole, even thinly settled in the western sections—and we eliminate from consideration the few densely settled states and the states with laws fixing maximum rates of fare so low as to discourage the railways from meeting various special causes for travel with specially low rates. The theory of passenger rate adjustment is that a rate of fare be established for various causes for travel, obtaining an average rate which, multiplied by the number of miles obtained from all causes for travel, will produce fairly remunerative returns.

As state laws are based on the needs of the citizen in general, and not on those of particular classes of citizens, so must the railway, in order to secure fairly remunerative returns in our comparatively sparsely settled country, adjust fares to the needs of travel in general and not for particular classes of travelers, on the principle that, there being no class distinction in the United States, the individual who to-day pays the maximum rate, to-morrow pays the lesser rate, and always the lowest rate that may be available. This tendency, to be discussed subsequently, must be considered the complicating feature of the rate adjustment. The records of the Interstate Commerce Commission show that the average rate on the American railway is but two-thirds of the average maximum rate.

It must be remembered that the Constitution of the United States guards against class distinction in persons, and, under a Republican form of government, railways must operate on Republican principles. So, if we except the immigrant ticket, and some few second class tickets which differ from first class tickets only in that in one case the traveler is privileged to use standard sleeping or parlor cars upon additional payment, while in the other case the traveler is restricted to coach accommodations, we have in general use but one ticket. The various forms of tickets covered by the maximum and lesser rates of fare differ not in class but in privilege, such as limit, stop-over or the excursion privilege. Therefore, in applying the theory of rate adjustment, we neither fix rates of fare to fit the needs of the lower classes, the middle classes and the upper classes, respectively, as on foreign railways, nor do we fix rates of fare to suit the respective needs of the rich man, the man of moderate means or the poor man. There is but one ticket in general use.

(To be continued.)

NEW UNION ELECTRIC INTERLOCKING.

The Union Switch & Signal Company has recently installed at Sterling, Ohio, at the crossing of the Baltimore & Ohio with the Erie, an electric interlocking plant in which each lever, with its appurtenances, is complete in itself so that it can be easily taken out, as is done with the rectangular syrup receptacles in some styles of soda fountains. This plant has been in operation for some time and the builders report that it is giving satisfactory service. They send us the following:

The apparatus on the ground is similar to that which has been installed by the Union Company for some years. The switch and lock movement is the same in all respects, except that the motor armature has two independent series of coils, each connected to a commutator. During the movement of the switch, the two sets of coils are in series and act jointly as a motor to drive the mechanism. At the end of the movement the driving current is switched over to one set of coils, which results in raising the potential of the two sets in series, so that a higher potential is produced at the motor than exists at the battery. This results in a current flowing towards the positive pole of the battery through one coil of the indication apparatus. The other coil of the indication magnet is energized by the current which drives the motor.

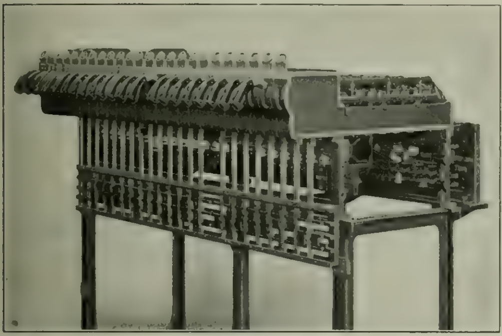


Fig. 1—Union Electric Interlocking Machine.

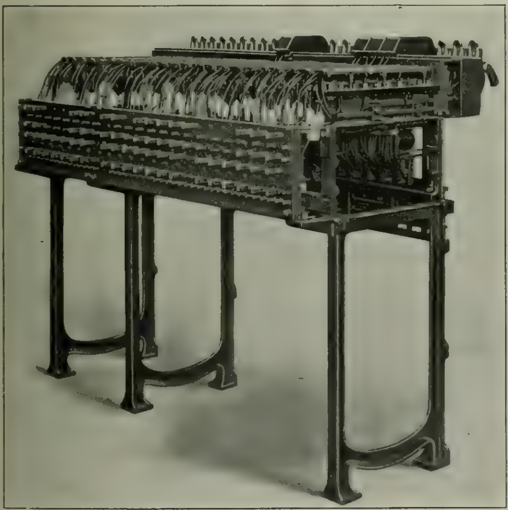


Fig. 2—Rear View—Union Interlocking.

The switch and lock movement and circuit controllers, including the magnetic controller which guards against improper movements, are the same as used by the Union for some years.

The interlocking machine is called the "multiple unit" design. Each lever is an independent unit in itself, and may be removed from the machine by taking out a few screws. The lever movements are novel. The first movement is a longitudinal movement, which actuates the mechanical locking in the machine. The medial movement is a movement in the arc of a circle; this operates the circuit controller on the switch or signal circuit. The final movement is a longitudinal movement, which takes place only after the indication has been received, and results in the release of certain mechanical locking. The final movement is made by a spring, and is automatic. The operator makes the preliminary movement and the medial movement, after which, when the indication is received, the lever automatically goes to its final position.

The indication apparatus comprises a polarized magnet, without permanent magnets, however. The polarization is effected by the driving current to the motor passing through one of the magnet coils. The other coil must then have current in a certain direction relative to the driving current in order to actuate the latch. This coil is also connected to the positive side of the battery, and current must flow towards the positive pole of the battery to be in the right direction to energize the magnet. To cause current to flow in opposition to the battery is the purpose of the two sets of coils on the motor armature. As is well known, the counter-electromotive force of a motor, when running light, is nearly equal to that of the source supplying the current. The difference between the two is due to the fall of potential in overcoming the resistance in circuit. This difference, when the motor is running light, is not more than 10 per cent. of the total voltage of the source. When the motor then is driven through one set of coils on the armature, the counter-electromotive force of this set is nearly equal to that of the battery; and since the other set of coils is rotating at the same speed in the same magnetic field, its counter-electromotive force is the same as that in the set driving the motor. The sum of the two then is nearly double that of the battery. The result is that a potential nearly double that of the battery is produced at the motor, so that the current can be readily caused to flow towards the positive pole of the battery, or in a direction opposite to that in which the current should come from the battery. This arrangement of the circuits and motor coil makes the apparatus absolutely safe against the giving of false indications by foreign currents, for the current could not possibly flow from the indication magnet coils in the right direction if it came from a wire which was accidentally crossed with the indication wire. A false indication could not result from the wire being crossed with the indication wire to another switch which was in the act of indicating, because unless the switch had completed its movement and a change in circuits been made at the motor, the potential would be held down by the motor which had not reached the proper point for indicating; for the potential at this motor cannot equal that of the battery until after the change in the circuit has been effected by the movement of the mechanical controller at the switch.

Fig. 1 is the front view of a "multiple unit" machine, showing the locking frame (vertical), and Fig. 2 is a back view of the same machine showing the terminal board and arrangement of wiring. When set up for use the whole machine is enclosed in an oak case with glass panels in the top.

The dwarf signals in this interlocking are actuated by a solenoid with battery indication. This is arranged so that current must flow in two wires in certain relative directions in each, in order to actuate the magnet, and by similar means the signal is protected against being cleared improperly.

In the high signals but one slot arm is employed for operating a 3-position signal, and the method of indicat-

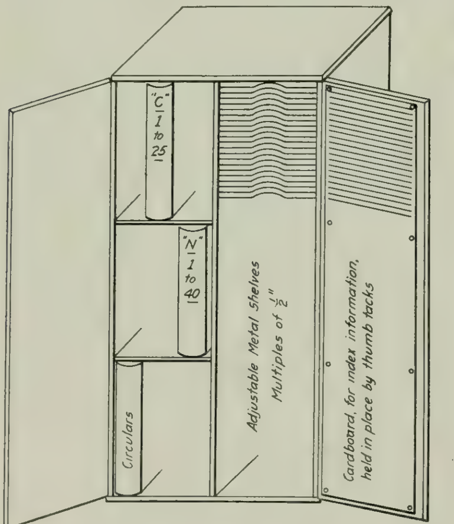
ing is the same as that which is used for switches.

All material for this plant was furnished by the Union Switch & Signal Company and the work was installed by its forces, under the direction of W. H. Willis, Signal Engineer of the Erie, and F. P. Patenall, Signal Engineer of the Baltimore & Ohio.

TARIFF FILING CASE; PENNSYLVANIA LINES.

BY C. R. FRENCH.

The Pennsylvania Lines West of Pittsburgh are installing a tariff filing case at all stations to comply with the requirements of the Interstate Commerce Commission, in the matter of the provisions of Section Six of the Act with regard to posting tariffs at stations and modifications thereto. After an investigation extending over a period of several months, during which an exhaustive study of all manner of filing devices was made, the case as shown on the accompanying sketch was adopted. It is a distinct departure from former tariff filing methods and it is believed will give the agent a complete system. The cases are of mission oak oil finished, 40 in. high, 21 in. wide and 13 in. deep, divided by a partition into two compartments, that on the right-hand side being grooved for shelves in multiples of one half inch, while the left-hand side has three shelves, on which are placed nine "Tengwall" binders, three to a shelf. Two doors are used, each exposing one half of the case. In addition to the requirements of the Commission for filing tariffs, it is the intention



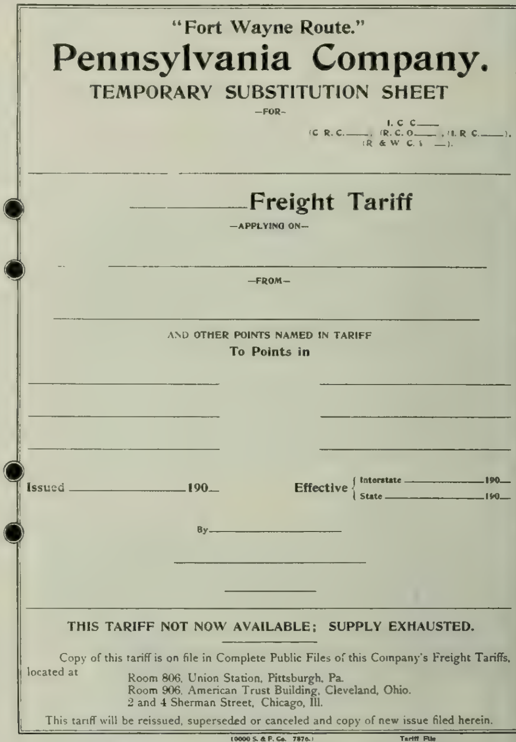
Tariff Filing Case.

of the Pennsylvania Lines to keep all circulars, general notices, instructions to agents, percentage sheets and the bulletins of tariff changes in the case.

The basis or key to the working of the case is the tariff index or Agent's Ready Reference Index, which lists the tariffs applicable from each station in the system. The tariffs are divided into six groups, those lettered "C," being applicable to Central Freight Association territory; "E," Trunk Line territory; "N," northern territory and Canada; "S," southern territory; "T," trans-continental territory and "W," western territory.

Each tariff issued by, or to which the Pennsylvania Lines is a party, is given a file number under one of the six groups, according to the territory to which it applies. These tariffs are then shown in the Ready Reference Index under the stations from which they apply, each station having its number, as "PF 1," Pittsburgh; "CP 76," Cleveland; "WV 38," Toledo; etc.

The "Tengwall" binders contain tariffs bearing tariff file numbers with the prefix letters "C," (all issues,) "E," (Nos. 1 to 53) and "N," (all issues). Between each file number is a cardboard divider with an index tab, on which is placed the prefix letter and file number, these, of course, being arranged numerically.



"Fort Wayne Route."

Pennsylvania Company.

TEMPORARY SUBSTITUTION SHEET

—FOR—

I. C. C.___ (C. R. C.___, (R. C. O.___, (I. R. C.___), (R. & W. C. ___).

______ **Freight Tariff**

—APPLYING ON—

—FROM—

AND OTHER POINTS NAMED IN TARIFF

To Points in

Issued ______ 190_ Effective { Interstate ______ 190_ / State ______ 190_

By______

THIS TARIFF NOT NOW AVAILABLE; SUPPLY EXHAUSTED.

Copy of this tariff is on file in Complete Public Files of this Company's Freight Tariffs, located at Room 806, Union Station, Pittsburgh, Pa. Room 906, American Trust Building, Cleveland, Ohio. 2 and 4 Sherman Street, Chicago, Ill.

This tariff will be reissued, superseded or canceled and copy of new issue filed herein.

10000 S. & P. Co. 7876.) Tariff File

Temporary Substitution Tariff Sheet.

All circulars, instructions to agents, general notices and notices of a permanent nature are filed in another binder. A base index, comprising forty-eight subjects and covering all subjects about which circulars may be issued, is used as a guide. Every circular, instruction or notice, no matter by whom issued, pertaining to a certain subject, is filed under its subject number, so that when an agent wants information on any subject he has it all together in one place. Dividers separate each subject and the tabs shows the subject number.

All percentage sheets are filed in two binders, each sheet bearing a page number, according to an index published showing all issues.

Another binder has dividers for 31 days, corresponding to the days of the month, for bulletins of tariff changes. For each new tariff or supplement issued a bulletin sheet must be placed in the bulletin binder under the date on which the tariff or supplement will become effective and must be so filed at least thirty days prior to the date effective. The bulletin binder must be examined daily and all changes shown under the date made, cancelled tariffs or supplements being destroyed.

On the metal shelves (39 in number) are placed the balance

of the tariffs of the "E," "S," "T" and "W" numbers. On the door opposite the shelves a cardboard is placed, slightly smaller than the door and ruled every half inch, on which an index of the contents of the shelves is written together with the file number and prefix letter.

When a new tariff or supplement supersedes one already in the file the old one is marked

"VOID AFTER
(*date*)
SEE (*new tariff number*)"

and the new tariff or supplement is placed under the old one until the date arrives for it to take effect, when the old one is destroyed. The destruction of the obsolete tariffs and supplements is made sure through the bulletins.

In case a tariff or supplement applying from a certain station is not on file and cannot be secured, a "dummy" sheet is put in the file in place of the original, which sheet shows the number, date effective, to and from what territory and the commodity on which the tariff applies, together with a printed notation to the effect that the original tariff cannot be obtained, but will be supplied as soon as possible, or that it will be reprinted.

60M-12-08 / 8X11 FORM 389

"Fort Wayne Route."

Pennsylvania Company.

BULLETIN

—OF—

FREIGHT TARIFF CHANGES.

Effective________, 190__

Tariff I. C. C.,_____R. C. O.,_____I. R. C.,_____R. & W. C. I.,_____

OR

Supplement____to Tariff I. C. C.,____R. C. O.,____I. R. C.,____R. & W. C. I.,____

Pages__________

Applying on__________

From__________

To__________

☞ The new issue described above is posted in Agent's Tariff File No.______

Agents must examine the Bulletin Binder daily and remove from compartment corresponding with that date the Bulletin of Freight Tariff Changes, and also remove from Agent's Tariff File and destroy canceled tariff or tariffs, supplement or supplements expiring on that date.

Bulletin of Freight Tariff Changes.

At the larger stations an additional case is installed, which contains shelves on both sides and in which the Official Guide, Bullinger's Guide, southern and western local tariffs, inbound tariffs, routing, loading, carding and billing instructions, city directory and other things of this nature are filed, the idea being to get all the agent's "tools of trade" together in convenient form and handy for his use. The case is so made and arranged as to be a unit and any number of cases necessary may be used. It is expected that at some of the largest stations more than two cases will be required.

A. R. A. REPORT ON CAR EFFICIENCY.*

The work of the committee in collecting and publishing statistics has been continued. The bulletins covering car surpluses have tended to confirm the growing impression of the public that the railways have, in general, done all that could be expected in the provision and improvement of facilities. Although the surpluses are to-day about what they were a year ago, the shop car situation indicates a considerable improvement in business conditions. The bulletins covering general statistics taken in connection with the surplus reports show that the efficiency of cars actually in use is well maintained, and indicate that when an increase of business provides an additional incentive an increased efficiency may be expected.

The increased competition forced upon the railways by the hard times has tended to the making of concessions to the public, creating a decrease in car efficiency, but, notwithstanding this, the demurrage rules have been well maintained and in certain cases extended. Marked progress has been made in the application of demurrage to tidewater coal, and there are prospects of an improvement in the export situation. Even in the case of lake coal demurrage, where it has been impracticable to apply the rules at all points through the whole season, it is fully understood that they will be restored on the first symptom of car scarcity.

The committee, at the request of the General Superintendents' Association of Chicago, has made an extensive investigation of the interchange question in parts of the Chicago district, and at the request of the General Managers' Association of St. Louis the switching reclaim question in the St. Louis district.

Since the Interstate Commerce Commission, at the request of your committee, instructed its inspectors that the setting back at interchange points of cars with defective safety appliances was not necessary, a better understanding and a quicker interchange has been secured at many points.

The work of the clearing house in the line of clearing car hire balances has been decidedly increased. The amounts cleared at the last monthly settlement aggregate $1,110,600.79. The clerical and other expenses which are borne by the subscribers amount to $157 monthly. Superintendence is furnished by the committee.

It is thought that any plan for settling car hire on a car balance will involve the establishment of some central bureau or clearing house. The experience in the detail of handling these balances which has been acquired by the clerical force of this committee will be at the service of any such bureau.

General Statistics.

The monthly bulletins of car balance and performance have been continued. Owing to the enforced reductions in the offices of a number of railways the receipt of information for use in these bulletins has, in some instances, been delayed, resulting in the issues falling somewhat behind. However, the reports covering periods of depression are of less value as current operating reports than as historical statistics, for which purpose they are sufficiently close to date.

Reports of Car Surpluses, Etc.

The surplus and shortage bulletins continue to record large surpluses, with practically nothing on the shortage side. With the report for November 11, 1908, there was a slight reaction from the steady reduction. On January 6, 1909, the total surplus was 333,019, the highest since August, 1908. With the bulletin for January 20, 1909, the total dropped to 311,664, since which time there have been further decreases.

In comparing these figures with those for previous periods consideration should be given to the shop cars, which are not included in the surplus figures. During July and August, 1908, the number of bad order cars averaged over 200,000, or more

*Extracts from the report of the Committee on Car Efficiency, of the American Railway Association, Arthur Hale, chairman, presented at the New York meeting, May 19.

than 100 per cent. above normal. This number has since been reduced, and about 100,000 cars thus added to the available supply on which the surplus figures are based.

As opposed to this, some allowance should be made for the gradual reduction in equipment which has resulted from an almost total suspension of car building. It is true that this has been minimized by a similar suspension in the general retirement of old cars, but it is probable that the net decrease in equipment during the past years has been close to 1.5 per cent., or something over 30,000 cars for the entire country.

Car Location, Distribution, Etc.

The existence of a surplus resulted in a curtailment of car interchange and the return under car service rules of such equipment as was loaded off the home line. The reports indicate that after the general equalization, which took place during the early part of 1908, the general balance has been preserved with very little increase in the proportion of empty mileage.

Performance of Cars During Times of Shortage and Surplus.

One of the chief objects aimed at by the committee in the compilation of statistics was the study of freight car performance under changing conditions. So far as pertains to that particular object, it is fortunate that the information collected covers periods of car shortage and surplus, as we are thereby furnished with comparisons that will be invaluable in guiding future action by the association in devising methods for the efficient and economical handling of freight cars. * * * In April, 1907, with a shortage approximating 100,000 cars, the proportion of cars on their home lines was only 54 per cent. of the total railway ownership. If the private cars in service are added to the ownership the per cent. of home cars to the total in use is only 51 per cent. As the shortage disappeared and was replaced by a surplus the per cent. of cars at home increased, reaching 62 per cent. in August, 1907.

When cars again became scarce there was another exodus of home cars, which was checked, however, by the panic of October, 1907. With the increasing surplus during the first six months of 1908 the return of cars to their owners developed into a veritable rout, and by April, 1908, 78 per cent. of the freight cars in the country were at home. It is a significant indication of the extent to which the interchange of freight cars has developed during the past few years that even in the face of the almost unprecedented conditions that obtained during the year 1908 the interchange requirements equaled 22 per cent. of the total equipment. Indeed, if we base our figures on the active cars, which were but 75 per cent. of the total, the percentage would be close to 30 per cent.

Closely connected with the fluctuation in balance is the percentage of loaded car mileage. From a loaded movement of 69.3 per cent. in July, 1907, with a homeward flow of equipment, the excellent average of 72.9 per cent. was reached in October, 1907, when the number of cars at home had been reduced to 58 per cent. The decrease from this figure with the renewal of the return movement was most marked, and in January, 1908, only 61.4 per cent. of the total freight car mileage was made under load.

Demurrage Rules.

Your committee has continued its activity in endeavoring to have uniform rules adopted, and is in active correspondence with the different demurrage bureaus, although no material changes have been made since the last report. With the exception of the Canadian bureaus, all but three have changed their name from "Car Service" to "Demurrage Bureaus."

Holding Freight in Cars for Export and Coastwise Trade.

Officials of lines handling export freight at the Atlantic seaboard have asked your chairman to take this matter up with the roads leading to other ports, with a view of bringing all of the ports into harmonious working, and he is now engaged in this investigation. Demurrage rules on bituminous coal at tidewater are now being maintained by all lines at all ports on the Atlantic coast. Demurrage rules on coal at the lake have not been rigidly enforced, on account of the large surplus of empty coal cars in that territory.

Light Loading of Cars.

While no change has been made in the minimum carload weight in Southern Classification Territory, such as was made in Official and Western Territory, yet from time to time changes are made as the classification is reissued which have raised the standard minimum from 24,000 lbs. to 30,000 lbs., provided the article will stand this minimum weight and the traffic will bear it.

Reductions in Free Time.

The committee is still watching the amount of free time allowed before demurrage accrues in different parts of the country and presents the two statements following, showing (1) by districts where and under what conditions more than the standard time is allowed (the standard is 48 hours for loading or unloading and 24 hours for reconsignment), and (2) an abstract of state laws and regulations on this subject.

Free Time Allowed by Demurrage Bureaus.

(See explanation in text.)

BUREAU.	COMMODITY.	TIME ALLOWED.	ACCOUNT.
Alabama	Grain.	48 hours.	Milling in transit.
Baltimore and Washington	Grain.	48 hours.	Milling in transit.
British Columbia	Coal, coke and lime.	72 hours.	Unloading.
	Lumber.	72 hours.	Loading and unloading.
Canadian	Coal, coke and lime.	72 hours.	Unloading.
	Lumber.	72 hours.	Unloading and loading.
Central New York	All freight.	48 hours.	Reconsignment.
Chicago	All freight.	48 hours.	Reconsignment.
	Coal.	96 hours.	Reconsignment (except by some roads).
	Grain in elevators.	72 hours.	Unloading
Cincinnati	Grain.	48 hours.	Milling in transit.
Cleveland	Grain.	48 hours.	Milling in transit.
Colorado	Ore and concentrates.	48 hours.	Sampling en route.
	Coal, coke, lime rock ore and concentrates.	120 hours.	Unloading.
	All freight at interior points to be teamed.	120 to 360 hours.	Loading and unloading.
Columbus	Grain.	48 hours.	Milling in transit.
East Tennessee	Grain.	48 hours.	Milling in transit.
Illinois and Iowa	Sand, Springfield, Ill.	120 hours.	Disposition.
	Coal, Peoria, Ill.	48 hours.	Disposition.
	Coal, Marshalltown, Ia., Cedar Rapids, Ia., Freeport, Ill., Dubuque, Ia.	96 hours.	Disposition.
	Anthracite coal, Rankin, Ill., and Quiver, Ill.	120 hours.	Disposition.
	Coal, Wilkinson, Ill., Galena Junction, Ia., and Oelwein, Ia.	72 hours.	Disposition.
Indiana	Grain.	48 hours.	Milling in transit.
Intermountain	Ore.	48 hours.	Reconsignment, including time for sampling.
	Ore.	96 hours.	Unloading.
Louisville	All freight.	48 hours.	Reconsignment.
Memphis	Grain.	48 hours.	Milling in transit.
Michigan	Coal, coke, charcoal.	72 hours.	Unloading.
	Coal.	120 hours.	Loading at mines.
	Coal at coking ovens.	96 hours.	Unloading.
	Coal at mines.	120 hours.	Loading, weighing and billing.
	Grain.	120 hours.	Unloading from team tracks at Grand Rapids.
	Lumber.	72 hours.	Unloading.
	Lumber, cargo and lighterage.	120 hours.	Unloading.
	Logs when teamed from cars.	72 hours.	Unloading.
	Dressed lumber.	96 hours.	Loading.
	Furniture by various consignees.	96 hours.	Loading.
	Potatoes in special cars.	72 hours.	Loading.
	Coal for fueling transient vessels.	360 hours.	Unloading.
	Tan bark.	72 hours.	Unloading.
	All freight.	48 hours.	Reconsignment
Missabe Range	Bituminous coal, bulk lime, fruit or vegetables and lumber.	72 hours.	Unloading.
Missouri Valley	Coal, coke, bulk lime, ore for smelting.	72 hours.	Unloading by C. G. W. Ry.
	Coal.	72 hours.	Reconsignment by C. G. W. Ry.
Montana	Stulls, lagging, coal, coke, lumber, lime, lime rock and bulk precipitate.	72 hours.	Unloading.
Nashville	Grain.	48 hours.	Milling in transit.
New England R. Rs.	All freight.	96 hours.	Loading and unloading. No allowance for reconsigning; this is deducted from 96 hours loading and unloading.
New York and New Jersey	All freight.	48 hours.	Reconsignment at duly authorized points.
	Grain.	72 hours.	For track delivery in New York Harbor.
North Carolina	Grain.	48 hours.	Milling in transit.
Northeastern Pennsylvania	All freight.	48 hours.	Reconsignment at duly authorized points.
Northern	Soft coal in Twin City Terminals.	72 hours.	Reconsignment.
Pacific	Lumber	72 hours.	Unloading.
Pacific Northwest	Various.	72 hours.	Unloading at few points.
Philadelphia	All freight.	48 hours.	Reconsignment.
Pittsburgh (Territory in Ohio).	Grain.	48 hours.	Milling in transit.
Pittsburgh	Grain.	48 hours.	Milling in transit.
Southeastern	Grain.	48 hours.	Milling in transit.
Southern	Coal, coke, bulk meat, fresh fruit and vegetables at New Orleans.	72 hours.	Unloading.
Texas	All freight.	48 hours.	Reconsignment.
	Coal and coke.	72 hours.	Unloading.
	Cotton at interior compresses.	72 hours.	Unloading.
	Lumber 60,000 lbs. weight or more, in covered cars.	72 hours.	Unloading.
	All freight.	96 hours.	Loading and unloading when consignor or consignee is located more than five miles from the railroad station.
Toledo	Grain.	48 hours.	Milling in transit
Virginia and West Virginia	Grain.	48 hours.	Milling in transit.
Western	Coal.	48 hours.	Reconsignment at specified points.
Western New York	All freight.	48 hours.	Reconsignment at duly authorized points.

Free Time Allowed by State Laws and State Commissions.

(When over 48 hours for loading or unloading or 24 hours for reconsignment.)

STATE.	COMMODITY.	TIME ALLOWED—ACCOUNT.
Alabama	Fertilizer, hay, coal, coke, brick and lumber in covered cars, bulk meat, potatoes, grain, grain products, cotton seed, cotton seed meal aud cotton seed hulls.	72 hours for unloading.
	All freight.	96 to 144 hours for loading or unloading when consignor or consignee lives three miles or more from station.
Arkansas	Fertilizer, hay, coal, coke, brick and lumber in covered cars, and the following in bulk: meat, potatoes, grain and grain products, cotton seed and cotton seed hulls.	72 hours for unloading.
	All freight	120 hours if consignee or consignor lives fives miles or more from station.
Connecticut	All freight.	96 hours loading or unloading
Florida	All freight.	72 hours loading or unloading.
	Seed cotton cotton seed in bulk, cotton seed hulls in bulk, coal bulk potatoes, fertilizer material in bulk, bulk cabbage, brick, dressed lumber in box cars.	96 hours for unloading.
	All freight.	Additional time allowed if consignee lives more than four miles from station.
Georgia	Coal in cars containing 60,000 lbs. or over and sides 8½ feet high or over.	60 hours unloading.
Kansas	All freight.	72 hours on cars over 60,000 lbs. capacity
Louisiana	All freight.	48 hours reconsigning.
	Coal, coke, bulk meat and all fresh fruit and vegetables, New Orleans.	72 hours unloading.
	Long material, requiring two or more cars.	72 hours loading and unloading.
	All freight.	Additional free time from 120 to 168 hours allowed when consignee lives distance from station.
Minnesota	Coal, bulk lime, fruit, vegetables and lumber.	72 hours unloading.
Mississippi	All freight.	120 hours when consignee lives over three miles from station, and 168 hours when over ten miles.
Missouri	All freight.	72 hours loading or unloading cars of 60,000 lbs. or greater capacity.
Montana	Lumber, stulls, lagging, coal, coke, wood, lime, lime rock and bulk precipitates.	72 hours unloading.
New Jersey	All freight.	72 hours loading and unloading.
North Carolina	Fertilizer, brick, and following in bulk: cotton seed, cotton seed hulls, coal, coke, fertilizer material, grain, lime, tan bark and dressed lumber in box cars.	72 hours unloading.
	All freight.	Consignees residing more than five miles from station to be allowed a maximum of 120 hours.
Ohio	All freight.	72 hours unloading cars containing over 66,000 lbs.
South Carolina	Grain, flour, meal, bran, mill feed, cotton seed, cotton seed hulls, cotton seed meal, fertilizer, fertilizer material, hay, coal, pyrites, bulk apples, potatoes and cabbage, dressed lumber (in box cars), brick and crushed stone.	72 hours unloading.
	All freight.	Additional time allowed to consignees living four miles or more from station.
Texas		Same as Texas Car Demurrage Bureau.
Vermont	All freight.	96 hours loading and unloading.
Virginia	Fertilizer, hay, coal, coke, brick and lumber in covered cars.	72 hours unloading.
	Meat, potatoes, grain, grain products, cotton seed, cotton seed hulls in bulk, glass bottles.	72 hours unloading.
	All freight.	120 hours as maximum to parties living five miles or more from station.

[It will be noticed that these irregularities are numerous and varied. For example, in Colorado a period of from five to 15 days is allowed for loading and unloading freight which has to be teamed. At certain coal mines in Michigan, a period of five days is allowed for loading, weighing and billing. The four days' free time required by law in Connecticut and Vermont appears to be general throughout New England. At New Orleans 72 hours is allowed for unloading fresh fruit and vegetables. This appears to be a state regulation—designed by the legislature, no doubt, to aid the down-trodden consignee in preserving the freshness of his fruit and vegetables.]

Interchange of Cars.

Your committee has continued its investigation into the method of car interchange and inspection at large centers, one a transportation matter, the other mechanical. These two questions are both important, but have heretofore been considered by both departments of the railways from entirely different standpoints. Local committees have been appointed to investigate the methods pursued in both cases, with the result that it had been found that the work is largely duplicated. The transportation department wants all information received by the mechanical department, except the information as to repairs necessary, and the mechanical department wants all the information needed by the transportation department except car seals, and probably only 30 per cent. of cars interchanged move under seals. At some points joint committees of transportation and mechanical officials are endeavoring to work out a combination plan to save the duplications of work, improve the records and save expense. Your committee has been endeavoring to reconcile the differences which exist between the two departments, arising from long continued independent operation.

The monthly per diem reports frequently omit a considerable number of the foreign cars handled. These cars must be traced to determine the number of days due. Even these reports are subject to disputes, on account of inaccuracy and many per diem reports for many years back are still open. Progress has been made in correcting these evils, at St. Louis particularly, where the records of the mechanical department have been utilized in checking the interchange reports. The idea of settling per diem by balance rather than by individual cars has of late had many strong advocates. Discrepancies in seal reports give rise to much difficulty in locating responsibility for claims, some roads taking their record in the breaking-up yard rather than at actual point of interchange. * * * At many points understanding as to the interpretation of the M. C. B. rules has been agreed upon and supervision has been installed to insure their uniform application. There are still some places where the practice of rejecting cars with defective safety appliances still exists. Where this practice has not been corrected, the trouble is usually traceable to two things: First. Lack of repair material. Second. Misconception on the part of the inspector as to the effect his attitude has upon the transportation business. The experiment has been tried by some railroads of having the inspectors represent both the mechanical and transportation departments with very beneficial results, as a broader view is taken of the necessities.

The plan in effect at Denver, where the two departments cooperate, is well known. An agreement is now proposed at Omaha [the committee presents a copy of it]. In this proposed agreement provision is made for supervision by the Omaha division of the Central Association of Railroad Officers, and the governing committee is to consist of one officer of the transportation department and two of the mechanical. These men are to be appointed by the president of the Omaha division of the association, and will select their own chairman. The chief inspector shall appoint the necessary assistants. Where two or more inspectors are on duty together, one of them must be made inspector-in-charge. The inspectors inspect for mechanical defects and take all necessary records for interchange reports, for icing, for ventilation and for seal records. It is proposed to have the joint bureau take charge of joint yard clerk work where the lines interested so desire. No company shall withdraw from the agreement except on 90 days' notice.

FOREIGN RAILWAY NOTES.

The Prussian State Railways pay rewards to the men who serve them longest. Recently they paid:

20 marks	to	2,814	men who had served	20	years.
30 "	"	2,030	" " " "	25	"
40 "	"	1,174	" " " "	30	"
60 "	"	1,254	" " " "	35	"
80 "	"	381	" " " "	40	"
100 "	"	99	" " " "	45	"
150 "	"	34	" " " "	50	"

Altogether 284,860 marks, or $67,797.

A consular report says that work on the Pukow-Tientsin Railway was formally opened on January 3. It is to be finished between Tientsin and Pukow, which is near Nanking, within three years. A British and German syndicate is furnishing the money for the construction of the railway in the form of a loan guaranteed by the Chinese government.

In Switzerland the acquisition of the Gotthard Railroad by the state encounters some difficulties; not to speak of the rights of Germany and Italy, which contributed large sums to the enterprise, there is the pay of the employees, which is higher than on other Swiss railways, while the laws provide one and the same salary for men of the same grade.

The employees of the Belgian State Railways have claimed the right to combine in one organization. Railroad Minister Helleputte has brought in a bill securing them that right, but forbidding under severe penalties their participation in a strike.

ENGLISH RAILWAYS.

BY WILLIAM WICKHAM TURLAY.

IV.

BAGGAGE.

As cab fares in England are low, the rate in London, for instance, being one shilling (24 cents) for the first two miles or fraction thereof, and sixpence (12 cents) for each additional mile, with twopence (4 cents) extra for each piece of baggage, an English traveler having baggage drives to or from the station and keeps his baggage with him. At the station the large pieces, if any, are labeled with the name of the station for which they are destined, and placed in one of several baggage compartments in the train, usually in the one nearest the car occupied by the owner, who, on reaching his destination, claims his baggage, which he finds on the platform, a porter being at hand to call a cab and place the baggage on it. This system makes it necessary for the traveler to claim his baggage promptly on arriving at his destination or run the risk of having it claimed by thieves who are on the watch for such opportunities,* and he cannot readily change his stopping place after he has begun his journey. On the other hand, he is saved the annoyance and delay, as well as the expense, which the American methods impose upon anyone who travels with baggage beyond a hand-bag, and there is no accumulation of unclaimed baggage at stations. If one wishes it, the railways will collect baggage at the traveler's residence or hotel, take it to the station in their own wagons, and deliver it again at residence or hotel at destination, for an inclusive charge of one shilling (24 cents) per piece; this avoids risk of loss, but involves some delay. There seems to be no valid reason why the English railways should not adopt a system of checking baggage—either the American one, or better yet, the Continental one, involving the use of books of labels consecutively numbered in triplicate, one being given to the passenger as a receipt, one pasted on the piece of baggage, and the third, or stub, remaining in the book as a record.

It may be proper to say that nowhere in England does baggage undergo the outrageously rough and careless handling which it too often receives in America at the hands of the employes of railway and transfer companies.

TRACKS AND TRAINS.

English railway tracks differ from those in America mainly in the fact that the rails are of a different shape, and instead of being held in place by spikes driven into the wooden cross-ties, rest in heavy iron castings called chairs, two of which are securely screwed or bolted to each cross-tie. This prevents spreading of the rails and diminishes the evil effects of broken rails, two sources of many serious accidents on American railways. In general the tracks are very good and the cars well built. The writer has eaten a meal in the dining car of a train which was scheduled to run 113 miles in exactly two hours, without a stop, or 56½ miles to the hour, doing this to the minute, and so smoothly that water was not splashed out of a full glass on the table.

The number of very fast trains running regularly on English railways, and the total number of passenger trains, both fast and slow, being so much greater than in America, in proportion to mileage of tracks, no fair comparison can be made. It must be remembered that the population is more dense in England than in any but a very few parts of America, and that the relative amount of freight and passenger traffic in the two countries is almost reversed. We must rest our claims for high speed on a few trains running between New York and Chicago and New York and Buffalo, for distances greater than are covered in England, and on a somewhat larger number of trains running for shorter distances between Boston, New York, Philadelphia and Atlantic City.

ELECTRIC LINES.

As in America, some of the English roads which do a large suburban business have changed their motive power from steam to electricity on a portion of their lines, notably in and around London, where some lines are used jointly by steam and electric trains of different companies. Such a change has also been made on lines running out of Liverpool and Newcastle-on-Tyne.

OMNIBUS LINES.

Automobile omnibuses, owned and operated by the railway companies, are largely used as "feeders." Many small country towns, lying away from the railways, and to which it would not be practicable or economical to extend the latter, are thus given a regular service to the nearest station throughout the year. In other cases the 'bus lines are maintained only during the summer months to enable tourists to ride through picturesque parts of the country, or to reach villages remote from the railways, and to which there is ordinarily little travel. In either case such lines create business for the railways.

Omnibuses, operated by horses or by motors, are also maintained in some of the large cities for carrying through passengers across town from one station to another, or from a station to a steamboat dock.

THROUGH CARS.

A great many through cars are run to places which are not on the line or division of the road over which the rest of the train goes on to its destination, these through cars being switched off at junction points and attached to trains which run over other branches of the same road, and sometimes even over the lines of other, and competing roads. This gives direct service by the shortest available route, and is a great convenience, as the through cars contain compartments of each of the several classes, and the service is given not only for long distances, but for comparatively short ones also, while in America the traveler finds few through cars except Pullmans, and even these are seldom available for comparatively short journeys over two or more lines. Our American railways often compel a passenger to travel a longer distance over their own lines, even when a short route might be available, attaining their object not only by their failure to provide a joint through service by the shorter route, but by so arranging their time tables that a passenger cannot connect at the junction point with trains of the other line without great delay and loss of time.

SUBURBAN SERVICE.

The English railways entering the larger cities, and especially London, must handle, in addition to their long distance main line trains, an immense number of suburban trains, running over an intricate network of short lines, extending to various suburban regions, and the complication is increased by the fact that in order to accommodate the commuters trains must be run from each of these branch lines, not merely to and from one terminal station in the city, but to and from two or three different terminal stations maintained by the company itself, and also to and from several other city terminals of other companies, whose lines and stations as well as those of the local London District Railway are used in common for this service by agreement. A commuter may thus choose the one of a number of terminal stations which is nearest to his place of business, and is saved from considerable loss of time, but the complicated problems involved, and the congestion of traffic at some of the junctions and terminals, are unequalled at the most important terminal stations in America, and the safe and prompt hauling of this enormous traffic, especially during the foggy weather so common around London from fall to spring, does great honor to all concerned in it.

(To be continued.)

* Actual claims from these losses are negligible.—EDITOR.

General News Section.

Governor Hughes of New York has approved a bill passed by the legislature appropriating $5,000,000 for the construction of "good roads" at the expense of the state.

The Boston & Maine is to restore the pay of those officers and employees who, on February 14, 1908, accepted a reduction of 10 per cent. The order affects about 400 men, all of whom formerly received $100 a month or more.

Governor Hughes of New York has approved a bill providing for a commission to investigate the question of providing terminal facilities for the canals of the state—which means the provision of docks and harbor facilities at New York City and other places.

The Canadian Railway Commission has extended the time within which railways shall equip their passenger cars with fire extinguishers as follows: In cars under construction or in shops undergoing repairs within six months from May 4, 1909; cars at present in use within 18 months from Nov. 3, 1908.

At St. Louis, May 20, four railways were fined a total of $9,700 for violating the law providing that cattle shall be taken from cars at least once in every 28 hours and fed and watered. The companies fined were the St. Louis, Iron Mountain & Southern, the Terminal Railroad Association, the Wabash and the Missouri Pacific. They pleaded guilty.

On Thursday, May 20, the Cunard steamship Mauretania, which had left Liverpool on Saturday evening, May 15, arrived at the quarantine station, New York harbor, at 11:10 p. m., and the mails from the vessel reached the New York post-office about 3:30 on the morning of Friday. Most of the mail for western states was, therefore, sent out from New York on the early morning trains.

The Post-office department at Washington is planning to send first-class mail from New York to Seattle in 96 hours. This is made possible by the new through train which has been put on by the Chicago, Burlington & Quincy and the Northern Pacific, which leaves Chicago at 9.20 a. m., 25 minutes after the arrival of the 18-hour train from New York over the Pennsylvania Lines. Letters leaving New York at 3.55 p. m. on Monday would thus be due in Seattle at 12.30 p. m. on Friday.

The New York State Public Service Commission, Second District, reports for the month of March that 92 per cent. of the passenger trains run in the state reached their division termini on time. The commission has now kept these records 12 months, and the percentage now reported is the highest yet. For the entire year the number of trains reported was 650,592, of which 83 5/6 per cent. were on time. For March the Erie, the Boston & Albany and the Northern Central each reported 96 per cent. on time.

The plans of the New York, New Haven & Hartford for the extension of electrification include both the Harlem River branch and the main line from Stamford to New Haven. At New Haven the plans include the electrification of all four tracks in the cut there and of the Cedar Hill freight yard. It is believed that when the work is begun it can be completed in about 18 months, and it is now given out that it may be started at an early date.

The State Board of Health of Montana has issued rules govering the sanitation of railway trains and other public conveyances. Persons having any contagious disease are prohibited from entering a train, and if a conductor suspects that any person on his train has a disease which makes his presence unlawful he must notify the nearest health officer or competent physician, who must meet the train and examine the suspected person. If the health officer shall find that persons on any car have been exposed to smallpox, he shall cause the car to be removed from the train. Expectorating in cars or railway stations, except in spittoons, is prohibited, and railways are required to post notices to this effect and to place spittoons on the floors in waiting rooms of stations and in offices used by railway officers and employees. Each sleeping car run in Montana must be supplied with one spittoon for each section or compartment. Each smoking compartment in a day coach, chair, parlor or sleeping car must be furnished with at least two spittoons. Each smoking car must be provided with at least 12 spittoons, and each combination smoking car with at least 8 spittoons. Dry sweeping and dusting of the cars while in transit is prohibited. The floors of all cars must be cleaned with soap and water at the end of each trip, after which the floors must be mopped with a 1 per cent. solution of the formaldehyde solution prescribed by the United States pharmacopoeia or with some other disinfectant approved by the Board of Health. Sleeping cars must be fumigated at least once every 2 months and for this detailed rules are given. Porters shall not be allowed to sleep in sleeping cars in Montana unless a special compartment and special bedding are provided for them. Detailed rules are also prescribed for the sanitation of stations and appurtenant buildings.

The Consolidated Express Company.

Incorporation papers have been filed with the Secretary of State of Connecticut for an express company with the above name and with a capital stock of $1,000,000 ($500,000 paid in), to do express business on the New York, New Haven & Hartford and on the steamers of the companies controlled by the road. This includes the Fall River Line. At present the Adams Express Co. has the contract to do business throughout the New Haven lines. The incorporators of the new company are H. M. Kochersperger and Benjamin Campbell, vice-presidents, and H. S. May, treasurer of the New Haven road.

Kansas City Terminal.

The Board of Directors of the Kansas City Terminal Railway Company, at a meeting in Chicago on May 17, adopted a resolution to the effect that the proposed ordinance providing for the erection of new passenger stations and terminals in Kansas City is acceptable to the Terminal Company, subject to agreement as to certain details, and subject also to the ability of the company to acquire necessary property at reasonable prices. (May 21, p. 1102.) The ordinance will have to be submitted to a vote of the people of Kansas City before it can become effective. The situation in Kansas City was reviewed at length in an editorial in the *Railroad Age Gazette* of October 23. As stated then the principal objections in the way of agreement in regard to the ordinance under which the new passenger stations and new terminals are to be built were differences of opinion between the representatives of the city and the representatives of the railways regarding switching charges and payment by the railways for damages to property. The difference regarding switching charges was settled by the roads indicating that no advance in switching charges would be made, and the city withdrawing the demand that the ordinance should contain a provision perpetually requiring the roads to absorb switching charges. The basis of agreement regarding damage to property was outlined in last week's issue of the *Railroad Age Gazette*, p. 1102.

"Wireless" Demonstration by the Union Pacific.

An interesting demonstration of wireless control of electrical apparatus at a distance was given on May 12 at the electrical show in Omaha, Neb. Dr. Frederick H. Millener, Experimental Electrician of the Union Pacific, turned on the lights in the building by means of an impulse sent from the Fort Omaha wireless tower, six miles away, facilities at the fort having been made available through the courtesy of Colonel Glassford, Signal Corps, U. S. A. The wireless im-

pulse acted on a specially constructed delicate coherer, similar in construction to that used about a year ago on the electrically controlled truck in the shop yards of the Union Pacific, at Omaha, and described in these columns at the time. By the means of a large solenoid switch, which is closed when the impulse passes through the coherer, 75 h.p. was turned on and the auditorium lighted. The power was turned off in the same way, the operation being repeated several times. This demonstration was made in connection with experiments that the Union Pacific is conducting at its shops.

Train Robbery at Omaha.

The Overland Limited Express, eastbound, of the Union Pacific was stopped by four robbers about three miles west of Omaha at 11:45 o'clock on the night of May 22 and seven sacks of valuable registered mail were rifled. The Union Pacific offered a reward of $5,000 for the capture and conviction of each of the robbers. After the robbers had taken the sacks which they wanted they put them into an automobile and soon disappeared, having detained the train only about 15 minutes.

Standard Code on the I. & G. N.

The International & Great Northern on April 26 adopted the standard code of train rules and, according to the *Galveston News* of May 9, the somewhat radical change from the old rules was carried out without the slightest disturbance. The first two weeks did not develop a single misunderstanding. The new book was compiled by S. E. Burkhead, who was Inspector of Transportation, but who has since been appointed Assistant Superintendent of the Gulf division.

Although the International & Great Northern operates 1,100 miles of road, it has until now continued the old-fashion of having its rules printed on the back of the time-table, which, for the Fort Worth division, is a sheet 22 in. x 29 in.

The new book is well arranged and the amendments to the standard code are not numerous. The standard rules are Nos. 1 to 106 inclusive; train order rules, 201 to 223, inclusive, and interlocking signal rules, 1 to 16, inclusive. Following the standard rules are chapters for trainmasters, train despatchers, yardmasters and the different classes in the train and station service, and also separate chapters on air-brakes, on courtesy to patrons, on bulletin orders, on employment, promotion, uniforms, hospital regulations, emergency boxes, what to do in case of personal injuries, U. S. mails, Pintsch gas, steam heat, loading and handling cotton, the transportation of explosives and four pages of special rules which have to do with the work of all classes of men in the operating department. The rules for handling cotton are of interest to a northern railway man mainly as a curiosity, as they deal largely with "exposed" cotton, that is to say, cotton carried on platform cars or otherwise exposed to fire. The regulations for the transportation of explosives consist of a six-page condensation of the more elaborate rules prescribed by the Bureau of Explosives. The special chapter on courtesy to patrons is a reprint of that which was published by the Lackawanna a year ago, and which was reprinted in the *Railroad Gazette* of May 29, 1908. The chapter on personal injuries contains the most essential "first aid suggestions" compressed into six paragraphs, occupying only three pages. The headings of these paragraphs are: Wounds; boiled water; fractures; eye; burns, and shock.

We quote some of the principal features of the standard train rules as here given: Rule 10 prescribes red for stop, green for proceed, yellow for caution. Rule 89 requires conductors to signal enginemen on approaching a meeting station. Rule 90-*a* requires all except first-class trains and following sections of all trains, including first-class, to approach time-table, coal and water stations under control (the comma after "time-table" would seem to leave very few exceptions to this rule).

The time interval in rule 91 is 10 minutes. A section of a passenger train which does not make the schedule stops must pass the platforms of stations at reduced speed. Under rule 93 the main track may be used within yard limits by protecting against first-class trains. Rule 99-*c* reads: "An obstruction of the main line must be protected by flagman when necessary to prevent accident." Rule 104 has eight supplementary paragraphs. In approaching switches enginemen must "when practicable" regulate speed so as to be able to stop if the switch is wrong.

A New Kind of Train Accident.

At Far Rockaway, N. Y., one day last week, the engineman of a locomotive of the Long Island Railroad, just starting from the station, was knocked out of his cab by an electric current which came through the roof of the locomotive cab from an overhead trolley wire which had become displaced. The wire was broken by coming in contact with the cab, and the ends, falling on the roof of the baggage car, communicated through the gas pipe to the tanks beneath the car and ignited the gas therein. The cars at once took fire from the flames, and the passengers—100 or more—were alarmed and fell into a panic. Some of them were trampled on in the mad rush to escape from the cars. There was also a live third rail at the point and one of the passengers was shocked by coming in contact with that. It was about ten minutes before anyone was able to get the power current turned off.

F. D. Underwood on the Business Situation.

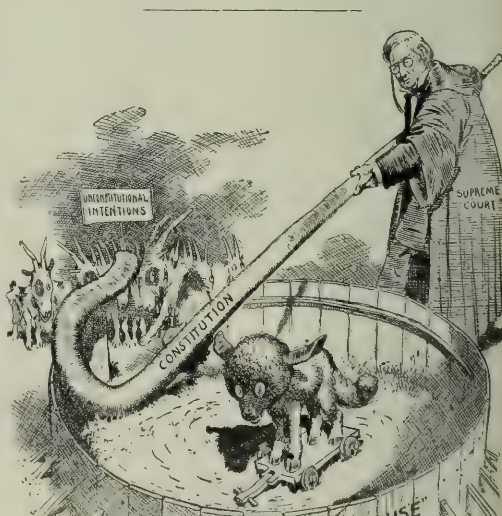
President Underwood, of the Erie, gave the following characteristic statement to the *Milwaukee Wisconsin* while in Milwaukee on May 15:

"The country at large is entering upon an era of prosperity, say the wise men, and they know; not so fast a speed as heretofore, but a good family horse, safe gait.

"The public has awakened and is awakening to the fact that baiting corporations 'does not pay,' and in the end pay is what we all want.

"Not that the dollar is the only thing, but just before you get the other desirable things you need the dollar.

"Reform is a great thing—overworked of late—and now due for a quiet summer rest."



All That Is Left.

—Boston Herald.

Street Railway Training School.

A street railway training school is to be established by the Metropolitan Street Railway Company, New York City, open to college and scientific school graduates, for the purpose of educating officers for the company. The pupils will be paid living wages while taking the two-year course.

The difficulty of obtaining high-class men who are willing to begin at the bottom and learn the street railway business led Mr. Root, the general manager, to try the experiment. The prospectus of the school and application blanks have been sent to the presidents of nineteen colleges and scientific schools as follows: Amherst College, Brown University, Cornell University, Cambridge Manual Training School, Dartmouth College, Hamilton College, Massachusetts Institute of Technology, Purdue University, Brooklyn Polytechnic Institute, Pratt Institute, Rensselaer Polytechnic Institute, Stevens Institute of Technology, Syracuse University, Tufts College, Union College, Wesleyan University, Sheffield Scientific School, Worcester Polytechnic Institute and Williams College. Mr. Root hopes to get young men who have had some technical training and who have an inclination to enter upon work of this character.

The course will be two years. During the first year the student will be paid $15 a week. The second year man will receive $20 a week. The pupil will be assigned to duty in the maintenance of way, the electrical, the equipment and the transportation departments, spending three months in each department.

In the first he will do field work in connection with renewal of rails, installing tracks, surveying, etc., and will study designing and construction of buildings, efficient handling of men, laying of pavements, car-house construction, etc. In the electrical department he will familiarize himself with the conduit and feeder system, the location and character of the cables by which power is transmitted from the power station to the cars on the streets and electrical and steam engineering. In the car barns and repair shops he will study maintenance of car equipment under operating conditions, rewinding of armatures, repairing of commutators, blacksmithing, lathe turning and metal work in general.

In the transportation department he will learn to run a car and act as conductor and motorman for a short period. Then he will have a thorough course in the details of regulating the service under normal and emergency conditions. He will also learn routine work in the division offices, such as timekeeping, checking up the cash received from conductors, making up of accident and other reports, etc. Applications are to be sent to F. T. Wood, No. 621 Broadway.

Extension of the Texas State Railroad.

The Texas legislature at its recent session passed a bill providing for the extension of the Texas State Railroad from Rusk to Palestine. This road is operated mainly to handle traffic between the various industries conducted as a part of the state penitentiary system at and near Rusk. The road now runs from Rusk to Gill, a distance of 24 miles, and connects with the St. Louis Southwestern at State Crossing and at Rusk. The extension will be about 10 miles long and will connect with the International & Great Northern at Palestine.

The bill passed provides for an issue of $200,000 5 per cent. bonds secured on the property of the company. The Comptroller of Public Accounts and the State Board of Education are required to buy the bonds from the penitentiary board and pay for them out of the permanent state school fund at their face value, the principal of the bonds to constitute and remain a part of the permanent school fund.

About $150,000 is to be used to redeem bonds previously issued and the remainder of the money realized from the securities is to be applied to the completion of the road. When the railway is completed to Palestine it shall be the duty of the penitentiary board to try to sell it. The board is authorized at its discretion to make application to the State Railway Commission to value the railway property, and in no event shall it be sold for less than such valuation.

This indicates that the state of Texas is not disposed to embark extensively in the construction and management of railways, and this is further indicated by the refusal of the legislature to pass another bill which contemplated the construction of 100 miles of railway in addition to the extension from Rusk to Palestine. For the purpose of enabling the state to build the additional 100 miles, the bill provided that the state should issue 5 per cent. bonds which should be bought out of the permanent school fund at their face value. After a hot fight this bill was defeated by a large majority.

Grand Trunk Pacific Shops and Yards.

The shops and yards at Winnipeg, Man., contract for which was recently awarded to Haney, Quinlan & Robertson, of Toronto, Ont., consist of a locomotive, machine and erecting shop, 170 ft. x 612 ft., provided with 25 pits; a boiler and tank shop, 185 ft. x 210 ft.; a power house, 110 ft. x 150 ft.; an iron foundry, 130 ft. x 200 ft. with cleaning room, 48 ft. x 80 ft.; a carpenter and pattern shop, 70 ft. x 100 ft.; a storeroom, 60 ft. x 260 ft.; an oil house, 40 ft. x 60 ft., with store platform, 60 ft. x 120 ft.; a forge shop, 100 ft. x 260 ft.; stores and scrap shop, 40 ft. x 220 ft.; an oil house, 20 ft. x 60 ft.; and a frog and track shop, 60 ft. x 100 ft.

The layout of the yards provides for a second track along the main line, and the freight sheds and tracks for team delivery are situated between Springfield Road and the main line. The eastbound receiving and classification yard is located on the other side of the main line and beyond is the westbound lead with tracks for repairs and other purposes. Further on are the track scales, ice-house, wrecking outfit tracks, etc., and the tracks leading to the roundhouse, coaling trestles, etc. The roundhouse will accommodate 37 locomotives, and has a 75-ft. turntable.

Where New Coins Are Common.

J. C. Lawrence, one of the railway commissioners of the state of Washington, after an inspection of the Idaho & Washington, declares that it is a model railway. "Its grades and curves are perfect. Its cars are the latest and best product of the Pullman shops. Each car carries a dynamo and storage batteries that light it with electricity while it is running, and for eight hours afterward. The engines are the latest models and shine like new coins."—*Exchange.*

Railway Men's Day at the Alaska-Yukon-Pacific Exposition.

The Alaska-Yukon-Pacific Railway Men's Day Association has been organized by the railway men of Seattle, Wash., to further the success of Railway Men's Day at the exposition, which will be Saturday, July 3, 1909. The following are the officers of the Railway Men's Day Association: President, F. W. Parker; Vice-Presidents, R. Dudgeon and A. E. Campbell; Secretary, F. R. Hanlon. The program on Railway Men's Day will consist largely of features illustrative of the development of the art of transportation.

Carloads and Gradients on the Bessemer & Lake Erie.

In 1908, on the Bessemer & Lake Erie, the average number of tons of revenue freight per train was 931, and the average trainload southbound was 1,345 tons. Yet the Bessemer & Lake Erie is by no means a water level line. The only piece of level track in the 142 miles between Conneaut harbor, on Lake Erie, and North Bessemer, is a 10-mile stretch between Conneaut Junction and Springboro. The total lift southbound is 1,745 ft. and this is in the direction of maximum traffic. There is one grade southbound of 68 ft. to the mile and 37 per cent. of the entire line is on curve.

P. R. R. Pensions.

The number of employees of the Pennsylvania Railroad receiving pensions from the company on Jan. 1, 1909, was over 2,000, and the payments to them during the year 1908 amounted to $544,245. Since the Pension Department was established in 1900 the sum of $3,445,794 has been paid to retired employees. When the pension system was inaugurated the sum of $300,000 was appropriated for the first year's

payments; in 1902 this was increased to $390,000 and in 1907 to $600,000. This does not include the operating expenses of the department, which in 1908 amounted to $5,369. A total of 367 employees were retired on pensions in 1908, while 211 men who were already on the pension list died during the year. The number of retired employees on December 31, 1908, was 2,176. The average age of those receiving pensions is 73 years and 3 months, while the oldest employee on the list attained the age of 92 years in 1908.

Railway Signal Association.

The subjects that will come up for discussion at the New York meeting, which is to be held on June 8 at the Engineering Societies building, West Thirty-ninth street, New York, are The Semaphore Signal—Upper Left-hand Quadrant versus Upper Right-hand Quadrant, by C. H. Morrison (N. Y., N. H. & H.), and The Use of Alternating Current in Signaling, by W. K. Howe (General Railway Signal Co.), Rochester, N. Y.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION. F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penna. Co., Toledo, O.; June 22-25; Albany, N. Y.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION. W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION. S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION. R. E. Wilson, Ry. Exchange, Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS. Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS. C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 26-28, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS. Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB. H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION. Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.
IOWA RAILWAY CLUB. W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB. G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB. H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH WEST RAILWAY CLUB. T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH. J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION. C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.
RAILWAY STOREKEEPERS' ASSOCIATION. J. P. Murphy, Box C., Collinwood, Ohio.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION. Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov. 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS. C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS. J. H. O'Donnell, Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB. A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION. W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
WESTERN CANADA RAILWAY CLUB. W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
WESTERN RAILWAY CLUB. J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The Canadian Railway Commission has ordered that Grand Trunk and Canadian Pacific railways honor from the international boundary through tickets issued by initial United States railways to non-competitive points on the Canadian Northern. This order was granted at the instance of the Keystone Camping Club of Pittsburgh, Pa.

The Interstate Commerce Committee of the Spokane Chamber of Commerce has adopted resolutions favoring the entire rejection by the shipping interests of Spokane of the tariffs of rates which the transcontinental railways have suggested shall be put in effect to Spokane in place of those provided for by the decision of the Interstate Commerce Commission in the Spokane rate case. This move seems to have been taken at the instance of H. M. Stephens, who was the attorney for the city of Spokane in the case before the Commission, and indicates that the business interests of the city will not voluntarily accept any rates which are not as low as, or lower than, those to Pacific Coast points.

Newspaper reports say that unless the Interstate Commerce Commission modifies its decision in the Spokane rate case or unless the plans of the railways to conform to that decision by making the rates to intermediate points in the west on many commodities the same as the rates to the Pacific coast are changed, proceedings will be instituted by the Chambers of Commerce of San Francisco, Portland, Seattle and other Pacific coast cities to compel readjustment of the distributing rates from Pacific coast cities to inland points. Evidence will be introduced, it is stated, to show that rates charged jobbers from Pacific coast points to inland points are much higher than those charged jobbers at inland points on goods shipped to retailers in the surrounding country, and if intermediate cities, such as Spokane and Salt Lake, are to have the same rates as are given to Pacific coast points the jobbers on the coast will be put at a disadvantage compared to those at inland points.

The Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago & North Western, the Chicago, Milwaukee & St. Paul, the Atchison, Topeka & Santa Fe, the Missouri Pacific and the Wabash filed a petition in the Federal court at Chicago on May 18 for an injunction to restrain the Interstate Commerce Commission from enforcing its order for reduction in class freight rates from Chicago to Denver. It is alleged that the rates fixed by the Commission would give shippers at Chicago an advantage of 25 cents per 100 lbs. and shippers at St. Louis an advantage of 23 cents per 100 lbs. over shippers at the Missouri River in competing for business at Denver, and would therefore unjustly discriminate, and would reduce the earnings of the railways by $1,000,000 a year and would therefore be confiscatory; also that they would destroy the existing system of basing rates on the Missouri river and therefore cause a disturbance in commercial conditions that would cause heavy loss to many business interests.

Jack Love, Chairman of the Oklahoma Corporation Commission, delivered an address before the Oklahoma State Grain Dealers and Millers' Association in Oklahoma City on May 22, in which he discussed the attitude of the Commission toward the railways. Referring to criticisms of the Commission on the ground that it does not know the facts about railway operation, and, therefore, cannot be just and fair with the roads, Mr. Love said that the roads have refused to answer questions submitted to them with the purpose of securing for the Commission necessary information. For example, an inquiry was made about the cost of the properties of the roads, the details of their cost per mile, and the cost of their equipment per mile. The roads replied that they were unable to give the information because their books did not show it. Their accounting officers had stated that it was not possible to separate the cost of freight from the cost of passenger transportation. If these things were true, said Mr. Love, how could either the Commission or the railway officials know whether certain rates were too high or too low? He said the Commission desires to be fair and just both to the railways and to the people; and the fairness and justness of a rate can best be determined on the basis of cost of serv-

ice; and this can only be ascertained by separating passenger from freight, and interstate from state expenses. He said that if the railways would recognize the honest efforts of the Commission to deal fairly and equitably and would give it the assistance that it needs, there would result an adjustment that would be beneficial to both railways and people.

Russian Coal Shipments.

The rail shipments of coal from the Donetz basin in Russia, by far the greatest mines in the country, amounted to 13,831,147 tons in 1908, which is nearly 3 per cent. more than in the previous year. Less than 18 per cent. was anthracite. The rail shipments were nearly 70 per cent. of the whole amount mined.

Freight Car Balance and Performance, December, 1908.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting statistical bulletin No. 46, covering car balance and performance for December, 1908, says:

"There was a further increase of surplus cars during the period covered by this report, the daily average being 198,860 cars, or 9.30 per cent. of the total equipment. The shop cars decreased slightly, averaging 7.32 per cent., an "excess" of 2.30 per cent. Combining these, we have a total of 11.60 per cent. to be deducted from the equipment on line in order to continue our comparative summary of performance as below:

	Average miles per day. Inc.surp. cars.	Average miles per day. Exc.surp. cars.	Average ton-miles per car per day. Inc.surp.	Average ton-miles per car per day. Exc.surp.	Average earnings per car per day. Inc. surp. cars.	Average earnings per car per day. Exc. surp. cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908...	19.6	24.5	258	324	1.83	2.29
May, 1908....	19.3	24.8	254	329	1.72	2.22
June, 1908....	19.6	24.7	276	347	1.88	2.37
July, 1908....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
Sept., 1908....	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45

"It will be noted that the car mileage and car earnings performance was slightly below the October and November marks, although the ton-miles per car per day held up well. The decrease in loaded movement noted in November continued, the percentage in December being 68.0 per cent. This result was accompanied by an increase in the number of cars at home, which rose from 68 per cent. to 69 per cent. The report shows some improvement in car loading, the average tonnage per loaded car increasing from 21.0 in November to 21.4 in December

"Although business conditions during December were still considerably below normal, with indications of a further recession, the car performance was much more satisfactory than during the same month of 1907. The conditions as regards car surplus were quite similar during the two periods, the surplus in December, 1907, and December, 1908, equaling 7.89 per cent. and 9.30 per cent. respectively. The averages for this report, especially those that exclude surplus cars, indicate that the roads had adapted their operations to a condition of surplus, and were securing much better service from the cars actually in use than during the earlier months of the depression. The average miles per day (excluding surplus cars) was 25.2 in December, 1908, as against 23.9 in December, 1907; the ton-miles per car per day were 376, as compared with 316 the previous year, and the daily earnings averaged $2.45 and $2.17, respectively. In the loaded mileage the difference between 68.0 per cent. and 64.6 per cent. is also in favor of the later period.

"Although these results do not represent the maximum achievement in car performance, they are quite satisfactory for a period in which conditions were so far below normal. As an indication of the possibilities in the way of an increased efficiency of freight equipment, they are very encouraging, as they give rise to the hope that new records may be reached when the car movement is again stimulated by an increased demand for equipment."

The accompanying table shows car balance and performance by groups.

CAR BALANCE AND PERFORMANCE IN DECEMBER, 1908.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	73,028	653,545	276,507	132,751	172,545	370,345	15,469	134,215	25,904	112,754	100,795	2,067,858
Average number of system cars on line..	52,221	449,100	201,796	87,928	110,941	285,317	6,227	87,281	13,172	59,414	77,645	1,431,042
Railroad owned cars: Av. foreign on line	32,306	174,175	68,404	35,960	46,603	95,613	11,401	53,893	24,042	44,985	17,289	604,671
Total cars on line	84,527	623,275	270,200	123,888	157,544	380,930	17,628	141,174	37,214	104,399	94,934	2,035,713
Excess	11,499	....	....	....	....	10,585	2,159	6,959	11,310	....	....	....
Per cent. cars on line of total owned:												
Home	72	69	73	66	64	77	40	65	51	53	77	69
Foreign	44	26	25	27	27	26	62	40	93	40	17	29
All railroads	116	95	98	93	91	103	114	105	144	93	94	98
Private cars on line	3,222	40,379	11,769	3,041	6,355	13,419	1,620	7,597	1,963	8,534	4,012	101,911
Total, all cars on line	87,749	663,654	281,969	126,929	163,899	394,349	19,248	148,771	39,177	112,933	98,946	2,137,624
Per cent. of cars in shop.	6.09	7.08	7.76	8.61	10.88	4.75	4.58	12.81	5.32	5.29	9.08	7.32
No. of freight engines owned	1,118	9,856	3,753	2,215	2,554	6,298	440	2,481	697	2,334	2,112	33,858
Av. cars on line per freight engine owned	78	67	75	57	64	63	43	60	56	48	47	63
Total freight car mileage	42,721,281	476,722,701	165,828,643	87,344,944	115,725,555	254,805,356	23,890,722	85,611,528	31,898,627	101,475,941	83,631,446	1,469,656,744
Average mileage per car per day	15.7	23.2	19.0	22.2	22.8	21.0	40.0	19.3	26.2	29.0	27.4	22.3
Per cent. loaded mileage	69.8	64.2	64.3	67.0	69.9	72.8	73.2	69.0	63.8	74.4	71.7	68.0
Ton miles of freight, inc. Co. freight	427,015,069	7,207,955,295	2,314,749,899	1,178,230,761	1,665,762,293	2,357,327,653	369,474,447	1,205,839,346	382,490,268	1,535,675,542	1,186,100,281	19,830,620,854
Average ton miles, including Co. freight:												
Per car mile	10.0	15.1	14.8	13.5	14.4	14.5	15.9	14.1	12.0	15.1	14.1	14.5
Per loaded car mile	14.3	23.5	23.0	20.1	18.5	20.5	21.7	20.5	18.2	20.3	19.7	21.4
Per car per day	157	350	312	299	340	328	664	273	315	440	387	332
Gross freight earnings	$4,860,166	$41,972,187	$13,391,355	$8,235,956	$10,981,471	$19,167,703	$2,901,929	$10,422,240	$3,686,060	$13,868,756	$7,137,315	$136,625,138
Average daily earnings: Per car owned.	$2.15	$2.07	$1.56	[illegible]	$2.07	$2.19	$6.05	$2.51	$4.59	$3.98	$2.28	$2.23
Per railroad owned car on line	1.85	2.17	1.60	2.14	2.26	2.19	5.31	2.39	3.19	4.30	2.43	2.28
All cars on line	1.79	2.04	1.53	2.09	2.17	2.10	4.86	2.27	3.04	3.97	2.33	2.16

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1909.
(See also issues of May 7, 14, and 21.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$196,086	$59,131	$285,049	$30,137	$43,610	$8,040	$92,261	$10,553	$184,601	$100,448	$412*	$11,778	$88,258	$47,009
Atlanta & Birmingham Air Line	237	64,818	17,350	86,529	9,435	9,687	939	30,343	1,192	51,596	34,933	.....	4,813	30,120	9,238
Central Branch	388	113,871	26,344	149,122	18,191	23,344	3,388	56,453	3,829	105,205	43,917	.....	9,500	34,417	‡10,246
Chicago, Cincinnati & Louisville	285	89,164	19,744	113,940	15,894	24,985	8,365	57,211	5,675	112,130	1,810	.....	3,330	1,520†	12,664
Chicago Great Western	818	531,735	130,472	713,510	69,175	177,965	37,634	323,681	33,394	641,849	71,661	1,537	18,385	54,813	‡37,656
Chicago, Indiana & Southern	329	214,599	17,955	240,763	24,665	47,698	8,776	98,002	6,103	185,244	55,519	124*	12,500	42,895	‡7,726
Chicago, Peoria & St. Louis	255	106,348	23,444	135,746	16,270	30,991	6,067	61,312	4,978	119,618	16,128	.....	4,150	11,978	‡4,117
Cleveland, Akron & Columbus	210	115,530	32,269	161,478	24,454	39,360	1,933	51,969	2,826	120,542	40,936	.....	5,000	35,936	867
Cleveland, Lorain & Wheeling	194	160,873	16,406	183,137	32,765	41,131	6,177	80,177	6,258	166,508	16,629	.....	9,406	7,223	‡94,544
Duluth, Missabe & Northern	282	80,137	33,063	117,191	59,673	46,262	1,728	57,492	12,112	177,267	60,076*	2,842*	4,900	67,818†	21,663
Fort Worth & Denver City	454	249,715	123,380	390,791	61,629	63,653	6,368	144,135	13,046	288,831	101,960	227	9,319	92,868	20,182
Fort Worth & Rio Grande	196	58,881	28,050	93,974	13,397	5,658	3,577	36,214	819	59,665	34,309	.....	1,900	32,409	34,304
Georgia	307	181,878	54,479	250,598	27,760	47,633	8,810	103,689	6,730	194,622	55,976	.....	1,122	54,854	176
Georgia Southern & Florida	395	119,956	49,824	191,995	14,533	28,684	5,673	71,112	8,050	128,052	63,943	1,584	8,058	57,469	31,420
Grand Trunk Western	336	338,360	105,203	478,019	24,565	72,621	20,172	204,830	12,355	334,543	143,476	1,964*	32,000	109,512	‡35,378
Houston, East & West Texas	191	73,730	22,834	102,419	16,177	10,092	984	35,459	3,460	66,172	36,247	.....	4,808	31,439	7,241
Kanawha & Michigan	177	130,714	23,584	158,100	29,121	42,723	2,313	51,912	2,418	128,487	29,613	19	6,648	22,984	5,272
Mason City & Fort Dodge	386	122,617	31,639	164,138	14,526	29,840	1,612	72,405	772	119,156	44,982	1,405	8,937	37,450	‡22,671
Midland Valley	324	43,565	22,358	71,238	17,356	16,612	2,121	25,167	5,189	66,445	4,793	.....	8,000	3,207†	‡19,344
Missouri Pacific	3,492	1,361,550	298,987	1,831,324	293,737	310,922	44,990	762,457	56,606	1,468,712	362,612	767*	77,105	284,740	‡122,874
Mobile, Jackson & Kansas City	403	99,312	24,318	132,380	21,992	17,605	1,856	41,869	9,130	92,452	39,928	.....	3,344	36,584	9,585
Morgan's La. & Tex. R.R. & S. S. Co.	351	259,903	88,881	373,239	47,452	42,647	10,400	142,252	13,129	255,880	117,359	425	16,000	101,784	‡3,931
Nevada & California	379	77,012	21,045	104,726	9,962	11,031	556	31,359	1,850	54,759	49,967	909*	6,200	42,858	40,684
New Orleans & Northeastern	196	206,564	43,830	269,031	27,853	41,498	8,250	92,324	9,622	179,547	89,484	.....	9,000	80,484	27,930
New York, Susquehanna & Western	151	177,088	44,063	245,707	13,234	20,738	1,314	93,140	3,404	131,830	113,877	4,430	15,089	103,218	67,093
Quincy, Omaha & Kansas City	262	41,287	16,191	62,243	17,018	13,054	1,745	34,304	2,778	68,899	6,656*	.....	2,450	9,106†	3,675
St. Joseph & Grand Island	319	90,654	28,133	127,557	23,621	16,959	5,372	46,998	3,705	96,655	30,902	1,113	5,143	26,872	‡32,048
St. Louis, Brownsville & Mexico	454	83,829	45,386	136,363	18,502	12,007	3,584	44,924	6,139	85,157	51,207	125*	4,000	47,082	24,854
St. Louis, Iron Mt. & Southern	2,608	1,535,573	371,503	2,072,428	329,995	318,227	45,128	655,177	64,323	1,412,850	659,578	1,490*	63,161	594,927	2,409
Southern Indiana	236	85,653	11,918	99,690	10,366	12,021	1,778	28,616	4,986	57,767	41,923	.....	6,929	34,994	‡208
Stephenville, No. & So. Texas	43	4,041	1,557	5,971	616	1,365	195	2,312	736	5,224	747	.....	158	589	...
Texas Central	268	56,163	27,269	91,295	25,040	17,359	1,110	33,451	4,629	81,589	9,706	.....	2,933	6,773	4,113
Toledo, Peoria & Western	248	60,333	29,384	94,299	14,899	20,172	2,101	36,274	3,523	76,969	17,330	.....	4,800	12,530	‡8,135
Trinity & Brazos Valley	455	121,063	13,169	137,525	33,975	20,400	4,308	74,756	11,254	144,693	7,168*	.....	3,000	10,168†	46,587
Vicksburg, Shreveport & Pacific	171	70.126	32,180	110,674	20,908	23,001	3,445	40,259	4,478	92,091	18,583	.....	6,000	12,583	‡6,831
Wisconsin, Minnesota & Pacific	271	32,889	14,341	51,410	10,005	5,390	313	22,611	243	38,562	12,848	4*	3,443	9,401	‡4,561

NINE MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$1,698,754	$726,603	$2,688,767	$340,868	$506,256	$68,015	$893,118	$76,945	$1,885,202	$803,565	$5,882*	$103,574	$694,109	$310,187
Atlanta & Birmingham Air Line	237	498,897	180,433	715,093	102,706	55,354	11,341	276,613	16,664	462,678	252,415	.....	43,320	209,095	63,395
Central Branch	388	971,459	254,940	1,317,851	202,515	172,211	29,821	457,094	34,493	896,134	421,717	.....	85,500	336,217	31,122
Chicago, Cincinnati & Louisville	285	765,801	210,656	1,025,737	220,792	224,626	71,062	459,641	53,199	1,029,320	3,583*	.....	29,965	33,548†	38,918
Chicago Great Western	818	4,364,085	1,428,285	6,266,786	813,300	1,233,589	328,065	2,793,269	288,067	5,456,290	810,496	4,463*	167,218	638,815	‡275,655
Chicago, Indiana & Southern	329	1,874,298	182,193	2,126,043	228,542	415,089	68,733	829,963	61,583	1,603,910	522,133	12,812	125,042	409,903	70,140
Chicago, Peoria & St. Louis	255	912,109	246,744	1,216,605	167,823	273,650	54,875	516,464	42,824	1,055,636	160,969	.....	40,350	120,619	32,575
Cleveland, Akron & Columbus	210	1,012,485	332,686	1,467,606	177,608	270,142	20,348	479,677	27,035	974,810	492,796	.....	55,222	437,574	50,217
Cleveland, Lorain & Wheeling	194	2,363,693	169,945	2,690,285	286,065	499,456	54,503	935,094	54,350	1,829,468	860,817	.....	84,658	776,159	‡250,450
Duluth, Missabe & Northern	282	6,673,460	268,979	6,984,373	625,166	657,249	11,807	974,166	110,806	2,379,194	4,605,179	31,554	284,610	4,352,123	‡550,566
Fort Worth & Denver City	454	2,388,691	1,303,175	3,863,358	598,245	556,358	64,578	1,204,279	129,273	2,552,733	1,310,625	5,194	79,495	1,225,936	‡16,447
Fort Worth & Rio Grande	196	617,971	262,940	932,670	113,247	82,693	25,371	306,131	41,991	569,433	363,237	.....	9,971	353,266	294,215
Georgia	307	1,512,275	553,764	2,197,495	394,155	323,569	75,159	897,176	63,742	1,753,801	443,694	.....	13,983	429,711	43,323
Georgia Southern & Florida	395	864,314	460,954	1,501,841	134,655	250,034	46,088	556,754	76,732	1,064,263	437,578	13,294	74,492	376,380	147,977
Grand Trunk Western	336	2,662,934	1,262,126	4,180,649	332,386	584,088	182,227	1,634,408	103,046	2,836,155	1,344,494	9,414*	288,000	1,047,080	367,450
Houston, East & West Texas	191	652,647	210,467	913,933	165,218	80,329	11,851	300,153	28,588	586,139	327,794	.....	30,483	297,311	69,356
Kanawha & Michigan	177	1,355,156	240,427	1,634,264	313,075	425,095	21,248	506,038	24,983	1,290,439	343,825	142*	59,672	284,011	208,244
Mason City & Fort Dodge	386	1,039,838	329,639	1,456,002	158,949	225,017	15,374	622,389	6,389	1,028,118	427,884	5,614	62,810	370,688	‡59,635
Midland Valley	324	480,679	198,830	722,237	173,641	164,720	15,912	243,765	39,904	637,942	84,295	.....	68,083	16,212	‡148,720
Missouri Pacific	3,492	11,734,678	3,006,167	16,315,000	2,299,365	2,476,795	425,538	6,796,941	532,659	12,531,298	3,783,702	12,610*	693,945	3,077,147	74,079
Mobile, Jackson & Kansas City	403	871,654	232,941	1,180,762	186,606	140,413	14,988	368,387	80,802	791,196	389,566	.....	30,565	359,001	176,194
Morgan's La. & Tex. R.R. & S. S. Co.	351	2,575,695	788,794	3,594,642	609,669	376,209	76,087	1,313,059	113,360	2,488,384	1,106,258	9,894	145,115	971,037	183,249
Nevada & California	379	550,035	192,726	809,719	103,160	102,462	7,081	313,182	17,565	543,450	266,269	3,652*	58,467	204,150	‡329,037
New Orleans & Northeastern	196	1,733,788	422,660	2,312,620	225,285	415,841	67,328	782,169	93,580	1,584,203	728,417	.....	69,000	659,417	121,514
New York, Susquehanna & Western	151	1,238,099	442,890	1,898,636	186.628	192,301	13,144	688,848	35,130	1,116,051	782,585	9,422*	104,750	668,413	147,771
Quincy, Omaha & Kansas City	262	406,564	160,471	614,353	151,537	107,382	14,157	287,478	26,822	587,376	26,977	.....	22,560	4,417	18,948
St. Joseph & Grand Island	319	846,168	291,786	1,232,339	184,799	132,898	46,690	411,304	33,317	809,008	423,331	1,812	36,505	388,638	‡73,397
St. Louis, Brownsville & Mexico	454	571,069	285,893	917,839	154,597	117,583	26,110	332,302	49,284	679,876	237,963	623	39,361	199,225	37,272
St. Louis, Iron Mt. & Southern	2,608	12,806,222	3,419,242	17,714,268	2,500,680	2,398,493	394,443	5.870,963	533,938	11,698,517	6,015,751	20,920*	560,969	5,433,862	732,548
Southern Indiana	236	740,689	120,382	881,641	116,400	150,175	15,145	256,734	56,156	594,610	287,031	.....	62,356	224,675	‡207,750
Stephenville, No. & So. Texas	43	70,328	13,727	87,161	6,387	7,905	1,493	21,615	5,280	42,680	44,481	.....	892	43,589	.....
Texas Central	268	576,437	309,466	946,111	139,298	128,865	9,366	322,000	39,567	639,096	307,015	.....	21,002	286,013	24,252
Toledo, Peoria & Western	248	507,480	291,667	842,354	136,877	169,075	18,607	319,518	29,555	673,632	168,722	.....	37,200	131,522	1,393
Trinity & Brazos Valley	455	1,451,807	126,158	1,604,144	308,666	228,381	39,227	758,105	104,081	1,438,460	165,684	.....	28,399	137,285	501,967
Vicksburg, Shreveport & Pacific	171	617,278	356,790	1,053,430	183,687	209,791	30,345	331,764	38,192	793,779	259,651	.....	54,453	205,198	48,870
Wisconsin, Minnesota & Pacific	271	354,136	134,821	527,751	108,908	53,375	3,196	200,711	2,633	368,823	158,928	50	25,517	133,461	12,736

*Deficit. †Loss. ‡Decrease.

Summary of Revenues and Expenses of Railways for March.

Rail operations	Amount 1908.	Amount 1909.	Per mile of line 1908.	Per mile of line 1909.	Ratio per cent. 1908.	Ratio per cent. 1909.
Freight revenue....	$112,057,012	$129,031,377	$609	$686	70.27	72.03
Passenger revenue...	34,696,089	37,232,617	188	197	21.76	20.79
Other transp. rev...	11,298,377	11,366,889	61	60	7.08	6.35
Nontransp. revenue..	1,418,352	1,492,094	7	7	.89	.83
Unclassified rev.....	....	....	...	...	....	....
Total op. revenues..	159,469,832	179,122,978	867	952	100.00	100.00
Maint. way & struct.	17,090,676	19,683,038	92	104	10.71	10.99
Maint. of equip....	24,824,820	28,182,430	135	149	15.57	15.73
Traffic expenses.....	3,319,443	3,599,090	18	19	2.08	2.01
Transp. expenses...	61,649,746	61,966,768	335	329	38.66	34.60
General expenses...	4,301,287	4,375,908	23	23	2.70	2.44
Unclassified exp....	....	....	...	...	....	....
Total op. expenses..	111,185,974	117,807,236	604	626	69.72	65.77
Net operating rev...	48,283,858	61,315,741	262	325	39.28	34.23
Outside operations.						
Total revenues.....	2,368,420	3,455,202	12	18	....	....
Total expenses......	2,253,679	3,419,285	12	18	....	....
Net revenue	114,741	35,916	...	...	....	....
Total net revenue....	48,398,599	61,351,658	263	326	....	....
1/12 annual taxes.....	6,042,582	6,436,670	32	34	....	....
Operating income...	42,356,016	54,914,988	230	291	....	....
Number of reports..	240	246	...	...	....	....
Mileage operated....	183,839.94	188,106.82	...	...	....	....

Car Surpluses and Shortages.

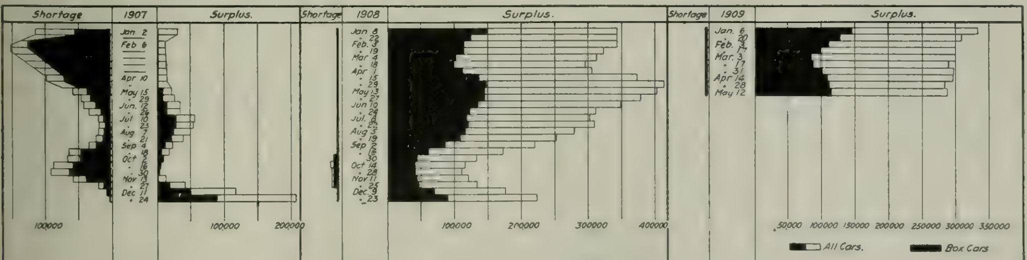
Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 47 giving a summary of car surpluses and shortages by groups from February 19, 1908, to May 12, 1909, says:

"This report shows a total of 284,479 surplus cars, an increase of 2,151 over the report for April 28. The box car surplus increased 5,936, while coal and gondolas show a decrease of 4,854. Group 2 (Eastern), which includes the anthracite roads, show a large increase in coal and gondola, and also in box cars, while group 3 (Middle), composed largely of bituminous coal roads, shows a decrease of 10,235 in coal and gondola cars. Group 6 (Northwestern) report fewer surplus box cars, while the surplus of this class increased slightly in groups 1 (New England), 9 (Southwestern) and 11 (Canadian)."

The accompanying table shows car surpluses and shortages in the period covered by the report and the chart shows surpluses and shortages in 1907, 1908 and 1909.

CAR SURPLUSES AND SHORTAGES, FEBRUARY 19, 1908, TO MAY 12, 1909, INCLUSIVE.

	Number of roads.	Surpluses. Box.	Surpluses. Flat.	Surpluses. Coal. gondola and hopper.	Surpluses. Other kinds.	Surpluses. Total.	Shortages. Box.	Shortages. Flat.	Shortages. Coal. gondola and hopper.	Shortages. Other kinds.	Shortages. Total.
May 12, 1909	158	113,601	16,574	105,684	48,620	284,479	78	4	22	83	187
April 28, 1909	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
April 14, 1909......................	163	108,291	17,692	122,982	47,698	296,663	80	135	109	19	343
March 31, 1909......................	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
March 17, 1909......................	161	88,459	20,328	139,997	42,634	291,418	310	74	27	139	550
February 17, 1909......................	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
January 20, 1909......................	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908......................	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908......................	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908......................	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908.	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908......................	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908......................	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908......................	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908......................	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249



Car Surpluses and Shortages in 1907, 1908 and 1909.

INTERSTATE COMMERCE COMMISSION.

The Portland Gateway Opened.

In re through passenger routes via Portland, Ore. Opinion by Commissioner Prouty.

The Northern Pacific, the Union Pacific lines and the Chicago & North Western are ordered to join in the sale of through passenger tickets between Seattle and other points in the Northwest and eastern destinations via Portland, Ore., and to accord through facilities, like the checking of baggage, over this route. Chairman Knapp and Commissioner Clark dissent from this opinion.

Discrimination Against Indianapolis.

Indianapolis Freight Bureau v. Cleveland, Cincinnati, Chicago & St. Louis et al. Opinion by Commissioner Clements.

Complainant alleges unjust discrimination against Indianapolis in favor of Cincinnati, Louisville, New Albany, Evansville and Chicago in the application of charges for the transportation of furniture, etc., to destinations in Texas, Arkansas, Oklahoma and Louisiana under the so-called "two-for-one rule," permitting the application of carload rates on part car lots in excess of full carloads from Cincinnati, etc., whereas less than carload rates are charged on any excess from Indianapolis. The rule as applied on such shipments from the other points mentioned should be extended to Indianapolis, but in such modified form as to eradicate manipulation whereby one shipper secures an improper advantage over another, or else the minimum weights should be readjusted so as to conform with the actual loading capacity of cars.

Uujust discrimination is alleged against Indianapolis and in favor of Chicago in respect to class and commodity rates enforced by defendants on shipments to Oklahoma. A proper relationship is suggested between the class rates and rates on furniture (new, N. O. S.), kitchen safes, etc., from Indianapolis to Muskogee, and the rates should not exceed those in effect from Cincinnati.

Complainant also alleges that defendants unjustly discrimi-

nate against Indianapolis in the transportation of vehicles, etc., to Arkansas common points in that the local class rates to East St. Louis are applied on such shipments from Indianapolis to common points in Arkansas, whereas on similar shipments from Chicago and the other points of origin mentioned, arbitrary differential bases via East St. Louis are applied, which added to the rate beyond, result in lower through rates. The commission is of the opinion that the several articles referred to should be accorded the same rates from Indianapolis as are applied from Cincinnati to Arkansas common points.

Unjust discrimination is alleged against Indianapolis in the application of class rates to points in Louisiana as compared with rates applied from Cincinnati and Louisville to same destinations. The commission is of the opinion that class rates from Indianapolis should not exceed those charged from Cincinnati to points in Louisiana.

The matters involved herein will be held in abeyance until June 28, 1909, for the purpose of permitting carriers to check in the rates and file tariffs in conformance with the views expressed. If by that date the carriers have not filed tariffs containing the changes suggested, the commission will then make such order as may appear necessary in the premises.

Same v. same.

Complainant alleges unjust discrimination against Indianapolis in favor of St. Louis in the application of class and commodity rates to points in Wisconsin, Minnesota and Michigan, particularly St. Paul and Winona, Minn. An order as prayed for in relation to the class rates is not warranted in view of the peculiar conditions under which traffic is handled and rates constructed from Indianapolis and the competing cities of St. Louis and Chicago to St. Paul and Winona territory. Chicago not only has the advantage of more intense railway competition, but is a much shorter distance and enjoys natural advantages of location over Indianapolis. Likewise St. Louis, while but little nearer than Indianapolis by short line, reaches St. Paul and Winona by direct routes, which must compete not only with each other, but also with boat lines plying on the Mississippi river.

While the class rates from Indianapolis to St. Paul are approximately 30 per cent. in excess of those from St. Louis, on many commodities the disparities between the rates are much greater. These greater disparities as between commodity rates are not warranted, and the commission is of the opinion that the same should not be greater ordinarily than those appearing in the class rates to St. Paul and group points, and also to Winona and group territory from Indianapolis and St. Louis, respectively. The case is retained with the expectation that the carriers will promptly readjust commodity rates in accordance with this suggestion.

Milling in Transit.

Douglas & Co. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Clark.

Complaint arises from the withdrawal by defendants of certain transit privileges and rates which were in effect at the point where complainant's works are located for several years prior to the establishment of said works, and which are continued as to other manufacturers of grain products at that point.

It might be reasonable to withhold transit privilege from a product that is essentially different from the raw material and from the other products of the same raw material which are accorded transit rates, as, for example, a liquid product of grain; but it is clearly discriminatory to single out one or more of several milled products of grain and withhold from it or them transit privilege which is accorded at that or some other competitive point to other milled products of grain of substantially similar character, value and packing, and which are transported under substantially the same conditions where there is competition between the millers of the grain either in marketing their product or in securing their material for milling.

Defendants argue that the commission is without power to direct a carrier to grant a transit privilege. There can, however, be no question as to the right and power of the commission to order the removal of an unjust discrimination and to prescribe such reasonable rates and regulations as will effect such removal. The commission desires to leave defendants reasonable opportunity to remove the unjust discrimination herein found in such manner as will best effect that purpose. Defendants may therefore submit for approval a plan for removing the unjust discrimination against complainant, and if that is not done the commission will consider entering such an order as will accomplish that object.

Additional Charges for Certain Sizes of Car.

Kaye & Carter Lumber Co. v. Minnesota & International et al. Opinion by Commissioner Harlan.

A carload rate and a minimum weight for a car of definite dimensions when lawfully published in the tariffs of a carrier constitute an open offer to the shipping public to move their merchandise on those terms; and it would be wholly unsound in principle to permit the carrier to impose additional transportation charges on the shipper who ordered a car of a capacity, length or dimension specified in its tariffs, simply because it is not provided with cars of the dimensions ordered. The obligation to carry the merchandise of shippers on the basis of the published rates and minimum weights, and to use whatever cars are available for that purpose, ought to have been covered in the published tariffs of the defendants by proper rule to that effect, and their tariffs were unreasonable and unlawful in not containing such a provision at the time these shipments were made. Reparation awarded.

STATE COMMISSIONS.

No Fare Reduction in Mississippi.

By unanimous vote the Railroad Commission of Mississippi decided on May 18 to leave the passenger fare at 3 cents per mile. It took this action after a hearing at which representatives of the various railways in the state argued that reduction of passenger fares would cause deterioration in service rendered and would interfere with railway development. Petitions bearing over 50,000 signatures were filed protesting against a reduction in fares, and there was only one petition, bearing only a trifling number of names, which was in favor of a reduction.

COURT NEWS.

At Rochester, N. Y., last Monday the federal grand jury indicted the Buffalo & Susquehanna and the Erie for making unlawful rates on freight.

The Circuit Attorney of St. Louis, Mo., has filed in the Federal court at Kansas City an appeal from the recent action of Judge Smith McPherson in continuing in force an injunction restraining the Circuit Attorney from prosecuting a suit in the state courts to restrain the railways in Missouri from raising their passenger rates from 3 cents per mile. The appeal was filed with the consent of Judge McPherson.

The railways of New Jersey which have been contesting the large increase in their taxes during the last few years have secured a decision in their favor from the Supreme Court of the state, which has set aside the assessments levied against terminal properties in Jersey City and Hoboken. The court holds that the assessments should have been made upon the basis of the actual market value of the property without consideration of the increased value which may be imparted by reason of its use under a railway franchise. The franchises of the railways are taxed separately for the use of the state and therefore should not be included in determining values of the so-called second class property, which includes the terminals. To do otherwise, the court holds, would mean the imposition of a double tax. The railways which appealed from the assessments on the terminal properties were the Erie, the Central of New Jersey and the Delaware, Lackawanna & Western.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

T. M. Johnson has been appointed the Paymaster of the Chicago Great Western, succeeding K. F. Draehr, resigned to engage in other business.

Edward Buckley, General Manager of the Manistee & Northeastern, has been elected the President, with office at Manistee, Mich. C. F. Kuehl has been appointed Auditor, succeeding P. R. L. Carl, transferred to the Operating department.

Operating Officers.

P. R. L. Carl, Auditor of the Manistee & Northeastern, has been appointed the General Manager, with office at Manistee, Mich., succeeding Edward Buckley, resigned.

John P. Burrus, Traveling Freight Agent of the International & Great Northern at Houston, Tex., has been appointed the Superintendent of Terminals, with office at Houston, Tex.

A. M. Ardery, Superintendent of Telegraph and Master of Transportation of the Virginia & Truckee, has been appointed the General Manager at Carson City, Nev., succeeding H. M. Yerington, resigned. Mr. Yerington will continue to perform the duties of Vice-President, which office he has also held.

Albert Wilcox, whose appointment as Superintendent of the Canadian Northern, with office at Dauphin, Man., has been previously announced, was born in 1865 in Kincardine, Ont. He began railway work in 1881 on the Toronto, Gray & Bruce, now part of the Canadian Pacific. In 1883 he became a telegraph operator for the Canadian Pacific at Winnipeg, and subsequently was made despatcher and then Chief Despatcher. In 1903 he was appointed Chief Despatcher of the Canadian Northern at Port Arthur, Ont., and the next year was promoted to Superintendent of District 2, with office at Winnipeg. In 1908 he was transferred as Superintendent to Port Arthur, which position he held until his recent appointment.

Sherwood S. Foley, whose appointment as Superintendent of the Canadian Northern at Saskatoon was recently announced in these columns, was born in 1871 at Lindsay, Ont. After a common school and high school education at Lindsay he began railway work in 1884 as operator and agent on the Northern & Northwestern, now part of the Grand Trunk. Two years later he became operator on the Canadian Pacific, later being made terminal agent, then despatcher and then Chief Despatcher. In 1901 he became despatcher on the Algoma Central, now the Algoma Central & Hudson Bay, and by 1903 had become Superintendent of Telegraph Construction. In 1903 he became terminal agent for the Canadian Northern, becoming successively despatcher, Chief Despatcher and Trainmaster, which position he held until his appointment on May 1.

Traffic Officers.

George H. Corse, Jr., has been appointed the General Oriental Agent of the Chicago, Milwaukee & Puget Sound, with office at Shanghai, China.

A. T. Stark, Soliciting Freight Agent of the Lehigh Valley, with office at Geneva, N. Y., has been appointed an Agent, with office at Rochester, N. Y.

H. H. Swearingen has been appointed a General Agent of the Chicago, Burlington & Quincy, with office at Billings, Mont., succeeding F. W. Klippel, resigned.

E. C. Nettels has resigned as Assistant General Freight Agent of the Chicago, Milwaukee & St. Paul to become Traffic Manager of the Postum Cereal Company at Battle Creek, Mich.

R. N. Collyer, a member of the Uniform Classification Committee, has been elected Chairman, succeeding F. S. Holbrook, resigned to become Chairman of the Official Classification Committee.

J. J. Dooley has been appointed a Contracting Freight Agent of the Iowa Central and the Minneapolis & St. Louis, with office at St. Louis, succeeding Baxter Weaver, resigned to go with another road.

Baxter Weaver, Contracting Freight Agent of the Iowa Central and the Minneapolis & St. Louis, at St. Louis, has been appointed a Commercial Agent of the St. Louis & Des Moines, with office at St. Louis.

C. L. Hunter, Commissioner of the Passenger Department of the Trunk Line Association, has been elected the Vice-Chairman in charge of the Passenger department, and his former title has been abolished.

J. L. Patton, Contracting Freight Agent of the St. Joseph & Grand Island at San Francisco, Cal., has resigned to accept the position of Contracting Freight Agent of the Wabash, in the same city. Frank C. Thompson succeeds Mr. Patton.

L. E. Paskill, Commercial Agent of the Wisconsin Central at Spokane, Wash., has been appointed a General Agent of the Chicago Division of the Minneapolis, St. Paul & Sault Ste. Marie (Wisconsin Central) with office at Tacoma, Wash.

A. E. Lee has been appointed a Commercial Agent of the Minneapolis & St. Louis and the Iowa Central, with office at Indianapolis, Ind., reporting to the General Freight Department at Chicago, succeeding R. M. Jenks, assigned to other duties.

E. J. McVann, Secretary of the Omaha Grain Exchange, has been elected Manager of the newly organized Traffic Bureau of the Commercial Club of Omaha, with office at Omaha, Neb. F. P. Manchester, formerly General Agent of the Union Pacific at Pueblo, Colo., succeeds Mr. McVann.

E. T. Campbell, recently appointed Traffic Manager of the Erie, began railway work as Commercial Agent of the Queen & Crescent in 1891. The next year he was assigned to duty in the general office at Cincinnati, and after remaining there for about a year was appointed by L. F. Day, then Traffic Manager of the Huntington Lines East of the Mississippi, chief clerk at Louisville, Ky. When Mr. Day was elected Chairman of the Southwestern Traffic Association, Mr. Campbell was appointed his Secretary, and in 1896 when the Association was reorganized as the Southwestern Freight Bureau Mr. Campbell was elected Chairman. In 1899 he was appointed Purchasing Agent of the Minneapolis & St. Louis, and in 1902 was made Purchasing Agent of the Erie, which position he held until his recent appointment.

George Stephen, whose appointment as General Freight Agent of the Canadian Northern has been announced in these columns, was born in 1876 at Montreal, Que. After a public and high school education at Montreal he began railway work in 1890 in the Foreign Freight department of the Canadian Pacific at Montreal. By 1899 he had become chief clerk to the Assistant General Freight Agent at Winnipeg. In June of the next year he was appointed Traveling Freight Agent for the western lines, and in December, 1900, was appointed Contracting Freight Agent for the Kootenay district of the Canadian Pacific. In 1901 he was made chief clerk in the Freight Traffic department of the Canadian Northern, and in 1906 was promoted to the position of Assistant General Freight Agent, which office he held until his recent promotion.

Engineering and Rolling Stock Officers.

F. O. Hill has been appointed the Supervisor of Bridges and Buildings of the Montpelier & Wells River, with office at Montpelier, Vt. This is a new office.

T. Kennard Thomson, M. Am. Soc. C. E. and a Consulting Engineer, with office at 50 Church street, New York, has been retained by the Erie as Consulting and Supervising Engineer for the Penhorn Creek viaduct.

The office of B. B. Kelliher, Chief Engineer of the Grand Trunk Pacific, has been moved from Montreal, Que., to Winnipeg, Man. The office of H. A. Woods, Assistant Chief Engineer, will remain at Montreal.

Railroad Construction.

New Incorporations, Surveys, Etc.

ANN ARBOR.—It is said that this company is building a six-mile branch from the main line to the New Haven coal mine.

BABYLON RAILROAD (ELECTRIC).—The New York Public Service Commission, Second district, has authorized this company to extend its lines from the present terminus in Babylon, Long Island, N. Y., to Amityville, 5.81 miles.

BELLINGHAM BAY & BRITISH COLUMBIA.—According to press reports bids have been asked for a new cut-off around the water front of Bellingham, Wash., four miles. The new line will join the present line at Wahl, and it is estimated will cost $100,000.

BRITISH COLOMBIA ROADS (ELECTRIC).—John T. Langan, of Chicago, is said to be interested in a company which proposes to build a 100-mile electric line from Vernon, B. C.

CANADIAN NORTHERN.—Contracts have been let for lines in western Canada to be built this year as follows:

To the Northern Construction Co., Winnipeg, Man.: From Vegreville, Alb., southwest to Calgary, 235 miles; Goose Lake branch, building from Saskatoon, Sask., southwest, contract for 100-mile extension; Edmonton & Slave Lake from Morinville, Alb., north, contract for 50-mile extension; eastward from Ochre River, Man., 20 miles; west from Rapid City, Man., 30 miles.

To the Cowan Construction Co., Winnipeg, Man.: The Maryfield extension, southwest for 125 miles; the Prince Albert (Sask.) branch, 30 miles, eventually to be extended west to Battleford; the Oak Point (Man.) branch, 20 miles; the Rossburn extension, 30 miles. (May 14, p. 1051).

To N. K. Bolt, Calgary, Alb.: An extension from Wakapa, Alb., west, 12 miles.

CANADIAN PACIFIC.—According to press reports bids will be invited soon for grading and construction work on the Alberni extension of the Esquimalt & Nanaimo. (May 21, p. 1099.)

CHICAGO & NORTH WESTERN.—Surveyors are said to be at work in South Dakota, west of the Missouri river, from a point on the Pierre Rapid City line to a point north of Thunder Butte, to be opened for settlement this fall.

Surveys said to be under way for an extension from Dallas, S. Dak., northwest. The line may be continued northwest to a connection with the Pierre-Rapid City line, probably at Wendte or at Midland.

CHICAGO, MILWAUKEE & PUGET SOUND.—Track laying has been finished on this line and some freight trains are now being operated over the entire route. It is the intention to inaugurate regular freight service about June 1. (April 9, p. 820.)

A large number of branch lines are to be built, on which work is to be started this summer. (April 23, p. 918.)

CHICAGO, MILWAUKEE & ST. PAUL.—Two surveys are being made, it is said, from Mobridge, S. Dak., west, one running a little south of west towards the Thunder Butte country, and the other south to the crossing of the Moreau river thence west.

CHICAGO, ROCK ISLAND & PACIFIC.—Press reports say work will be started about July 1 on a connecting line from Ardmore, Okla., west to Waurika, about 55 miles.

EDMONTON & SLAVE LAKE.—See Canadian Northern.

GARVIN & NORTHWESTERN.—Chartered in Oklahoma, with $100,000 capital stock, to build two lines of railway through McCurtain and Pushmataha counties. One of these lines will run from Garvin, Okla., northwest to Dexter, 55 miles, and the other from some point on the first line to Eagletown, 25 miles. The directors include E. E. Bushby, C. Gamble and G. A. Spaulding, of Garvin, and A. J. Waldrock, of Oklahoma City.

GARY, HOBART & VALPARAISO (ELECTRIC).—Work is said to have been started on a line from Gary, Ind., southeast via Hobart to Valparaiso. The project is backed by the Hopkins Syndicate of Illinois, in which A. M. Hopkins is interested.

GRAND TRUNK PACIFIC.—Bids will be asked about June 1 for building a branch line from Biggar, Sask., north to Battleford, 49 miles. (May 7, p. 1007.)

GREAT NORTHERN.—See Harriman Lines.

GULF, COLORADO & SANTA FE.—An officer writes that track laying from Center, Tex., north to Zuber, 21.3 miles, will be completed by the end of May. (May 21, p. 1099.)

HAMPSHIRE SOUTHERN.—Contract has been let to the F. H. Blodgett Construction Co., Wheeling, W. Va., and work is to be started about June 1 from Romney, W. Va., southwest via Moorefield to Petersburg, about 40 miles. The project, it is thought, is being backed by the Baltimore & Ohio. The work will include building three steel bridges. W. B. Conwell, Pres., Fairmount, W. Va.; W. Tropnell, Ch. Engr., Romney. (April 23, p. 918.)

HARRIMAN LINES.—Julius Kruttschnitt, director of maintenance and operation of the Harriman lines, is said to have made the following statement:

"An arrangement has been made between the Northern Pacific, Union Pacific, and Great Northern, under which the Northern Pacific line between South Tacoma, Wash., and Vancouver, and the bridge over the Columbia river, will be used jointly by the three companies named.

"The Northern Pacific will at once begin work to complete the double-tracking of its road so as to care for the business of the three companies. The property will be used for any and all kinds of business by the three roads, and will be maintained as a first-class modern double-track road for all the interests named between Portland and Puget Sound."

IDAHO & WASHINGTON NORTHERN.—An officer is quoted as saying that track laying will be started this month on the extension from Newport, Wash., north to Ione, 52 miles. Grant, Smith & Co., Spokane, contractors. Contract is to be let soon for eight miles additional and a bridge over the Pend d'Oreille river, to be 275 ft. long and 85 ft. above the water. (March 19, p. 654.)

LACHINE, JACQUES CARTIER & MAISONNEUVE.—Incorporated in Quebec to build a line of railway from Lachine, Que., on the Grand Trunk, to a point in the Hochelaga section of Montreal. Extensions are projected from Lachine northwest to Dorval, and from Lachine to the northern end of Montreal Island.

MARSHALL & EAST TEXAS.—Press reports indicate that track laying on the extension from Marshall, Tex., south to Walker, 20 miles, has been begun, and that the new track is being laid with 60-lb. rails. (March 19, p. 655.)

MISSOURI INLAND & SOUTHERN.—Incorporated in Missouri. E. E. Young, Pres.; E. C. Halbert, Secy.; D. M. Meadows, Treas It is said that Chief Engineer Palmer will have surveyors on the field by June 1 and that work of construction will begin by Sept. 15.

MISSOURI, OKLAHOMA & GULF.—Press reports indicate that this company will build a four-mile spur line in Muskogee county, Okla. (April 30, p. 961.)

MISSOURI PACIFIC.—According to press reports, a contract has been given to the Walsh Construction Co. for the grading and bridging in connection with the double-track work on the Illinois division of the St. Louis, Iron Mountain & Southern. This division extends from East St. Louis, Ill., south to Thebes, 129 miles. This work will include double-tracking from Bixby, Ill., to Brownsburg, 26 miles; from Prairie du Rocher to Roots, 12 miles; from Raddle to Howardton, 14 miles, and from a point four miles south of Howardton to Gale, 23 miles, a total of about 75 miles. It is understood that this work will be completed by fall, ready for regular service.

NEVADA ROADS (ELECTRIC).—A company is being formed by S. Rosenthal and others interested in the Nevada Interurban, associated with T. S. Dunaway, V.-Pres. and Genl. Mgr. of the Nevada-California-Oregon Railway of Reno, to build from Reno, Nev., south around the base of Mount Rose to Lake Tahoe, about 20 miles.

NEW ORLEANS GREAT NORTHERN.—Announcement is said to

have been made that trains will be in operation between New Orleans, La., and Jackson, Miss., after July 1. (April 2, p. 775.)

NORTHERN PACIFIC.—See Harriman Lines.

OREGON RAILROAD & NAVIGATION CO.—According to press reports surveyors are now at work relocating the line from Hay, Wash., south to Riparia. The new line is to have easy curves and follow one side of Texas creek, as compared with the existing line which has sharp curves and crosses the creek at a number of points.

According to press reports work is to be started June 1 on a cut-off from Lockwood, Wash., east to the west shore of Coeur d'Alene lake, Idaho, about 13 miles. The new line will be about 25 miles shorter than the existing line.

PACIFIC & OREGON SOUTHERN.—According to reports from Central Point, Ore., work will soon be under way on this line. The projected route is from Central Point or Medford, Jackson county, Ore., west to near Wilderville, thence southwest to Selma, along the Illinois river valley, to a point near Deering, continuing southwest through the Chetco river valley and Mill creek flats to Crescent City, Cal., about 102 miles. Elias Ruud, Ch. Engr. The Central Point Commercial Club and residents of Medford are interested in the project.

PACIFIC RAILWAY & NAVIGATION.—Building from Hillsboro, Ore., west to Tillamook, 96 miles. In operation from Hillsboro for 27 miles and nearing completion on 15 miles from the Tillamook end. Contract is said to have been given recently to J. W. Sweeney, of Portland, for the remaining 53 miles. The work will be heavy, as this section is through a mountainous country, and will include 17 tunnels. The contract is said to amount to $1,500,000. (Sept. 11, p. 934.)

ROGERS PEA RIDGE & NORTHWESTERN INTERURBAN.—Incorporated in Arkansas, to build from Rogers, Ark., northwest via Bentonville to Sulphur Springs, thence north via Neosho, Mo., to Joplin, about 70 miles. The plans include the construction of a repair shop and power plant at Rogers. Preliminary surveys, it is said, have been made, and it is expected that construction work will be started within 90 days. A. R. Potter, Pres.; W. T. Patterson and J. F. Walker, V.-Pres.; B. Snyder, Sec., of Rogers, and J. J. Putnam, Treas.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—See Missouri Pacific.

SOUTHERN PACIFIC.—According to press reports plans are being made to begin work soon on a new passenger station at Oroville, Cal., and raise the grade of the Marysville-Oroville branch, also renewing the trestles, reballasting the line and putting in 70-lb. rails. When this work is finished a cut-off is to be built from Oroville west to Nelson.

TEXAS ROADS.—R. A. Hall, of the Hall Construction Co., and Lieut. C. S. Ripley, of Denver, Colo., are interested in the proposed Hall railway between Pactolus, Colo. and Central City, 17 miles. There will also be a line from Pactolus to Russell Gulch, 22 miles, and a spur to Blackhawk, three miles. R. A. Hall, Pres., Central City.

TEXAS STATE RAILROAD.—See article on page 1137.

TOPEKA & NORTHWESTERN.—See Union Pacific.

UNION PACIFIC.—According to press reports a grading contract has been given to MacArthur Brothers for work on the Topeka & Northwestern, building from Onaga, Kan., northwest to Marysville, 32.44 miles. Sub-contracts recently let to E. W. Lammeraux for about 3½ miles, to C. W. Humbred for 4½ miles and to H. H. Hannancrat for 1½ miles. The latter contract includes a change of channel for the south fork of the Vermillion river near Frankfort. (March 19, p. 658.)

VANDALIA.—Press reports indicate that work is to be started soon enlarging the company's terminal at Terre Haute, Ind. The improvements will include new shops on a site of 120 acres. The work to be carried out at once is to cost about $500,000, and further improvements, including several miles of double track, will bring the total cost up to $1,500,000. (March 19, p. 659.)

WAUTAGA & DOE RIVER.—Incorporated in Tennessee to build and operate a railway from Point Virginia to a connection with the East Tennessee & Western Carolina near Blevins.

Railroad Financial News.

ATLANTIC COAST LINE.—A semi-annual dividend of 3 per cent. has been declared on the outstanding $47,537,600 common stock, payable July 10. In 1906 and 1907 6 per cent. was paid, and in January, 1908, 3 per cent. was paid in 4 per cent. certificates of indebtedness. In July, 1908, and January, 1909, 2½ per cent. was paid in cash.

CANADIAN NORTHERN.—Mortgages securing $1,000,000 equipment trust "series S" 4½ per cent. first mortgage bonds of 1909, maturing serially from 1910 to 1919, issued by the Imperial Rolling Stock Co., Limited, and guaranteed by the Canadian Northern, and equipment trust bonds "series T" of 1909 have been filed. Wm. A. Read & Co., New York, and the Dominion Securities Co., Toronto, Ont., are placing $1,000,000 of the "series S" bonds. No amount has been announced for the "series T" bonds, but it is said that about $1,500,000 are to be issued.

CHESAPEAKE & OHIO.—A quarterly dividend has been declared, payable June 28, on the $62,799,100 stock outstanding. This puts the stock on a 4 per cent. per year basis. Since 1898 1 per cent. has been paid annually.

Collateral trust 6 per cent. notes amounting to $7,500,000 have been called for payment on July 1 at 102. Cash to fund these notes was raised by the sale of $11,000,000 general funding and improvement 5 per cent. bonds of 1909-1929. The sale of these bonds took place last December.

CHICAGO, CINCINNATI & LOUISVILLE.—The receiver has asked permission of the Federal court to issue $1,500,000 receiver's certificates, the proceeds of which are to be used for improvements and for the purchase of equipment.

CHICAGO GREAT WESTERN.—It is understood that J. P. Morgan & Co., New York, have underwritten $15,000,000 bonds to be issued by the Chicago Great Western under the reorganization plan. The bonds, of which $60,000,000 are to be authorized, will be secured by a first mortgage and will bear 4 per cent. interest. It is planned to invest the control of the reorganized property in a voting trust for five years.

The Wisconsin, Minnesota & Pacific and the Mason City & Fort Dodge, controlled by stock ownership and operated under lease, will become a part of the Chicago Great Western. The official announcement of the reorganization plan, an unofficial outline of which was published in these columns May 14, page 1052, is expected to be made shortly. The conferences at the offices of J. P. Morgan & Co., which have been held by Frank B. Kellogg, counsel for the road; Horace Burt, receiver, and H. A. Vernet, representing the majority debenture holders, have been concluded.

CHICAGO, LAKE SHORE & EASTERN.—See Elgin, Joliet & Eastern.

CINCINNATI, HAMILTON & DAYTON.—The Boston News Bureau publishes the following plan as the agreement between the Baltimore & Ohio and the C., H. & D., which is understood to be substantially correct:

The Baltimore & Ohio will take over the practical operation of the C., H. & D. under an agreement to buy from J. P. Morgan & Co. the majority stock at the end of a seven-year period. During this seven years Baltimore & Ohio will guarantee the principal and interest of the $11,307,000 4 per cent. refunding mortgage bonds. The other bond issues will not be disturbed.

Holders of the $15,000,000 4½ per cent. three and one-half year notes will be given an income bond which at the end of the seven-year period may be exchanged for a straight 4½ per cent. bond or redeemed in cash by the Baltimore & Ohio at a price in the vicinity of 85. So far as the defaulted interest is concerned it will probably be paid off in securities at about 50 per cent. of the total amount involved. The defaulted interest on the $15,000,000 notes now amounts to 13½ per cent., or over $2,000,000.

The Cincinnati, Hamilton & Dayton stock which J. P. Morgan & Co. own was purchased over four years ago at $160 per share, and it is figured that including the cost of carrying this stock for nearly four years, the investment stands the bankers to-day about $200 per share. The price which Morgan & Co. are to receive for their stock

seven years hence when the Baltimore & Ohio buys the road will be determined by arbitration.

ELGIN, JOLIET & EASTERN.—Wm. A. Read & Co., New York, have bought $9,000,000 first mortgage Chicago, Lake Shore & Eastern 4½ per cent. 60-year bonds. The bonds are jointly guaranteed, principal and interest, by the Elgin, Joliet & Eastern and by the United States Steel Corporation.

GENEVA, CORNING & SOUTHERN.—The stockholders' meeting originally called for May 29 to vote on approving a lease of the property to the New York Central & Hudson River and on making a mortgage to secure $10,000,000 4 per cent. bonds of the New York Central & Hudson River "to be assumed by the Geneva, Corning & Southern," has been postponed until July 22. (April 2, page 775.)

GULF & CHICAGO.—See New Orleans, Mobile & Chicago.

JAMESTOWN, FRANKLIN & CLEARFIELD.—A meeting of the stockholders has been called for July 22 to vote on authorizing a lease of the company's property to the Lake Shore & Michigan Southern for the term of the corporate existence of the Jamestown, Franklin & Clearfield, and on making a mortgage securing an issue of $25,000,000 4 per cent. bonds, the proceeds of which are to be used to adjust present indebtedness and for future additions and betterments. (Feb. 26, page 436.)

KANSAS CITY SOUTHERN.—L. F. Loree, President of the Delaware & Hudson and chairman of the executive committee of the K. C. S., has been elected also chairman of the board of directors, succeeding Herman Sielcken, who continues a director and a member of the executive committee.

MASON CITY & FORT DODGE.—See Chicago Great Western.

METROPOLITAN STREET RAILWAY.—The sale of the company's property under the foreclosure of the mortgage securing the $12,500,000 general mortgage and collateral trust 5 per cent. bonds has been postponed from June 29 to November 18. (May 14, page 1052.)

MISSOURI RIVER & NORTHWESTERN.—C. O. Bailey, Receiver, announces that, effective May 1, the ownership of the property of this company passed to the Rapid City, Black Hills & Western, a new company. The line of the M. R. & N. W. runs from Mystic, S. Dak., to Black Hills, 34 miles.

MOBILE, JACKSON & KANSAS CITY.—See New Orleans, Mobile & Chicago.

NEW ORLEANS, MOBILE & CHICAGO.—A decree has been entered by the Federal court for the Western District of Tennessee ordering the sale under foreclosure of the Mobile, Jackson & Kansas City; the Gulf & Chicago, and the New Orleans, Mobile & Chicago. A similar decree has been entered in the Federal court for the Southern District of Missouri. The New Orleans, Mobile & Chicago was organized in June, 1908, under the laws of Mississippi to take over without foreclosure the Mobile, Jackson & Kansas City, 199 miles, and the Gulf & Chicago, 203 miles, and to build an extension to New Orleans. The New Orleans, Mobile & Chicago is mentioned in the decrees as the consolidated corporation, but it sems that the consolidation has never been carried out according to the original plans. The total indebtedness of the companies affected is stated to be $5,000,000.

RAPID CITY, BLACK HILLS & WESTERN.—See Missouri River & Northwestern.

TREMONT & GULF.—The company has increased its stock from $1,000,000 to $5,000,000, and there is $2,000,000 outstanding. There is also outstanding $1,550,000 first mortgage bonds of February, 1908-1948. This is part of an authorized issue of $5,000,000 bonds. The line of the company runs from Tremont, La., to Winnfield, 50 miles.

WESTERN PACIFIC.—The Denver & Rio Grande announces that it will endorse on all first mortgage 5 per cent. 30-year bonds of the Western Pacific an unconditional guarantee of interest. When the bonds were sold in 1905 provision was made that interest should be paid from the money received from the sale of the bonds themselves until the road was in operation and that after that the D. & R. G. should guarantee the interest.

WISCONSIN, MINNESOTA & PACIFIC.—See Chicago Great Western.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Southern Railway does not expect to buy new locomotives at present.

The Montpelier & Wells River has ordered one 65-ton mogul from the Baldwin Locomotive Works.

The Chicago & North Western has ordered 20 consolidation locomotives from the American Locomotive Co.

The Barre Railroad has ordered one 70-ton saddle back locomotive from the Baldwin Locomotive Works.

The Bessemer & Lake Erie advises that there is nothing in the report that it is in the market for locomotives.

The Buffalo, Rochester & Pittsburgh, as reported in the *Railroad Age Gazette* of May 21, has ordered from the American Locomotive Co. one simple Atlantic locomotive, eight simple consolidation and two simple decapod engines, all for September delivery.

General Dimensions.

Type of locomotive	Atlantic
Weight, total	183,500 lbs.
Weight on drivers	106,000 lbs.
Diameter of drivers	73 in.
Cylinders	20½ in. x 26 in.
Boiler, type	Straight top, radial stayed
" working steam pressure	210 lbs.
" number of tubes	333
" diameter of tubes	2 in.
" length of tubes	15 ft. 9¼ in.
Firebox, type	Wide
" length	107 in.
" width	73¼ in.
" material	Worth Bros.' steel
" grate area	54.4 sq. ft.
Heating surface, tubes	2,729.8 "
" " firebox	174.5 "
" " total	2,904.3 "
Tank capacity	6,000 gals.
Coal capacity	10 tons.
Tractive effort	25,445 lbs.

General Dimensions.

Type of locomotive	Consolidation	Decapod
Weight, total	189,500 lbs.	268,000 lbs.
" on drivers	167,500 "	243,000 "
Diameter of drivers	57 in.	52 in.
Cylinders	21 in. x 28 in.	24 in. x 28 in.
Boiler, type	Extended wagon top, radial stayed	Conical connection type, radial stayed, with firebox combustion chamber.
" work'g steam pressure	210 lbs.	210 lbs.
" number of tubes	354	404
" diameter of tubes	2 in.	2 in.
" length of tubes	14 ft. 6⅜ in.	15 ft. 6 1/16 in.
Firebox, type	Wide	Wide
" length	107 in.	108 in.
" width	73¼ in.	73¼ in.
" material	Worth Bros.' steel	Worth Bros.' steel
" grate area	54.4 sq. ft.	55.5 sq. ft.
Heating surface, tubes	2,672 "	3,280 "
" " firebox	190 "	255.5 "
" " total	2,862 "	3,535.5 "
Tank capacity	6,000 gal.	9,000 gal.
Coal capacity	12 tons	14 tons
Tractive effort	36,827 lbs.	52,730 lbs.

Special Equipment.

Air brakes	Westinghouse
Axles	Hammered, open-hearth steel
Bell ringer	Hammett
Boiler lagging	Franklin magnesia sectional
Brake-beams	(Atlantic and decapod) Davis, (Consolidation) Buffalo
Brake-shoes	Am. B. S. & F. Co.'s steel-back flanged
Couplers	Climax
Draft gear	Westinghouse
Driving boxes	Cast steel
Headlights	(Atlantic) Pyle Elec. with Ross case (Consolidation and decapod) B. R. & P. standard
Injector	Monitor and Hancock
Journal bearings	B. R. & P. standard
Side bearings	(Atlantic and decapod) Miner, (Consolidation) Stucki
Piston and valve-rod packings	U. S. Multi-angular
Safety valve	Consolidated
Sanding device	Leach
Sight-feed lubricators	Nathan Triple Bull's-Eye
Springs	Railway Steel-Spring
Steam gages	Ashcroft
Tires	Midvale
Steam heat equipment	Consolidated Car Heating Co. (Atlantic and consolidation)
Tubes	Charcoal iron
Valve gear	Walschaerts, except Baker-Pilliod on one consolidation
Wheel centers	Cast steel

The Ann Arbor is said to have ordered two Atlantic engines in addition to the 12 consolidation locomotives reported in the

Railroad Age Gazette of May 14. This item is not confirmed.

The Northern Pacific is said to have ordered 10 locomotives from the Baldwin Locomotive Works. This is not yet confirmed.

The Harriman Lines are asking bids on locomotives. There will be about 145 engines, all heavy, and about 45 of them will be Mallet compounds.

The Western Pacific has ordered 45 consolidation engines, 40 ten-wheel passenger locomotives and 15 six-wheel switchers from the American Locomotive Co.

The New York Central Lines order for locomotives, noted in the *Railroad Age Gazette* of May 14, included 46 engines for the Michigan Central, of which nine will be built at the Montreal Locomotive Works. These are: One decapod, two six-wheel switches and six Atlantic engines.

General Dimensions.

	Decapod.	6-wheel.	Atlantic.
Weight on drivers.....	....	....	153,000 lbs.
" " engine truck	....	....	44,000 "
" " trailer	....	....	47,000 "
" total	274,000 lbs.	163,000 lbs.	244,000 "
Wheel base, driving....	....	....	13 ft.
" " total, eng..	19 ft.	11 ft. 6 in.	33 ft. 7½ in.
" " eng. & tndr	54 ft. 5½ in.	42 ft. 5¾ in.	65 ft. 8½ in.
Cylinders	24 in. x 28 in.	21 in. x 28 in.	22 in. x 26 in.
Driving wheels, diam..	51 in.	57 in.	75 in.
Boiler, type	Straight top.	Straight top.	Straight top.
" diameter	80 in.	67⅜ in.	72 1/16 in.
" pressure	210 lbs.	180 lbs.	200 lbs.
Firebox	108⅛x73¼ in.	72⅛x65¼ in.	108⅛x75½ in.
Tubes, number	447	308	394
" diameter	2 in.	2 in.	2 in.
" length	19 ft.	16 ft.	21 ft.
Driving journals..Main,	10½ x 12 in.	9 x 12 in.	10 x 12 in.
Others,	9½ x 12 in.		
Capacity, water	8,000 gals.	5,100 gals.	7,000 gals.
Capacity, coal	12 tons.	7½ tons.	12 tons.
Tender, truck	4-wheel.	4-wheel.	4-wheel, arch-bar.
" wheels, diam...	33 in.	33 in.	36 in.
" journals	5½ x 10 in.	5 x 9 in.	5½ x 10 in.
Valve gear	Walschaerts.	Stephenson.	Walschaerts.
Brakes	Westinghouse	Westinghouse	Westinghouse

CAR BUILDING.

The Chicago & North Western is in the market for two parlor cars.

The Central of New Jersey is in the market for 1,500 freight cars.

The Baltimore & Ohio is preparing specifications on 70 coaches.

The St. Louis & San Francisco is in the market for 60 coaches.

The Baltimore & Ohio advises that it is not at present in the market for freight cars.

The Pennsylvania has ordered 17 steel passenger cars from the American Car & Foundry Co.

The Bessemer & Lake Erie advises that there is nothing in the report that it is in the market for cars.

The Atchison, Topeka & Santa Fe has ordered 500 combination automobile and furniture cars from the American Car & Foundry Co.

The Aliquippa & Southern, as reported in the *Railroad Age Gazette* of May 21, expects to buy some cars, but specifications are not yet prepared.

The Temiskaming & Northern Ontario, as reported in the *Railroad Age Gazette* of May 21, has ordered seven steel underframe cabooses from the Silliker Car Co.

The Buffalo, Rochester & Pittsburgh has ordered from the American Car & Foundry Co. the three steel underframe combination baggage and smoking cars mentioned in the *Railroad Age Gazette* of April 30.

The Pukow-Tientsin, Tientsin, China, is on the market for 100 low side gondolas, 100 high side gondolas and 50 box cars. These cars will be built according to English design and specifications, some of them being eight-wheel and some four-wheel.

The Western Pacific was reported in the *Railroad Age Gazette* of April 30 as having ordered 1,500 fifty-ton gondola cars from the Pressed Steel Car Co. These were ordered by the Denver & Rio Grande, and while some of them may go to the Western Pacific the allotment has not yet been decided.

The Missouri, Kansas & Texas, as reported in the *Railroad Age Gazette* of May 21, has ordered 78 fifty-ton steel underframe flat cars from the Ralston Steel Car Co.; 111 fifty-ton steel underframe gondolas and 19 cabooses from the Mount Vernon Car Co., and 459 thirty-ton box cars, 7 thirty-ton ventilated box cars, 50 thirty-ton stock cars, 13 refrigerator cars for passenger service, 13 thirty-ton 40-ft. refrigerator cars, 18 fifty-ton steel underframe Hart convertible cars, 8 forty-ton side dump ballast cars and 40 thirty-ton furniture cars from the American Car & Foundry Co.

The Maine Central, as reported in the *Railroad Age Gazette* of May 21, has ordered fifty 50-ton gondolas and fifty 40-ton gondolas from the Standard Steel Car Co. for August delivery. The 50-ton gondolas are bottom and side discharge coal cars and will measure 40 ft. long, 9 ft. 6 in. wide and 4 ft. 4 in. high, inside measurements, and 40 ft. 7½ in. long, 10 ft. 1½ in. wide and 8 ft. 2 in. high, over all. Bodies and underframes will be of steel. The 40-ton cars are low side gondolas and will measure 37 ft. 10 in. long, 8 ft. 1 in. wide and 2 ft. 6 in. high, inside measurements, and 40 ft. 6 in. long, 9 ft. 4 in. wide and 6 ft. 4 in. high, over all. Bodies will be of wood and underframes of steel. The special equipment for both types includes:

Axles	Steel
Bolsters, truck	Cast steel
Brakes, 50-ton cars	Westinghouse
Draft gear	Tandem
Trucks, 50-ton	Arch bar
" 40-ton	Bettendorf
Wheels, 50-ton	Steel
" 40-ton	Chilled iron

IRON AND STEEL.

The Texas & Pacific is said to be in the market for rails.

The Chicago & Alton are said to be in the market for 10,000 tons of rails.

The Harriman Lines are said to be in the market for 40,000 tons of rails.

The Chicago, Rock Island & Pacific is said to be in the market for 22,000 tons of rails.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 10,000 tons of rails from the Illinois Steel Co.

The Altus, Roswell & El Paso has ordered rails for laying 33 miles of track from the Block-Pollak Company.

The Western Pacific has ordered 6,000 tons of bridge material from the McClintic-Marshall Construction Co.

The Peoria & Pekin Union is said to be in the market for about 1,500 tons of structural steel for bridge work.

The San Antonio Traction Co., San Antonio, Texas, is reported in the market for four miles of 55-lb. T-rails.

The Montpelier & Wells River, Montpelier, Vt., has ordered 500 tons of 60-lb. open hearth rails from the Pennsylvania Steel Co.

The Temiskaming & Northern Ontario has ordered 2,000 tons of 80-lb. rails from the Algoma Steel Co. These will be used for sidings and double tracking.

The Grand Trunk Pacific is reported to have ordered 16,000 tons of rails from the Dominion Steel Co., to be delivered at Prince Rupert, B. C., in August.

The Eastern Railway Supply Co., Baltimore, Md., has ordered 400 tons of steel from the Lackawanna Steel Co., for delivery at Louisville, Ky., and an additional order of 600 tons will be placed this month.

An American Consul in the United Kingdom reports to the Bureau of Manufacturers (Inquiry No. 3447) that a business house in the city in which he is located is in the market for 200 tons of steel rivets, and is anxiouc to get in touch with firms in the United States.

General Conditions in Steel.—Southern iron and steel districts are now said to be reporting considerable improvement,

especially during the last two weeks. The most convincing report is that inquiries are based on actual requirements and a genuine desire to buy, rather than for speculative information. The demand at the present time is said to be stronger than it has been during the past eighteen months. The low level of furnace operation reached last summer was 50 per cent., and present reports place this figure at 70 per cent. Independent iron and steel workers in the Pittsburgh district, whose wages were cut 10 per cent. last April, will have their old scale resumed on June 1.

RAILROAD STRUCTURES.

CANADIAN, TEXAS.—The Atchison, Topeka & Santa Fe roundhouse was totally destroyed by fire May 19. The loss is estimated at $100,000.

DENISON, TEXAS.—The creosoting plant of the Missouri, Kansas & Texas at Greenville, which was destroyed by fire, will be rebuilt at Denison at a cost of about $200,000. (Feb. 19, p. 383.)

EDMONTON, ALBERTA.—The Department of Public Works during 1908 built 284 bridges and has plans for 429 to be built this year. W. H. Cushing, Minister of Public Works, Edmonton.

HELENA, ARK.—A terminal company has been incorporated to build a passenger station. No plans have yet been made or the cost determined. W. S. Hawley, Ch. Engr., St. Louis, Mo.

KANSAS CITY, MO.—See item in regard to Kansas City Terminal Railway in another column. (May 21, p. 1102.)

MARSHALLTOWN, IOWA.—The Iowa Central has increased its general repair shop, which was 22 ft. x 160 ft., to 45 ft. x 160 ft. The company has also installed additional new machinery as follows:

2 return flue boilers.
1 400-h. p. feed-water heater.
1 150-h. p. Corliss engine.
1 85-in. Niles-Bement driving tire lathe with double quartering attachment.
1 42-in. Gisholt boring mill.
1 36-in. x 8-ft. bed Putnam planer.
1 30-in. x 14-ft. bed Schumaker & Boye engine lathe.
1 Niles-Bement-Pond, full universal radial drill, 5-ft. arm.
1 Warner & Swasey, No. 3, Universal turret lathe.
2 20-in. Cincinnati crank shapers

All the above tools are belt-driven. The following additional machinery has been installed in the blacksmith shop:

1 1600-lb. Monighan steam hammer.
1 2-in. Acme heading and forging machine.

The following additional machinery has been installed in the car shop:

1 Niles-Bement-Pond heavy pattern, double-axle lathe.

MOOSE CREEK, ONT.—According to press reports the Grand Trunk intends soon to begin work on a new station.

NEW YORK, N. Y.—Sealed bids or estimates will be received by J. W. Stevenson, Commissioner of Bridges, Borough of Manhattan, until June 3, for building the railings, stairways, etc., roadway and foot-walk pavements and track and electrical equipment of the Manhattan bridge. (April 9, p. 823.)

OROVILLE, CAL.—See Southern Pacific under Railroad Construction.

PLUM COULEE, MAN.—Bids are wanted May 31 by R. Rogers, Minister of Public Works at Winnipeg, Man., for a steel bridge on concrete abutments over the river at Plum Coulee.

ROGERS, ARK.—See Rogers, Pea Ridge & Northwestern Interurban, under Railroad Construction.

SAN ANTONIO, TEX.—According to press reports the International & Great Northern will put up a freight house and make other improvements, including a subway, at the West Commerce street crossing in San Antonio, to cost $250,000.

SPRINGFIELD, OHIO.—The Pennsylvania is receiving bids for a freight house to cost about $35,000.

TACOMA, WASH.—The Chicago, Milwaukee & Puget Sound has begun the preparation of detailed plans and specifications for a new passenger station, but details as to the size, architecture and cost of the structure will not be available for some time.

TAYLOR, TEX.—The International & Great Northern is having plans made to double the capacity of its shops. It is planned to have the shops accommodate all the car repairing and building work between Palestine, Tex., and Laredo. (May 7, p. 1010.)

TORONTO, ONT.—Bids are wanted by June 1 by J. J. Ward, Toronto, Ont., for the re-construction of bridges over the tracks of the Canadian Pacific and Grand Trunk lines at Dundas street.

TWIN FALLS, IDAHO.—Press reports indicate that a bridge, 700 ft. high, will be built to carry an electric road across Snake river canyon, at a point a short distance below the Great Shoshone Falls.

VERA CRUZ, MEX.—Work is said to have been begun on the new union railway station and terminal improvements. (Feb. 12, p. 334.)

WINNIPEG, MAN.—See item in another column regarding Grand Trunk Pacific shops and yards. (Feb. 12, p. 334.)

The proposed bridge of the Grand Trunk Pacific over the Red river will provide for a double-track railway. There will be a Strauss bascule span over a 100-ft. clear waterway at the western end. The construction in Winnipeg consists of elevated tracks with retaining walls and solid fill, crossing Mill, Water and Notre Dame streets, with through plate girders. The contract for the sub-structure was awarded to Haney, Robinson & Quinlan, and the superstructure to the Dominion Bridge Co., both of Montreal. The estimated amount of steel is 2,500 tons. (March 26, p. 729.)

SIGNALING.

The Wheeling & Lake Erie is to install interlocking plants at Spencer, Clyde, Bellevue, Monroeville, Massillon and Valley Junction, and at three crossings in Cleveland. Some of these plants will be mechanical, and some power, but how many of each has not yet been decided.

The Long Island has installed an interlocking plant at Hicksville, N. Y. It is equipped throughout with Federal switch guards instead of detector bars. This road is using the Federal switch guard instead of detector bars at Long Island City, with electro-pneumatic interlocking, and at Woodhaven with mechanical. The guards were subjected to severe working tests before being applied extensively.

The Lake Shore & Michigan Southern is putting in electric detector locking on all its switches at the Polk street plant, Chicago. This is an all-electric interlocking plant made by the General Railway Signal Company. It is the entrance to the passenger terminal of the Lake Shore-Rock Island at La Salle street. There are 280 functions, controlled by 134 working levers in a 192-lever frame. There will be 43 track circuits, all fed from storage battery, controlling 39 locks on switch levers in the machine. All lock circuits are normally open and are closed by pressing down on a floor-push, there being one push for each lock.

A Signal Engineers' Excursion.

On Monday last the Union Switch & Signal Company entertained a party of about 60, mostly signal engineers of prominent railways, on an excursion from Cleveland, Ohio, to Sterling, to see its new style electric interlocking machine lately installed there. Illustrations of the machine are given on another page of this paper. A special train was run over the Baltimore & Ohio, and the first stop was at Akron, where there is a Union all-electric plant at the Union station, which is used by the Cleveland, Akron & Columbus, the Baltimore & Ohio and the Erie. This is a 46-lever plant and has been in service since February. It has alternating current indication. The stop there was to give the visitors an opportunity to compare this plant with the new one at Sterling. The Union company's offices entertained the party with breakfast at Cleveland, luncheon at Akron, and a dinner at the Hollenden in Cleveland in the evening.

Supply Trade News.

J. W. L. Kerr has been appointed agent in the Chicago territory for the Lawrenceville Bronze Co., Pittsburgh, Pa.

The Buckeye Jack Manufacturing Co., Louisville, Ohio, has been working full time and with a full force since November, 1908.

Henry Lang was elected a director of the Ingersoll-Rand Co., New York, at the recent annual meeting, succeeding Jasper R. Rand, deceased.

W. P. Stevens, who has been associated with the Chicago office of the Consolidated Car Heating Co., Albany, N. Y., for the past 18 months, has resigned.

The Chicago Steel Car Co., Chicago, has increased its capital stock from $50,000 to $250,000. It has also increased the number of directors from four to five.

J. P. Morgan, Jr., has been elected a director and a member of the finance committee of the United States Steel Corporation, succeeding the late H. H. Rogers.

The Railway Steel Products Co., Elyria, Ohio, has been incorporated with a capital stock of $100,000. The incorporators are C. D. Hine, L. A. Manchester, C. A. Manchester, Richard Garlick and J. A. Campbell.

The Allis-Chalmers Co., Milwaukee, Wis., has moved its Cincinnati, Ohio, office, in charge of F. C. Colwell, to 1603 First National Bank building, and its Cleveland, Ohio, office, W. B. Huskey, Manager, to 1407-9-11 Schofield building.

The Chicago office of the Buckeye Steel Castings Co., Columbus, O., will hereafter be in charge of C. B. Goodspeed, who is a director of the corporation. Mr. Goodspeed is a son of Major W. F. Goodspeed, deceased, founder of the company.

Peter Gray & Sons recently moved their office and factory to E. Cambridge, Mass., corner of Third and Binney streets. The main building has a basement and two upper stories, 117 ft. x 54 ft., with an ell 22 ft. x 34 ft., giving a total floor area of 22,000 sq. ft.

A meeting of all members of the Signal Appliance Association is to be held on June 8, at two o'clock, in the Engineering Societies building, 29 West 39th street, New York. This is the same day the Railway Signal Association holds its only meeting to be held in New York this year.

The Maxwell Concrete Steel Co., Detroit, Mich., announces that hereafter the Maxwell deformed bar for reinforcing concrete will be exclusively made and sold by the Q. & C. Company, West Street building, New York; Old Colony building, Chicago; Continental building, Baltimore, Md.; Penobscot building, Detroit, Mich.; and Land & Title building, Philadelphia, Pa.

R. C. Hallett has gone to the Estate of Edward R. Ladew, 82 Fulton street, New York, successor to Fayerweather & Ladew and J. B. Hoyt & Co., in connection with the sale of its leather beltings to railways. His headquarters will be at the main office. This concern has been a manufacturer of belts for 67 years. The plant is at Glen Cove, N. Y.

The Isthmian Canal Commission is asking bids up to June 14 on one 18-in. centrifugal pump and steam engine, one 20-h.p. section motor car, two gasolene motors, one 2-ton motor-driven trolley, one 2-ton electric hoist, one horizontal boring and drilling machine, one mortising and boring machine, and other machine tools, including a pneumatic riveter; also transformers, crucibles, steel cable and other supplies. (Circular No. 512.)

The several factories of the Westinghouse companies at East Pittsburg, Pa., and Wilmerding, and of the Union Switch & Signal Co. at Swissvale, Pa., have added to their forces within recent weeks, owing to increased orders. In the Electric works the railway department has been making good records. While the month's business of that department for April was the largest in the company's history, owing to some few exceptionally large orders for railway apparatus, it was not expected that the record could be maintained. However, these orders have kept on coming in during May. Among the interesting work of this character which is now being turned out in East Pittsburg are three locomotives for the Fort Dodge & Des Moines Southern. Two of these are to be used as freight locomotives and the other as an electric shifting engine. For the Honolulu Rapid Transit & Railway Co., Hawaii, thirty 60-h.p. railway motors are being made. The Havana Electric Railway Co., Havana, Cuba, has sent in an order for a complete sub-station and power-house equipment, consisting of two 1,000-h.p. turbo outfits, four 500-h.p. rotary converters, 18 transformers, as well as switchboard and auxiliary apparatus. The Wilkesbarre & Wyoming Valley Traction Co. is having forty-four 100-h.p. motors constructed for the equipment of some new cars which the company is adding to its rolling stock. An unusual number of orders for electric mining locomotives have been placed at the East Pittsburg works. Within the last month these orders have averaged more than one locomotive per day, coming from coal companies in Pennsylvania, Virginia and West Virginia, from iron mines in Minnesota, and from copper, silver and gold mines in the West. The rate of improvement which set in at the shops of the Westinghouse Machine Co. some months ago is still being maintained, and the business for the month of May shows an unusual demand for gas engines of large size.

The Youngstown Sheet & Tube Co., Youngstown, Ohio, has added to its 5,000 h.p. of Crocker-Wheeler motors by installing a 500-h.p. synchronous motor. This machine will operate on a 3-phase, 25-cycle circuit at the unusually high potential of 6,000 volts. It will be used to drive a centrifugal pump. The Indiana Steel Co., Gary, Ind., has ordered from the Crocker-Wheeler Co., Ampere, N. J., 21 form W motors, aggregating 655 h.p., for rolling mill service. These machines will be used to operate cranes on a 200-volt direct-current circuit.

TRADE PUBLICATIONS.

Hand Cars and Velocipedes.—The Buda Foundry & Manufacturing Co., Chicago, has issued Bulletin No. 131 on hand cars, push cars, velocipedes and new style Paulus track drill.

A. C. Generator.—The Crocker-Wheeler Co., Ampere, N. J., has just issued Bulletin No. 114, which supersedes Bulletin No. 77, illustrating and describing coupled type a.c. generators. This bulletin contains interesting and valuable engineering information.

Hydraulic Jacks.—The Joyce Cridland Co., Dayton, Ohio, has just issued Bulletin No. 33, which contains a good amount of information concerning the operation of hydraulic jacks. Special mention is also made of the new speeding device for quickly running up the jack to the load.

Jacks.—The Buckeye Jack Manufacturing Co., Louisville, Ohio, has issued a new catalogue on the different kinds of jacks which it makes. The last page has an illustration of a Buckeye automobile jack, which is rated at one ton capacity, lifting a load of 3,900 lbs., or nearly twice its rated capacity.

Leather Belting.—The Estate of Edward R. Ladew, New York, successor to Fayerweather & Ladew, and J. B. Hoyt & Co., has just issued a small catalogue in regard to Hoyt's short lap leather belting and sundries. This catalogue contains an amount of general information on belting, also a table of prices on belts running from ½ in. to 26 in. wide.

Temperature Regulator, Steam Coupler.—The Gold Car Heating & Lighting Co., New York. is mailing an illustrated circular descriptive of its new stop valve temperature regulator, which was illustrated and described in the *Railroad Age Gazette* of May 14; also a circular descriptive of its universal straight port steam coupler, with interchangeable gaskets and nipples, which was illustrated and described in the *Railroad Age Gazette* of May 21.

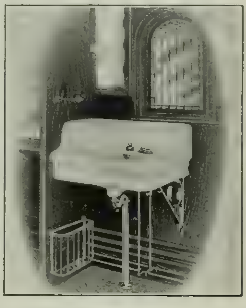
Freight Cars.—Those who are intending to purchase freight cars will do well to obtain a copy of the first edition catalogue just issued by the Middletown Car Works, Inc., Middletown, Pa. The catalogue is well bound in flexible leather, 13 in. x 10 in., and contains 185 pages, with illustrations, both half-tone and line cuts, showing the most representative

types of freight cars manufactured by this company. These illustrations show standard designs of the company, also those of purchasers, so that practically the entire field of freight car equipment is covered. Variations from any design may be arranged to suit special needs, for which the company will submit original drawings to meet unusual requirements. Some ten pages are devoted to freight car trucks, ranging from 15-ton to 50-ton. All of the illustrations are large, so that all details are well shown.

Watrous Vitreous Car Lavatories.

The Watrous Company, Chicago, has a new line of vitreous ware and white metal lavatories of special and attractive design for cars, two patterns of which are illustrated herewith. The New York Central and the Pennsylvania have recently put these lavatories on some private cars, for which they are especially adapted, although arranged in several different forms to meet all conditions and for all kinds of cars.

These lavatories are of extra heavy boxed in construction with



Watrous Car Lavatories.

heavy roll rim and integral back cast in one piece, and oval shaped bowl with projecting edge to prevent splashing of water on the floor while the car is in motion. Suitable fastenings are provided to hold the lavatory securely in position to prevent any possible loosening or breakage of the same.

They resemble in appearance high-class residence lavatories, but are designed to occupy as small a space as possible without sacrifice of efficiency. They are made to fit into a recess or corner; they are also made with a flat back, or with right or left-hand ends if desired. They require very little attention to keep them clean, as no scrubbing or polishing is necessary. The fixtures are of the Watrous type, in general use in Pullman cars, the faucets being the combination push-button type, arranged to supply hot and cold water, or a mixture if desired. Controlling valves are applied to both hot and cold water lines, to enable the water to be turned off when necessary. The waste from the bowl is controlled by a metal plug, operated by turning the waste knob to the right or left. It is simple, cannot get out of order, and dispenses with the old style rubber plug. These fixtures may be used equally well in cars having either air or gravity water pressure systems.

Galena-Signal Oil.

John G. Milburn, in concluding his argument at St. Louis, Mo., in the suit of the Government against the Standard Oil Co., spoke as follows regarding the Galena-Signal Oil Co., Franklin, Pa., one of the defendants:

"The Galena-Signal runs itself—that is, Gen. Charles Miller is its president, and has been since in the '70s. He runs that business. It is his business. It is his achievement. . . . General Miller has built up the business until he lubricates almost all the railways in the United States, including the Panama Railroad. And we have here—they got in on some Government vouchers—the certificates of military engineers that only Galena oil will serve their purpose. Seventy-five per cent. of the railways of South America, 29 per cent. of the street railways of the United States, and substantial portions of the railways in England, France, Germany, Italy and other countries of Europe, use the oil. That is what General Miller has accomplished. And he has done it by having the best article—by an invention—by a discovery—by a secret process with the use of oxide of lead which produces that article—something which nobody else can do—by having a corps of experts who go to trains and instruct the men in its use and who watch its application. He sells lubrication—not oil by the gallon. . . . No basis exists for any charge against the Standard Oil in the achievements of General Miller with his Galena-Signal company. He is entitled to the credit. . . ."

National Railway Devices Company.

Announcement is made of the formation of the National Railway Devices Co., with offices at 400 Old Colony building, Chicago. The officers are: President, Jay G. Robinson, formerly Manager of Sales, Latrobe Steel & Coupler Co., Philadelphia, Pa.; Secretary, Francis E. Hinckley; Treasurer, H. C. Adams, President of the Jones & Adams Co., and of the Springfield Colliery Co. J. W. Luttrell, who was formerly Superintendent of the Locomotive and Car Department of the Missouri Pacific, will have charge of the mechanical work in connection with the devices of the company, and will join in the sales work. The devices include the Schroyer uncoupling apparatus, the Shoemaker pneumatic firebox door operator, the Dohlin automatic freight car door fastener, and the Turnbull driving wheel flange lubricator.

The uncoupling apparatus, which was designed by C. A. Schroyer, Superintendent of Car Department of the Chicago & North Western, was described and illustrated in the *Railroad Age Gazette,* June 12, 1908, page 88. It works with any of the present types of couplers, and does away with lifting attachments, thus avoiding the imposition of fines by the Interstate Commerce Commission due to faulty lifting attachments.

The Shoemaker fire-door operator opens and closes the door of the locomotive firebox by means of a single cylinder fitted with a differential piston, there being no springs to perform any part of the operation. The door is opened and closed in a uniform length of time, regardless of the air pressure, and there is no slamming of the door.

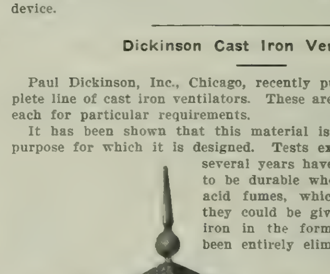
With the Dohlin freight car door fastener the door fastens automatically. There is therefore no need of dependence on employees to insert a pin, as with the staple and hasp fastening, an operation so much neglected. The device is made of malleable iron and can be sealed readily.

The Turnbull driving wheel flange lubricator is so designed as not to allow the lubricant to spread over the tread of the wheel and cause slipping. It is understood to have been tested by one of the large roads with entirely satisfactory results. It is quite simple, being attached to the frame of the locomotive above the driver, and adjusted to bring the lubricant, which is of a hard consistency, in contact with the flange with a uniform pressure. It is claimed that one road, in a year's trial of the device on a locomotive, reduced driver flange-wear 90 per cent. The present year's experiments included trial on an engine through snow and ice, the most severe test for such a device.

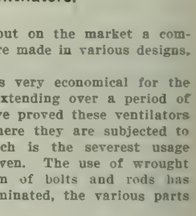
Dickinson Cast Iron Ventilators.

Paul Dickinson, Inc., Chicago, recently put on the market a complete line of cast iron ventilators. These are made in various designs, each for particular requirements.

It has been shown that this material is very economical for the purpose for which it is designed. Tests extending over a period of several years have proved these ventilators to be durable where they are subjected to acid fumes, which is the severest usage they could be given. The use of wrought iron in the form of bolts and rods has been entirely eliminated, the various parts



Square Ventilator.



Round Ventilator.

being supported by cast iron braces. By this method the life of the ventilators is not limited to the life of the rods and wrought iron bolts.

The ventilators are made either round or square shaped, as shown in the accompanying illustrations, and range in size from 9 in. to 48 in. The Dickinson idea of the adjustable roof connection, as used in its cast iron chimneys, is carried out in one type of these ventilators. Detailed drawings of the standard ventilators or any special requirements will be furnished. The offices of the company are in the Security building.

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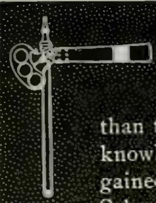

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CONTENTS

The report on the Chicago track elevation work which is printed on another page is taken from a volume prepared by the track elevation department of the city. It is of especial value and interest, since it is the first thorough report of this character to be prepared concerning this great work. The reader will be impressed with the fairness shown, and the credit given the railways for their willing co-operation and their promptness in executing the work, once the preliminaries were satisfactorily settled. The figures on cost are impressive, and the table giving the decreases in grade crossing accidents is, as the report states, the most eloquent argument possible for track elevation in cities. Other cities have had and are having track elevation done, but the Chicago situation is unique both as to conditions and magnitude. No other place in the world has such a complicated track and terminal system, or so many streets with heavy traffic crossed by railway lines. Information for guidance in almost any situation which may arise may be got from the methods used in solving the Chicago track elevation problems.

The New York Public Service Commission, Second District, last January ordered all steam railways to report the number of rails broken in service within the state. Figures have also been gathered covering December, 1907, and January, February and March, 1908, for comparison. The reports for the months of December, 1908, and January, February and March, 1909, show a total of 1,829 rail failures, as compared with 3,917 during the corresponding months of a year ago. The reports are complete, with unimportant exceptions. Figures for some of the larger roads are as follows:

	1907-8.	1908-9.
Erie	473	202
B., R. & P.	206	102
D. & H.	500	162
D., L. & W.	144	96
Lake Shore	354	93
N. Y. C. & H. R.	1,601	537
N. Y., O. & W.	80	49
Pennsylvania (not including Northern Central)	228	139

Of the 54 steam roads from which reports were received, only 32 report any rail failures. Of the failures during the past winter only four caused accidents, all of them being to freight trains. Only 75 failures of open hearth rails are reported. This striking reduction in rail failures does not add to our information as to the quality of rails furnished in 1908 as compared with those laid in 1907. Only a detailed analysis of the individual reports would show this. The totals, of course, simply reflect the mild winter of 1908-9. In the southern part of the state there was only about nine inches of frost in the ground. To a certain extent track has been kept in better shape, not because maintenance of way forces have been larger, but because better men were employed. The stopping of new construction made available during the last year so much high class railway labor that it has been possible to get picked men for track work. At present there are several thousand good track workmen looking for railway employment near New York city.

The consular service of the United States long has been a source of much more expense and discredit than of benefit to the country. While it contains competent men here and there, it is composed mainly of persons who secured their places through no special fitness but through rendering political services of one kind or another to members of Congress. The railways are directly and indirectly as much interested as any other industry in everything that tends to promote the country's business welfare; whatever increases commercial prosperity increases railway traffic. Therefore, railway men will be interested in plans that have been formulated and efforts that are being made by the Industrial Club of Chicago, of which Mason B. Starring, President of the Northwestern Elevated Railroad, is President, for legislation to improve the consular service. The Industrial Club has got bills introduced in Congress for the establishment of a National Consular School and for placing appointments to the consular service on a civil service basis. The proposed school would be maintained by the Government, and would give special instruction and training for consular work. In order to open the door of opportunity to young men regardless of their financial resources, each student would be allowed $300 per year by the government, and to repay the government for his education the graduate would remain in the consular service at least ten years after receiving his appointment, or be subject to call for service for five years after graduation. "For war," says Mr. Starring in an article in the May *World's Events*, "we train soldiers at West Point and sailors at Annapolis, and what those sailors can do was recently emphasized in the minds of not our countrymen alone, but of all nations, when our fleet made its trip around the world. Why, therefore, should we not train our soldiers of commerce for the warfare of trade, in a governmental school established especially for that purpose?" That the consular service would be improved greatly by the adoption of some such plan as that advocated by the Industrial Club of Chicago there can be no question. But there is also no question that no such plan will ever be accepted by the public men who have been used to peddling consular appointments as part of their patronage until it is forced on them by the overwhelming

pressure of a public sentiment that has been thoroughly educated as to the needs of our foreign commerce.

The strike of the firemen on the Georgia railroad was officially declared off at 2 p. m. on Saturday, May 29, after a total suspension of traffic throughout the company lines for nearly a week and almost complete paralysis for nearly two weeks. The terms of the settlement were unofficially given out, as follows: The men to return to work under conditions existing at the time the strike began, until final adjustment is made; all negro firemen at the terminal stations to be dispensed with; all discharged brotherhood firemen to be reinstated.

Three other points were left to be decided later: First, whether negro firemen shall be eliminated from the road; second, if not eliminated, what percentage of negroes there shall be; third, seniority of negro firemen over white firemen. Both Knapp and Neill, Federal arbitration commissioners, went to Georgia, and it seems to be the general understanding that their intimation of President Taft's purpose to enforce obedience to law. with a view to free passage for mail trains, was an important element which led to a speedy compromise after the arrival of Judge Knapp. The reporters concluded that the railway company had agreed to recognize the seniority of white firemen, but with the proviso that the employment of certain negro firemen who have been with the road many years should be continued. On Monday, however, the questions left unsettled Saturday still remained unsettled, and it was agreed to appoint arbitrators. The difficulty of this situation is peculiar, even if the race controversy were far less troublesome than it is, for the relations of the parties were anomalous to start with. A railway needs a large force of firemen in training, out of which to make its engineers; yet the southern roads deliberately sacrifice this advantage, to a greater or less extent, apparently because negroes can be hired cheaper. Negroes are not promoted to be runners. The reason for refusing them promotion evidently is wholly social. If we call it racial, we may have to admit that there is a race question in the North as well as in the South; for, as one of the strike leaders observed, "the Georgia Railroad is asked to employ white firemen exclusively, as is done in the North." Again the difficulty of the situation is enhanced by the fact that the displacement of the negroes involves violation of the fundamental economic principle that negroes shall have "equal rights" as regards work. In the words of a level-headed southern leader of public opinion: "The South has always declared that it gave the negro a square deal industrially. To oust negroes from positions which they are filling efficiently and without personal friction is to repudiate this wise policy and to start a program the logical result of which is the continuing multiplication of the idle negro." It looks as though these arbitrators ought to require the Georgia Railroad to provide a permanent field of labor for the men that it turns off from its engines—though the railway manager can, of course, reply that it is not he, but his intolerant neighbors who are responsible for the trouble.

The Pennsylvania Railroad has issued a circular to the newspapers defining its attitude toward them in giving out information about accidents. News-gatherers must apply to the general office or to other division superintendents. Miscellaneous employees know only certain features of the situation, and not until all information is assembled by a central authority can it be given out properly. As to the number and names of persons injured the newspapers may be assured that the company will make them public freely and fully, but "there are many phases of accidents, especially regarding their causes, the facts of which cannot be ascertained even by the railway company until after considerable investigation and inquiry. The company will, however, give prompt publicity to all known facts." We hold no brief for the daily newspapers, and for ourselves we are content to feed on conjecture when facts cannot be had; but the Pennsylvania officers need not flatter themselves that this will be satisfactory either to the reporter or to his employer—and we mean, now, the same reporter, not the sensation monger, the modern reporter, deals largely in matters of "human interest," and there is no use in trying to postpone discussion of causes till everything is positively known. Take, for example, a derailment at a facing point switch. The question whether the trouble was due to a sharp flange on the wheel or to a loose switch point would, in many cases, never be settled if the two different departments had their way. When an engineman mismanages the air-brakes the popular explanation is "failure of air-brakes" (*i. e.*, air-brake apparatus). Of course, the company does not want to come out and blame the runner without a hearing; but that does not warrant complete silence on the subject. The passengers are bound to guess and gossip, and the company might just as well put in a few words to clarify their guessing. In a bad derailment broken axles, bent axles, broken rails and spread rails may be all charged with being the primary cause, with little evidence as to either; but this much, padded, perhaps, with a paragraph or two about the details, would make a much better ending to the newspaper account than the ambitious efforts of the reporters usually furnish. As to the facts for which a railway company may really have strong reasons for wishing to keep from the public as long as possible we have the testimony of the Union Pacific that the excessive caution of the legal department is useless. Officers of that road have given the public free access to the investigators' hearings and have not injured their interests thereby. Even the manager, who actually is ashamed—because of poor track, loose discipline, or insufficient inspection—is not likely to be any the worse off for making a reasonably frank statement, for where these defects are readily discoverable the reporters will herald them, in spite of efforts at prevention, while if the questions at issue are obscure, or if there are facts which explain or excuse, the manager can hope for a satisfactory verdict only after he gets some unbiased critic to take up the case. Every well-meaning railway officer should favor impartial and intelligent governmental investigation of accidents.

THE CINCINNATI, HAMILTON & DAYTON TAKEN OVER BY THE BALTIMORE & OHIO.

Some of the mutual advantages, from a traffic standpoint, to be gained by the taking over of the Cincinnati, Hamilton & Dayton by the Baltimore & Ohio were pointed out in these columns in the issue of May 7. The plan, as approved by the directors of the Baltimore & Ohio and by the bond and noteholders' protective committees of the Cincinnati, Hamilton & Dayton, is given in another column of this issue.

This is apparently the final chapter in that book of rather exciting financial adventures, of which the formation of the so-called Great Central system in the latter part of 1904 was the first chapter. In July, 1904, the C., H. & D. bought $11,000,000 common stock of the Pere Marquette, and afterward bought jointly with the Pere Marquette the entire outstanding capital stock of the Chicago, Cincinnati & Louisville. In January, 1905, the C., H. & D. leased for 99 years the property of the C., C. & L., and in March it leased the property of the Pere Marquette for 999 years, assuming all obligations of the Pere Marquette and agreeing to pay as annual rental dividends of 4 per cent. on the $12,000,000 preferred stock and 5 per cent. on the $16,000,000 common stock of the Pere Marquette.

The obligations assumed by the C., H. & D. soon proved burdensome, and before the end of 1905 a floating debt of more than $6,000,000 had been accumulated. In the meantime a syndicate formed by H. B. Hollins & Co. had sold to the Erie, through J. P. Morgan & Co., $5,000,000 common stock of the C., H. & D., the total outstanding common stock amounting to

about $8,000,000. After the Erie had arranged to sell $12,000,000 convertible bonds to finance the purchase, among other things, of this control of the C., H. & D., it was found that the burdens assumed by the C., H. & D. were such that it would interfere with the development of the Erie's own property to carry out the purchase. J. P. Morgan, therefore, took over from the Erie this C., H. & D. stock at a price in the neighborhood of 160, and the Erie proceeded with the sale of its convertible bonds, but used the proceeds for improvement and extension of its road. On December 4, 1905, the Cincinnati, Hamilton & Dayton was placed in the hands of a receiver, and protective committees were formed representing the security holders. The receivership extended to the Pere Marquette and the Chicago, Cincinnati & Louisville, and on December 20 the board of directors of the C., H. & D. rescinded the lease of the Pere Marquette and all agreements and obligations relating to the C., C. & L., and later the receiver of the C., H. & D., under instructions from the court, refused to assume these obligations. Since that time various efforts have been made both by the security holders' protective committees and by J. P. Morgan & Co. to reorganize the affairs of the Cincinnati, Hamilton & Dayton.

The present plan apparently accomplishes the two objects which all of the interests that had to do with the reorganization agreed were essential. It gives the C., H. & D. credit, enabling it to pay off its floating debt and acquire working capital, and it rids the C., H. & D. of its burdensome obligations assumed in connection with the Pere Marquette and the C., C. & L. This has been accomplished without the disturbance of a very heavy capitalization and without radical wiping out of any class of bonds or stock. The now rather unusual device of issuing income bonds is resorted to, however, and the readiness of the 4½ per cent. note holders to exchange their securities for these bonds will depend largely on the hopes that they may have of the advantages of a new management and a working agreement with the B. & O.

THE LOW CURVE OF RAILWAY FORECLOSURES.

In an editorial article not long ago (January 8, 1909) under the title of "The High Curves of Railway Receiverships" we pointed out some of the striking features of past epochs of business depression and their natural and logical product in many railway receiverships. Incidentally we also called attention to the fact that the $596,350,000 of railway stocks and bonds involved in the receiverships of 1908 contrasted very favorably with the $467,000,000 of 1876, when the railway interests of the country were relatively small, and with the $714,755,000 of the year 1884 and the crest of the upward curve of $1,781,046,000 in 1893. Certain figures for railway foreclosures are not only very striking in themselves but become more so in contrast with the receiverships. The singularly quick descent of the foreclosure curve is indicated if we take three consecutive quadrennial periods of the immediate past in the tables annexed:

First Period.

	No. of roads.	Mileage.	Total Stock & funded debt.
1905	6	679	$20,307,000
1906	8	262	10,400,000
1907	6	114	13,777,000
1908	3	138	2,547,000
Total	23	1,193	$47,031,000

Second Period.

	No. of roads.	Mileage.	Total stock and bonds.
1901	17	1,139	$85,808,000
1902	20	693	39,788,000
1903	13	555	15,885,000
1904	13	524	28,266,000
Total	63	2,911	$169,747,000

Third Period.

	No. of roads.	Mileage.	Total stock and bonds.
1897	42	6,675	$517,680,000
1898	47	6,054	252,910,000
1899	32	4,294	267,534,000
1900	24	3,477	190,374,000
Total	145	20,500	$1,228,498,000

The swift decrease of foreclosures is obvious at a glance but the most impressive thing of all appears in the first period running back for the last four years. The railway receiverships of that time are depicted as follows:

	No. of roads.	Mileage.	Total stock and bonds.
1905	10	3,593	$176,321,000
1906	6	204	55,042,000
1907	7	317	13,585,000
1908	24	8,009	596,659,000
Total	47	12,123	$841,607,000

Thus in the last quadrennial period only about half the number of receivership lines, a tenth of their mileage and less than one-seventeenth of their stock and bond par values reached the foreclosure stage. In 1908, the low ebb year following panic, there were but three lines with 138 miles and $2,547,000 fell under foreclosure, corresponding returns for the receiverships being 24,809 and $596,659,000, the ratio of foreclosure to receivership being thus absolutely trivial. Contrast such a showing with the $190,374,000 of foreclosures and $78,234,000 of receiverships in 1900; or the $1,150,377,000 of foreclosures and $275,597,000 or receiverships in 1896 or the $311,631,000 of foreclosures and $92,385,000 receiverships of 1878. Of course there are bound to be some modifying facts in any such landscape and sweeping view backward. Foreclosures may come after a painful struggle of a receiver to set a railway on its feet, that effort extending over a year or series of years; and both receiverships and foreclosures on big railway systems in particular years affect the comparisons. Still, with all due allowance for accidental factors, it seems very obvious that in this country the ratio of railway foreclosure to receivership tends rapidly downward. Fewer and fewer railway receiverships are being forced to the point of snuffing out values and interests by foreclosure and reorganization which was so characteristic and painful a symptom of the "long drag" that followed for several years the panic of 1873.

The causes also are manifest enough and hardly need the testimony of the returns except to emphasize them. Capital is nowadays highly organized, concentered, mobile and self-protective. The receivership, while it certifies financial trouble and depresses the securities of the railway affected, at the same time tends to shield all interests; the foreclosure, on the other hand, seeks to extinguish them or some of them. Organized capital, with its investment imperilled, will sometimes resist a receivership, sometimes seek it as a cover; but the foreclosure, that spells the complete sacrifice of interests, organized capital will resist to the last extremity. In such resistance it will prolong receiverships, appeal to the courts, in the final emergency levy assessments on itself. But there are underlying influences also, partly resting on precedent and experience, partly on the psychology of railway investment. Under the one head may be cited the wonderful example of the Union Pacific, under receivership and later assessment on its stock only a few years ago, now paying its 10 per cent. dividend and its shares risen manifold. And, under the other head of what may be called investment "mentality" is that abiding confidence in railways as *properties* which has so persisted through the last 20 months of stress and strain when legislation has joined hard times in the anti-railway attack.

The low curve of the railway foreclosures which, if so marked in hard times, seems sure to continue into better times has another more specific and limited suggestion. If it indexes protection of the junior railway security—although now and then at some risk—much more does it index protection of the senior security. The holder of railway stock or of the railway note may betimes feel a bit chilly, though far less so than he used to feel two or three decades ago. Not so the holder of the railway mortgage. He need not have deep insight to perceive that under the "protective" conditions indicated and measured by the foreclosure returns there has grown up a genuine equity that safeguards his investment. That equity is not less real because it may depend

on extraneous financial conditions and on sentiment rather than on traffic returns and capitalization. The conservative railway investor sees that equity and knows its safety values. And it is no small vantage if the railway corporation itself, when it comes to refunding old mortgage or placing new ones, finds such an investor to "digest" the new senior security.

Letters to the Editor.

THE ADVANTAGES OF MODERATE SUPERHEAT.

Paris, May 25, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Since writing you on April 30 I have seen the second part of Mr. Vaughan's letter regarding the Advantages of Moderate Superheat. I shall be obliged for the opportunity of replying to the questions raised. I now see that Mr. Vaughan does not accept the estimated engine economy for the low superheat, and my first letter must therefore be modified slightly. It still remains true that Mr. Vaughan's method of determining the boiler efficiency of the high superheat gives lower results than I found and therefore entirely fails to justify Mr. Vaughan's criticisms. In discussing the engine economy Mr. Vaughan says that he does not know of any tests which show a saving of 12 per cent. by the use of low superheat. I am reminded of the lawyer who tried to defend his client from the testimony of a witness who had "seen him do it," by the testimony of two others who *hadn't.* Apart from the results obtained in practice with the Vauclain superheater, I may quote from Professor Perry's book, "The Steam Engine and Gas and Oil Engine," page 376, "Every test yet made of the effect of superheating shows that it leads to greatly increased economy. From 12 to 20 per cent. increase is not uncommon when the superheat has only been about 40 to 100 degrees Fahrenheit." As to the 3 per cent. deduced from Ripper's tests, it seems dangerous to work from a single series of tests without making any allowance for the difference of steam pressure and the variation in cylinder proportions. One might equally well deduce from Ripper that with a steam temperature of 400 degrees Fahrenheit, a horse power hour can be developed from 19500 B.T.U., while I allowed 24800. An examination of the figures given by Mr. Garbe in his recent book, "Die Dampflokomotiven der Gegenwart," page 223, and of those given by Mr. Toltz on page 1078 of the Transaction of the American Society of Mechanical Engineers for 1907, indicates that while the economy to be obtained increases with the superheat, yet the rate of increase of the economy is not in direct proportion to that of the superheat. This seems to be in accordance with commonsense. There is a limit to the gain in efficiency to be obtained by superheating, and as this limit is approached it becomes increasingly difficult to increase the efficiency. It is therefore to be expected, and the figures I have referred to above confirm the expectation, that equal increments of superheat will give a greater economy at low than at high temperatures. I pointed out that a considerable part of the gain in economy is probably due to the steam being dried before it reaches the cylinders, and to this Mr. Vaughan replies that it involves "a radically new theory of cylinder condensation." I thought that it was universally recognized that wet steam was one of the most potent factors in producing cylinder condensation, and it is surely immaterial how the water gets into the cylinders. *The Engineer* (London) on page 669 of the year 1908 says, "Although writers on the theory of the "steam engine seldom agree with each other, on one point they are united, namely, that water in the cylinder is highly mischievous, precisely how no one can prove." Perry on page 375 of his book quoted above says, "It is my belief, based on a good deal of practical knowledge of conductivity of heat, that if the metal of a cylinder were quite dry when fresh steam were admitted, the surface resistance to the passage of heat would be so great that almost no evil effects would be produced at the speeds usual in steam engines." Professor L. Marchis, of the University of Bordeaux, in his book, "Vapeur d'Eau Surchauffée," published this year, says on page 643, "If wet steam is in contact with metal which is covered with a film of water, even although the film be extremely thin, the steam and the metal will tend to take the same temperature very rapidly. On the other hand, if perfectly dry steam is in contact with metal of which the surface is also perfectly dry the exchange of temperature will be very slight and the two mediums may remain at different temperatures." It seems hardly necessary to explain that in the steam passages the entrained moisture will have no condensing effect for the walls have the same temperature as the steam, but on entering the cylinders which have been cooled by the exhaust, the moisture facilitates the conduction of heat throughout the body of the steam and from the steam to the cylinder walls, and thus has a strong condensing effect.

LAWFORD H. FRY.

Contributed Papers.

ENGLISH RAILWAYS.

BY WILLIAM WICKHAM TURLAY.

V.

FREIGHT SERVICE.

The freight cars used in England are usually small and light, carried on only four wheels, though some larger cars of the American type have been introduced for hauling coal and ore. The ordinary freight cars are designed to carry only eight or ten tons, and the majority of them are open, the load being protected from the weather, if necessary, by tarpaulins. These small cars can easily be moved by hand, and by means of turntables they may be taken into parts of docks and warehouses which would be inaccessible for the large and heavy American cars.

In comparing American and English freight rates, one must remember the different conditions prevailing in the two countries. The freight traffic in England is relatively smaller, and comprises mainly small shipments for short distances, instead of the large shipments for long distances which form so large a part of the traffic of American lines, and for which such low rates are possible. This accounts for the smaller cars and the higher rates common in England.

The most important things we can learn from the freight service in England are prompt despatch and delivery. Small lots of freight are collected by the railway companies' own wagons in the larger cities and towns, either from their branch offices or from the shippers' warehouses, taken to the station, forwarded, and delivered during the forenoon of the following day to the consignees by the railway company's wagons. For instance, a wholesale merchant in London can in this way have a case of dry-goods taken from his warehouse in the afternoon and count on its being delivered to his customer, a retail dealer in Manchester, the following morning, the distance being 183½ miles, at the following rates, which include cartage at both ends of the route:

112 lbs.	3 shillings .. =	$0.72	336 lbs.	7s. 6d....... =	$1.80
168 "	4s. 1d ...... =	.98	All over	40s. .... =	9.60
224 "	5s. 3d....... =	1.26			

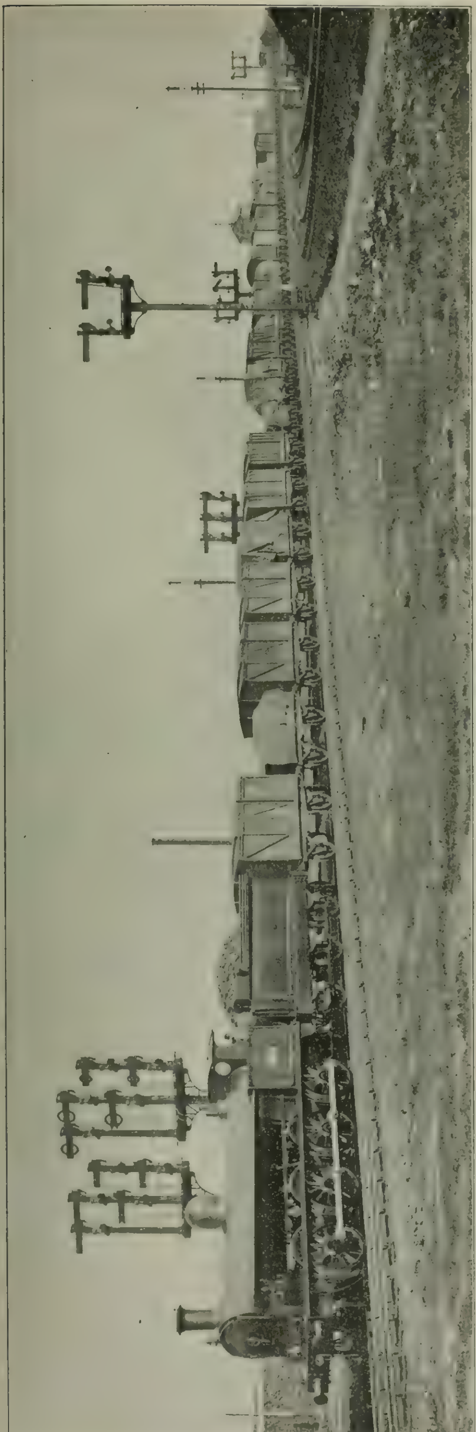
per ton of 2,240 lbs., or at the rate of a little less than 43 cents per 100 lbs.

If the goods are to go to a seaport for exportation, lower rates are charged, for instance, from London to Liverpool, a distance of 201 miles, they would then be as follows, for the same class of goods:

112 lbs.	2s. 4d....... =	$0.56	336 lbs.	5s. 10d...... =	$1.40
168 "	3s. 3d....... =	.78	All over	35s.......... =	8.40
224 "	4s. 1d....... =	.98			

per ton of 2,240 lbs., or at the rate of 37½ cents per 100 lbs.

The practice of giving preferential rates for imported and exported goods causes much complaint on the part of those



Typical English Goods Train. Note Open Cars with Tarpaulin Covers.

who are thus discriminated against. English market gardeners, for example, claim that fruit and vegetables are carried from France and Belgium to London by sea and rail at through rates which are less than the English gardener has to pay from his station less than 100 miles from London. A disposition to alter the natural course of trade and commerce, for the purpose of increasing their long distance traffic, seems to be common to the rate-making officers of all transportation companies, when they are not restrained by some higher power, as evidence of such action may be found in Continental Europe, as well as in Great Britain and America.

When freight is loaded into cars, or delivered at stations by shippers, and removed at destination by the consignees, the English rates are naturally lower than when the handling and cartage are done by the railway company's men and teams. This is shown by the following comparison of rates on steel sheets, in lots of two gross tons and upwards, between London and Manchester, a distance of 183½ miles:

Cartage, etc., done by R.R. Co.—30s. 6d (= $7.32) per ton of 2,240 lbs. = $32\frac{7}{10}$ cents per 100 lbs.
Cartage, etc., done by shipper and consignee.—19s. 5d. (= $4.66) per ton of 2,240 lbs. = $20\frac{8}{10}$ cents per 100 lbs.

It will be noticed that all of the freight rates mentioned are for hundred-weights of 112 lbs. or gross tons of 2,240 lbs., instead of per hundred-weight of 100 lbs. or net ton of 2,000 lbs., as is customary in America.

The English railways also carry packages on their passenger trains, at rates which vary according to weight and distance, and which include collection at place of shipment, and delivery at destination. A few specimens of such rates are given below, American money equivalents being used for convenience sake.

Weight lbs.	Up to 30 miles cents	30 to 50 miles cents	50 to 100 miles cents	100 to 200 miles cents	Above 200 miles cents
1 to 2	8	8	8	8	8
5	12	12	14	14	14
10	12	16	24	24	24
15	12	18	28	38	40
20	12	22	32	44	54
24	12	24	36	48	60
*24	½	1	1½	2	2½

*In excess of.

If desired by passengers or shippers, insurance is written by the railway companies at certain advertised rates, covering loss or damage while in transit, of either baggage or freight, of such a nature or amount as the companies would otherwise not be legally responsible for.

The Post Office Department carries packages weighing up to 11 lbs. between any two places in Great Britain or Ireland at uniform rates, which include delivery at destination by carrier, as follows:

Up to 1 lb	Total charge,	3 pence	= 6 cents
1 " 2 "	" "	4 "	= 8 "
2 " 3 "	" "	5 "	= 10 "
3 " 5 "	" "	6 "	= 12 "
5 " 7 "	" "	7 "	= 14 "
7 " 8 "	" "	8 "	= 16 "
8 " 9 "	" "	9 "	= 18 "
9 " 10 "	" "	10 "	= 20 "
10 " 11 "	" "	11 "	= 22 "

This government parcels post and the fast service of the railway companies, by freight and passenger trains, provide for all such shipments as are carried in America by the express companies, and while there are some firms in Great Britain which do a general cartage and forwarding business, they have no exclusive rights on any railway.

One of the advantages which result from the fast service given by the railways is that perishable provisions, such as meat, fish, fruit and vegetables, can be very quickly and generally distributed to all parts of the country, not only to dealers, but in small quantities direct to the consumers themselves. For instance, a family anywhere on the line of a railway may arrange with a dealer in one of the great fishing ports, like Grimsby, to have delivered to it once or oftener in each week, a basket of assorted fish, such as are in season, at a fixed price, according to quantity desired, and these fish are delivered from jetty and in good condition at the purchaser's residence either by the railway or the parcels post,

the empty baskets being returned to the shipper by the railway company or by the post. A 6-lb. basket of fish costs 8 cents per pound, including all charges, and large lots are cheaper. The advantages of such a service are especially appreciated by those who live in the country, and do much to make rural life enjoyable.

ORGANIZATION AND DISCIPLINE.

While the mileage of English railways is usually much smaller than of American, it is not so much so as might be expected, because the mileage of tracks is larger there than here in proportion to the area of the country. There is a chairman and a board of directors at the head of each company, while the executive head is the general manager, who has under him a "superintendent of the line," in charge of operation; a "mechanical superintendent," in charge of locomotives, cars, etc.; a "traffic manager," district superintendents, and the usual minor officials. The titles of president and vice-president are not used.

The number of men per mile of track employed on English railways is much greater than in America, because of the density of the traffic, and especially of passenger traffic, but no place on the lines of any company is more than a few hundred miles from headquarters, and the English railway officer is able to keep in closer personal touch with his men than the American railway officer whose duties correspond with his, whatever his title may be. The great extent of some of the American railway "systems," or combinations of lines, although useful in handling long distance traffic, and convenient for the financier, does not always promote good discipline or efficiency in management, because the officers who come in personal contact with the subordinate employees, and with the public, are too far removed in many cases, both officially and by actual distance, from the chief executive officer, and are given little discretion regarding important matters. They are compelled often to employ inexperienced men, who may not even be familiar with the language and customs of the country. There are other reasons why the question of discipline presents fewer difficulties in England than in America. The employees speak English as their native tongue, and are familiar with the customs of the country. Old-age pensions (now beginning to be introduced in America) are generally given to retired employees, thus putting a premium on long and faithful service, while 20,000 of the employees have served in the army and have had the benefit of military training and discipline. There is also usually a surplus of men looking for employment, and a larger field for selection of applicants. The results of all this are apparent in various ways, even to the casual traveler.

GOVERNMENTAL CONTROL.

English railways are under the general supervision of the Board of Trade, a department of the British government whose duties with regard to railways are somewhat similar to those of our Interstate Commerce Commission, now a part of the Department of Commerce and Labor. It employs experts who investigate accidents and complaints, and while its recommendations are not mandatory, they are quite universally complied with.

No English railway company is allowed to issue new stock or bonds, or even to change the proportionate amounts of outstanding stock and bonds without the consent of the Government. This wise provision, which protects the stockholders and bondholders from depreciation in the value of their investments and the general public from overcharges in rates to pay dividends and interest on "watered" stock and bonds, is one which President Roosevelt has urged on Congress to adopt, and it is unfortunate that some of our financiers have seen fit to oppose him in a course which would accomplish so much for the protection of all honest people and enhance the credit of our securities both at home and abroad.*

The consent of the Government must also be obtained before any new railway lines can be built in England, either by an existing company or by a new one. This further protects the investors and the general public from loss and expense caused by the building of needless lines from motives which are not for the general good.

PUBLIC VERSUS PRIVATE OWNERSHIP.

While the street railways on the Continent are quite generally owned by private corporations, the steam or long distance railways are almost always owned and operated by the various states or countries, the only important exception being France, while even there the Government already owns some of the lines and will probably soon acquire the others under an option which it holds. In England these conditions are almost exactly reversed. The street railways are almost always owned and operated by the municipalities, which also frequently own the water, gas and electric light plants, while the general Government through the post-office department owns the telegraph lines and many of the telephone lines. This has all come to be accepted quite as a matter of course, such opposition as there is being manifested chiefly in newspapers which are the organs of financial interests which do not like to have such profitable fields closed to their activities. The steam, or long distance railways, throughout the whole of Great Britain and Ireland, and the underground railways in the London district are, on the other hand, all owned by private corporations and will probably continue to be, as the interests of the public are protected by the Governmental supervision already referred to. The Socialist party in Great Britain, which is strong only among the poorer residents of the large cities, naturally advocates public ownership of the public utilities and cites in particular the result of public ownership of railways in Prussia, where the state railways during the last fiscal year after paying interest to the amount of $73,250,000 on the bonds issued for their purchase, besides paying all operating expenses, earned a profit of $57,000,000, which was turned over to the public treasury and, of course, reduced to that extent the amount to be raised by taxation.*

GENERAL CONCLUSIONS.

It must not be imagined that the conditions of railway operation in England are ideal. Shippers demand lower rates, travelers want still more and faster trains, and shareholders want larger dividends, while the employees through their organizations ask for shorter hours and larger pay. These conflicting interests have to be reckoned with by railroad managers everywhere. We have seen that the English railways have had a much longer experience than ours in dealing with the problems incident to a thickly settled country. We can perhaps learn more from them than from the railways of Continental Europe because the English roads, like our own, are owned and operated by private corporations and because the manners and customs of the English people are also more nearly like our own.

The American public will be quite justified in demanding a number of improvements in the service furnished by our railways. Some of these improvements can be and should be made at once, while others, involving changes in construction of locomotives and cars, can only be made by degrees without unreasonable expense. All of them are practicable and would probably be profitable as well. Those we would propose are as follows:

Corridor compartment cars combining all the advantages of the ordinary American passenger cars with those of the old style European cars without the disadvantages of either.

Platforms at stations to be built on a level with floors of

*We do not think that any effective protection has been given the investor by this supervision in Great Britain. Intelligent supervision of new capital issues is pretty well beyond the powers of a government office, even in a small and compact country like England. We believe that the British regulations have greatly promoted the safety of travel (although at a cost which would have forbidden much of the railway development in this country), but we have seen no evidence that they have benefited the investor or encouraged new enterprise.—Editor.

*Possibly—it depends upon the accounts.—Editor.

cars, doing away with car steps. This has already been done on our elevated and underground lines in cities and will involve also:

Foot-bridges over or subways under tracks to enable passengers to cross in safety from one side of the station to the other.

Side doors in cars in addition to those in the vestibule to facilitate access to and from cars, prevent crowding and reduce length of stops.

Improvement in arrangement of berths in sleeping cars. A beginning can at least be made by providing berths for women and children in compartments or state-rooms without extra charge.

Diminution of needless noise and smoke. Bell-ringing and whistling cannot be entirely done away with while grade crossings remain unprotected, but black smoke represents wasted fuel and can be reduced.

Increased joint through service of ordinary cars by shortest available routes. This great convenience involves co-operation by competing lines in some cases and may then be difficult to obtain except by means of Government control.

Promptness and reliability in the movement of freight. Our freight service, especially for small shipments, is disgracefully slow and uncertain and shippers are compelled to pay the rates charged by the express companies when prompt delivery is desired. There is no good reason why freight shipments should not be exchanged within a radius of 200 or 300 miles between the afternoon of one day and the forenoon of the following one. If a slight advance in rates was found necessary there is little doubt that merchants would be willing to pay it if assured of a fast and reliable service.

The reader may naturally ask why greater safety is not also insisted on. It is quite true that the percentages of accidents to passengers, employees and trespassers on American railways are appallingly high in comparison with those shown in European statistics. This is due to a great number of causes. The operating officers of our railways have long been working hard to raise the standard of discipline among the employees—a matter of the highest importance as regards safety—and have made good progress in this direction, but there remain many other causes of accidents, some of which are wholly or partially beyond their control, such as inferior track and rolling stock, lack of proper signal apparatus, violent storms, innumerable grade crossings of railways and highways, the migrations of a horde of tramps, and, most important of all, perhaps, the hurry and recklessness—not to say lawlessness—unfortunately so common among our people. Many of these sources of accident are incident to a comparatively new country and their evil results will only become less numerous by slow degrees.

AMERICAN RAILWAY ASSOCIATION.

The revised articles of organization adopted by the American Railway Association May 19 differ from those proposed a year ago (see *Railroad Age Gazette*, June 26, 1908) quite materially. The committees are reorganized and simplified, as then proposed; but the two committees which would have made the most important changes in the association's work—that on traffic relations and that on legal and economic relations—have been dropped. The committee on accounting and statistical inquiry is also abandoned; but one is added on safe transportation of explosives. We summarize the principal changes.

The following clause added to article 4 puts in words what has heretofore been implied:

To be admitted to membership a road must be a common carrier dependent upon its revenue from transportation. Railways are ineligible to membership, whether incorporated or not, which are used primarily to transport the material or product of an industry or industries to and from a point on a railway which is a common carrier, or those which are merely adjuncts to such industries.

Article 5 has a provision that "No official of a member below the grade of a division superintendent shall cast a vote without written authority from the actual or present ranking operating officer of the member voting."

The secretary becomes "general secretary" and the treasurership is a separate office, but Mr. Allen continues to hold both. The terms of these, as well as of the president and vice-president, will be two years instead of one year. Article 7 provides for only two committees, the executive committee and the committee on nominations. The general secretary is the secretary of these two committees and also of the other committees, referred to later, but he, in connection with the chairman of a committee, may appoint a secretary of a committee. All committees must promptly and fully report to the general secretary.

The other changes in the articles of organization have to do with details. The articles of organization can be amended only by a four-fifths vote. Coming now to the by-laws, which can be amended by a two-thirds vote, the first section after that fixing dates for the meetings (third Wednesday of May and November) is that which provides for five committees, namely, on transportation, on maintenance, on relations between railways, on safe transportation of explosives, etc., and on electrical working. The last named has seven members, each of the others six members. Whenever from any cause a committee shall cease to have a quorum in its membership, the executive committee may make such appointments as may be necessary to fill the vacancies. The standing committees may be divided into divisions and a vice-chairman may be elected for each division. Each of the five committees just named may, with the approval of the association, appoint a chairman who need not be an officer of a railway company.

In adopting the revised Articles of Organization and By-laws the association resolved, "That all committees of the association not included in the list of standing committees as given in the revised by-laws be and are hereby discharged with the thanks of the association; this, however, not to affect the Committee on Relations with the Interstate Commerce Commission, appointed April 22, 1908." The Commission on Interchange of Freight Cars (the McCrea Commission) is not technically a committee of the association and is not affected by this action. To serve until the association elects the members of the new committees, the Executive Committee will soon appoint members to serve thereon and prescribe their terms of service.

In presenting the revised articles the Executive Committee explained its reasons for the more important changes, and especially for the dissolution of the Committees on Train Rules, on Car Service, on Safety Appliances, on Standard Box Cars, on Car Efficiency, on the Standard Cipher Code, on the Metric System, on Accounting and Statistical Inquiry, on the Standard Location of Third Rail Working Conductors and on Standard Rail and Wheel Sections. If the new committees prove insufficient for the work the association, at any time, can direct the appointment of other special committees.

The duties of the Committee on Relations with Traffic Organizations [proposed a year ago] are believed to be sufficiently covered by the duties assigned to the Committee on Relations between Railways. In place of the proposed Committee on Legal and Economic Relations the Executive Committee will obtain legal advice when necessary, and the General Secretary has been made the custodian of the nucleus of a library. The provision for the appointment of a chairman of a committee, who need not be an officer of a member of a company which is a member of the association, is in accord with the action of the association last November with respect to the chairman of the Committee on Car Service and the Committee on Car Efficiency. When a company has been elected a member of a committee the "Chief Executive Officer," in place of the "ranking operating officer," will become the individual member of the committee or shall select some other official for that purpose.

STUDENT EMPLOYEES ON THE HARRIMAN LINES.

One of the difficulties that the managements of all railways meet is that of getting young men with a broad enough knowledge of railway matters to put in line for promotion to official positions in the operating departments. For some years J. Kruttschnitt, Director of Maintenance and Operation of the Harriman lines, has been developing a plan for teaching possible officers in a practical way the fundamentals of the operating side of the railway business, and there are now young men scattered through the stations and offices of all grades of the operating department of these lines who, while doing work for which they are paid, are being instructed regarding numerous phases of railway operation. This "student work" is in general charge of F. G. Athearn, formerly of the University of California, who is the author of a curriculum having the title, "An Outline of Work and Reading for Students in Railroad Operations," which recently has been published by the Harriman lines.

Any man between the ages of 21 and 30 is eligible to appointment for a studentship. Other things being equal, preference is given, first, to college or technical school graduates in the employ of the company; second, to men with common school education in the employ of the company; third, to college or technical school graduates not in the employ of the company. Appointment to a studentship does not carry with it a promise or obligation on the part of the company to give the appointee an official position on the completion of the course; but one who has been graduated from the student class will be given preference in the filling of a vacancy if he is temperamentally fit to meet the requirements of the position, and there is now a considerable number of men in minor official places on these lines who have taken the student course.

The work of students is divided into six periods as follows: First period, six months, in station service; second period, nine months, in maintenance of way service under yard master and resident engineer; third period, six months, in master mechanic's office; fourth period, five months, in service with regular train crew as student brakeman and conductor; fifth period, two months, in signal engineer's office; sixth period, two months, in store department; seventh period, four months, in accounting department; eighth period, eight months, with trainmaster—a total of 42 months. The work of the several periods must be pursued in the order here indicated, unless special permission has been secured to deviate from it. Students in the main are treated just like other employees. They are subject at all times to the rules governing the particular work in which they are employed and must report to, and be subject to the discipline of the officer in charge of the department or division with which they are connected in the same way as other employees. Any infraction of the usual regulations which would cause the dismissal of any other employee will also cause the dismissal of a student. They are required to be on duty during the entire working time of the month, and all reading must be done on their own time.

The students are carried on the payroll, receiving the following wages: First and second periods, $80 per month; third, fourth and fifth periods, $85 per month; sixth and seventh periods, $90 per month; eighth period, first four months, $95 per month, and last four months, $100 per month. They are allowed personal expense accounts where their duties are such as would carry carry an expense account for an ordinary employee.

There are now about 25 students in the employ of the various Harriman lines, and they include graduates of a large number of the leading technical schools of the United States. Upon the completion of a period, the head of the department or the superintendent of the division under whom the student has studied during this period, renders to the officer in charge of the work of instruction, a confidential report, giving his personal estimate of whether the young man is one who will develop into an efficient railway officer. This estimate should be based on personal observation, and when this is not possible, on reports from subordinate officers.

Students are graded by officers under whom they serve as follows:

Grade 1 (Between 95 and 100 per cent.)—Very rare and exceptional ability.

Grade 2 (Between 85 and 95 per cent.).—Work, reports, application to duty, ability to learn and general effectiveness, very satisfactory.

Grade 3 (Between 75 and 85 per cent.).—Work, reports, application to duty, ability to learn and general effectiveness good, but could be improved without requiring "very rare and exceptional ability."

Grade 4 (75 per cent. and under)

A student receiving an average grade of 75 per cent. or less for any period is dropped. The reports show that most of them are doing good, and that many are doing really excellent work. Appointees who have had experience in railway work or who have had technical training which, in the opinion of their superior officers, covers the work outlined for one or more periods, are allowed credit on account of such experience and the course shortened accordingly.

Students must report in writing on the first day of each month to Mr. Athearn, the officer in charge of students. Their reports must be full and comprehensive reviews and criticisms of the work and reading done during the previous month. They are instructed not to hesitate to criticize adversely, to comment or to suggest improvements. They are told, however, that "it should be remembered that destructive criticism without the recommendation of something better, is nothing more than fault-finding, and as such accrues not to the benefit of the writer." They are graded on the basis of their monthly reports and of the accounts of them given by their superior officers, and in passing on their own reports grammar, phrasing and general literary construction are taken into consideration.

While the railway business is highly specialized, it is well known that the most successful railway men are those who know everything about some particular department and something about every department. The foregoing indicates, and the extended outline of the curriculum which is printed below shows still more clearly, that the object of the management is to teach the students something about every phase of railway operation, and thereby lay for them a broad foundation before they begin to specialize in some particular branch of the business.

Despite the excellent wages paid and the fine opportunities afforded, it has not been found easy to get enough of just the right kind of young men for studentships. This no doubt is mainly due to the fact that most young men rather shortsightedly prefer to get employment that, temporarily, is more remunerative, than to spend almost four years in work and study that will lay broad and deep the foundations for future success.

It is thought that the following abstract of the curriculum prepared by Mr. Athearn, with the aid of the officials of the Harriman Lines, for student work, may prove interesting to the officers of other roads that feel the need of some plan of better educating and training young men for official duties:

FIRST PERIOD—IN STATION SERVICE.

A

1. Receiving, trucking, marking and preparing freight for loading and unloading. 2. Loading and storing freight in cars; juxtaposition of different commodities. 3. Station order loading. 4. Handling of explosives. 5. Transferring of freight. 6. Checking of errors in loading and unloading. 7. Different systems of handling freight. 8. Cost of handling freight per ton, and how affected.

B

1. Placing cars for loading and unloading. Importance of proper arrangement. 2. Carloads and less than carload lots, with special attention to loading cars to maximum capacity and the assigning of cars in commercial switching of such capacity as to as nearly as possible fit the shipment offered. 3. Over and short shipments. How best avoided. 4. Sealing and seal records. 5. Routing, particularly of foreign cars. 6. Demurrage charges.

C

1. Accounts and statistics. Make a careful study of all forms and reports and why used. 2. Filing of correspondence. 3. Classification of freight and tariffs. Note the difference between the Western and the Official classification. These classifications should be studied with

the view to learning how to find and apply rates. 4. Way-bills and bills of lading. 5. Car records. 6. Loss and damage claims. 7. Per diem service rules. 8. Mail service. 9. Handling of train orders. (A general knowledge is all that is required at this time. Standard rules 201 to 223, inclusive, also 250 to 256, inclusive.) 10. Ticket sales. 11. Baggage and baggage records. 12. Soliciting business and representing company.

Reading in First Period.—"Yards and Terminals," Droege, chapters 16 and 19; "Economics of Railroad Operation," Byers, pages 513-536 and 194-209; "Railroad Organization and Working," Dewsnup, pages, 63-75, 113-126, 127-146, 433-440, 440-446, 447-458, 463-487; "American Railway Transportation," Johnson (read the entire book, giving special attention to chapters 9, 10, 12 and 19); "Railway Mail Service," Tunell; "Train rules, baggage rules, rules governing safe transportation of explosives"; "Standard Rules," 916 to 963, inclusive; make a careful study of Official Time Table.

SECOND PERIOD—IN MAINTENANCE OF WAY SERVICE.

A

1. Roadbed, width, cuts and fills, subgrade, ditches; method of forming embankments, culverts, drainage, destruction of weeds, fencing. 2. Ballast, purpose, requirements, kinds of ballast and relative values, methods of laying, cost per cubic yard and how affected. 3. Surfacing, purpose, importance of not raising general level of track in surfacing; causes of center-binding and springy track; how avoided. 4. Ties, kinds; relative cost and durability; regulations for and methods of laying. 5. Tie-renewals, importance of this item and best method of determining when renewals should be made; cost. 6. Tie-preservation, methods of treating, cost of different methods, comparison of treated and untreated ties as to cost and durability. 7. Rails, weight to be used and how determined; rail wear, on curves, on tangents; creeping; rail-renewal, most effective organization of gang for this work; use of discarded rail; use of rail removed from main line for side tracks; transferring inner and outer rail on curves. 8. Joints and joint fastenings; relative merits of supported and suspended joints; comparative advantage of angle bars, 100 per cent., Bonzano, Weber and continuous joints of various patterns; theoretical requirements for a perfect joint; causes of rail joint failures; tamping of joints. 9. Switches and frogs, split switch, Wharton switch, stub switch, elements of safety and danger in each; derailing switch and its uses; rules for laying switches. Frogs; give careful attention to the various designs for frogs, such as the spring-rail, stiff frog and sliding-wing frog. 10. Tie plates, advantages and different designs; merits of each. 11. Track implements, proper care and record of same. 12. Buildings, bridges, track on bridges, trestles. 13. Wrecking and emergency work, protection of trains, patrolling of dangerous track, assembling material, organization of gangs, reports and records. 14. Compensation of grades, curvatures, taper curves, super-elevations.

B

Division Engineer's Office: Handling of material, distribution of forces, examination and study of reports, estimates for repairs and new work, accounts and records.

C

Students will spend not less than two months in actual charge of a section gang, assume all responsibility ordinarily devolving upon a section foreman and keep all records in connection therewith.

Reading in Second Period.—"Economics of Railway Operation," Byers, chapter 2, part 5; "Elements of Railroad Engineering," Raymond; "Railroad Construction," Webb, chapters 1 to 12, inclusive; "Railway Organization and Working," Dewsnup, pages 160-174; "Notes on Track," Camp; "Manual of Recommended Practice for Railway Engineers and Maintenance of Way"; "Economics of Railroad Construction," Webb, chapter 9; "Elements of Railroad Engineering," Raymond, chapters 1 to 9, inclusive.

THIRD PERIOD—IN MASTER MECHANICS' OFFICE.

A

1. Preparation and care of passenger cars. 2. Preparation and care of freight cars. 3. Car inspection, importance from standpoints of economy and safety, and with special attention to the relation of inspection to cost of repairs. 4. Rough handling and how best prevented. 5. Classification and construction of freight cars.

B

1. Engines—Types and how classified. 2. Difference in design of various types of engines. 3. Purpose of different designs. 4. Repairs—Principal item in cost of repairs, cost per engine-mile. 5. Total cost of operating an engine per engine-mile. Elements which go to make up this cost and how affected. 6. Flange lubrication and results derived. 7. Fuel, elements which determine the value of any given fuel; comparison of coal and oil. 8. Proper and improper use of fuel in firing and effect upon cost of repairs per engine-mile. 9. Water, importance of good water. What constitutes good water. 10. Effect of poor water on cost of operation and repairs. 11. Methods of treating and economic results. 12. Pumping plants.

C

1. Shops and roundhouses. 2. Organization of shop forces. 3. Distribution of labor. 4. Sources of expensive shop operations. 5. Distribution and care of supplies. 6. Importance of accurate checking of issues of supplies to engines other than water and fuel. 7. Careful study of the air brake. 8. Engine failures, causes and remedies. 9. Clerical organization. 10. Reports, statistics and accounts. 11. Tonnage rating. 12. Effect of grades and curves on engine mileage and application of these factors to local tonnage rating.

Reading in Third Period.—"New Catechism of the Steam Engine," Hawkins; "How to Run Engines and Boilers," Watson; "Elements of Railroad Engineering," Raymond, chapters 11, 12 and 13; "Economics of Railroad Operation," Byers, chapter 3, part 5, and pages 492-513; "Railway Organization and Working," Dewsnup, pages 212-263; "Economics of Railroad Construction," Webb, chapter 7; "Railroad Construction," Webb, chapters 15 and 16; *Railroad Age Gazette*, Jan. 15, 1909, page 119; Official Proceedings of Pittsburgh Railway Club, January, 1908, page 94; Standard Air brake Rules; Locomotive Data, Baldwin Locomotive Works.

FOURTH PERIOD—STUDENT BRAKEMAN AND CONDUCTOR, WITH REGULAR CREW.

A

1. Train signals. 2. Protection of trains. 3. Coupling and uncoupling, with attention to prevention of personal injuries. 4. Switching, with attention to prevention of personal injuries. 4. Switching, with attention to prevention of personal injury. 5. Handling cars, importance of careful handling. 6. Advantageous placing of cars in train. 7. Careful study of air brake machinery and structure of cars.

B

1. Way-freight work. 2. Handling of bills. 3. Conductor's records and reports. 4. Handling of train orders (to be studied from conductor's point of view). 5. Action in case of accidents

Reading in Fourth Period. Standard Book of Rules; Current Time Table; "Economics of Railroad Construction," Webb, chapters 5, 10, 11 and 12; "Economics of Railway Operation," Byers, chapter 4, part 5; "Railway Organization and Working," Dewsnup, pages 243-263; "Air Brake Catechism," Blackall; "American Railway Transportation," Johnson, chapters 9 and 10.

FIFTH PERIOD—IN SIGNAL ENGINEER'S OFFICE.

1. Manual block signals, staff system, telegraph system permissive, absolute. 2. Automatic block signals. 3. Interlocking plants, mechanical, electro-pneumatic, hydro-pneumatic, all air, all electric. 4. On single track; on double track. 5. Protection of crossings. 6. Mechanism, maintenance, installation. 7. Cost of maintenance, accounts and records.

Reading in Fifth Period.—"Elements of Railroad Engineering," Raymond, chapter 10; "Railroad Construction," Webb, chapter 14; "The Block System," Adams; "Railway Organization and Working," Dewsnup, pages 160-211; standard Book of Rules; for definitions and illustrations, see Signal Dictionary, 1908 edition.

SIXTH PERIOD—IN STORE DEPARTMENT.

1. Careful study of uses, value and proper care of company material. This information to be gained as helper to section storekeeper in general store. 2. Handling of requisitions; necessary approvals; from what data prepared; method by which stock is made available quickly. 3. Pricing; distribution of charges to various accounts; analysis and purpose of statements in connection with Stores Department.

Reading in Sixth Period.—"Railway Organization and Working," Dewsnup, pages 141-159; "Elements of Railroad Engineering," Raymond, pages 1-16; "Economics of Railroad Construction," Webb, chapters 1 to 5, inclusive; "Economics of Railway Operation," Byers, chapter 6, part 5.

SEVENTH PERIOD—IN ACCOUNTING DEPARTMENT

1. Daily report of movement of trains. 2. Statement of gross and net tons hauled in freight and mixed trains. 3. Locomotive performance in freight service. 4. Statistics of freight train service. 5. Statistics of passenger train service. 6. Operating statistics by divisions. 7. Operating of important freight stations. 8. Statistics of maintenance of way and structures. 10. Railroad organization.

Reading in Seventh Period.—"Economics of Railway Operation," Byers, parts 1, 2, 3 and 4; "Railway Organization and Working," Dewsnup, pages 1-36, 44-62, 141-146, 264-384; "Elements of Railroad Engineering," Raymond, pages 1-16; "Economics of Railroad Construction," Webb, chapters 1, 2, 3, 5 and 6; "American Railway Transportation," Johnson, chapters 5, 6, 7, 8, 13, 14, 25, 26, 27, 28 and 29; "The Railway Auditor," Whitehead; "Anatomy of a Railroad Report and Ton Mile Cost," Woodlock; accounting system required by Interstate Commerce Commission.

EIGHTH PERIOD—WITH TRAINMASTER.

A—With Yardmaster.

1. Make-up of yard; purposes and uses of several groups of tracks. 2. Switching. 3. Weighing. 4. Make-up of trains: First, as to safety; second, as to destination; third, as to contents. 5. Necessity for care in handling cars. 6. Causes of unnecessary switching, and how avoided. 7. Loading of engine to full tonnage rating. 8. Special attention to methods of clearing blockades. 9. Yardmaster's records. 10. Yard expenses per freight car handled; how affected.

B—With Despatcher

1. Systems of despatching: Double order, telephone, A. B. C., and staff system, and relative merits of each. 2. Different forms of train orders and their uses. 3. Handling trains, importance of economy of time in making meets. 4. Importance of familiarity with length of sidings, grades, etc. 5. Knowledge of capacity of engines. Effect of train resistance. 6. Chief causes of delays, and various methods of overcoming same. 7. Work on time table charts. 8. Balancing of traffic. 9. Despatcher's records and reports.

C—With Trainmaster.

1. Expedition of car movements, and distribution. 2. Handling of fast and slow freight, with reference to necessity and competition. 3. Full loading of cars and engines. 4. Education of station agents in the matter of full loading of cars, prevention of delays, maintenance of neat yards and stations. 5. Cutting down of overtime. How best accomplished. 6. Balancing of way-work between crews. 7. Investigation of delays. 8. Enforcing operating rules. 9. Wrecking work. 10. Carrying out of the division's policy. 11. Disciplining of employees.

Reading in Eighth Period.—"Standard Book of Rules," in its entirety; all wage schedules and agreements between company and employees; "Yard and Yard Terminals," Droege; "Elements of Railroad Engineering," Raymond, all portions relative to economics of railway operation not previously assigned; "Economics of Railroad Construction," Webb, all portions relative to economics of railway operation not previously assigned; "Economics of Railway Operation," Byers, all portions not previously assigned; "Railway Organization and Working," Dewsnup, all portions not previously assigned; "American Railway Transportation," Johnson, all portions not previously assigned; "Letters of an Old Railroad Official to His Son, a Division Superintendent," Hine.

INTERLOCKING IN EUROPE.*

The protection of switches on most European railways is much more complete than in America, as practically all main-track switches are interlocked with fixed signals. By far the greater proportion of the interlocking is mechanical, though both in Great Britain and on the Continent power interlocking has come prominently to the front in the last few years, not, by any means, however, to so great an extent as it has in America. In Europe there is a marked tendency to use mechanical intelocking machines at much larger plants than would be mechanically interlocked on American roads. The mechanical interlocking used in the United States is of British origin, but appears to have developed faster in improvement of details than has the English practice.

Notable features of British mechanical interlocking machines are the small amount of preliminary latch locking used and the heavy and substantial construction of the locking bars and tappets. Some British signal engineers claim that there is no advantage in preliminary latch locking, but to the American observer it would appear that the reason it is not used is principally because many of the machines are so large and the locking bars so long and so heavy that it would be exceedingly difficult for a signalman to operate a lever latch which was provided with a latch spring sufficiently powerful to drive the locking bars.

Junction at South Box, Crewe; London & North Western.

Almost all distant signals are operated with a single connection, a small galvanized stranded cable being used. The night indication of the distant signal in the caution position is identical with the night indication of the home signal in the stop position, namely, a single red light. In a number of other respects the indications differ from those used in America, particularly as regards the indications for route signaling. The practice in this respect in Great Britain and to a considerable extent on the continent is to display each signal arm denoting a diverging route upon a separate post rather than to display the arms one above the other on the same post. The Belgian State Railways formerly used the American method for indicating diverging routes, but have recently changed from the one-pole, two-arm type to the English practice, using a separate post or doll for each track, mounted upon a bracket mast or, as the French and Belgians call it, a "chandelier" or candlestick.

"Calling-on" arms are frequently employed to permit switching movements to be made past a signal at the entrance of a section of track which is not clear.

A Bit of American Scenery in England; Automatic Block Signals on London & South Western.

On the Belgian State Railways the proceed indication is given by the upward inclination of the semaphore arm. On the Northern Railway of France distant block signals are in the form of a circular disk; home block signals are semaphores of the skeleton type with enlarged rounded ends; distant signals for interlocking plants are square or lozenge-shaped metal banners, the former being used when the signal is located 800 meters or more from the home signal, and the latter form when on account of view or other conditions it is necessary to locate the distant signal at a less distance from the home; and the home interlocking signals are in the form of a square. Disk and square banners have the disadvantage that in the proceed position they are turned edgeways to an approaching train, the proceed indication being given simply by the absence of the caution or stop indication. On this railway diverging routes are signaled by pointed or fishtail arms in addition to the square banner home signal.

Lattice cantilever brackets are frequently used to support home signals in such a manner as to bring them over the tracks to which they refer. Very large wire compensators, mounted in heavy cast-iron frames, are placed at the middle point of most distant signal wire lines, the distant signal being operated by a single stranded cable. These compensators are used for distances as great as 2 miles.

Both inside and outside detector bars are in use. Some roads are using solid rods for cross leads instead of pipe, and a few roads use channel-iron sections for switch lock and signal connections instead of pipe. At least one road in Great Britain uses separate facing point locks for each point of a pair of switch points.

*From report of Ames and Adams, Interstate Commerce Commission, January, 1909.

In power interlocking little advance is being made in Great Britain along electrical lines, with the exception of a few isolated examples of electric systems. The only type in extensive use is the Crewe system on the London & North Western. This system of power electric interlocking was designed by officers of the road, and the apparatus is all manufactured, as is all signaling and interlocking apparatus used on this road, in its own shops. The system is relatively simple and rugged in construction. Current is supplied at about 230 volts potential. The switch motors take about two amperes in starting light and about ten when carrying the full load of the switch points. The signals, which are of the solenoid type, require about three amperes for clearing and hold clear on one-half ampere. At Crewe Station, which is an important and complicated junction, single-arm semaphore signals are used for the diverging routes, provided with a route indicator in the shape of a stationary rectangular board constructed on the principle of slatted signs to display a very large letter to indicate the route, such as M for Manchester, H, Holyhead, etc.

The tappet locking of these machines is arranged in two and even three banks, the tappets being crank driven from vertical rods operated from miniature levers of the mechanical interlocking machine type arranged one above the other. These rods also operate heavy carbon contact blocks for the control of the circuits operating the various functions, and are in turn controlled by indication latches of the hook form having horizontal magnets. All parts of the switch machines except the motors run in oil. Battery indication is used and there are no considerable refinements of circuits or protective devices for cross and ground protection, at least not to anything like the same extent as in America.

A considerable number of low pressure pneumatic interlocking machines have been installed in Great Britain and a

One-Arm Route-Signal and Indicator at Crewe.

number on the continent, and in some of the installations, notably on the Northern Railway of France, route levers rather than function levers have been used; that is, instead of having a lever for each switch or crossover, and a lever for each signal, one lever is provided for each route through the plant, the apparatus being so arranged that when the lever for a given route is reversed the various switches in that route will be successively set, locked, and indicated, the proper signal clearing upon the return of the last indication, denoting the complete setting up and locking of the route.

Two notable installations of power interlocking in Great Britain are the electro-pneumatic plants recently installed at Newcastle-on-Tyne for the Northeastern Railway, the south box of this station containing 211 levers, and the new plant at the Glasgow Central Station on the Caledonian Railway, which, so far as known, is the largest power interlocking machine in the world. It contains 374 spaces.

At the Newcastle plant selection is freely used, as on machines of this type in the United States. There appears to be a considerable difference of opinion among British signal officers as to the use of this expedient. In the Newcastle installation the track circuit is used extensively for operating an illuminated track diagram or indicator to denote the presence of trains on the various track sections. It is to be noted that these track circuits control visual indications only and are not used for the control of electric locks on the interlocking machine levers.

A new electric interlocking system is being developed by Mr. Arthur H. Johnson, signal and telegraph superintendent of the London & South Western, in which an electric motor drives a rotary paddle in oil to force the oil into a cylinder, the piston of which operates a lock and switch movement. The return indication in this system is of the alternating current type, in which a small A. C. motor is provided for each lever. Thi sdrives a ball governor of ingenious design for tripping the indication latch.

A novel piece of apparatus is an electric signal repeater, chiefly used for fog-signaling purposes, designed by Mr. Johnson. The magnets, and in fact all working parts of this repeater, are mounted in a glass bath which is filled with refined petroleum, affording additional insulation protection as well as prevailing rust. The glass being of good quality and the miniature semaphore arm of the repeater being placed quite close to the glass, the visability of the indication is not at all impaired by the immersion in oil. This repeater is used at Waterloo Station, London, one mounted in a wooden box at each fogman's station. The cover of the box operates a switch so that current from the battery is not thrown on to the apparatus until the cover of the box is opened.

IDLE THOUGHTS OF AN IDLE CAR.

BY O. C. CASTLE.

It is pretty dull for a fellow of my roving nature and energetic disposition to be chucked off here with a lot of other cars classed as "surplus," with nothing better to do than to swap yarns with my companions or reflect on the disappointments which life holds for us all. It seems to me but yesterday that I was a fine new car, just out of the shop, glistening with fresh paint and eager to forge to the front in the battle of commerce. What a superior air I assumed as I mingled with the scarred veterans which I encountered after reaching the yards in the outside world. How I sneered as they told of the averages produced by them in their yearly performances.

Twenty-five miles per day—Pooh! Twenty tons per load—Tush! In my journey from the big shop where I was built to the yard of my home road I had rolled along at the rate of 200 miles a day, and I thought I knew something about what a freight car ought to do. True, I had not as yet handled any loads, but did I not have in plain stencilling on my sides a capacity almost double the amount my companions seemed to think a fair average load?

The older fellows seemed only amused at my egotism, and exchanged knowing winks and nudges which quite nettled me. But in spite of their ridicule (which I attributed to jealousy), I secretly resolved that I, for one, would pitch in with a will and would do my very best to redeem the reputation which seemed to attach to the freight car, as a general proposition—as a reporter would say.

While I was still chafing under the delay which hindered me from putting my resolution into effect, a young man came out of a little shed, and walking down the track on which we stood, marked something in white chalk on each

car. Soon after, a little yard engine came puffing down, and grabbing me and several of my fellows, jerked us away to another siding quite a distance from the main yard, placing us alongside a high building with no windows in it that I could see. While I was wondering what I was there for, a man came along and placed a long spout in my door. Soon a lot of little yellow kernels began to run through the spout, and with the warm pressure of the grain against my sides, I realized that I was at last a cog in the great wheel of transportation, and I swelled with pride in my own importance.

When I was filled a card was tacked to my door, and with my fellows I was shifted back to the main yard where we were placed on a track with a lot of other cars, some belonging to our family and some to others, but all filled with grain, the same as we were.

After a time we were made up into a train, and moving out of the yard were soon bowling along at the rate of twenty miles an hour. I could scarcely refrain from taunting the lazy fellows who had been laughing at me only a few hours before; but I decided to wait until I had a more favorable opportunity.

In the course of four or five days we arrived at our journey's end, which was in a yard bordering on a large body of water. At this point we were shifted onto a track alongside another tall windowless building, where I was soon relieved of my load and switched back into the main yard.

The next day I was set in on the "house track," which ran in under a big shed where there was a platform on which were piles and piles of boxes, barrels and all sorts of packages. The track was filled with cars, and there were a great many men going up and down the platform with hand trucks, stowing the packages, some into one car and some into another.

Towards evening, although few of us were more than half filled, our doors were closed and sealed and we were taken out into the yard. I thought we would be taken back in the morning and our loading completed, but instead we were made up into trains and started out on the road. In a chat with the fellows nearest to me in the train, I learned that they were all going to different stations, and that each had all the freight there was for his particular destination, which accounted for the light loading we had all been given.

I traveled all that night and the next day, and late in the following night arrived at my destination, where I was pushed into another big shed. In the morning I was unloaded promptly, again partially filled with boxes and started on my way. Along about midnight, while we were moving swiftly along and I was wondering what service I would next be called upon to perform, I suddenly felt my brakes tighten, the fellow ahead of me jerked violently forward, then stopped, while those behind pushed me forcibly against him. There was a loud crash all around me, I felt a crunching throughout my body, a twisting of my running gear, and turning over on my side I came to an abrupt stop up against the embankment.

Soon there were lanterns moving down the track toward us; the trainmen gathered around talking excitedly. Then the rest of the cars were cut off and pulled away, leaving three of us lying all bunched together, like dead horses, with our wheels and brake rigging hopelessly twisted and tangled.

I had been terribly frightened at the accident, and at this seeming desertion I was well-nigh frantic, but the fellow ahead of me, who was a seasoned stager, assured me that they had only gone to get the wrecker and would be back soon to rescue us. Sure enough, they returned after a while, with an immense derrick, and a couple of hours' work by torchlight saw us relieved of our loading, placed on our trucks and started off toward the division repair shop, where we were jammed in on a track with a lot of other cripples.

I could see them repairing cars every day, but it seemed an age before they got around to me, and I was quite impatient at the delay. Finally, however, I was repaired and moved out into the yard and in due time was again in active service, running up and down the country, handling all sorts of freight from and to all sorts of places.

This kept up for some time, and when I had begun to feel that life was somewhat monotonous after all, I came one day to a big yard where there seemed to be an unusually large number of cars. I was quite gratified to find that the car next to me was one of my own family. I had not met any of them since last leaving home, and you may be sure I was glad to strike up a conversation with this chap. I had been on and off our home road several times in the past few weeks, and was quite surprised when he told me he had not been home for five months. He said he had not been lonesome, as he frequently met cars of our family, but he complained that he was getting in bad shape physically, on account of the indifferent care he received when away from home. As he spoke he glanced at a patch which had been bunglingly placed on his side and painted quite a different color from the rest of his body. I also noticed that his shoes were considerably worn and his roof was in need of repair.

While we were talking a couple of men passed down the track looking over the cars. One of them said he was short some "Southern route" cars, and I thought we would surely be taken out and given a load. My brother dashed my hopes, however, by informing me that we were "Western route," and could not be used.

This question of routing was one that had puzzled me a great deal, and I took advantage of the opportunity to enquire regarding it. My brother was not a little surprised at my ignorance, but informed me that it was against the rules to load cars except to or over their home roads. This rule, as I knew by experience, was but little observed when cars were badly needed, but it seemed that just now cars were becoming a little more plentiful, and consequently the rule was being more strictly lived up to.

I thought it rather odd that there should be a rule which was effective under one condition, but not enforcible when conditions were reversed, especially as it worked such hardship to us poor cars and our owners. It looked to me as though our owners were not able to get hold of us when they had use for us, but as soon as we were not needed we were chased back home.

Our conversation was interrupted by the shifter which came to take me over to a private siding, where some men began to load me with hay; but when I was about half loaded they went away, and I was allowed to stand for several days. At the end of a week, however, the loading was resumed, and I was again en route.

On arrival at my destination I was shifted out to one side of the yard and a card reading "Hold for Reconsignment" was tacked to my side. This was a new experience for me, and I did not exactly understand it, but supposed it meant that I would soon be traveling again. However, I was not moved for several days, and was then merely switched through the terminal and placed on a siding with a lot of other cars. Some of the fellows there told me they had been standing on the siding for a week or more. There were a few teams engaged in unloading the cars, but they didn't seem to be making much progress, and no one started to unload me until after several parties of men had come and looked over my lading; but after I had been there five or six days I was finally released.

I had noticed that a good many of the cars were immediately reloaded, but when it came my turn, I was shifted out and placed in the big yard. Since business had begun to fall off I had become accustomed to being passed in the loading when there was no freight for my home line, but in this case I saw the car next to me, which belonged to the road I was then on, given a load for my own home. I wanted to volunteer to handle it myself, but before I had an opportunity to do so I was whisked away and put in a train with a lot of other empties and started out on the road. I could not under-

stand why we were not given the loads for our own homes, but one fellow who was better posted than the rest of us said there were plenty of empty cars and that the owner of the road wanted to get his own cars in service so that they could earn their expenses.

My return home was somewhat delayed by the refusal of one road to handle me, claiming that I had not traveled that route on my original movement away from home. One of my fellows remarked that there must be something wrong, as he was quite sure he had been accepted by that road under the same routing conditions, but added that it was at a time when cars were in demand. The result of this holdup was that I had to go home in a round-about way which greatly increased my mileage. I certainly had no cause to complain about the speed at which I was moved, as it was much faster than I was used to traveling when under load, but as I was empty I could not see that my activity was particularly productive, and I was sure that the movement must be quite expensive to some one.

I worried a good bit about all this empty travel, but consoled myself with the thought that my owner would probably adopt the same tactics as the road I had been on, and I should be given a load for some foreign line as soon as I reached home. My surmise proved correct, as I was immediately loaded to a distant point on another road, although I could see cars of that road going home empty. I could not help feeling that this was wrong, and was especially sorry for the poor fellows who were placed in the position I had so recently occupied.

However, there was a surprise in store for me. When I arrived at the point of junction with the line to which I was to be delivered I found that my lading was to be transferred. I had been through that experience once before when there was something wrong with one of my sills, and I didn't like it at all. I remembered that I had lost two days waiting for the transfer, and had then been moved back empty to the shop, where I was further delayed. I had also heard the freight complaining at the rough manner in which it was handled during the transfer, and I felt sure that it was not a good thing to do unless there was no way to avoid it. There was nothing the matter with me now, and the only reason I could see for the transfer was that the road to which my lading was consigned had plenty of its own cars to handle the freight in, and did not want to pay the small amount my owners charged for me.

After being relieved of my load I was allowed to stand around for several days, but was finally coupled on to a string of other empties and moved over here to this storage track. On another track close by there were several cars marked "shop," but I could see no repairmen anywhere around. While I congratulated myself on not being in the shop bunch I felt pretty blue at being side-tracked with no definite idea as to when I should be restored to service.

But after all, "What's the use?" I suppose I might as well take it easy while I have the chance. It seems that no matter how hard I try I can't get more than just a certain amount done. I am sure that if I were allowed to go my own gait, and not have to be guided by a lot of rules that I can't understand, I could do lots better. I don't see why a fellow has to stick so close to home, or always have his folks making a fuss about him when he is away. I suppose my parents feel a personal interest in me, and like to have me around, but I've been battered to and fro so much that I've really become quite weaned away from my legal family. Besides I've noticed that they are not nearly so particular about me individually, when they have other cars to do my work, and they seem actually indifferent to my welfare when there is what they call a "surplus" of cars.

I've often talked with my fellows about these troubles and they all seem to think it would be better if we were all one family and could help each other. No, not quite all of them either, for there are a few big aristocratic chaps who seem to think themselves too good for common service; but I notice they don't fare much better than the rest of us when they get away from home.

Of course, we are just poor ignorant freight cars, and can hardly be expected to possess the wisdom of those who direct our destinies, nor to appreciate the difficulties in the way of reconciling such widely divergent principles as Individualism and Communism. But then, some of the shippers, the same people who have so often delayed me by failure to load or unload me promptly, seem provoked at the conditions imposed on the use of the cars which come to their sidings. Many a time I have been almost ashamed of the beautiful decoration which designates my family connection, because it was displeasing to a shipper who wanted a car of another family. Indeed, quite often shippers would utterly disregard my family name and, to avoid the delay caused by shifting me out and waiting for the proper car to be placed on their siding, would use me for a shipment to any road or in any direction. In such cases there would be a lot of argument, and sometimes I would be delayed several days before being allowed to go forward. In fact, quite often I have been taken back in disgrace and compelled to give up my load to another car. This distinction between cars of different lettering not only hurt my feelings, but frequently resulted in injury to my anatomy through the excessive battering I received by the yard engines compelled to pick out particular cars for particular destinations.

Once I heard an irate shipper say that such illogical methods as were pursued by my owner and other car owners, and such utter indifference on their part to their own interests and those of the public, would encourage regulative legislation which might put in force rules more difficult of operation than those which could and should be devised by the car owners themselves. Of course a shipper must look at this from his own viewpoint, and I suppose it is rank heresy for me to repeat such radical doctrine even under my breath. But I hope I'll get out of here soon. I've done too much thinking for a poor brainless box car, and the hot sun on my roof makes my head ache.

The other day I picked up a piece of chalk which an inspector had dropped, and while I have been loafing I figured up what I did during the past year.

I find that I traveled 7,980 miles, an average of 22 miles for every day in the year. Of this mileage 5,466 miles were under load and 2,514 empty. I hauled 467 tons of freight, moving each ton a distance of 241 miles, which is equivalent to handling one ton a total distance of 112,599 miles. To accomplish this I had to handle 20.6 tons over each mile I traveled under load. During the year I contributed $772 toward the gross freight revenue of the roads using me, which is an average of $2.11 for each day. I was at home 249 days in the year, and away from home 117 days. The time I spent in the shop totalled 26 days, and I lay idle for 55 days, making 81 days out of the 366 during which I was out of active service. You will see that I made exactly the same record as was made last year by the well-known "average car," about which Mr. Hale has so much to say.

To be sure this doesn't seem like much of a performance, and I'll admit I was quite disappointed at some of the figures, but in view of what I've been up against I guess that the deficiencies in my record can hardly be charged to any negligence or lack of effort on my part.

. . . .

Oh, dear. I thought I was lucky to be out of the shop class, but while I have been standing here some one came along and stole all the brasses out of my journal boxes and cut the rubber hose off my train line, and a careless yard engine in pushing some more cars in on the storage track jammed my drawbar back under the end sill. Now, I suppose when they do want me I'll not be in condition for work without a course on the "rip" track.

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE ON RAILWAYS OF THE UNITED STATES—1900 AND 1907.
(NOTE.—Narrow gage cars excluded. Non-revenue cars excluded. Company freight included.)

	Miles.		Freight equipment.		Increase.	Per cent. of ch'nge.	Freight cars per mile of road		Average length of haul.		Freight cars Per 1,000 freight-car miles.		Freight cars Per 1,000 rev'nue-ton miles		Rate per ton-mile. dollars.		Fr't cars per $1,000 freight earn'gs	
New England Roads.	1900.	1907.	1900.	1907.			1900.	1907.	1900.	1907.	1900.	1907.	1900.	1907.	1900.	1907.	1900.	1907
Boston & Maine	1,787	2,288	12,230	20,376	8,146	66.6	6.8	8.8	66.99	98.74	.126	.098	.0146	.0088	.01440	.01097	1.02	0.80
Central Vermont	513	536	2,006	2,983	977	48.7	3.9	5.5	94.97	79.28	.063	.105	.0079	.0113	.00880	.00947	0.90	1.19
Maine Central	816	845	3,586	7,174	3,588	100.0	4.4	8.4	81.11	88.56	.163	.167	.0123	.0146	.01130	.01018	1.09	1.43
N. Y., N. H. & Hartford.	2,008	2,060	13,116	19,776	6,660	50.8	6.5	9.6	85.36	90.20	.076	.098	.0097	.0102	.01451	.01472	0.67	0.70
Total	5,124	5,729	30,938	50,309	19,371	62.6	6.0	8.8	82.11	89.19	.107	.117	.0112	.0112	.01225	.01134	0.92	1.03
Trunk Line Roads.																		
Baltimore & Ohio	3,199	4,006	61,708	78,073	16,365	26.5	19.3	19.5	194.81	193.85	.128	.104	.0068	.0068	.00412	.00570	1.96	1.20
Buff., Roch. & Pitts	472	569	8,858	13,508	4,650	52.5	18.7	23.7	136.16	145.70	.139	.177	.0097	.0097	.00470	.00498	1.99	1.95
Central of New Jersey.	639	610	15,002	21,537	6,535	43.6	23.4	35.2	77.88	75.27	.153	.160	.0118	.0102	.00871	.00840	1.36	1.21
Chesapeake & Ohio	1,476	1,827	17,270	30,535	13,265	76.8	21.6	16.7	302.00	274.00	.082	.119	.0058	.0066	.00343	.00432	1.71	1.53
Delaware & Hudson	665	845	13,030	21,458	8,428	64.7	19.6	25.4	94.46	121.70	.147	.151	.0113	.0085	.00789	.00663	1.54	1.29
Del., Lack. & Western	947	958	27,287	27,441	154	0.6	28.8	28.7	151.00	175.00	....	.109	.0144	.0078	.00808	.00765	1.79	1.03
Erie	2,104	2,151	46,225	51,514	5,289	11.4	21.9	23.9	191.40	160.22	.101	.115	.0089	.0083	.00559	.00614	1.60	1.33
Lehigh Valley	1,382	1,440	34,954	41,431	6,477	18.5	25.3	28.8	188.08	169.43	.135	.130	.0106	.0087	.00542	.00631	1.97	1.37
N. Y. C. & H. R.	2,817	3,782	59,180	66,012	6,832	11.5	21.1	17.4	163.00	195.00	....	.081	.0088	.0061	.00560	.00624	1.72	1.11
Pennsylvania	3,716	3,903	80,385	128,024	47,639	59.3	21.6	32.9	109.54	162.33	.091	.102	.0067	.0059	.00540	.00527	1.25	1.03
Reading	1,000	1,000	31,824	40,970	9,146	28.7	31.8	40.9	89.42	90.90	.139	.141	.0114	.0087	.00831	.00748	1.50	1.17
Western Maryland	279	540	691	6,224	5,533	800.7	2.5	11.5	51.02	95.24	....	.099	.0038	.0096	.00734	.00678	0.53	1.41
Total	18,696	21,630	396,414	526,727	130,313	32.9	21.2	24.3	145.73	154.89	.093	.124	.0092	.0081	.00622	.00637	1.56	1.30
Southern Classification.																		
Atlantic Coast Line	1,759	4,361	5,378	22,724	17,346	322.5	3.6	5.2	121.90	147.66	....	.126	.0143	.0152	.01401	.01235	1.02	1.23
Central of Georgia	1,196	1,899	5,041	10,218	5,177	102.7	4.2	5.4	148.86	149.76	.107	.137	.0183	.0106	.01096	.00853	1.26	1.25
Louisville & Nashville	3,007	4,343	23,402	39,528	16,126	68.9	7.7	9.1	163.00	168.45	.096	.116	.0090	.0090	.00758	.00801	1.13	1.12
Mobile & Ohio	876	926	5,389	10,091	4,702	87.3	6.2	10.9	195.63	244.65	....	.106	.0076	.0077	.00590	.00620	1.33	1.25
Nash., Chat. & St. Louis	1,189	1,230	5,328	9,080	3,752	70.4	4.4	7.4	151.00	170.43	.113	.373	.0096	.0090	.00880	.00887	1.10	1.01
Norfolk & Western	1,551	1,876	18,656	36,910	18,254	97.8	12.0	19.7	253.41	260.24	.085	.116	.0068	.0074	.00430	.00523	1.58	1.41
Seaboard Air Line (1901)	2,604	2,611	8,335	12,210	3,875	46.5	3.2	4.7	153.32	159.25	.119	.121	.0136	.0119	.01180	.01118	1.14	1.07
Southern	6,306	7,547	26,814	55,409	28,595	106.6	4.2	7.3	168.82	165.25	.107	.164	.0116	.0124	.00916	.00834	1.27	1.48
Total	18,488	24,793	98,343	196,170	97,827	99.5	5.3	7.9	169.49	183.21	.105	.157	.0114	.0104	.00906	.00859	1.23	1.24
Central Classification.																		
Chic., Ind. & Louisville.	546	600	5,440	5,428	*12	0.2	9.9	9.0	153.00	153.00	.155	.134	.0141	.0105	.00757	.00810	1.86	1.29
Cin., Ham. & Dayton	652	1,038	7,838	13,461	5,623	71.7	12.0	13.0	108.96	115.85	....	.201	.0122	.0125	.00610	.00590	2.00	2.11
C., C., C. & St. Louis	1,891	1,983	15,484	23,189	7,705	49.8	8.2	11.9	169.30	153.20	.094	.107	.0083	.0073	.00583	.00572	1.42	1.34
Grand Rapids & Indiana	582	582	3,015	3,232	217	7.2	5.2	5.5	90.12	102.77	.140	.099	.0156	.0068	.00870	.00680	1.88	1.01
Lake Erie & Western	725	886	5,549	4,916	*633	11.4	7.6	5.5	153.51	130.22	.137	.116	0110	.0083	.00614	.00702	1.89	1.23
Lake Shore & Mich. So.	1,411	1,520	19,958	35,389	15,431	77.3	14.1	23.2	178.00	159.80	.067	.091	.0055	.0058	.00505	.00533	1.09	1.13
Michigan Central	1,635	1,746	14,219	18,890	4,671	32.8	8.6	10.8	193.50	170.00	....	.073	.0070	.0059	.00592	.00641	1.19	0.94
N. Y., Chic. & St. Louis.	513	523	6,743	10,576	3,833	56.8	13.1	20.2	297.00	224.00	.059	.079	.0055	.0062	.00478	.00511	1.16	1.22
Pennsylvania Co.	1,396	1,414	43,967	52,844	8,877	20.2	31.5	37.4	77.95	75.32	.177	.143	.0135	.0078	.00590	.00600	2.30	1.31
P., C., C. & St. Louis	1,407	1,472	12,884	22,910	10,026	77.8	9.1	15.6	111.14	99.95	.056	.072	.0052	.0053	.00620	.00630	0.84	0.83
Pere Marquette	1,821	2,298	7,944	18,365	10,421	131.2	4.3	8.0	112.64	169.11	....	.154	.0124	.0113	.00802	.00546	1.55	1.85
Vandalia	727	829	5,922	7,827	1,905	32.2	8.1	9.4	74.46	104.99	.121	.105	.0119	.0078	.00718	.00580	1.66	1.14
Total	13,306	14,891	148,963	217,027	68,064	45.7	11.2	14.5	143.63	138.18	.112	.110	.0102	.0080	.00645	.00625	1.57	1.28
Western Classification.																		
Atch., Top. & Santa Fe.	7,426	9,350	27,486	46,605	19,119	69.6	3.7	5.0	349.19	403.00	.073	.076	.0079	.0068	.00976	.00957	0.81	0.71
Chicago & Alton	855	970	9,386	10,548	1,162	12.4	10.9	10.9	176.16	165.94	.135	.109	.0148	.0076	.00794	.00604	1.87	1.26
Chic. & Eastern Ill.	711	948	8,206	18,700	10,494	127.9	11.5	19.7	144.70	155.46	.132	.171	.0096	.0096	.00483	.00480	1.99	2.01
Chicago & Northwestern	5,219	7,623	40,846	57,413	16,567	40.6	7.8	7.5	151.30	144.46	.108	.167	.0106	.0106	.00830	.00904	1.28	1.17
Chic., Burl. & Quincy	7,546	9,134	42,287	51,362	9,075	21.2	5.6	5.6	254.87	250.19	....	.092	.0111	.0063	.00851	.00690	1.29	0.91
Chicago Great Western.	930	818	5,782	7,438	1,656	28.6	6.2	9.1	301.68	271.20	.087	.087	.0081	.0077	.00720	.00656	1.13	1.17
Chic., Mil. & St. Paul	6,423	7,187	35,740	42,533	6,793	19.0	5.6	5.9	189.07	180.29	.093	.088	.0106	.0082	.00929	.00855	1.14	0.96
Chic., Rock Isl. & Pacific	3,647	7,780	17,150	41,261	24,111	140.6	4.7	5.3	213.00	219.47	.094	.111	.0096	.0086	.00990	.00844	1.08	1.01
Chic., St. Paul, M. & O.	1,557	1,711	10,253	11,887	1,634	15.9	6.6	6.9	160.55	144.97	.149	.174	.0135	.0111	.00971	.00884	1.39	1.26
Colorado & Southern	762	1,858	2,979	9,049	6,070	203.7	3.9	4.9	101.00	151.00	.108	.124	.0115	.0088	.01242	.00942	0.93	0.93
Denver & Rio Grande	1,674	2,552	8,359	10,262	1,903	22.8	4.9	4.0	.....	128.70	.118	.108	.....	.0091	....	.01345	1.09	0.67
Dul., S. S. & Atlantic	585	591	2,697	2,847	150	5.5	4.6	4.8	49.07	72.40	....	....	.0209	.0120	.01221	.00858	1.70	1.39
Great Northern	5,418	6,109	21,484	38,385	16,901	78.7	3.9	6.3	192.00	254.46	.104	.110	.0085	.0063	.00899	.00684	0.93	0.92
Illinois Central	3,996	4,377	32,439	56,949	24,510	75.6	8.1	13.0	213.83	244.84	.092	.116	.0094	.0086	.00651	.00576	1.45	1.50
Iowa Central	510	558	2,238	2,968	730	32.6	4.4	5.3	152.30	166.67	.099	.112	.0084	.0071	.00696	.00604	1.21	1.18
Kansas City Southern	833	827	5,118	7,285	2,167	42.3	6.1	8.8	304.41	278.34	.118	.113	.0091	.0066	.00613	.00636	1.49	1.04
Minn. & St. Louis	597	799	3,066	4,078	1,012	33.0	5.1	5.1	108.79	97.38	.196	.203	.0155	.0151	.01212	.00995	1.45	1.52
Minn., St. P. & S. S. M.	1,255	2,282	6,631	12,795	6,164	92.9	5.3	5.6	194.65	224.70	.129	.143	.0109	.0096	.00658	.00716	1.67	1.35
Missouri Pacific	4,938	6,376	25,186	36,932	11,746	46.6	5.1	5.8	236.24	228.57	.102	.114	.0095	.0074	.00834	.00715	1.15	1.04
Mo., Kan. & Texas	2,218	3,072	9,669	18,796	9,127	94.4	4.4	6.1	298.93	244.74	.073	.105	.0082	.0110	.00840	.01076	0.98	1.02
Northern Pacific	5,006	5,448	23,138	42,320	19,182	82.9	4.6	7.8	309.60	328.80	.105	.108	.0104	.0077	.00987	.00879	1.04	0.87
St. L. & San Francisco	†1,659	5,062	5,974	26,702	20,728	346.9	3.6	5.3	182.05	158.10	.093	.124	.0114	.0088	.01058	.00889	1.08	0.99
St. L. & Southwestern	1,258	1,452	5,386	9,651	4,265	79.2	4.3	6.6	196.28	239.58	.127	.156	.0130	.0131	.01110	.01072	1.17	1.22
San An. & Aransas Pass	687	724	1,553	1,630	77	4.9	2.3	2.2	162.26	156.88	.113	.089	.0142	.0095	.01861	.01713	0.95	0.62
Southern Pacific	7,576	9,694	29,413	42,608	13,195	44.9	3.9	4.4	307.31	260.04	.096	.076	.0062	.0053	.00957	.01105	0.73	0.56
Texas & Pacific	1,570	1,885	6,263	11,452	5,189	82.8	3.9	6.1	231.77	211.66	.079	.102	.0093	.0101	.01030	.00990	0.91	1.01
Union Pacific	5,428	5,645	21,826	24,970	3,144	14.4	4.0	4.4	305.69	405.00	.080	.059	.0082	.0037	.01046	.00819	0.78	0.46
Wabash	2,340	2,514	13,087	23,536	10,449	79.9	5.6	9.4	216.70	228.01	.071	.094	.0068	.0067	.00558	.00524	1.23	1.27
Wisconsin Central	950	1,018	7,968	8,309	341	4.3	8.4	8.2	143.16	184.03	.202	.168	.0139	.0103	.00731	.00693	1.91	1.48
Total	83,574	108,364	431,610	679,271	247,661	57.4	5.1	6.2	208.81	213.79	.109	.119	.0107	.0087	.00919	.00852	1.23	1.09
Total all roads	139,188	175,407	1,106,268	1,669,504	563,236	51.0	7.9	9.5	171.92	177.52	.106	.120	.0104	.0088	.00829	.00788	1.33	1.21

*Decrease. †Before consolidation with other companies.

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE ON RAILWAYS OF THE UNITED STATES—1900 AND 1908.

(NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.)

	Miles.		Freight equipment.		In-crease.	Per cent. of ch'nge.	Freight cars per mile of road		Average length of haul.		Freight cars—Per 1,000 freight car miles.		Freight cars—Per 1,000 rev'nue ton miles		Rate, per ton-mile, dollars.		Fr't cars per $1,000 freight earn'gs	
New England Roads.	1900.	1908.	1900.	1908.			1900.	1908.	1900.	1908.	1900.	1908.	1900.	1908.	1900.	1908.	1900.	1908
Boston & Maine	1,787	2,288	12,230	23,964	11,734	95.9	6.8	10.5	66.99	106.91	.126	.119	.0146	.0111	.01440	.01045	1.02	1.07
Central Vermont	513	536	2,006	2,866	860	42.8	3.9	5.3	94.97	77.56	.063	.112	.0079	.0119	.00880	.00960	0.90	1.23
Maine Central	816	931	3,586	7,223	3,637	101.4	4.4	7.8	81.11	81.61	.163	.163	.0123	.0150	.01130	.01062	1.09	1.42
N. Y., N. H. & Hartford	2,008	2,047	13,116	29,821	16,705	127.4	6.5	14.6	85.36	94.83	.076	.156	.0097	.0167	.01451	.01414	0.67	1.18
Total	5,124	5,802	30,938	63,874	32,936	106.5	6.0	9.6	82.11	90.23	.107	.138	.0112	.0137	.01225	.01120	0.92	1.23
Trunk Line Roads.																		
Baltimore & Ohio	3,199	3,992	61,708	82,592	20,884	33.8	19.3	20.7	194.81	197.77	.128	.114	.0068	.0084	.00412	.00569	1.96	1.48
Buf., Roch. & Pitts.	472	568	8,858	15,349	6,491	73.3	18.7	27.0	136.16	145.10	.139	.217	.0097	.0118	.00470	.00493	1.99	2.40
Central of New Jersey	639	610	15,002	21,247	6,245	41.6	23.4	34.8	77.88	78.84	.153	.165	.0118	.0102	.00871	.00845	1.36	1.22
Chesapeake & Ohio	1,476	1,840	17,270	34,252	16,982	98.3	21.6	18.6	302.00	274.00	.082	.135	.0058	.0076	.00343	.00432	1.71	1.75
Delaware & Hudson	665	845	13,030	21,235	8,205	62.9	19.6	25.1	94.46	121.23	.147	.156	.0113	.0099	.00789	.00710	1.54	1.39
Del., Lack. & Western	947	958	27,287	27,211	*76	0.3	28.8	28.2	151.00	179.50	....	....	.0144	.0088	.00808	.00785	1.79	1.11
Erie	2,104	2,171	46,225	54,909	8,684	18.8	21.9	25.3	191.40	168.35	.101	.144	.0089	.0097	.00559	.00600	1.60	1.62
Lehigh Valley	1,382	1,446	34,954	42,405	7,451	21.8	25.3	29.3	188.08	181.08	.135	.139	.0106	.0088	.00542	.00630	1.97	1.40
N. Y. C. & H. R.	2,817	3,781	59,180	61,882	2,702	4.5	21.1	16.3	163.00	197.00	....	.084	.0088	.0069	.00560	.00643	1.72	1.21
Pennsylvania	3,716	3,980	80,385	130,163	49,778	61.9	21.6	32.7	109.54	167.76	.091	.127	.0067	.0077	.00540	.00569	1.25	1.33
Reading	1,000	1,007	31,824	44,676	12,852	40.4	31.8	44.4	89.42	93.76	.139	.160	.0114	.0101	.00831	.00726	1.50	1.39
Western Maryland	279	543	691	5,949	5,258	760.9	2.5	10.9	51.02	109.86	....	.136	.0038	.0085	.00734	.00655	0.53	1.30
Total	18,696	21,741	396,414	541,870	145,456	36.6	21.2	26.1	145.73	159.52	.093	.131	.0092	.0090	.00622	.00638	1.56	1.47
Southern Classification.																		
Atlantic Coast Line	1,759	4,407	5,378	24,408	19,030	353.7	3.6	5.5	121.90	142.52	....	.144	.0143	.0170	.01401	.01235	1.02	1.38
Central of Georgia	1,196	1,913	5,041	10,440	5,399	107.1	4.2	5.4	148.86	149.64	.107	.152	.0183	.0123	.01096	.01082	1.26	1.37
Louisville & Nashville	3,007	4,365	23,402	40,589	17,187	73.4	7.7	9.3	163.00	172.87	.096	.132	.0090	.0101	.00758	.00779	1.13	1.30
Mobile & Ohio	876	926	5,389	11,247	5,858	108.7	6.2	12.1	195.63	229.66	....	....	.0076	.0099	.00590	.00631	1.33	1.58
Nash., Chat. & St. Louis	1,189	1,230	5,328	9,440	4,112	77.2	4.4	7.7	151.00	161.00	.113	.300	.0096	.0111	.00880	.00890	1.10	1.24
Norfolk & Western	1,551	1,881	18,656	37,276	18,620	100.0	12.0	19.8	253.41	267.94	.085	.125	.0068	.0075	.00430	.00481	1.58	1.55
Seaboard Air Line. (1901)	2,604	2,611	8,335	13,902	5,567	66.8	3.2	5.3	153.32	149.96	.119	.135	.0136	.0148	.01180	.01124	1.14	1.32
Southern	6,306	7,489	26,814	54,086	27,272	101.7	4.2	7.2	168.82	154.05	.107	.161	.0116	.0155	.00916	.00979	1.27	1.58
Total.	18,488	24,822	98,343	201,388	103,045	104.8	5.3	9.0	169.49	178.45	.105	.164	.0114	.0123	.00906	.00900	1.23	1.41
Central Classification.																		
Chic., Ind. & Louisville	546	616	5,440	5,563	123	2.3	9.9	9.0	153.00	146.00	.155	.155	.0141	.0135	.00757	.00822	1.86	1.64
Cin., Ham. & Dayton	652	1,038	7,838	12,704	4,866	62.1	12.0	12.2	108.96	114.19	....	.197	.0122	.0136	.00610	.00624	2.00	2.27
C., C., C. & St. Louis	1,891	1,982	15,484	22,670	7,186	46.4	8.2	11.4	169.30	146.20	.094	.100	.0083	.0079	.00583	.00568	1.42	1.44
Grand Rapids & Indiana	582	592	3,015	3,233	218	7.2	5.2	5.5	90.12	95.99	.140	.107	.0156	.0092	.00870	.00730	1.88	1.25
Lake Erie & Western	725	886	5,549	4,663	*886	15.9	7.6	5.0	153.51	120.40	.137	.116	.0110	.0092	.00614	.00738	1.89	1.33
Lake Shore & Mich. So.	1,411	1,511	19,958	34,549	14,591	73.1	14.1	22.9	178.00	173.50	.067	.091	.0055	.0068	.00505	.00525	1.09	1.33
Michigan Central	1,635	1,746	14,219	18,579	4,360	30.6	8.6	10.6	193.50	171.00	....	.076	.0070	.0068	.00592	.00627	1.19	1.09
N. Y., Chic. & St. Louis.	513	523	6,743	11,877	5,134	76.1	13.1	22.7	297.00	229.00	.059	.086	.0055	.0071	.00478	.00526	1.16	1.50
Pennsylvania Co.	1,396	1,416	43,967	53,044	9,077	20.6	31.5	37.4	77.95	79.93	.177	.172	.0135	.0113	.00590	.00610	2.30	1.81
P., C., C. & St. Louis	1,407	1,472	12,884	22,905	10,021	77.7	9.1	15.6	111.14	118.07	.056	.084	.0052	.0071	.00620	.00640	0.84	1.07
Pere Marquette	1,821	2,298	7,944	18,858	10,914	137.4	4.3	8.2	112.64	169.01	....	.148	.0124	.0117	.00802	.00602	1.55	2.09
Vandalia	727	829	5,922	7,832	1,910	32.2	8.1	9.4	74.46	99.78	.121	.132	.0119	.0100	.00718	.00690	1.66	1.41
Total.	13,306	14,909	148,963	216,477	67,514	45.3	11.2	14.2	143.63	146.92	.112	.122	.0102	.0095	.00645	.00642	1.57	1.52
Western Classification.																		
Atch., Top. & Santa Fe.	7,426	9,431	27,486	51,834	24,348	88.6	3.7	5.5	349.19	392.24	.073	.089	.0079	.0065	.00976	.00949	0.81	0.84
Chicago & Alton	855	998	9,386	10,395	1,009	10.8	10.9	10.4	176.16	151.85	.135	.112	.0148	.0076	.00794	.00610	1.87	1.36
Chic. & Eastern Ill.	711	957	8,206	19,983	11,777	143.5	11.5	20.9	144.70	156.19	.132	.192	.0096	.0105	.00483	.00470	1.99	2.34
Chicago & Northwestern	5,219	7,632	40,846	57,620	16,774	41.1	7.8	7.6	151.30	158.07	.108	.177	.0106	.0119	.00830	.00870	1.28	1.37
Chic., Burl. & Quincy	7,546	9,282	42,287	53,156	10,869	25.7	5.6	5.7	254.87	240.82	....	.099	.0111	.0068	.00851	.00800	1.29	1.00
Chicago Great Western.	930	818	5,782	7,939	2,157	37.3	6.2	9.7	301.68	267.71	.087	.105	.0081	.0094	.00720	.00645	1.13	1.46
Chic., Mil. & St. Paul	6,423	7,301	35,740	44,086	8,346	33.4	5.6	6.0	189.07	190.17	.093	.095	.0106	.0077	.00929	.00811	1.14	1.09
Chic., Rock Isl. & Pacific	3,647	7,970	17,150	39,581	22,431	130.8	4.7	4.9	213.00	221.40	.094	.105	.0096	.0087	.00990	.00940	1.08	1.04
Chic., St. P., M. & Om.	1,557	1,730	10,253	12,430	2,177	21.2	6.6	7.2	160.55	140.17	.149	....	.0135	.0134	.00971	.00893	1.39	1.50
Colorado & Southern	762	1,952	2,979	9,166	6,187	207.7	3.9	4.7	101.00	132.00	.108	.130	.0115	.0093	.01242	.01034	0.93	0.92
Denver & Rio Grande	1,674	2,499	8,359	11,673	3,314	39.6	4.9	4.7	.....	117.02	.118	.137	.....	.0108	......	.01330	1.09	0.81
Dul., S. S. & Atlantic	585	595	2,697	2,813	116	4.3	4.6	4.7	49.07	61.40	....	....	.0209	.0155	.01221	.00987	1.70	1.57
Great Northern	5,418	6,637	21,484	42,131	20,647	96.1	3.9	6.3	192.00	268.00	.104	.128	.0085	.0070	.00899	.00780	0.93	1.05
Illinois Central	3,996	4,594	32,439	60,871	28,432	87.7	8.1	13.2	213.83	241.09	.092	.130	.0094	.0084	.00651	.00586	1.45	1.72
Iowa Central	510	558	2,238	2,924	686	30.6	4.4	5.2	152.30	175.65	.099	.110	.0084	.0069	.00696	.00592	1.21	1.23
Kansas City Southern	833	828	5,118	7,148	2,030	39.7	6.1	8.6	304.41	278.64	.118	.111	.0091	.0069	.00613	.00723	1.49	1.07
Minn. & St. Louis	597	1,027	3,066	3,942	876	28.6	5.1	3.8	108.79	105.25	.196	.192	.0155	.0145	.01212	.01063	1.45	1.54
Minn., St. P. & S. S. M.	1,255	2,308	6,631	12,762	6,131	92.5	5.3	5.5	194.65	213.65	.129	.154	.0109	.0118	.00658	.00814	1.67	1.63
Missouri Pacific	4,938	6,479	25,186	41,295	16,109	64.0	5.1	6.4	236.24	218.59	.102	.128	.0095	.0090	.00834	.00685	1.15	1.31
Mo., Kan. & Texas	2,218	3,072	9,669	22,417	12,748	131.9	4.4	7.3	298.93	236.57	.073	.136	.0082	.0147	.00840	.01010	0.98	1.45
Northern Pacific	5,006	5,649	23,138	42,171	19,033	82.2	4.6	7.4	309.60	325.60	.105	.125	.0104	.0082	.00987	.00900	1.04	0.90
St. L. & San Francisco.	1,659†	5,064	5,974	29,984	24,010	401.9	3.6	5.9	182.05	154.80	.093	.140	.0114	.0106	.01058	.00970	1.08	1.25
St. L. & Southwestern	1,258	1,464	5,386	9,452	4,066	75.5	4.3	6.5	196.28	240.82	.127	.149	.0130	.0133	.01110	.01010	1.17	1.32
San An. & Aransas Pass	687	724	1,553	1,611	58	3.7	2.3	2.2	162.26	160.80	.113	.093	.0142	.0098	.01861	.01472	0.95	0.75
Southern Pacific	7,576	9,834	29,413	42,677	13,264	11.1	3.9	4.3	307.31	270.53	.096	.077	.0062	.0054	.00957	.01907	0.73	0.60
Texas & Pacific	1,570	1,885	6,263	11,212	4,949	79.0	3.9	5.9	231.77	185.06	.079	.114	.0093	.0122	.01030	.01030	0.91	1.19
Union Pacific	5,428	5,781	21,826	25,040	3,214	14.7	4.0	4.3	305.69	402.77	.080	.067	.0082	.0040	.01046	.00826	0.78	0.47
Wabash	2,340	2,514	13,087	22,979	9,892	75.6	5.6	9.1	216.70	225.23	.071	.092	.0068	.0072	.00558	.00573	1.23	1.34
Wisconsin Central	950	1,023	7,968	7,632	*336	4.2	8.4	7.5	143.16	179.32	.202	.158	.0139	.0096	.00731	.00672	1.91	1.43
Total.	83,574	110,606	431,610	706,924	275,314	63.8	5.1	6.4	208.81	210.74	.109	.124	.0107	.0096	.00919	.00867	1.23	1.23
Total all roads	139,188	177,880	1,106,268	1,730,533	624,265	56.4	7.9	9.7	171.92	178.11	.106	.130	.0104	.0100	.00829	.00803	1.33	1.34

*Decrease. †Before consolidation with other companies.

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE ON RAILWAYS OF THE UNITED STATES—1907 AND 1908.
(Note.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.)

	Miles.		Freight equipment.		Increase.	Per cent. of ch'nge.	Freight cars per mile of road 1907.	Freight cars per mile of road 1908.	Average length of haul 1907.	Average length of haul 1908.	Freight cars Per 1,000 freight-car miles 1907.	Freight cars Per 1,000 freight-car miles 1908.	Freight cars Per 1,000 rev'nue-ton miles 1907.	Freight cars Per 1,000 rev'nue-ton miles 1908.	Rate, per ton-mile, dollars 1907.	Rate, per ton-mile, dollars 1908.	Fr't cars per $1,000 freight earn'gs 1907.	Fr't cars per $1,000 freight earn'gs 1908.
New England Roads.	1907.	1908.	1907.	1908.														
Boston & Maine.......	2,288	2,288	20,376	23,964	3,588	17.6	8.8	10.5	98.74	106.91	.098	.119	.0088	.0111	.01097	.01045	0.80	1.07
Central Vermont	536	536	2,983	2,866	*117	3.9	5.5	5.3	79.28	77.56	.105	.112	.0113	.0119	.00947	.00960	1.19	1.23
Maine Central	845	931	7,174	7,223	49	0.7	8.4	7.8	88.56	81.61	.167	.163	.0146	.0150	.01018	.01062	1.43	1.42
N. Y., N. H. & Hartford	2,060	2,047	19,776	29,821	10,045	50.8	9.6	14.6	90.20	94.83	.098	.156	.0102	.0167	.01472	.01414	0.70	1.18
Total	5,729	5,802	50,309	63,874	13,565	26.9	8.8	9.6	89.19	90.23	.117	.138	.0112	.0137	.01134	.01120	1.03	1.23
Trunk Line Roads.																		
Baltimore & Ohio	4,006	3,992	78,073	82,592	4,519	5.8	19.5	20.7	193.85	197.77	.104	.114	.0068	.0084	.00570	.00569	1.20	1.48
Buf., Roch. & Pitts....	569	568	13,508	15,349	1,841	13.6	23.7	27.0	145.70	145.10	.177	.217	.0097	.0118	.00498	.00493	1.95	2.40
Central of New Jersey..	610	610	21,537	21,247	*290	1.3	35.2	34.8	75.27	78.84	.160	.165	.0102	.0102	.00840	.00845	1.21	1.22
Chesapeake & Ohio	1,827	1,840	30,535	34,252	3,717	12.2	16.7	18.6	274.00	274.00	.119	.135	.0066	.0076	.00432	.00432	1.53	1.75
Delaware & Hudson ...	845	845	21,458	21,235	*223	1.0	25.4	25.1	121.70	121.23	.151	.156	.0085	.0099	.00663	.00710	1.29	1.39
Del., Lack. & Western..	958	958	27,441	27,211	*230	0.8	28.7	28.2	175.00	179.50	.109	....	.0078	.0088	.00765	.00785	1.03	1.11
Erie	2,151	2,171	51,514	54,909	3,395	6.6	23.9	25.3	160.22	168.35	.115	.144	.0083	.0097	.00614	.00600	1.33	1.62
Lehigh Valley	1,440	1,446	41,431	42,405	974	2.4	28.8	29.3	169.43	181.08	.130	.139	.0087	.0088	.00631	.00630	1.37	1.40
N. Y. C. & H. R........	3,782	3,781	66,012	61,882	*4,130	6.2	17.4	16.3	195.00	197.00	.081	.084	.0061	.0069	.00624	.00643	1.11	1.21
Pennsylvania	3,903	3,980	128,024	130,163	2,139	1.7	32.9	32.7	162.33	167.76	.102	.127	.0059	.0077	.00527	.00569	1.03	1.33
Reading	1,000	1,007	40,970	44,676	3,706	9.0	40.0	44.4	90.90	93.76	.141	.160	.0087	.0101	.00748	.00726	1.17	1.39
Western Maryland	540	543	6,224	5,949	*275	4.4	11.5	10.9	95.24	109.86	.099	.136	.0096	.0085	.00678	.00655	1.41	1.30
Total	21,630	21,741	526,727	541,870	15,143	2.9	24.3	26.1	154.89	159.52	.124	.131	.0081	.0090	.00637	.00638	1.30	1.47
Southern Classification.																		
Atlantic Coast Line ...	4,361	4,407	22,724	24,408	1,684	7.4	5.2	5.5	147.66	142.52	.126	.144	.0152	.0170	.01235	.01235	1.23	1.38
Central of Georgia	1,899	1,913	10,218	10,440	222	2.2	5.4	5.4	149.76	149.64	.137	.152	.0106	.0123	.00853	.01082	1.25	1.37
Louisville & Nashville..	4,343	4,365	39,528	40,589	1,061	2.7	9.1	9.3	168.45	172.87	.116	.132	.0090	.0101	.00801	.00779	1.12	1.30
Mobile & Ohio	926	926	10,091	11,247	1,156	11.4	10.9	12.1	244.65	229.66	.106	....	.0077	.0099	.00620	.00631	1.25	1.58
Nash., Chat. & St. Louis	1,230	1,230	9,080	9,440	360	3.9	7.4	7.7	170.43	161.00	.373	.300	.0090	.0111	.00887	.00890	1.01	1.24
Norfolk & Western	1,876	1,881	36,910	37,276	366	1.0	19.7	19.8	260.24	267.94	.116	.125	.0074	.0075	.00523	.00481	1.41	1.55
Seaboard Air Line.....	2,611	2,611	12,210	13,902	1,692	13.9	4.7	5.3	159.25	149.96	.121	.135	.0119	.0148	.01118	.01124	1.07	1.32
Southern	7,547	7,489	55,409	54,086	*1,323	2.4	7.3	7.2	165.25	154.05	.164	.161	.0124	.0155	.00834	.00979	1.48	1.58
Total	24,793	24,822	196,170	201,388	5,218	2.7	7.9	9.0	183.21	178.45	.157	.164	.0104	.0123	.00859	.00900	1.24	1.41
Central Classification.																		
Chic., Ind. & Louisville.	600	616	5,428	5,563	135	2.5	9.0	9.0	153.00	146.00	.134	.155	.0105	.0135	.00810	.00822	1.29	1.64
Cin., Ham. & Dayton...	1,038	1,038	13,461	12,704	*757	5.6	13.0	12.2	115.85	114.19	.201	.197	.0125	.0136	.00590	.00624	2.11	2.27
C., C., C. & St. Louis...	1,983	1,982	23,189	22,670	*519	2.2	11.9	11.4	153.20	146.20	.107	.100	.0073	.0079	.00572	.00568	1.34	1.44
Grand Rapids & Indiana	582	592	3,232	3,233	1	0.0	5.5	5.5	102.77	95.99	.099	.107	.0068	.0092	.00680	.00730	1.01	1.25
Lake Erie & Western...	886	886	4,916	4,663	*253	5.1	5.5	5.0	130.22	120.40	.116	.116	.0083	.0092	.00702	.00738	1.23	1.33
Lake Shore & Mich. So.	1,520	1,511	35,389	34,549	*840	2.4	23.2	22.9	159.80	173.50	.091	.091	.0058	.0068	.00533	.00525	1.13	1.33
Michigan Central	1,746	1,746	18,890	18,579	*311	1.6	10.8	10.6	170.00	171.00	.073	.076	.0059	.0068	.00641	.00627	0.94	1.09
N. Y., Chic. & St. Louis	523	523	10,576	11,877	1,301	12.3	20.2	22.7	224.00	229.00	.079	.086	.0062	.0071	.00511	.00526	1.22	1.50
Pennsylvania Co.......	1,414	1,416	52,844	53,044	200	0.4	37.4	37.4	75.32	79.93	.143	.172	.0078	.0113	.00600	.00610	1.31	1.81
P., C., C. & St. Louis...	1,472	1,472	22,910	22,905	*5	0.0	15.6	15.6	99.95	118.07	.072	.084	.0053	.0071	.00630	.00640	0.83	1.07
Pere Marquette	2,298	2,298	18,365	18,858	493	2.7	8.0	8.2	169.11	169.01	.154	.148	.0113	.0117	.00546	.00602	1.85	2.09
Vandalia	829	829	7,827	7,832	5	0.1	9.4	9.4	104.99	99.78	.105	.132	.0078	.0100	.00580	.00690	1.14	1.41
Total.	14,891	14,909	217,027	216,477	*550	0.2	14.5	14.2	138.18	146.92	.110	.122	.0080	.0095	.00625	.00642	1.28	1.52
Western Classification.																		
Atch., Top. & Santa Fe.	9,350	9,431	46,605	51,834	5,229	11.2	5.0	5.5	403.00	392.24	.076	.089	.0068	.0065	.00957	.00949	0.71	0.84
Chicago & Alton......	970	998	10,548	10,395	*153	1.4	10.9	10.4	165.94	151.85	.109	.112	.0076	.0076	.00604	.00610	1.26	1.36
Chic. & Eastern Ill.....	948	957	18,700	19,983	1,283	6.9	19.7	20.9	155.46	156.19	.171	.192	.0096	.0105	.00480	.00470	2.01	2.34
Chicago & Northwestern	7,623	7,632	57,413	57,620	207	0.4	7.5	7.6	144.46	158.07	.167	.177	.0106	.0119	.00904	.00870	1.17	1.37
Chic., Burl. & Quincy..	9,134	9,282	51,362	53,156	1,794	3.4	5.6	5.7	250.19	240.82	.092	.099	.0063	.0068	.00690	.00800	0.91	1.00
Chicago Great Western.	818	818	7,438	7,939	501	6.9	9.1	9.7	271.20	267.71	.087	.105	.0077	.0094	.00656	.00645	1.17	1.46
Chic., Mil. & St. Paul..	7,187	7,301	42,533	44,086	1,553	3.6	5.9	6.0	180.29	190.17	.088	.095	.0082	.0077	.00855	.00811	0.96	1.09
Chic., Rock Isl. & Pacific	7,780	7,970	41,261	39,581	*1,680	4.1	5.3	4.9	219.47	221.40	.111	.105	.0086	.0087	.00844	.00940	1.01	1.04
Chic., St. P., M. & Om..	1,711	1,730	11,887	12,430	543	4.6	6.9	7.2	144.97	140.17	.174	....	.0111	.0134	.00884	.00893	1.26	1.50
Colorado & Southern ...	1,858	1,952	9,049	9,166	117	1.3	4.9	4.7	151.00	132.00	.124	.130	.0088	.0093	.00942	.01034	0.93	0.92
Denver & Rio Grande...	2,552	2,499	10,262	11,673	1,411	13.7	4.0	4.7	128.70	117.02	.108	.137	.0091	.0108	.01345	.01330	0.67	0.81
Duluth, S. S. & Atlantic	591	595	2,847	2,813	*34	1.2	4.8	4.7	72.40	61.40	....	....	.0120	.0155	.00858	.00987	1.39	1.57
Great Northern	6,109	6,637	38,385	42,131	3,746	9.8	6.3	6.3	254.46	268.00	.110	.128	.0063	.0070	.00684	.00780	0.92	1.05
Illinois Central	4,377	4,594	56,949	60,871	3,922	6.9	13.0	13.2	244.84	241.09	.116	.130	.0086	.0084	.00576	.00586	1.50	1.72
Iowa Central	558	558	2,968	2,924	*44	1.5	5.3	5.2	166.67	175.65	.112	.110	.0071	.0069	.00604	.00592	1.18	1.23
Kansas City Southern..	828	828	7,285	7,148	*137	1.9	8.8	8.6	278.34	278.64	.113	.111	.0066	.0069	.00636	.00723	1.04	1.07
Minn. & St. Louis......	799	1,027	4,078	3,942	*136	3.3	5.1	3.8	97.38	105.25	.203	.192	.0151	.0145	.00995	.01063	1.52	1.54
Minn., St. P. & S. S. M..	2,282	2,308	12,795	12,762	*33	0.3	5.6	5.5	224.70	213.65	.143	.154	.0096	.0118	.00716	.00814	1.35	1.63
Missouri Pacific........	6,376	6,479	36,932	41,295	4,363	11.8	5.8	6.4	228.57	218.59	.114	.128	.0074	.0090	.00715	.00685	1.04	1.31
Mo., Kan. & Texas	3,072	3,072	18,796	22,417	3,621	19.3	6.1	7.3	244.74	236.57	.105	.136	.0110	.0147	.01076	.01010	1.02	1.45
Northern Pacific	5,448	5,649	42,320	42,171	*149	0.3	7.8	7.4	328.80	325.60	.108	.125	.0077	.0082	.00879	.00900	0.87	0.90
St. L. & San Francisco..	5,062	5,064	26,702	29,984	3,282	12.3	5.3	5.9	158.10	154.80	.124	.140	.0088	.0106	.00889	.00970	0.99	1.25
St. L. & Southwestern..	1,452	1,464	9,651	9,452	*199	2.1	6.6	6.5	239.58	240.82	.156	.149	.0131	.0133	.01072	.01010	1.22	1.32
San An. & Aransas Pass	724	724	1,630	1,611	*19	1.2	2.2	2.2	156.88	160.80	.089	.093	.0095	.0098	.01713	.01472	0.62	0.75
Southern Pacific	9,694	9,834	42,608	42,677	69	0.2	4.4	4.3	260.04	270.53	.076	.077	.0053	.0054	.01105	.01097	0.56	0.60
Texas & Pacific	1,885	1,885	11,452	11,212	*240	2.1	6.1	5.9	211.66	185.06	.102	.114	.0101	.0122	.00990	.01030	1.01	1.19
Union Pacific	5,645	5,781	24,970	25,040	70	0.3	4.4	4.3	405.00	402.77	.059	.067	.0037	.0040	.00819	.00826	0.46	0.47
Wabash	2,514	2,514	23,536	22,979	*557	2.4	9.4	9.1	228.01	225.23	.094	.092	.0067	.0072	.00524	.00573	1.27	1.34
Wisconsin Central	1,018	1,023	8,309	7,632	*677	8.1	8.2	7.5	184.03	179.32	.168	.158	.0103	.0096	.00693	.00672	1.48	1.43
Total	108,364	110,606	679,271	706,924	27,653	4.1	6.2	6.4	213.79	210.74	.119	.124	.0087	.0096	.00852	.00867	1.09	1.23
Total all roads..	175,407	177,880	1,669,504	1,730,533	61,029	3.7	9.5	9.7	177.52	178.11	.120	.130	.0088	.0100	.00788	.00803	1.21	1.34

*Decrease.

RAILWAY RATE MAKING IN PRACTICE.

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CHAPTER IV.

THE INTRICACY OF FREIGHT RATE ADJUSTMENT (CONT'D).

Not only must rates of all sorts be delicately adjusted to suit the immediate exigencies of trade; they must be constantly modified in order to keep pace with its ever changing conditions. This is peculiarly true of a rapidly growing country like the United States. An admirable instance is afforded by the complaint of the Lincoln Commercial Club before the Interstate Commerce Commission.* Lincoln, Nebraska, lies about 55 miles southwest of Omaha. Originally all its supplies came from the East, as both cities were for a time out-posts of civilization. The coal supply came from Iowa and Illinois and the salt from Michigan. On these and most other commodities the rates to Lincoln were made up of a through rate from the East to the Missouri river plus the local rate on to destination. The city of Lincoln thus paid considerably more than Omaha for all of its supplies. Gradually conditions have changed until in 1907 it appeared that over half the soft coal consumed in Lincoln was brought from Kansas and Missouri; four-fifths of the lumber from the South and nearly all the rest from the Pacific coast; glass and salt from the gas belt and salt beds of Kansas and a great deal of beet sugar from the western fields. For a large proportion of these and other supplies, Lincoln was actually as near or nearer the point of production than Omaha, and yet the difficulties of effecting an adjustment between rival carriers had prevented any modification of rates corresponding to these changes in economic conditions. On every one of these commodities the rate to Lincoln remained steadily higher than to Omaha, regardless of the source of supply. Unanimous consent was necessary for readjustment. So long as any single road refused assent, a general rate disturbance might be precipated by any independent action. The beneficent effect of the exercise of governmental authority, powerful enough over all interested parties to compel acquiescence, has been clearly apparent in affording relief. A similar instance in the state of Wisconsin is afforded by the compulsory readjustment of the freight rate on wood pulp, lumber and sawed logs.† On investigation it appeared that despite a very much lower commercial value for the raw material used in paper manufacture, the rates on pulp wood were more than double those on logs to be sawed up for lumber. It appeared, moreover, that this apparent anomaly was due not so much to high rates on the pulp wood as to very low rates on sawed logs. This latter rate for many years had been fixed at a very low figure because originally the bulk of such logs, cut in the river bottoms, was floated down stream to mills along the Mississippi river. Competition with lumber raft rates originally determined the charges on lumber by rail. The paper industry did not begin until these conditions of water competition had quite disappeared. Gradually with the progress of deforestation all the timber is now found on the uplands far from navigable water courses; so that the rates to-day are not at all influenced by competitive rates on the lumber rafts down river. Nevertheless the old tariffs on lumber remained in force despite the changed conditions, while the new rates on pulp wood were fixed independently of any rates by water. It was only after careful investigation that the injustice to the paper manufacturers from the disparity in charges appeared. Here again it was the rigidity and interlocked complexity of adjustment which placed it in the power of one road to block change of any sort.‡ The compulsory exercise of governmental authority cut the Gordian knot with the result that substantial justice now obtains.

*No. 1102, decided April 6, 1908.
†Wisconsin Railroad Commission, 1908.
‡The diverse interests to be reconciled must also include the lumbering centers once "next the stump," but now placed at a relative disadvantage. The Eau Claire lumber case [reprinted in Railway Problems, pp. 203-233] should be read in this connection.

From the preceding statements it will be observed that carriers have another important commercial function beside that of equalizing industrial conditions. They also act in a protective or insurance capacity to the merchant or manufacturer. The policy of "keeping everyone in business" implies not only variety but variability of conditions. Capital is proverbially timid. It will not venture into a new and uncertain enterprise unless either profits are immediate and high; or, if moderate, likely to endure. In any event some guarantee of permanence is required. This guarantee the carrier is often able to offer. It may assume the obligation of protecting its clients; that is of saving them harmless against the intrusion or irruption of hurtful competition. It thus exercises in a certain sense the function of an insurance company, but with this important difference: that while it has the strongest interest in protecting its established industries against ruinous competition from abroad, it may desire to share in some degree in their development and prosperity by way of reward. In this latter sense the relation of the carrier to its clients partakes of a profit-sharing arrangement. One of the broadest issues between American railways and the public at the present time is precisely this: whether the carriers are to share in business profits; or merely, in addition to furnishing transportation, are to collect a fixed fee for a service in the nature of industrial insurance. That it lies in their way to furnish such protection under modern economic practice is an indisputable fact.

This nice question is almost daily pressing for solution at the hands of the Interstate Commerce Commission. It arises every time an increase of freight rates occurs. Take, for example, the Pacific coast lumber cases of 1908. The dissenting opinions of the commission show how debatable the proposition is.* Up to about 1893 the lumber interests of the Pacific coast were quite undeveloped and entirely dependent upon water transportation for reaching markets. At this time low rates of 40 to 60 cents per hundred pounds on forest products to markets in the middle west were introduced, partly to build up the industry and partly to create a back loading for the preponderantly west-bound tonnage of all transcontinental lines. Under these rates the business has enormously developed until on the Northern Pacific road in 1906 the shipments of lumber east-bound amounted to one-third of its entire traffic both ways, and yielded nearly one-fifth of its freight revenue. So greatly had this traffic expanded that it aided, if not actually produced, a reversal of the direction of transcontinental empties. Practically all these roads now have an excess of tonnage to the east whereas ten years ago much the larger volume of freight was moving westward. Meantime the lumbermen under the stimulus of these rates, together with the phenomenal rise in the price of lumber, had been wonderfully prosperous. The price of logs had risen since 1893 from about $2.50 per 1,000 ft. to $13.50 in 1906; partly in consequence of the extraordinary demand consequent on the Valparaiso and San Francisco earthquakes. The mills had moved in from the rivers and the coast, and had become absolutely dependent upon rail transportation for reaching markets. At this stage, and most unfortunately in November, 1907, just at a time of industrial panic, the carriers raised their rates by about ten cents per 100 lbs. The market price of logs had already dropped from $13.50 per thousand by approximately one-third. These two causes, commercial depression and the increased freight rate, brought about a complete collapse in the industry. And the increased freight rates were contested before the Interstate Commerce Commission in the hope that, as in the southern field the rate increases from Georgia points had been annulled, these might also be found unreasonable. The broad question concerns the obligation of carriers once having brought about an investment of

*I. C. C. Reports, Nos. 1327, 1329, 1335, 1348, decided in 1908.

capital of the industry to continue to give the same rates as those under which the ventures had been undertaken, due regard being had, of course, to such changes in costs of service as might have ensued. The lumbermen demand that all the increment of profit due to prosperous development shall remain unto them; in other words, that the carriers' share of the increased values shall remain fixed. On the other hand, the railways defend their increases, partly upon the ground of increasing expenses of operation, and partly upon the broader ground that the freight rate being proportioned to the price of the product, should rise in harmony with it. Upon this question the commission is divided, the majority holding in favor of annulling the increase, while the chairman and one other member decided that the increase was justifiable.

Elasticity and quick adaptation to the exigencies of business are peculiarities of American railway operation. Our railway managers have always been most progressive in seeking, in and out of season, to develop new territory and build up traffic. The strongest contrast between Europe and the United States lies in this fact. European railways more often take business as they find it. Our railways *make* it. Much of this business is made possible only by special rates adapted to the case in hand. These need not be secret or discriminating, as has already been observed. For although offered with reference to particular cases, they may be open to all comers. The economic justification lies in the fact that the railway can afford to make a low rate, leaving a bare margin of profit above the extra cost of adding this traffic to that which is already in motion. Such rates cannot exceed a definite figure based upon what the traffic will bear. A higher rate than this would kill the business. Something is contributed toward fixed charges by the new traffic, so far as the railway is concerned; and at the same time the shipper on his part is enabled to enlarge his operations. Yet such a scale of rates if applied to the whole traffic of the railway might be ruinous in the extreme. The domestic shipper of wheat may conceivably be helped rather than injured by a special rate on grain for Liverpool without which the railway would lose the business entirely. To transport California fruit for a mere fraction of the rate per ton mile which is laid upon other traffic may actually enable those other goods to be carried more cheaply than before. Of course, if the other traffic be directly competitive, as for instance in this case, oranges from Florida, that is an entirely different matter. Railway representatives rightfully insist upon these special rates to develop new business as a boon to the commercial world. They contrast them with the hard and fast schedules of European railways. They allege that such elasticity loosens the joints of competition, "keeps everyone in business," equalizes prices over large areas and is in fact the life of trade. One of the stock objections to railway regulation is that it may lessen this elasticity, "substitute mile posts for brains" and produce stagnation in place of activity.

Paradoxical as it may seem, a certain rigidity of rate schedules is a natural consequence of the very delicacy with which individual rates are adjusted to meet the demands of trade. Each road is jealously and aggressively alert to protect its own constituency regardless of the rights of others. No single traffic manager is free to grant reductions of rates, even when considered to be just, by reason of the opposition of competing lines. The consent of every one of these interests is necessary in order to insure stability, and the penalty for acting independently may be a rate war, disastrously affecting relations with connecting lines. Thus, for example, in the South the Southern Railway for some time was willing to concede as a measure of justice a reduction of rates on cotton from Mississippi river points to the mills in North and South Carolina.* The growth of the textile industry had resulted in a demand for cotton far exceeding the production of the Carolinas. At the same time the increasing attention devoted to manufacturing of a higher grade had forced the manufacturers to draw upon the long-staple supplies of the Mississippi bottom lands. The Piedmont cotton was too short in fiber for the finer sorts of goods. The Carolina mills were, however, compelled to pay a higher rate upon cotton from such points as Memphis than was paid for the long haul up to New England. Thus, for instance, as late as 1900 rates were 59 cents to South Carolina, while they were only 55½ cents per hundred pounds from the same points to New England mills. This was obviously unjust. But the Southern Railway alone, interested in the welfare of its Carolina clients, was powerless to act without the consent of its competitors operating from Memphis west of the Alleghanies. These latter lines having no interest in the southern mills and a unity of interest in the long haul traversed to New England, sought to prevent an equalization of the differences. Controlling rates also on cotton for export to various sea-ports they were for a long time able to prevent a change. On the other hand, in the same territory the railways operating south from Cincinnati and Louisville desired to reduce rates on manufactured products from the central west.* These were the very lines which in the former instance prevented the reduction of cotton rates on the Southern Railway to Carolina points by threats to meet such reductions by cutting their own rates on cotton going north through the Ohio gateways. Yet a reduction of their rates on manufactures for building up western trade threatened the business of the Southern Railway, which had been mainly interested in the traffic from Atlanta seaboard points. It may readily be seen that this situation, extending to practically every important point, "jacked up" all these rates, not because of their inherent reasonableness and not even because the railways independently acknowledged them to be just, but simply and solely because any disturbance of this house of cards might lead to a general downfall of the whole system.

(*To be continued.*)

*Arbitration of cotton rates etc., Nov. 15 and 16, 1900; pamphlet arguments of Southern vs. Illinois Central Railways.

*This was the gist of the complaint in the maximum freight rate cases; reprinted in Ripley, Railway Problems, pp. 145-190.

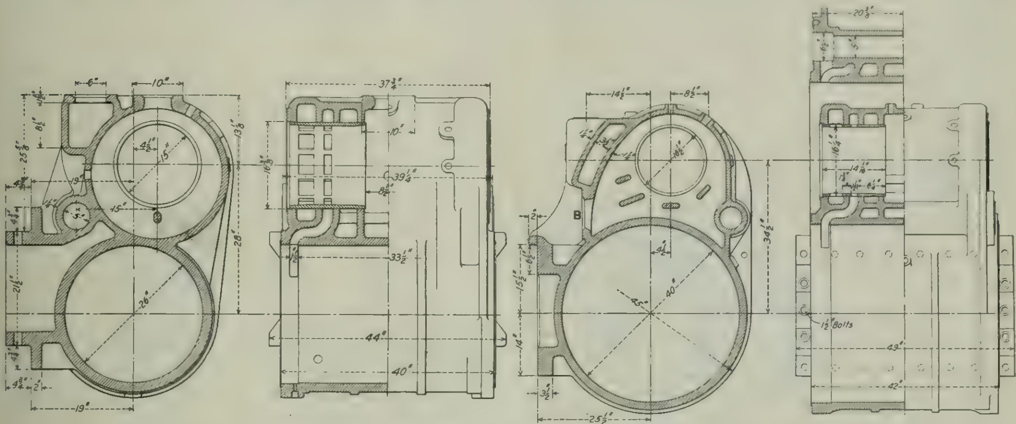
DETAILS OF ARTICULATED MALLET COMPOUND LOCOMOTIVE FOR THE SOUTHERN PACIFIC.

In addition to the detail engravings of the large Mallet locomotive, built by the Baldwin Locomotive Works for the Southern Pacific (*Railroad Age Gazette*, April 30), a few additional ones are presented herewith.

Attention has been called to the change in the valves from those of the Great Northern locomotives. The Southern Pacific Mallets are fitted with piston valves. The valve chambers of both the high and the low-pressure cylinders are fitted with the Sheedy relief or by-pass valve. A passage connecting the two ends of the cylinder is closed by valves that shut under steam pressure when the throttle is open, but are opened by springs when the throttle is closed. When open, the passage permits the contained air to be churned back and forth between the two ends of the cylinder, while the engine is drifting with no danger of drawing in gases from the smokebox or receiver. Both valve chambers are fitted with the usual cast-iron bushings, having ports 1½ in. wide for each cylinder, that discharge into the cored cylinder posts, which are 1¾ in. wide for the high and 2 in. wide for the low-pressure cylinder. It will be noticed, too, that the valve chamber has the same diameter, 15 in., for each cylinder.

Owing to the difference between the front and back frames, the method of cylinder fastening differs. At the rear end the frames are of the double bar type, extending the whole length, and the high-pressure cylinders are fastened by 1½ in. bolts driven both horizontally and vertically through both rails

and staggered. At the front the bar frame ends at the cylinders and the forward portion is a steel casting with a heavy slab section at the point of cylinder attachment. This construction was probably necessitated by the large diameter of the base, which is 40 in. and comes within 5½ in. of the face of the frame. As it is, each cylinder is held by 22 bolts, 1½ in. in diameter and arranged to drive through the flanges of the casting and the slab portion of the frame. The weight the saddle has no connection with the smoke-box and is of a somewhat simpler construction. The illustration of this saddle, when taken in connection with that of the steam pipe to the low-pressure cylinder on page 936 of the issue of April 30, gave an idea of the path of the steam to the cylinder. It is delivered by the steam pipe to the opening A in the saddle and discharged at B on either side, whence it is led by the elbow pipe (shown on page 936, April 30) to the low-pressure



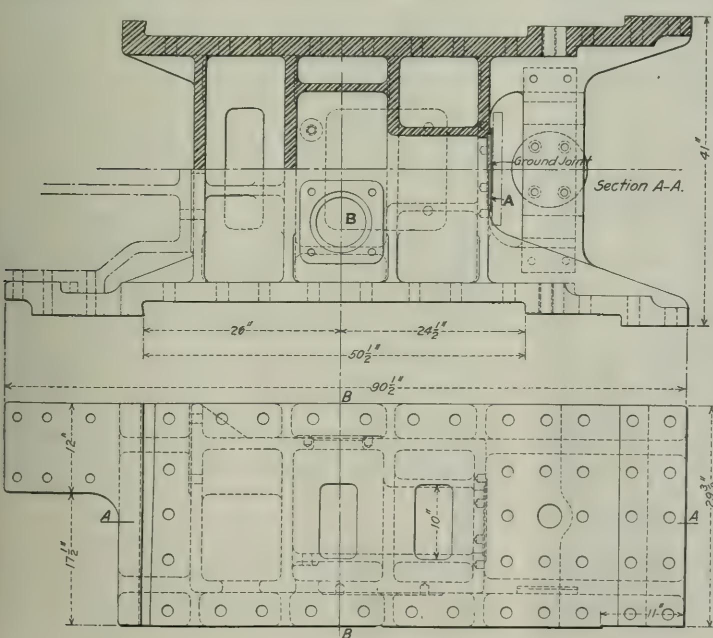
High and Low Pressure Cylinders; Mallet Articulated Compound for the Southern Pacific.

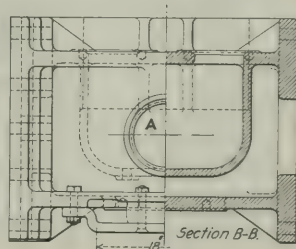
is carried by a lip bearing on the top of the frame, and the end-thrust by the usual keys and wedges. Both cylinders are stiffened by ribs about the barrel.

At the high-pressure cylinders, the saddle has the usual bearing for the boiler (illustrated April 30). As the low-pressure cylinders are free to move laterally with the forward truck, cylinder at B. The method of taking the exhaust to the smoke-box has already been described.

The saddle also serves as a means of stiffening the connection between the front and rear sections of the frame, and for this purpose has a slab projection extending to the rear through which there are 20 bolts of 1½ in. diameter to serve as frame fasteners in addition to those used in connection with the cylinder.

As in the case of the Great Northern locomotives, the McCarroll air reversing gear is used. Since the ordinary hand reverse lever has been discarded, and entire dependence is placed upon this mechanism for the work of reversing, it is evident that it is necessary to have an air pressure upon the engine when the gear is to be moved. The latest design of the mechanism is shown by the accompanying engraving. The reverse lever in the cab is about 18 in. long and the lower and shorter arm is connected to the valve lever of the gear by a

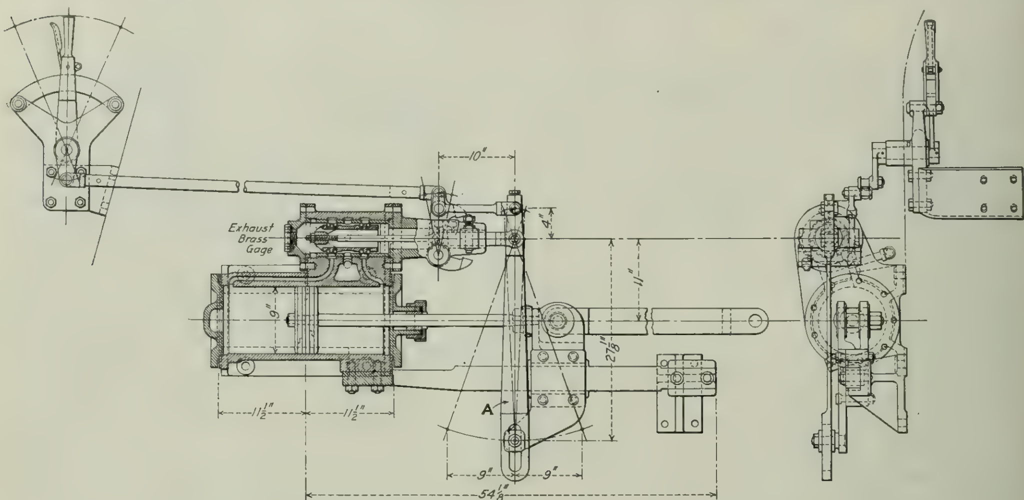




Castings Between Low Pressure Cylinders.

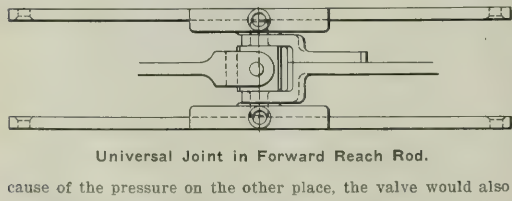
pipe reach rod. The power is applied to a 9-in. piston in the cylinder, whose piston rod is keyed directly to the main reach rod. The operation is exceedingly simple and efficient. The valve is of the piston type, with 1-32-in. inside and ⅛-in. outside lap, and designed for an inside admission and has its stem directly connected to a rocking lever A. The lever A is pivoted by means of a slotted hole to the crosshead arm. The operation is as follows:

When the reverse lever is moved to the forward position it draws back the lower arm, and with it, also, the upper end of the rocking lever A and the value of the reversing mechanism. As the valve is of the inside admission type, this movement admits air to the back end of the cylinder and pushes the piston to the front. As the piston moves out and the reverse lever is latched at a notch corresponding to the desired point of cut-off, the rocking lever A is turned about the upper connection and carries the valve stem with it, thus moving the valve also to the front and closing the port. When this has been done, the piston is air locked by a pressure on each side of it. Should it so happen that through leakage or for any other reason the pressure upon one side of the piston is reduced, and there should be a movement in that direction because of the pressure on the other place, the valve would also be moved in the same way and, by opening the corresponding port, admit air against the direction of movement and thus push the piston back to where the valve is held in its central position, thus maintaining the cut-off at the point at which it is set by the reverse lever.



McCarroll Air Reversing Gear; Mallet Articulated Compound for the Southern Pacific.

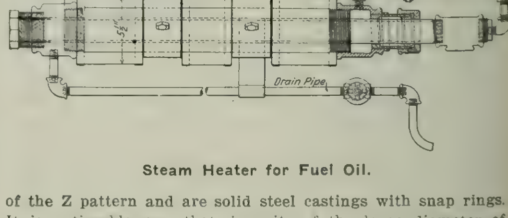
For transmitting the motion on from the rear to the front frames and, at the same time, to compensate for the angularity existing between the two when the engine is on a curve, a universal joint is put in the forward reach rod. This joint consists of two sets of trunions at right angles to each other, carried by a crosshead moving in guides in the high-pressure cylinder saddle. When the reversing mechanism is in the central position, this universal joint is directly over the pin connecting the front and rear frames, so that even when at the extreme front or back limits of its throw, the lengthening or shortening of the reach rod due to angularity will be so small as to be a negligible quantity, not great enough to cause any disturbance in the working of the valves.



Universal Joint in Forward Reach Rod.

The oil that is used on these locomotives is rather heavy and has to be warmed before delivery to the burners. This is accomplished by means of the steam heater shown. It consists simply of a 3-in. pipe about 7 ft. long, into which steam is admitted. It is capped at each end for the admission of a 1¼-in. pipe through which the oil flows, and which is there heated by the surrounding steam.

These are the principal features of the engines. The propelling and running gear mechanisms correspond, in general, with standard practice. There is a difference between the high and low-pressure pistons in that the former are of the ordinary box type, with a follower, while the low-pressure are of the Z pattern and are solid steel castings with snap rings. It is noticeable, too, that, in spite of the large diameter of the cylinders, especially that of the low-pressure, it has not been considered necessary to use tail rods to carry the weight.



Steam Heater for Fuel Oil.

The contract for the extension of the Rhodesian Railway from Broken Hill to Katanga, near the southeast corner of the Congo Free State, has been let to Pauling & Co., who began work in February. The copper mines at Katanga are reported to be extraordinarily rich. The ores will reach the sea, when the road is completed, at Beira, in Portuguese East Africa.

GRAIN HANDLING IN THE UNITED STATES.

BY SAMUEL O. DUNN.

Western Editorial Manager, *Railroad Age Gazette*.

Vastly the major part of the grain grown in the United States has for many years been transported to market in bulk. That is, it has been run directly from the spout of the threshing machine into the farmer's wagon, and then either has been hauled directly to the nearest country elevator or has been shoveled into the farmer's granary and subsequently shoveled out of it into wagons, hauled by the country elevator, loaded from the elevator into a car in bulk, hauled in bulk to the terminal elevator, transferred there in bulk, and finally exported or delivered to the miller in bulk. The practice of handling grain in bulk has for many years prevailed so exclusively in the great grain producing states of the Middle West and of the more easterly states of the Northwest, such as Minnesota and the Dakotas, that the farmers, grain dealers and railway men in that part of the country are almost unacquainted with any other method, and when they hear any other described they are pretty sure to condemn it as slow, expensive and primitive. Nevertheless, an older and different system of grain handling prevails in a large part of the world.

The wheat crop of Argentina, which amounted in 1907 to almost 156,000,000 bushels, was sent to market mainly in sacks. Similarly, the large wheat crop of the states of Oregon, Washington and Idaho, which in 1908 amounted to over 42,500,000 bushels, was moved to market mainly in sacks. Efforts have been made for years to introduce the system of bulk shipment in the Pacific Northwest, but they have been only partially successful. It is evident that there must be some reason for this adherence in a large part of the grain growing world to a method of handling which shippers and railway men elsewhere regard as costly and primitive.

The way in which grain is handled, whether in bulk or in sacks, affects its transportation by rail in various ways. It is apt to effect the rate on grain. It affects the tonnage of it that can be got into a car, and also otherwise affects the cost of rail transportation. It has a relation that is not generally recognized to the subject of car shortage, and to the kind of cars used in handling grain. In view of facts such as the foregoing, it is thought that an article dealing with the two methods of handling grain might not be uninteresting to the readers of this paper in England and elsewhere.

The grain elevator system, which is now one of the most characteristic parts of the machinery of commerce in the United States, has grown up largely in response to the same demand, and has been given its present form largely by the same conditions that have stimulated and shaped the growth of the American railway system, with which it has always been very closely interwoven.

The Chicago Board of Trade was organized in April, 1848. Its object was to establish a point where buyers and sellers of grain could meet to transact their business. At that time wheat was hauled to Chicago in wagons from a radius of 100 miles around and was sold in the Chicago market at 40 cents a bushel. Not only were there no railways to transport it, but roads and even bridges were wanting, and the farmer's profit from his crop, of course, was negligible. The issuance of a charter to the Illinois & Wisconsin Railroad Company in Illinois in 1851 marked the beginning of the development of the so-called "granger railways." The Illinois & Wisconsin is now a part of the Chicago & North Western system. As the various railways pushed out from Chicago the grain dealers in that city sent buyers to the country stations, who were either merely agents for the Chicago merchants or did business on capital furnished by them. In either case the grain bought at the local station was usually purchased either directly or indirectly on the account of the Chicago merchant and shipped to him. No one can say just when or where the first grain warehouse bearing a resemblance to the modern elevator was built. It can, however, be stated with assurance that in the early days the farmers of the Middle West hauled their grain to the local railway stations in sacks, and that the primitive structure which then served as an elevator had a hopper into which the grain was poured directly from the sack, after which it was elevated by an endless chain of buckets and deposited in bins, from whence it was discharged by gravity into cars on the adjoining tracks, horse power being used for the elevation of the grain. Subsequently, some inventive genius devised a scheme by which the hopper was located in a pit at the bottom of the elevator, and the wagon was driven over it and dumped by gravity. This marked the beginning of the end of the handling of grain in sacks in the middle west.

COUNTRY ELEVATORS.

Elevators built rapidly built at numerous country stations along every line of railway, and were well patronized from the first, because they met the needs of all directly concerned—the farmer, the grain dealer and the railway. By enabling the farmer to deliver grain in bulk they saved him the expense of buying sacks. If his grain came from the field wet, the elevator man had facilities for preventing it from spoiling that no individual farmer could provide. Grain grown in the Middle West, it is said, must sweat somewhere. If it does not sweat in the sack it is apt to sweat in the bin, and if it does not sweat in the bin it is apt to sweat in the flour. The elevator proprietor had facilities for preventing the grain from spoiling by sweating that the farmer did not have. In former years in the Middle West the farmers were all poor and needed to realize cash from their crops as soon as they were harvested. The elevator was not only a facility for transferring grain from the farmer's wagon to the car, but was also a storehouse. The fact that the dealer had a place to keep the grain if the market was unfavorable after he bought it, enabled him to take it as fast as it came in, and then hold it for a good price, a thing that the farmer with his lack of financial resources could not do.

The presence of elevators on its lines was advantageous to the railway. Grain could be accumulated in the elevator until there was several carloads and then poured rapidly into the cars. This made delays to rolling stock less than when the grain was shoveled from the farmer's wagons into cars or was transferred direct from the farmer's wagon to the cars in sacks. There was a time when there was a number of little flat warehouses along the railways in the Middle West, some of them having a capacity as small as 1,000 bushels. It took two, three or even four days to scoop enough grain from one of these to load a car. On the other hand, the ordinary country elevator had a capacity of several thousand bushels; a modern country elevator usually has a capacity of no less than 25,000 bushels; and 10 to 15 cars can be loaded from it daily. Where sack grain is accumulated in flat warehouses before being loaded on cars, the delay which loading it causes to railway equipment is less than the delay that would be caused by shoveling it from a wagon into a car, but it is substantially greater than the time taken to load cars from an elevator. In seasons of heavy railway traffic the elevators afford a place where large quantities of grain can be stored awaiting cars; and therefore, it is contended, the elevator system tends to reduce the congestion of traffic at such times.

TERMINAL ELEVATORS.

What has been said relates mainly to the country elevators. The advantages to the farmer, the shipper and the railway of the terminal elevators at the large markets were early recognized to be equally great. The grain as it came from the farmer in the Middle West often needed to be dried, cleaned, etc., to render it fit for export or for milling. For example, occasionally during a wet season, there is a soft corn crop in Illinois. Corn in this condition cannot be transported far without spoiling. It is necessary to get it as soon as practi-

cable where it can be properly treated, and this usually can be done only in a large terminal elevator, for the country elevators are seldom equipped with machinery for any purpose but the transferring of grain—elevation properly so-called. Of course the existence of facilities for so treating the grain as to keep it from spoiling inures in the long run to the advantage of producer, carrier, grain dealer and consumer.

Usually when grain was bought its ultimate destination was unknown. It is not known whether finally it would be ground into flour at Minneapolis, or St. Louis, or Chicago, or shipped to the Atlantic seaboard, or sent to Europe. The merchant, therefore, needed a place to keep the grain while he was finding a buyer for it. The terminal elevator served this purpose. It was often advantageous to mix a lower grade of grain with a higher grade in order to increase the value of the former, and the elevator was equipped with machinery for this purpose also.

The establishment of terminal elevators on its lines at the large markets was extremely desirable for the railway. When a terminal elevator was built on the lines of one road, the grain moving to that elevator was pretty sure to move over that road, giving it traffic. When the transportation of grain began before its ultimate destination was known, it was pretty sure to have to be held in storage somewhere, and if, after it began to move, it were not held in storage in a terminal warehouse it would have to be held in the railway's cars; and a car can commonly be used to better advantage as a transporter than as a warehouse. A great deal of grain had to be transferred at terminals from cars of one railway to cars of another or to boats on rivers, canals, the Great Lakes and the ocean, and these transfers, of course would be accomplished with least delay to the cars through an elevator. Both the country elevator and the terminal elevator were an advantage to the road in that they enabled it to load its cars to their cubic capacity with the lighter grains, such as oats, which could not be done when grain was shoveled into the car or stowed in it in bags.

Owing to these and other conditions, the railways in the Middle West from the start did all they could to stimulate the development of the elevator system. In some cases they built and operated both country and terminal elevators themselves. In other cases they furnished the capital for the organization of companies which built and operated the elevators. In other cases they built elevators and leased them at low rentals to grain dealers. In still other cases they leased land to private individuals for the construction of elevators at purely nominal rentals—at $1, $2 or $5 per year. Competition between the roads was such that it is believed the instances were few where elevators were built entirely with private capital and ground belonging to railways was leased for what it was worth. The evidence taken by the Interstate Commerce Commission in the so-called Peavey case, which appears in the various reports of the Commission under the title "In the Matter of Allowances to Elevators by the Union Pacific Railroad Company," throws much light on the relations that long have existed and still exist, between the railways, the grain dealers and the elevator operators. This testimony shows that grain is usually bought in the country by the manager of a country elevator. It is weighed, taken into the elevator, and paid for, and the transaction is completed so far as the farmer is concerned. Occasionally the farmer puts his grain into the elevator subject to order for future shipment, or sells to what is known as a "track buyer," in which case the grain is delivered directly from the wagon to the car. The owners of country elevators sometimes have no connection with any terminal elevator, in which case the grain is sold "f. o. b." at the country station and consigned to the owner in care of some commission house at a central market. In most cases, however, the country elevator is one of a string of elevators that is operated by some concern which also operates large terminal elevators and buys and sells grain. Ordinarily such concerns keep their business as operators of elevators and their business as dealers in grain nominally separate. For example, the Peavey Grain Company runs its elevator at Kansas City, Mo., under the name of the Midland Elevator Company, and its elevator at Council Bluffs, Ia., under the name of the Omaha Elevator Company. Similarly, the Armour Grain Company operates its elevators under the name of the Armour Elevator Company, and it is also pretty well understood that it controls the Neola Elevator Company. Usually a railway works on its line with a single large elevator company. For example, the Peavey Grain Company operates a large number of country elevators on the Union Pacific system and the Rosenbaum Grain Company on the Rock Island and some other roads.

(To be continued.)

THE PASSENGER RATE OF THE AMERICAN RAILWAY.*

BY WILLIAM S. BRONSON,
Assistant General Passenger Agent, Chesapeake & Ohio.

II.

The maximum rate of fare, covered by the first class one way ticket applies primarily to causes that occasion infrequent travel. The second class rate meets the same causes for travel as the maximum rate of fare, the distinction being merely one of accommodations. The immigrant rate meets those causes that occasion immigrant travel, mainly immigration from foreign lands to the United States, and these fares are not available for domestic travel. The round trip rate meets a kind of travel not fitted by lower lesser rates of fare such as mileage, commutation, tourists' and excursion tickets, and each other rate is occasioned by a definite distinction in the needs of the traffic it covers.

It is a maxim that passenger density depends upon the density of the population of the territory served by the railway. This means, in good plain English, that if people do not live on or near the line of a railway, the railway cannot carry them, and it must be apparent even to the layman that in such states as Massachusetts, with 347 people to the square mile, Connecticut with 187 people and Rhode Island, with 407, travel is necessarily greater than in Virginia, with 46 people to the square mile, West Virginia, with 39, and Kentucky, with 54. Yet, as we are dealing with a theory, it is our purpose to establish this theory clearly.

The New York, New Haven & Hartford Railroad, for the year ending June 30, 1906, operating in the above mentioned New England states, under a rate adjustment, which included a three-cent maximum rate, showed a passenger density of 610,416 passengers carried one mile, each mile of railway, at an average rate of 1.6 cents per mile, producing $10,233 in earnings, and $1.38 for every mile each passenger train ran. The corresponding report of the Chesapeake & Ohio Railway, operating in the above mentioned southern states, under a rate adjustment which included the same three-cent maximum rate, shows a passenger density of only 110,648 passengers carried one mile each mile of railway, at an average rate of 2.1 cents per mile, producing only $2,365 in passenger earnings for each mile of road and $1.17 for every mile each passenger train ran.

As density of population regulates density of travel, so does density of travel regulate the rate, for the average rate obtained by the rate adjustment of the New York, New Haven & Hartford was 1.6 cents per mile, while the average rate obtained by the Chesapeake & Ohio was 2.1 cents per mile. In other words, under a uniform maximum rate, the traveler in the sparsely settled southern states paid one-half cent per mile more for his travel than the traveler in the densely settled New England states. The greater the volume of business, the cheaper the selling price, and the railway operating

in sparsely settled states can no more carry passengers profitably at the same rate as the railway operating in densely settled states than can the country storekeeper sell his goods at the same price as the city merchant.

If necessity was the only cause for travel, and people could not be induced to travel through habit, for pleasure and recreation, or ror business causes through attractive rates of fare, then only one rate would be necessary, although even in that case, the one rate would vary on different railways serving different sections of territory, conforming to the density of population. But as a large proportion of travel is caused by reasons other than necessity, all these matters must be taken into consideration in the adjustment of rates of fare. Primarily, the railway is a common carrier, a public utility. Secondarily, it requires the revenue obtained from creative traffic, so that in order to satisfy both public and stockholders, we must provide various rates for various causes for travel.

The maximum one way rate is fixed first. It takes into consideration the density of population of the territory served by the railway, and the fact that business and social conditions and the railway's own welfare require the establishment of many lesser rates. If these two considerations work out a maximum rate, which, based on past experience and the experience of other similarly situated lines, would be so high as to tend to unduly dwarf general travel, the first consideration is to a certain extent disregarded, and after giving due weight to the second consideration, a maximum rate is fixed upon that will bring out a satisfactory general travel, and in connection with various lesser rates will obtain an average rate that will produce satisfactory returns. That the density of population must be disregarded when the maximum rate worked out is too high to fit the causes for travel is clearly illustrated by taking the New York, New Haven & Hartford Railroad as a standard. Based on population, the two-cent maximum rate on that railway is equivalent to a five-cent maximum rate on the Chesapeake & Ohio, in Virginia, West Virginia and Kentucky. Yet a three-cent maximum rate was voluntarily given by the Chesapeake & Ohio, because, regardless of population, this rate combined with various lesser rates produced better results than either a four-cent maximum rate with other lesser rates, or a two-cent maximum rate without the lesser rates. When railways were first established and had no guiding precedents to assist them in adjusting their fares, the charter rates were very naturally charged as the maximum, but these fares were quickly found to be so high as to dwarf travel. After an experience of 75 years the railways in most sections of the United States have found that a three-cent maximum rate, together with various lesser rates, gives the best general results. Too high a maximum rate simply forces people to stay at home, while, on the contrary, too low a maximum rate, which impels the railway to refrain from putting into effect the lesser rates for creative purposes, accomplishes exactly the same result. It is an assured fact that in our sparsely settled country the street car principle will not produce satisfactory results, for without the influence of the lesser rates fitted to the various causes for travel, travel, as a whole, is so dwarfed that no single rate, be it high or low, can produce remunerative returns for the railway.

Although, some years ago, second class fares were quite generally in use throughout the United States, to-day, by reason of the prejudice against class distinctions existing in the minds of the American people, these fares are the exception rather than the rule, and it requires no prophet to foretell the end of second class rates of fare in the very near future. The titles now are misnomers, since no second class accommodations are generally provided on our trains, and it is a daily occurrence to find two travelers riding side by side between the same points, one holding a ticket calling for a first class passage, and the other a ticket calling for a second class passage. As a matter of fact, in the near future tickets will be valid for railway transportation in any car on train, or will read "for one coach passage" when restricted to coach accommodations.

As to the second class rate in cents per mile, the old basis, years ago, seemed to fix the second class rates at about two-thirds of the first class rate. To-day, however, the difference is much less and rarely exceeds a 10 per cent. reduction.

Immigrant rates, effective from important ports of entry only, and not available for domestic purposes, have so little bearing of the rate adjustment that any extended explanation is unnecessary. The reduction under the maximum rate is now so small than the immigrant rate is well up to the average rate obtained from other travel factors.

A distinction is made between round trip rates and excursion rates, the former providing a basis of fares which are always available. Hence they are in the nature of a maximum rate for round trip travel, while the excursion rate, though a round trip rate, is available only during a specified period, and is established to fit temporary causes for travel entirely different from those causes fitted by the round trip rate. Under the general classification of round trip rates we include the so-called regular round trip local rates, which many railways have in effect between all points just as they have the maximum one way rates. In such cases, these rates, while fitting causes for round trip travel, accomplish a separate purpose by reducing the payment of cash fares on trains.

Round trip fares are frequently established at a considerable reduction under double the maximum rate between commercial centers reasonably distant and between commercial centers and adjoining country districts where existing causes for round trip travel warrant a rate that will bring out the travel. Illustrative of the first instance is the New York and Washington situation, where the one-way rate for years stood at \$6.50 as against a \$10 round trip rate, both voluntary rates, and each serving a distinct purpose. Yet, with these fares in effect, mileage rates of \$4.52 one way and \$9.04 round trip were also effective. Illustrative of the second instance, is the Richmond, Va., situation. Round trip rates from adjacent territory to Richmond were effective at a reduction of 20 per cent. under double the maximum rates.

The mileage rate being a lesser rate can be adjusted to much greater nicety than can the maximum rate, which, as before explained, cannot be fixed so high as to unduly dwarf general travel regardless either of population or of remunerativeness, while the mileage rate can be regulated to a great extent by density of population, and is always fixed at a figure presumably remunerative. In fixing commutation fares, however, a monthly rate of fare based on any ordinary rate per mile in cents would be prohibitive and would utterly fail to fit this cause for travel. Hence it is necessary to fix upon a rate per mile that multiplied by 60 (the number of trips comprising a monthly ticket) will give a monthly rate that will enable business to move. This rate averages about 7 mills per mile with a minimum monthly rate of \$2.50, so that the commuter living ten miles out of the city and traveling 600 miles monthly pays \$4.20. If he lives 25 miles outside the city and traveling 1,500 miles monthly, he pays about \$10.50. School tickets are sold at even a lower rate per mile, while family tickets are higher.

Within the last year many lines have withdrawn their party rates entirely rather than suffer the loss in revenue believed to be involved in opening up the rate to public use, as was required by the Interstate Commerce Commission. More than half of the railways of the country now have no party fares in effect, and such causes for travel as theatrical and amusement interests are not fitted by a rate of fare so that business interests that cannot afford to pay the maximum rate are forced out of business. On lines where the rate is in force the tendency is towards a party rate of 2 cents a mile, it having been pretty conclusively demonstrated that any less rate fails to encourage travel sufficiently to justify the greater

reduction, while any rate over 2 cents is a misfit and destroys the causes that occasion the travel. Possibly the Far West, with its small density of travel, can afford a 2½-cent rate.

The generally accepted basis for tourist fares is 80 per cent. of double the maximum, and they are rarely permitted to disturb rates between large commercial points where the volume of travel for regular causes is so much greater than the special traffic that tourist fares would result in loss in revenue rather than an encouragement to earnings. Excursion rates, however, given for conventions, meetings and gatherings, social and business, are temporary and vary from 1½ to 1 cent per mile, sentiment somewhat affecting these rates, as in the case of the G. A. R. and Confederate Veterans. Meetings of business concerns which find it advantageous to exchange views usually are given a temporary rate from 2 to 1½ cents per mile, and fairs, state and country, get the same.

For the recent Jamestown Exposition four separate and distinct rates of fare were fixed, to apply during the period as follows:

Season limit: 80 per cent. of double the maximum rate.

Sixty day limit: One and one-third fare, approximately equivalent to two cents per mile.

Fifteen-day limit: One fare plus $2, approximately equivalent to one and one-half cents per mile.

Ten-day limit: One cent per mile, restricted to coach accommodations.

Many lines traversing sparsely settled sections believe that the demands for holiday travel can be met only by fitting thereto a temporary rate of fare from 2 to 1½ cents per mile.

Cheap excursion travel comprises principally wage earners who travel preferably on holidays and Sundays for recreation and pleasure. To meet these causes for travel a very low rate must be made. Otherwise the travel will promptly disappear. We may say, in general, that any such rate exceeding 1 cent per mile is a misfit and in many cases, dependent upon local needs, even a lower rate is necessary.

In fixing these rates we consider the circumstances and interest surrounding the cause for travel, well knowing that these travel causes are at best precarious and cannot be met by any ordinary rate. In many cases it is necessary to create the cause for travel by a rate low enough to accomplish its purpose, and even then the time must be opportune, for there are certain times when no rate, however low, will create travel. Assuming a rate fixed it is well understood that this business, if profitable at all, is so only in train-load lots, and even then much of it barely shows the proper insurance percentage, for the loss of one accident might wipe out a whole year's earnings derived from this travel factor. But as it is the policy of many lines to meet existing causes for travel or create new causes by the necessary rates, such lines take this business chance whensoever they see the opportunity of conducting a profitable excursion, first expense alone being considered, that is, the cost of advertising and train service.

An important feature of travel which greatly complicates the rate adjustment is the fact that fares designed to meet various causes for travel can only in exceptional instances be confined to the particular cause for which they are designed. Rates in general are open to public use, and as there are no tickets to enforce class distinction in persons, each lower rate of fare interferes more or less with each higher rate of fare. The man whose business causes extensive travel, to which a mileage rate is fitted, cannot be compelled to use the mileage rate if a lower suitable rate happens to be available. Let an excursion rate be put in effect that meets his wants and he immediately avails himself of this lower rate. Hence it is very necessary that the most careful consideration be given surrounding circumstances and conditions, particularly in the case of temporary rates, for unless the rate reasonably fits the cause for travel it is certain that the loss in revenue occasioned by the use of the lower rate by individuals whose travel is not directly sought will unduly lessen the average, the loss exceeding the gain. If the maximum one way rate from St. Louis to Indianapolis were $7.50 and there were no special attraction at Indianapolis to induce travel, an excursion rate of $5 would not produce the revenue necessary to overcome the loss occasioned by the use of the $5 rate by the traveler who otherwise would have paid $7.50. But if the G. A. R. Encampment is held in Indianapolis it is reasonably certain that the $5 excursion rate will be profitable, for in that case the cause would induce so heavy an additional *bona fide* excursion travel that the additional revenue produced by the $5 rate would be much in excess of the loss occasioned by the use of the $5 ticket as above described.

In fixing in dollars and cents rates to fit the various causes for travel, exercise of the utmost care is required. Unless due consideration is given the loss occasioned by a sure but varying and uncertain percentage of travel, using lower rates in lieu of the higher rates established to fit their cases, the revenues as a whole will be non-remunerative. This explains why railways traversing sparsely settled sections operating under involuntary low maximum rates are utterly unable from a revenue viewpoint to establish special rates. The maximum rate must act as the regulator to the entire adjustment, and it cannot perform its important functions unless it is fixed at a figure sufficient to support its proper percentage of loss. Each lesser rate, in turn, has the same responsibility, and where the regulator in the form of the maximum rate is fixed too low the whole rate fabric is disarranged and many of the lesser rates established under a proper rate adjustment to meet social and business conditions must from sheer necessity disappear. Then the railway is compelled, in self protection, to rely almost entirely upon the revenue produced by the maximum rate, while the absence of a suitable rate for the traveler means an empty seat, and a would-be traveler converted into a stay-at-home to the disadvantage of all parties.

It is a safe assertion that too low a maximum rate is nearly as injurious to the public as too high a maximum rate. There is just about as much business sense in operating a railway traveling a sparsely settled country, needing every dollar it can earn, at too low a maximum rate, as in running a large department store without bargains and sales. In fixing the price for one kind of merchandise due consideration must necessarily be given to the prices fixed for other kinds, especially for staple articles or articles which during certain periods may be considered staple but may afterwards be changed to bargain articles. If the margin of profit on staples is reduced the case of the railway operating under too low a maximum rate is well paralleled. The railway can then no more afford to offer bargains in tickets than the department store can afford to sell dry goods below cost.

Thus it is evident that passenger rate adjustment is a most delicate matter. In fixing many of the lesser rates, such as excursion rates, no consideration can be given to other than the expense of creating and moving the particular traffic for which the rate applies, yet the whole passenger rate fabric must do much more than this. The working of the passenger rate adjustment can be likened to a clock, with the maximum rate as the regulator and the mileage rate as the pendulum, and it must be predicated on the population of the territory served in the effort to obtain an average rate which, multiplied by the number of miles of travel obtained from all causes for travel, will produce remunerative returns.

According to a Chinese newspaper, the Dalai Lama of Tibet is reported to have requested the Chinese government to allow him to float a foreign loan for the construction of a railway from Chumi, British India, to Lhassa, Tibet, and for the development of the mines along the route of the railway. It is believed in Peking that the proposal will be sanctioned by the Chinese government.

CHICAGO TRACK ELEVATION.*

BY M. K. TRUMBULL,
Engineer of Track Elevation.

The city of Chicago has maintained a track elevation policy for almost one-fourth of its corporate existence. The annual growth of track elevation has been consistent and the cumulative result is remarkable. The railways have executed mile after mile of this kind of construction with scarcely a word from public or press. Scarcely a train has been delayed, and the passengers are lifted almost while they ride.

With a congested right-of-way to begin with, the railway must rebuild from below the ground up and handle its traffic without delay at the same time. The commissioner of public works permits the blocking of but three or four consecutive streets at any one time. Two miles of track elevation, for instance, must be divided into from four to five separate sec-

*From a report of more than 1,000 pages, covering the Chicago track elevation in careful detail. In addition to the above discussion, the volume contains a list of the original ordinances, arranged chronologically, with indexes and reprints of the same, besides much other listed information, and plates, maps, etc.

Progress of Chicago Track Elevation.

tions, in each of which the operations are separate and distinct. The object of this program is to offer the minimum of obstruction to street travel; especially to surface cars and the city fire department. The restriction upon the railways increases the cost of work, complicates the handling of trains and lengthens the time to complete the work. Upon consideration of the many complications involved one wonders at the dispatch with which the work is accomplished.

Track elevation, properly speaking, began on May 23, 1892, when the Illinois Central secured from the city council an ordinance for the elevation of its tracks from 51st street to 67th street. An urgent necessity confronted the Illinois Central officials to make some quick and radical moves in order to place themselves in a position to handle the heavy passenger traffic at the opening of the World's Fair the following season. The population of Chicago at that time was 1,200,000. A crying need for relief at a great number of grade crossings, where the railways were annually killing and injuring many people, was felt. A few cases had been disposed of at important streets by constructing viaducts over the tracks to accommodate the street travel. The viaduct policy had, however, become unpopular. The height at which it was necessary to erect the viaducts, above the original grade of streets, required the construction of long approaches, not only in the streets provided with viaducts, but in those that intersected the site of the approaches as well. Then, as necessity arose, nearby streets were selected for viaducts. The logical result threatened that the zones of city property contiguous to the railways were soon to be enmeshed in a network of approaches which would not only offer long and heavy grades to street traffic but would considerably depreciate the value of the property affected.

The track elevation idea was eagerly grasped by the city administration, and on February 23, 1893, it passed a general ordinance which provided for the elimination of all grade crossings in the city by track elevation.

The railways, however, declined to enter into the wholesale scheme of construction expense. The administration thereupon made a survey of those zones in which the street crossing travel was most dense and decided to treat each zone separately, and, where necessary, to further sub-divide each into elements of reasonable length.

Seventy-four per cent. of the work, for which ordinances have been passed, has been completed. The 148.72 miles of railway roadbed already covered by track elevation ordinances is approximately 44 per cent. of the total mileage of roadbed within the city limits. Basing an estimate on this percentage the ultimate cost of track elevation will approximate $150,000,000, assuming: (1) That the city limits remain as they are at present; (2) that the growth of population will require all tracks to be elevated within these limits; (3) that the cost per mile of roadbed will be 80 per cent. of that already provided for, on the theory that there will be fewer tracks per mile of roadbed. This estimate, however, looks so far into the

TABLE I. TRACK ELEVATION COMPLETED OR PROVIDED FOR BY ORDINANCE TO DECEMBER 31, 1908.

RAILROADS	MILEAGE		SUBWAYS																COST
			INDIVIDUAL SUBWAYS								JOINT SUBWAYS								
			GENERAL SUBWAYS								GENERAL SUBWAYS								
	Miles of Roadbed out to out of Extreme Subways	Miles of all Tracks out to out of Extreme Subways	Roadway Grade Crossings abolished and Subways provided for	Viaducts remov'd and Subways provided for	Subways to be constructed when City opens Streets	Foot Passageways	Alleys	Separation of Railroad Grade Crossings provided for	Subways Constructed by Private Contract	Total Individual Subways	Roadway Grade Crossings abolished and Subways provided for	Viaducts remov'd and Subways provided for	Subways to be constructed when City opens Streets	Foot Passageways	Separation of Railroad Grade Crossings provided for	Subways Constructed by Private Contract	Total Joint Subways	Total All Subways	
A. T. & S. F. Ry	3.85	7.21	1	0	0	0	0	0	0	1	20	0	1	0	0	1	22	23	$ 710,000
B. & O. R. R.	1.53	5,04	0	0	0	0	0	0	0	0	10	0	0	0	0	0	10	10	1.500,000
C. B. & Q. R. R.	6.91	55.09	21	0	0	0	0	1	0	22	18	3	0	0	0	0	21	43	4,150,000
C. J. Ry. including	5.87	17.99	25	1	0	0	3	1	0	30	25	1	0	1	0	0	27	57	1,710,000
Burton Stock Car Co.																			
Canda Cattle Car Co.																			
Street's Western Stable Car Co.																			
C. M. & St. P. Ry	7.53	62.27	39	1	3	2	0	0	0	45	1	1	0	0	0	0	2	47	4,550,000
C. R. I. & P. Ry	12.80	52.60	32	0	1	4	0	0	0	37	44	1	0	0	1	0	46	83	2,908,000
C. T. T. R. R.	9.17	33.77	18	0	0	0	0	0	0	18	37	5	0	1	0	0	43	61	4,650,000
C. & A. R. R.	3.55	14.47	17	0	0	0	0	0	0	17	17	0	0	0	0	1	18	35	900,000
C. & I. W. R. R.	0.92	1.84	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	2,000,000
C. & N.-W. Ry.	30.54	205.85	154	0	3	5	14	0	0	176	42	6	1	0	0	0	49	225	13,778,000
C. & S. E. R. R.	1.39	1.80	0	0	0	0	0	0	0	0	10	0	0	0	0	0	10	10	130.000
C. & W. I R. R.	16.71	186.12	57	0	0	2	0	2	3	64	50	1	2	0	1	0	54	118	13,000,000
G. T. W. Ry.	2.27	5.70	0	0	0	0	0	0	0	0	24	0	0	0	1*	0	25	25	732,000
I. C. R. R.:																			
Main Line	3.58	28.34	18	0	0	1	0	1	0	20	4	0	0	0	0	0	4	24	3,090,000
C. M. & N. R. R.	3.85	7.21	1	0	0	0	0	0	0	1	20	0	1	0	0	1	22	23	
So. Chicago R. R.	0.53	1.34	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	4	
St. Charles Air Line	0.73	2.08	6	0	0	0	3	1	0	10	0	0	0	0	1	0	1	11	
I. H. B. R R.	1.05	2.10	0	0	0	0	0	0	0	0	21	0	0	0	1*	0	22	22	200,000
L. S. & M. S. Ry	13.33	98.20	0	0	0	0	0	0	0	0	65	1	1	0	3	0	70	70	6,000,000
N. Y. C & St. L. R. R.	0.80	1.50	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	5	850,000
P. C. C. & St. L. Ry.	8.19	38.15	9	0	0	1	0	0	0	10	48	3	0	1	0	0	52	62	4,340,000
P. F. W. & C. Ry.	12.01	81.01	16	0	0	0	0	0	0	16	56	1	2	0	3	0	62	78	7,074,000
Wabash R. R.	1.61	5.33	0	0	0	0	0	0	0	0	11	0	0	0	0	0	11	11	350,000
Totals	148.72	915.01	418	2	7	15	20	6	3	471	532	23	8	3	11	3	580	1051	$72,622,000

*Temporary. Note — Railroad grade crossing separations arbitrarily credited to the overhead roads.

TABLE II.—*Classification of Subways, Each Joint Subway Counted but Once.*

Subways constructed by railways.	Completed.	Under construction.	No work done.	Subways to be constructed when city opens streets.	Total.
General subways:					
Roadway grade crossings abolshd, subways provided	432	82	134	10	658
Viaducts removed and subways provided for	10	0	1	0	11
Foot passageway subways	10	0	6	0	16
Alley subways	7	6	7	0	20
Ry. grade crsgs separated	6	2*	3	0	11*
Subways constructed by private contract	4	0	0	0	4
Totals	469	90	151	10	720
Independent subways:†					
Across streets	12	3	4	0	19
Across alleys	4	0	1	0	5
Totals	16	3	5	0	24
Total, all subways	485	93	156	10	744

*One of these is temporary.
†Constructed by industries.—Subway bridges carrying industry tracks immediately adjacent to bridges of the railway not included in above.

future that any one or more of these assumptions may be found to be without foundation.

There are 744 subways, averaging seven to the mile of roadbed elevated, classified in Table II., considering as a single subway each case where two or more roads have elevated their adjacent roadbeds and have participated in the expense of constructing the joint subway.

In some cases negotiations between the city and the railway officers have consumed much time; but the average period has been short. The situation is parallel with negotiations preliminary to contracts of any character. As soon as the ordinances have been passed, approved and accepted, the railways have executed their part of the agreements in good faith. In numerous cases they have even gone further and have performed work not called for in the ordinances, either upon their own initiative or upon the request of the city officials. This brought about better feeling between the city and the railways than existed a decade or two ago.

The officers of the railways take personal interest in their work, with the result that the appearance and efficiency of their designs are steadily improving. Their efforts are inspired by the desire to produce permanent structures upon which the annual maintenance cost will be low. The railways made their designs ten or twelve years ago in the light of what was then deemed best. To-day shows the result of study and a desire to improve.

The benefits from track elevation are so many that it is difficult to describe them briefly. First and foremost is the manifest reduction in grade crossing fatalities and injuries. Table III speaks for itself, and no words can be more convincing when arguing in favor of track elevation.

This record takes no account of the accidents which occurred on the railway rights-of-way between streets. It is a grade crossing record only. Prior to 1899, 35 miles of railway roadbed had been elevated and 135 subways had been constructed. This work, comprising about 30 per cent. of what has been completed to date, saved many lives and many accidents.

An estimate based on the data in Table III would indicate that track elevation has prevented to date about 1,380 grade crossing fatalities and about 2,510 non-fatal accidents. How many more it has prevented between streets would be difficult to determine. There is now little temptation for boys to "hitch," and for other trespassers to climb upon the railway tracks which are elevated. On the basis of the $53,622,000 already spent, each grade crossing accident, prevented to date, has been affected at an expense of $13,800. The outlay for track elevation, spread over a period of years in the future, shows a material reduction for each estimated accident prevented, so that the $13,800 will become less than $3,000 within two generations on the basis of a total expenditure of $150,000,000.

Another result is the saving of time that would be lost annually in case no tracks had been elevated. During 1908 there were recorded 643,386,000 rides on the surface lines alone. Most of the railways intersect street car tracks every half mile where the city is built up and where surface traffic is heaviest. It is fair to assume that 150,000,000 of these rides encountered railway tracks or subways. If track elevation had not been accomplished, passengers would have suffered many delays, due to crossings being blocked. Assuming that each passenger trip of the 150,000,000 would have been delayed an average of one minute and that 90,000,000 pedestrian trips would have been obstructed a like amount, 4,000,000 hours time would have been lost. The street cars themselves would show decreased operating revenue. When the delay to teams, carriages and automobiles is also considered, a conservative estimate of the value of time lost would approximate $1,500,000 per year.

The reduction in annual fire losses due to track elevation is difficult to compute. The delay to the fire department in reaching conflagrations is enormous when railway crossing gates are closed for passenger or freight trains.

TABLE III.—DECREASE IN GRADE CROSSING ACCIDENTS.

Year	Population	Deaths All Causes		Grade Crossing Accidents: Fatal			Non-Fatal		Total	
		Number	Rate Per 1,000	Number	Rate Per 1,000,000	Percentage of Death All Causes	Number	Rate Per 1,000,000	Number	Rate Per 1,000,000
1899	1,626,333	25,503	15.7	113	69	0.44 per cent.	169	104	282	173
1900	1,698,575	24,941	14.7	97	57	0.39 " "	105	62	202	119
1901	1,757,010	24,406	13.9	64	36	0.26 " "	91	52	155	88
1902	1,815,445	26,455	14.6	61	34	0.23 " "	122	67	183	101
1903	1,873,880	28,914	15.4	69	37	0.24 " "	169	90	238	127
1904	1,932,315	26,311	13.6	55	29	0.21 " "	172	89	227	118
1905	1,990,750	27,212	13.7	99	50	0.36 " "	48	24	147	74
1906	2,049,185	29,048	14.2	68	33	0.23 " "	65	32	133	65
1907	2,107,620	32,143	15.2	38	18	0.12 " "	62	29	100	47
1908	2,166,055	30,548	14.1	20	9	0.07 " "	27	12	47	21
	Average 10 Years		14.5		37	.026 per cent.		56		93

Some additional benefits due to track elevation are:

1. New districts are opened for settlement, thus reducing local congestion in population.
2. Accessibility to churches, markets and schools is improved.
3. Courts have fewer cases due to trespass, "hitching," car thieving, etc.
4. Few streets are now crossed by railway yards. Twenty-one yards have been elevated to date.
5. Better time is made by trains; fewer accidents occur for which the public has to suffer and for which the railways have to pay; railway rights-of-way are more clearly defined; freight trains do not have to be cut at street intersections.
6. Underground pipes and conduits are more accessible in subways than when lying directly under the tracks where the latter have not been elevated. Breakages of pipes and conduits due to the impact of heavy track loads are eliminated.
7. Improvements, such as new station buildings, new team yards, new freight houses, etc., are secured. In fact, within the limits of track elevation, the railways are entirely rebuilt and are reconstructed along strictly modern lines.
8. Future electrification of railways is made easier, in that the third rail and return circuits can be more easily arranged.
9. Nine unsightly viaducts have been removed. An additional viaduct will be removed this year. Only three, away from the river, will remain after this year.
10. Seven railway grade crossings have been separated. One more has been temporarily separated. Three additional cases will be disposed of under existing ordinances with the probability that two more will be agreed upon by the railways before all the ordinances now in effect have been executed.

The writer has secured data from the different companies as to their subway designs, and has assembled the in-

formation in Table V. The number of subways shown in Table V does not check with the contents of Table I, nor with the classification of subways in Table II. The discrepancy with Table II is explained by the fact that in Tables I and V each joint subway has been counted as many times as there were railways participating in its construction. In Table II each subway has been considered as a single unit, whether individual or joint. The discrepancy between Table V and Table I is due to the fact that some roads made no detailed report for unfinished work, while others anticipated their construction by advising as to what design would be used.

Table IV.—*Cost of Track Elevation to the City of Chicago.*

Note.—Percentages shown are on basis of cost to the railways ($72,622,000).

			Per ct.
Department expenses to date	$66,084		0.09
Damages paid to date:			
At 10 streets; viaducts were removed	$256,151		
At 709 streets; no viaducts existed	105,108		
		361,259	0.50
Total paid out of city treasury to date		$427,343	0.59
Paid into city treasury, acc't track elevation		280,000	0.39
Net cost to city to date		$147,343	0.20
Est. damages yet to be paid on account track elevation ordinances to date		$350,000	0.48
Plus above		361,259	
Total est. to be paid out of city treasury*		$711,259	0.98
Plus above		66,084	
Total est. to be paid out of city treasury†		$777,343	1.07
Less above		280,000	
Net estimated cost to city		$497,843	0.68

*For damages, account of track elevation ordinances to date.
†Including department expenses, account of track elevation ordinances to date.

Table V.—Types of Subways.

Railroads	Rows of Columns: Clear Span	1 Row	2 Rows	3 Rows	More than 3 Rows	Type of Bridges: I	II	III	IV	V	VI	Type of Floor System: I	II	III	IV	V	VI	Type of Decking: No Decking	I	II	III	IV	V	Type of Waterproofing: No Waterproofing	I	II	III	IV	V	Ballasted: Yes	No
A. T. & S. Fe Ry	17	1	2	2	0	17	4	1	0	0	0	18	1	0	0	0	3	3	0	19	0	0	0	[illegible]	19	0	0	0	0	19	3
C. B. & Q. R. R	12	1	3	20	0	12	5	0	0	16	3	0	17	[illegible]	0	16	3	0	16	0	16	1	3	5	16	1	0	14	0	20	16
C. J. Ry	20	0	10	9	1	19	13	7	0	0	1	8	24	7	0	0	1	1	5	2	0	29	3	8	3	1	1	0	27	37	3
C. M. & St. P. Ry	20	1	16	3	0	6	33	0	0	0	1	0	39	0	[illegible]	0	1	0	34	1	4	0	1	0	0	0	0	0	40	5	35
C. R. I. & P. Ry	37	3	8	2	0	39	8	3	0	0	0	3	44	0	0	0	3	0	50	0	0	0	0	50	0	0	0	0	0	0	50
C. T. T. R. R	6	0	[illegible]	31	1	5	5	0	30	[illegible]	1	5	1	0	30	0	5	0	1	0	0	39	1	0	1	32	7	0	1	40	1
C. & A. R. R	17	3	12	3	0	16	16	1	0	0	2	0	35	0	0	0	0	0	[illegible]	35	0	0	0	0	35	0	0	0	0	33	2
C. & N.-W. Ry	49	3	53	101	0	35	70	5	82	0	14	3	110⅓	5	82⅓	0	5	0	107	0	0	96	3	95	15	39	0	0	57	112	94
C. & W. I. R. R	30	3	10	26	0	30	7	26	0	0	6	0	31	27	0	0	11	2	0⅓	20	36⅓	1	9	11	1	0	9⅓	47	0⅓	58	11
G. T. W. Ry	9 / 1*	1	13	1	0	0	23	0	0	0	1 / 1*	0	23	0	0	0	1 / 1*	0	0	0	24	0	1*	0	0	0	0	0	24 / 1*	24	1*
I. C. R. R., including C. M. & N. R. R., St. Charles Air Line	22	0	22	11	1	20	26	1	0	8	1	14	29	1	0	8	4	5	[illegible]	19	0	0	23	29	19	0	0	0	8	27	29
I. H. B. R. R	20 / 1*	0	0	1	0	20	1	[illegible]	0	0	1*	0	21	0	0	0	1*	0	0	0	21	0	1*	0	0	0	0	[illegible]	21 / 1*	21	1*
L. S. & M. S. Ry	26	1	5	11	0	26	6	11	0	0	0	3	29	11	0	0	0	2	37	0	4	0	0	4	35	4	0	0	0	4	[illegible]
P. C. C. & St. L. Ry	27	1	6	9	1	27	7	0	9	0	1	12	16	0	0	0	16	0	19	13	0	10	2	0	0	26	0	13	5	23	21
P. F. W. & C. Ry	12	2	10	35	0	11	2	2	34	0	10	2	18	2	33	0	4	0	0	0	0	59	0	0	5	0	3	41	0	59	0
	324 / 2*	20	173	265	4	283	226	57	155	24	41 / 2*	68	438⅓	53	115⅓	24	57 / 2*	13	278⅓	109	105⅓	235	45 / 2*	205	159	103	20⅓	115	183⅓ / 2*	482	304 / 2*
Percentage of total units	41.4	2.5	22.0	33.6	0.5	35.9	28.7	7.2	19.7	3.0	5.5	8.6	55.7	6.7	18.5	3.0	7.5	1.6	35.4	13.8	13.4	29.8	6.0	26.0	20.2	13.1	2.6	14.6	23.5	61.2	38.8
Total units	788					788						788						788						788						788	

*Temporary.

LEGEND.

TYPE OF BRIDGE:
- Type I —Clear girder spans.
- " II —Girder spans with columns.
- " III—Deck "I" beam spans with columns.
- " IV—Deck "trough" spans with columns.
- " V —Reinforced concrete slab spans with columns.
- " VI—Other designs.

TYPE OF FLOOR SYSTEM:
- Type I —"Troughs" normal to the girders.
- " II —"I" beams normal to the girders.
- " III—Deck "I" beam spans.
- " IV—Deck "trough" spans.
- " V —Reinforced concrete slab spans.
- " VI—Other designs.

TYPE OF DECKING:
- Type I —Steel plate (flat or buckled).
- " II —Creosoted timber.
- " III—Reinforced concrete slab.
- " IV—Concrete surrounding "I" beams or imbedded in troughs.
- " V —Other designs.

TYPE OF WATERPROOFING:
- Type I —Pitch or asphalt coating.
- " II —Pitch or asphalt mastic.
- " III—Burlap or felt mopped with pitch or asphalt, without protection of any description on top of waterproofing medium.
- " IV—Same as III but protected by creosoted plank, brick, concrete or mastic.
- " V —Other designs.

In the early years of track elevation the use of cut stone and rubble masonry was general, but to-day concrete is used exclusively. The soil in and about Chicago is not the best for foundations. Few of the roads place the bottom of foundations more than 1 ft. below the frost line. Two companies use caissons for column foundations. Of those companies constructing foundations only a trifle below frost line, some drive piling under the toes of the retaining walls and abutments. Others extend the toe to add greater resistance to overturning. The soil is soft and some settlement results, except where caissons are sunk in bed rock. To prevent the percolation of water through the walls and abutments some roads coat the back with asphalt or pitch. Some employ longitudinal drainage either 4 or 5 ft. below the elevated track level or at the original grade of the tracks. Some use weep holes.

In the early years, almost all work was done by hand, to-day nearly all heavy work is performed by machinery. The rate of progress is thereby accelerated and a more uniform daily output assured. Even with machinery, track elevation gives employment to about 5,000 men annually in Chicago.

The policy of the present administration has been, and is, to provide 13 ft. 6 in. headroom at all streets where surface lines exist or are probable, and 12 ft. at all others. A smaller amount of depression of the streets is being allowed the railways. At least eight subways are to be provided for each mile of elevation. A more careful consideration of all the many factors is being made than heretofore.

Strictly speaking, the authority of the track elevation department ceases in any piece of track elevation as soon as the filing plans, submitted by the railways as their interpretation of the provisions of the ordinance, are approved. At this stage the authority of the commissioner of public works begins. He issues all permits, passes on the program of the work and inspects all materials and workmanship. As a matter of fact, however, the track elevation department co-operates with the commissioner of public works during the progress of construction and not only consults with the latter, when called upon for advice, but follows each piece of track elevation from start to finish.

Recapitulation.—*Mileage Elevated, Subways Constructed and Cost.*

Items.	Work completed or under construction.	Work under ordinances but not begun.	Totals.
Miles of roadbed	113.44	35.28	148.72
Miles of all track	748.72	166.29	915.01
Subways	559	161	720
Cost	$53,662,000	$19,000,000	$72,622,000

General News Section.

At Kingston, N. Y., June 1, Justice Betts, of the Supreme Court of the state, refused to restrain the enforcement of the state law requiring railways to pay their employees twice a month.

Count Zeppelin, in his new dirigible balloon, Zeppelin II., flew about 900 miles on May 30 and 31, being in the air continuously for about 38 hours. In landing to get more gasolene, the wind drove the balloon against a tree and it was partially wrecked.

At Galveston, May 26, a barge of the Gulf & Interstate Railroad, carrying a passenger train and 40 passengers, was blown by a strong wind out to sea about seven miles. The barge, which was being towed by a tug, became unmanageable. The reports indicate that it was driven by the wind on to the beach, but that no persons were seriously injured, and the passengers were taken off by the life-saving crew.

Governor Hughes, of New York, acting on bills which were left in his hands at the adjournment of the legislature a month ago, has vetoed a large number. One of these is the bill putting into effect the consolidated railway laws, as drafted by the special commission. The Governor says that his action in this case is due to the fact that the consolidated statutes perpetuate an old section, which would prevent the Public Service Commission from reducing passenger fares below 3 cents a mile, except where the carrier earns more than 10 per cent. a year. As this 10 per cent. would be based on the total capital, including low-rate bonds, the law would prevent reduction of rates in some cases of 12 or 15 per cent. on stock. Following this action the Governor refused to sign a law changing the powers of the Public Service Commission relative to the issuance of stocks and bonds. This subject should receive further consideration from the legislature. The Governor signed the bill of Mr. Parker, allowing the Public Service Commission, under certain circumstances, to authorize the abandonment of unnecessary parallel railways.

The First Electric Locomotive.

J. A. F. Aspinall, President of the Institution of Mechanical Engineers, quotes from the *Edinburgh Journal* the following description, which appeared originally in the London *Times* Dec. 10, 1842.

A trial of this very ingenious machine, constructed by Mr. Davidson, was made last month on the Edinburgh & Glasgow Railway, in presence of a number of gentlemen, many of whom are eminent for their scientific knowledge. The carriage was impelled along the railway about a mile and a half, and traveled at the rate of upwards of four miles an hour, a rate which might be increased by giving greater power to the batteries and enlarging the diameter of the wheels. We understand that the carriage was built at the expense of the railway company, and we cannot but congratulate them in having the discernment to employ Mr. Davidson, a gentleman of much practical knowledge and talent, to whose genius great discoveries have been made in electro-magnetism, by whom the carriage was projected, and to whose unwearied exertions the practicability of the scheme is almost placed beyond a doubt.

The dimensions of the carriage are 16 ft. long by 7 ft. wide, and it is propelled by eight powerful electro-magnets. The carriage is supported by four wheels of 3 ft. diameter. On each of the two axles there is a wooden cylinder, on which are fastened three bars of iron at equal distances from each other and extending from end to the end of the cylinder. On each side of the cylinder and resting on the carriage there are two powerful electro-magnets. When the first bar on the cylinder has passed the faces of two of these magnets, the current of galvanism is then let on to the other two magnets. They immediately pull the second bar until it comes opposite them. The current is then cut off from these two magnets, and is let on to the other two. Again they pull the third bar until it comes opposite, and so on—the current of galvanism being always cut off from the one pair of magnets when it is let on to the other.

The manner in which the current is cut off and let on is simply this: At each end of the axles there is a small wooden cylinder, one-half of which is covered by a hoop of copper; the other is divided alternately with copper and wood (three parts of wood and three of copper). One end of the coil of wire which surrounds the four electro-magnets presses on one of these cylinders, on the part which is divided with copper and wood; the other end of the coil presses on the other cylinder in the same manner. One end of the wires or conductors which comes from the battery presses constantly on the undivided part of the copper on each cylinder. When one of the iron bars on the wooden cylinder has passed the faces of two magnets, the current of galvanism is let on to the other two magnets by one end of the coil which surrounds the magnets passing from the wood to the copper, and thereby forming a connection with the battery. This wire continues to press on the copper until the iron bar has come opposite the faces of the two magnets, which were thus charged with magnetism. On its coming into that position, the current is cut off from these two magnets by the wire or rod of copper passing from the copper to the wood, and thereby breaking the connection with the battery. But when the wire or rod of copper leaves the copper on the one cylinder, it leaves the wood and passes to the copper on the other cylinder at the other end of the axle, and in so doing connects the other two magnets with the battery, and they pull the next iron bar in the same manner. At the other end of the carriage there are four other magnets and wooden cylinders with iron bars arranged in the same manner.

The battery which is used for propelling the machine is composed of iron and zinc plates immersed in dilute sulphuric acid, the iron plates being fluted so as to expose greater surface in the same space. The weight propelled was about six tons.

Electric Headlight Conference in Indiana.

At a conference at Indianapolis, May 27, participated in by representatives of practically all the railways of Indiana, called by the Indiana Railroad Commission, the substitution of the electric headlight for the oil headlight, now in general use on locomotives, was unanimously opposed. W. J. Wood, chairman of the commission, pointed out the provision of the recently enacted law empowering the commission to make an investigation. He referred to the unsuccessful effort made by labor organizations to have the legislature pass a law requiring the compulsory use of electric headlights of at least 2,000 c.p. H. F. Houghton (C., C., C. & St. L.), C. C. Coffey (Southern), D. F. Crawford (Pennsylvania), F. H. Curtis (L. & N.), J. R. Onderdoek (B. & O.) and J. E. Keegan (G. R. & I.) made the principal arguments.

Mr. Houghton read a paper giving reports of experiences and tests with the electric headlight. Mr. Crawford and Mr. Curtis likewise cited unfavorable experiences. The intensity of the rays destroys the power of the enginemen to distinguish the color of the various signal lamps. Sitting behind the strong rays for a time produces fatigue of the eyes. In the passing of opposing trains on parallel tracks the strong light produces temporary blindness in the opposite enginemen. Where a practical test was made with a number of enginemen who first successfully passed an examination for color blindness it was found that after facing the strong rays for a few hours and the signal lights were turned on they were unable to distinguish the color of the signals. Eight-tenths of their notations were erroneous. Mr. Crawford and others were emphatic in their denunciation of the electric light and declared they would not install them if furnished free of cost. They urged the commission not to make such a

serious mistake as to order the compulsory use of electric headlights.

Edwin Taylor, a locomotive engineer, who had had experience with electric headlights, declared there was little use for a headlight on a locomotive other than for a marker to enable trespassers on the tracks or travelers on the highways to observe the approach of a train. The ordinary 20 c.p. oil lamp was sufficient for all practical purposes.

Chairman Wood announced that the commission was not wholly satisfied with this *ex parte* evidence and would call another conference June 10. The Pennsylvania and the Big Four will then furnish locomotives equipped with electric headlights and enginemen with them to make tests.

Restriction on R. R. B. Letters.

A circular has been issued by the Interstate Commerce Commission holding that the practice of one road carrying the mails of another without charge must be stopped. It has been the custom for roads to carry free of charge the mails of other roads with which they made direct connection. The commission states that this practice is illegal.

Notes on Railway Electrification.

John A. F. Aspinall, General Manager of the Lancashire & Yorkshire, points out that in our issue of May 7, page 989, the eighth line of the second column should read "center line of the motor," instead of "center line of the motor truck." This error occurred in the original document.

Edwin Hawley.

Edwin Hawley began by buying eggs; he is now buying railways. He is rapidly becoming a second Harriman. Already he has accomplished more than any living railway man with the exception of James J. Hill and Mr. Harriman. Outside of Wall street the name of Hawley is scarcely known, while even in financial circles his powerful ramifications are not adequately appreciated. He already controls seven railways and his close associates dominate two more; this combined system, 14,000 miles in length, has gross earnings of $130,000,000. Of financial support Hawley has now an abundance, although he was not always so fortunate. Vanderlip, Speyer, Huntington, Paul Morton, J. J. Mitchell, Henry Walters, John W. Castles, Shonts, J. N. Wallace, L. C. Weir. Hawley is on the directorate of 25 corporations.

What manner of man is this new power in American transportation? * * * He was born in Chatham, N. Y. His railway work was begun on the Erie, as a clerk, when 17, and after being with the Ohio & Mississippi and the Rock Island he was made New York agent of the California Fast Freight Line and the other Southern Pacific interests. The first railway that he controlled was the Minneapolis & St. Louis about 1895. The next was the Iowa Central.

"It has been alleged that when you get control of a road you immediately contrive to pay the utmost dollar in dividends."

"That complaint is not justified. I have built up all my roads. They are in as good physical condition as other roads in the same territory. You must compare like with like. Remember that the roads are low grade traffic properties. I have spent in maintenance all that earnings warranted. I have not loaded them with floating debt—that point should not be overlooked by critics. As to increasing dividends, Chesapeake & Ohio is earnings between 6½ and 7 per cent. and has just been placed on a 4 per cent. basis. Chicago & Alton is earning 11 and is paying 4 per cent. That is not extravagant."

Answering further questions Mr. Hawley said:

"Mr. Hill and I are friends."

"The fact that you sold him Colorado & Southern and still remain a director strengthens the belief that you and he are becoming closely allied."

"We have always been friends. We have no reason to quarrel.

"You have a great admiration for Mr. Hill?"

"Hill is a great man—the greatest railway builder in this country to-day."

"Greater than Harriman?"

"Yes, a greater builder. Harriman took roads already built and developed them. Hill is more like Huntington."

"Who is the greatest railway man American has ever produced?"

"Huntington, because he had to blaze the way. He had to build the foundation; he was a pioneer." * * *

"Mr. Hawley, your system of roads lacks a vital joint—from St. Louis or Chicago to Cincinnati or Louisville. I thought you would have bought the C., H. & D. from its reorganizers to bridge the gap."

"I could have had it, but I didn't want it. It is too heavily laden with debt."

"You have arranged to buy the Chicago, Cincinnati & Louisville, it is reported."

"So they say. I am not saying it."

"Well, you must find some way to join the two parts of your system."

"I can do that. That will not be difficult. The distance from Cincinnati to the Toledo, St. Louis & Western is short. I can easily get a road, or make one."—*Journal of Commerce*, New York.

American Society of Civil Engineers.

At the meeting held on June 2 two papers were presented for discussion: Tests of Built-Up Steel and Wrought Iron Compression Pieces, by Arthur N. Talbot, M. Am. Soc. C. E., and Herbert F. Moore, Esq., and Caisson Disease and Its Prevention, by Henry Japp, M. Am. Soc. C. E. These papers were printed in the April number of "Proceedings."

Society of Railway Club Secretaries.

The annual meeting will be held at the Hotel Brighton, Atlantic City, N. J., on Saturday, June 19, at 10 a.m. The annual dinner will be held in the evening, at a time and place to be announced at Atlantic City.

National Machine Tool Builders' Association.

The semi-annual convention of the National Machine Tool Builders' Association was held at the Plankington House, Milwaukee, Wis., May 25 and 26, 55 members being in attendance. The President is Fred L. Eberhardt, of Newark, N. J., and the Secretary is P. E. Montanes, of Springfield, Ohio. The seventh annual meeting of this association was held in New York City October, 1908, and the only meeting which has been previously held in the West was the semi-annual meeting in 1904, in Cincinnati, Ohio. At the meeting on May 25 the principal business related to the reports of officers, standing committees and special committees, and it concluded with an address on "Competition" by Murray Shippey. In the afternoon the several committees on tools (on lathes, shapers, drills, milling machines, etc.), held separate meetings, and on May 26 these committees made their reports. The convention closed with an address on "Machine Tools for Railroad Shops," by William Forsyth, Associate Editor of the *Railroad Age Gazette*. After adjournment a large number of the members visited the shops of Kearney & Trecker, manufacturers of milling machines, also the large shops of the Allis-Chalmers Company.

American Society for Testing Materials.

The twelfth annual meeting of the American Society for Testing Materials will be held at Atlantic City, N. J., June 29 to July 3. The headquarters will be at the Hotel Traymore. The social features include an informal dinner on the evening of July 1 and an engineering smoker on the evening of July 2.

The subject of the annual address by the President, Dr. C. B. Dudley, will be Engineering Responsibility. Among the

papers of more particular interest to railways are the following: Further Investigations of Broken Steel Rails, by Henry Fay and R. W. G. Wint; An Investigation of a Defective Open-Hearth Steel Rail, by Robert Job; report of Committee A on Standard Specifications for Iron and Steel, W. R. Webster, Chairman; report of Committee M on Standard Specifications for Staybolt Iron, by H. V. Wille; three papers by P. H. Dudley; Detailed Fractures of Cold-Rolled Rails at Low Temperatures, Elongation and Ductility Tests of Rail Sections Under the Manufacturers' Standard Drop-Testing Machine, and Dark Carbon Streaks in Segregated Metal of Split Heads of Rails; report of Committee U on The Corrosion of Iron and Steel, A. S. Cushman, Chairman; Notes on Corrosion Tests of Iron and Steel, by R. B. Carnahan, Jr.; report of Committee E on Preservative Coatings for Iron and Steel, S. S. Voorhees, Chairman, and An Interesting Driving-Axle Failure, by M. H. Wickhorst.

The program is unusually large and includes more than 60 papers and reports.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penna. Co., Toledo, O.; June 22-25; Albany, N. Y.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 26-28, 1909; Detroit, Mich.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

Beginning June 1 the Louisville & Nashville and its controlled lines in Alabama adopted in that state the reduced passenger fares which were ordered by the legislature of the state. The enforcement of this law has been contested in the courts for many months.

The Rock Island has been trying for some weeks the experiment of running trains "all night" from Chicago to a number of suburbs on its lines near that city. While the service has not yet proved profitable, it has built up a more satisfactory business than was expected and will be continued indefinitely.

Reports from Bakersfield, Cal., indicate that the independent oil producers are about ready to establish a complete system of pipe lines for conveying oil from the Kern county and Coalinga fields to the Pacific coast, and that terminal facilities at the seaboard will be provided, together with tank steamers, so that oil can be delivered to all points on the coast.

The trunk lines leading from New York, Philadelphia and Baltimore to the West have filed at Washington tariffs on import freight westbound, to take effect July 1, by which these roads aim to restore the differential which was obliterated by the reductions lately made by the Boston & Maine. On first-class the reductions are 3 cents per 100 lbs. and on the lower classes 1 cent.

At a meeting of the executive committee of the Western Passenger Association held in Chicago on May 27 it was recommended that all western roads grant a rate of one and one-half fare for the round trip for state fairs and conventions which give promise of sufficient business to warrant a low rate, and also that a rate of one and one-half fare for the round trip be made for the merchants' meetings which the Chicago Association of Commerce will hold early in the fall.

The Commercial Club Traffic Bureau of Salt Lake City has adopted a resolution protesting to the Interstate Commerce Commission against the rule of the transcontinental lines giving the initial carrier the "aboslute and unqualified right" to determine the routing of shipments beyond its own line. The traffic bureau says that the application of this rule is an unreasonable burden on shippers and a direct infringement on their rights, and paves the way for the carriers to enter into an effective but unlawful arrangement for the secret division of traffic.

The Executive Committee of the Southwestern Shippers Association has adopted a resolution to the effect that there ought to be on the Interstate Commerce Commission a representative of the shipping interests of the southwestern portion of the United States—"in other words someone who knows intimately and at first hand the traffic conditions that are as yet new on account of the chaotic and constantly changing condition of affairs caused by the fast development of the country." The secretary of the Association was instructed to bring this matter to the attention of the President of the United States.

At Charleston, W. Va., May 26, the Chesapeake & Ohio applied for an injunction to prohibit the officers of the state from enforcing the 2-cent fare law on the Chesapeake & Ohio. A statement was presented showing the receipts, cost and profit of the intrastate passenger business on that line in West Virginia during 18 months under the 2-cent law, in which it was declared that the net earnings were far below the sum necessary to pay the interest on that part of the company's bonded indebtedness which should be charged to this traffic. It is declared that the law was unsuccessful in stimulating traffic, as had been anticipated, and the company really lost about $600,000 in the 18 months. The present average receipts per passenger in West Virginia amount to only 1.78 cents a mile.

The Dominion government is making an investigation as to the cost of the transportation of goods from Montreal to the Canadian ports on the Pacific coast by water *via* Mexico over

the Tehuantepec Railway and thence by water again to destination, as compared with the freight rates charged by the Canadian Pacific for the all-rail haul. David Martin, Customs Inspector of Toronto, has been sent to Mexico to investigate the customs relations regarding the bonding of goods in transit through Mexico. It is claimed that freight is carried by this route 20 per cent. cheaper than overland by the Canadian Pacific, and that the high railway freight renders it impossible for eastern Canadian manufacturers shipping goods by the C. P. R. to compete successfully in British Columbia with Europeans sending goods round Cape Horn.

In connection with the dissensions among the trunk lines concerning westbound freight rates on imported goods figures have been published showing the total quantities of freight received by ocean vessels and shipped westward from New York during the year 1908. New York leads with 150,000 tons, and Baltimore follows with 145,000, Boston had 85,000, Philadelphia 85,000 (including 14,000 tons of nitrate of soda from South America, a trade not reckoned with in statistics of other cities), Newport News 18,000 and the combined ports of Portland, Montreal and West St. John 30,000 tons. Baltimore's gain, as compared with previous years, cannot be given in figures, but it is said that it has been increasing the volume of this traffic much more rapidly than any other large port. In explanation of the fact that they have not met the last import rate cut of the Boston & Maine, effective June 2, some of the trunk lines call attention to the fact that the Boston lines carry only a small proportion of the import business; and of the 85,000 tons of import freight handled at Boston in 1908, 70,000 took low commodity rates.

Readjustment of Transcontinental Freight Rates.

The plans of the transcontinental railways for the readjustment of freight rates between the central west and the Pacific coast are being received with almost universal opposition by the communities most directly affected. The plan for the readjustment of rates to Spokane is a fair index to the general plan that would be followed throughout the West if the scheme of rates to Spokane which the railways have proposed should finally go through. The following outlines the scheme of rates to Spokane, which the railways submitted to the Interstate Commerce Commission for its consideration:

"First—Adopt the class rates from St. Paul and Chicago as fixed by the Interstate Commerce Commission. Apply same class rates from Omaha as from St. Paul, and from St. Louis the same as from Chicago, except where combination of locals on Missouri river makes less; from Denver 90 per cent. of the Missouri river-Spokane rates, which is proportionate to the distance.

"Second—Reduce the class rates from the Coast to Spokane proportionately the same as the Commission rates from St. Paul to Spokane—that is, 16 2-3 per cent.

"Third—Establish commodity rates from Chicago to Spokane that will effectively meet competition of the water route from the Atlantic seaboard to Seattle, thence by rail to Spokane. The rates of water lines to Seattle vary. The Panama line publishes 60 per cent. of the all-rail rates, and the American-Hawaiian line applies generally about the same, but for the purpose of constructing the Spokane tariffs 75 per cent. of the present rail rates from Atlantic seaboard territory to Seattle has been adopted as representing a fair equalization of the ocean rate, taking into consideration the items of despatch, damage from rehandling, insurance, interior origin of some of the freight, etc. The rate to Spokane would be obtained by adding the new local tariff from Seattle to Spokane. Having thus determined what rates are necessary to Spokane to fully meet water competition, these rates are fixed from Chicago on such commodities as can be produced in this territory as advantageously as on the Atlantic seaboard. Lower rates are made: (a) where articles are principally or exclusively produced in Eastern territory, the local rate to Chicago is deducted so that the combination on Chicago from points of origin will be on water competitive basis; (b) where commodity is produced both in the East and in Chicago territory, but cost of production in the West is higher, a deduction is made in consideration of these commercial conditions and the advantage to the western lines by originating the traffic nearer their terminals. The Commission class rates are observed as maximum.

"Fourth—Exceptions to such commodity basis made where article is not subject to water competition or where local competition and other commercial conditions control, such as beer, oil, plaster, salt, cement, butter, furniture, packing-house products, etc.

"Fifth—Rates from St. Paul to Spokane lower than from Chicago in recognition of the additional cost of production there and advantages to the carriers in originating the traffic at their own eastern terminals."

The Commission will give a hearing at Washington on June 9, at which all interested parties are invited to appear.

As stated in our last issue, the shippers of Spokane are protesting against this scheme of readjustment. They claim that on the new basis some rates would be higher than on the old basis. Take, for example, the rates on cotton duck and denims in carloads. The present rate from New England to Spokane is $1.85, and the rate is the same from Chicago. The Interstate Commerce Commission ordered a rate of $1.75 from Chicago to Spokane. The railways suggested a rate of $1.32; and as all such goods are made in New England, under section 3 of the plan favored by the railways, the local rate of 55 cents from New England to Chicago would be added to the Chicago-Spokane rate of $1.32, making a total of $1.87, which is 2 cents more than the present rate.

The numerous protests received from shippers at Spokane caused J. G. Woodworth, Traffic Manager of the Northern Pacific, and W. P. Kenney, Assistant Traffic Manager of the Great Northern, to go to Spokane last week to confer with the shippers. It is reported that no satisfactory understanding was reached.

In the meantime the shippers at Pacific coast points are protesting violently against the proposed readjustment. The second section of the plan provides for the reduction of class rates from the coast to Spokane 16 2-3 per cent., which is the same percentage of reduction that is to be made from St. Paul to Spokane. William R. Wheeler, Manager of the Traffic Bureau of the Merchants' Exchange of San Francisco, says that this is unfair and inequitable to shippers at coast points, and that if the same principle were applied to rates throughout the territory affected, Pacific coast shippers would be placed at a great disadvantage in competing for business as compared with shippers on the Atlantic seaboard and at Chicago, St. Louis, the Twin Cities and Missouri river points. For example, the existing first-class rate from St. Paul to Spokane is $3. A reduction of 16 2-3 per cent. in this makes a specific reduction of 50 per cent. The existing first-class rate from Portland, Seattle and Tacoma to Spokane is $1.35, and 16 2-3 per cent. of this is 22½ cents. Therefore, if only the same *percentage* of reduction is made from the Pacific coast as is made from St. Paul, the readjustment will put the shippers at the Pacific coast cities at an increased disadvantage of 27½ cents in competing for business at inland points against the shipper at St. Paul. Mr. Wheeler says, however, that the third proposition is by far the most destructive to Pacific coast distributing interests of any under consideration. He has issued a statement which is in part as follows:

"Up to the present time tariffs from the East to interior points have been constructed by adding to the terminal commodity rate the local or distributive rate applying from the nearest terminal to the interior point, thus enabling the distributer at the terminal point to compete on even terms with the eastern, or, more properly speaking, middle west jobber. Owing to the high local rates prevailing upon the Pacific Coast even under this arrangement it was impossible except in rare instances for the Pacific Coast distributer to get beyond the states of Idaho and Nevada, within the boundaries of which states his limit of distribution was fixed at the points where the combination rate above described met the so-called 'intermediate rates' from the East, the latter rates to points easterly of such meeting place being, of course, lower than the combination of terminals and locals back. Not satisfied with thus limiting his zone of distribution, or, rather, zone where the Pacific Coast distributer has a fighting chance, the railways propose to put him out of business beyond the limits of his own dooryard by reducing the terminal

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,458	$4,452,469	$1,543,085	$6,598,246	$925,820	$821,278	$123,029	$1,760,195	$126,541	$3,756,863	$2,841,383	.....	$234,060	$2,607,323	$123,530
Buffalo, Rochester & Pittsburgh	568	470,454	68,070	554,241	34,182	131,237	7,701	154,212	12,007	339,339	214,902	$52*	10,000	204,850	119,604
Chesapeake & Ohio	1,896	1,730,160	353,811	2,183,233	290,118	326,746	44,196	615,254	47,915	1,324,229	859,004	204	67,100	792,108	284,661
Chicago & Eastern Illinois	965	624,295	121,749	785,302	62,536	98,333	21,235	288,106	34,210	504,420	280,882	1081*	26,500	253,301	208,049
Chicago & North Western	7,634	3,237,409	1,210,677	4,942,763	696,955	682,477	102,236	1,960,650	90,492	3,532,810	1,409,953	9,511*	215,000	1,185,442	‡35,382
Chicago, Burlington & Quincy	9,023	4,060,801	1,457,960	6,054,598	1,544,159	1,142,289	125,709	1,985,811	189,577	4,987,545	1,067,053	13,813*	212,600	840,640	342,134
Chicago, St. Paul, Minn. & Omaha	1,739	698,771	292,536	1,073,751	117,471	147,039	21,759	391,282	30,471	708,022	365,729	1,244*	53,008	311,477	55,256
Colorado & Southern	1,250	476,463	94,597	608,299	90,718	136,606	15,235	205,657	17,988	466,204	142,095	3,269*	19,953	118,873	‡16,387
Delaware, Lackawana & Western	893	2,128,871	527,551	2,826,271	357,517	391,906	56,421	747,843	58,285	1,611,972	1,214,299	26,843	98,400	1,142,742	221,669
El Paso & Southwestern	867	550,646	89,064	666,288	73,883	82,608	10,598	179,528	24,898	371,515	294,773	687*	17,167	276,919	84,045
Erie	1,901	2,551,216	626,156	3,415,520	277,037	713,127	83,131	1,164,765	100,712	2,338,772	1,076,748	3,499	105,994	974,253	286,615
Grand Rapids & Indiana	591	246,511	100,736	373,093	57,227	76,364	10,234	152,801	13,996	310,622	62,471	1,239*	21,132	40,100	‡23,145
Great Northern	6,960	2,735,522	886,726	3,887,370	825,720	470,413	63,589	1,160,464	87,642	2,607,828	1,279,542	16,088	184,579	1,111,051	194,708
Gulf, Colorado & Santa Fe	1,518	636,733	206,492	907,450	171,649	129,978	19,652	397,589	28,199	747,067	160,383	....	42,649	127,734	131,836
Illinois Central	4,518	2,751,202	814,795	4,106,777	504,089	895,547	98,795	1,550,736	99,942	3,149,109	957,668	3,009*	180,815	773,844	128,980
Kansas City Southern	827	585,385	99,121	760,942	87,129	80,554	24,515	239,864	29,917	461,979	298,963	.....	25,344	273,619	76,519
Lehigh Valley	1,446	2,468,588	302,255	2,866,980	275,198	427,201	72,904	808,294	54,774	1,638,371	1,228,609	18*	94,600	1,133,991	‡38,513
Maine Central	931	409,723	191,693	647,824	85,198	97,955	8,409	238,729	27,025	457,316	190,508	749	31,962	159,295	28,698
Mobile & Ohio	1,098	614,206	90,907	819,638	99,755	131,903	29,167	279,758	33,071	573,654	245,984	2,349*	24,000	219,635	30,154
New York, New Haven & Hartford	1,998	2,385,934	1,900,736	4,692,470	591,943	518,114	23,235	1,855,028	97,434	3,085,754	1,060,716	99,021	290,000	1,415,737	151,464
New York, Ontario & Western	546	568,844	97,211	689,987	75,306	109,599	10,190	257,833	11,908	464,836	225,151	6,463*	15,000	203,788	‡31,299
Northern Central	461	837,263	156,049	1,046,970	133,966	174,603	13,846	439,471	17,723	779,609	267,361	310	32,130	235,541	45,445
Northern Pacific	5,695	3,541,262	1,403,016	5,280,862	714,542	647,074	83,681	1,569,333	98,903	3,113,534	2,167,328	20,660	184,830	2,003,158	‡100,616
Norfolk & Western	1,930	2,069,458	269,350	2,413,271	282,166	417,158	42,742	674,866	52,068	1,469,000	944,271	1,819*	82,300	860,152	183,313
Pennsylvania Railroad	4,048	8,464,259	2,291,322	11,539,789	1,640,718	2,496,846	163,131	3,818,940	280,228	8,399,863	3,139,926	32,714*	239,161	2,868,051	404,448
Pennsylvania Company	1,416	2,455,360	530,730	3,292,152	523,443	547,475	65,236	1,155,906	70,923	2,362,983	929,169	3,750*	149,900	775,519	264,313
Pere Marquette	2,341	863,233	236,475	1,187,116	129,228	159,848	34,193	497,323	28,924	849,516	337,600	6,125*	42,575	288,900	118,462
Philadelphia & Reading	1,006	2,727,334	496,231	3,351,838	353,662	506,000	34,505	981,366	56,810	1,932,343	1,419,495	77,237	60,834	1,435,898	310,715
Philadelphia, Baltimore & Wash'n	716	703,746	573,057	1,438,992	201,000	224,636	24,950	595,014	28,868	1,074,468	364,524	......	37,435	327,089	46,018
Pitts., Cin., Chic. & St. Louis	1,472	1,845,548	531,776	2,697,983	476,778	481,639	64,892	969,591	54,403	2,047,303	650,680	429*	114,000	536,251	75,344
San Antonio & Aransas Pass	727	211,017	71,086	297,545	48,100	44,877	4,501	133,983	11,909	242,551	54,994	......	8,500	46,494	‡7,354
Southern Railway	7,055	2,859,584	1,006,557	4,229,607	483,811	693,811	105,763	1,512,782	149,182	2,945,349	1,284,258	8,153	160,662	1,131,749	183,713
Southern Railway in Mississippi	280	37,099	21,868	64,399	24,057	5,699	2,473	29,455	3,075	64,759	360*	......	4,502	4,862†	......
Toledo & Ohio Central	441	191,818	36,533	239,127	40,216	63,737	4,355	95,848	5,197	209,353	29,774	379	12,341	17,812	‡323
Vandalia	829	459,058	165,623	710,181	131,101	124,782	20,438	274,488	19,614	570,423	139,758	......	23,243	116,515	21,353
Yazoo & Mississippi Valley	1,371	534,003	144,314	722,559	200,958	123,838	15,871	288,817	24,220	653,704	68,855	2,311	30,835	40,331	‡2,195

TEN MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,458	43,049,694	15,343,734	63,443,893	8,124,651	9,626,665	1,286,741	17,175,794	1,318,318	37,532,170	25,911,723	......	2,092,737	23,818,986	3,224,286
Buffalo, Rochester & Pittsburgh	568	4,850,920	735,305	5,805,116	668,348	1,392,534	82,564	1,744,305	134,342	4,022,093	1,783,023	209	145,000	1,638,232	‡71,277
Chesapeake & Ohio	1,896	17,168,526	3,699,452	21,819,485	2,476,754	4,076,696	372,462	6,092,331	432,885	13,451,128	8,368,357	9,768*	667,400	7,691,189	955,552
Chicago & Eastern Illinois	965	6,754,080	1,410,912	8,663,668	884,962	1,472,679	166,680	3,078,567	346,852	5,949,740	2,713,928	15,350*	221,115	2,477,463	‡20,020
Chicago & North Western	7,634	36,373,564	14,098,392	55,032,552	6,488,518	6,427,748	944,643	20,695,556	934,538	35,491,003	19,541,549	*1,798	2,265,000	17,274,751	1,282,258
Chicago, Burlington & Quincy	9,023	44,114,553	16,304,495	66,046,113	9,683,277	11,017,171	1,277,090	20,592,646	1,710,592	44,280,776	21,765,337	*125,184	2,126,000	19,514,153	1,059,112
Chicago, St. Paul, Minn. & Omaha	1,739	7,218,803	3,378,312	11,369,658	1,294,421	1,251,892	218,115	4,217,755	291,119	7,273,302	4,096,356	194	529,849	3,566,701	350,821
Colorado & Southern	1,250	5,565,660	1,227,281	7,174,477	902,741	1,325,610	139,656	2,215,720	253,865	4,837,591	2,336,885	1,258*	209,210	2,126,417	‡42,284
Delaware, Lackawana & Western	893	20,677,026	5,460,313	27,851,423	2,649,080	3,818,588	491,258	7,747,701	549,354	15,255,981	12,595,442	248,557	897,600	11,946,399	1,092,781
El Paso & Southwestern	867	4,936,902	808,922	6,013,350	706,583	798,862	94,349	1,639,631	242,455	3,481,880	2,531,470	14,373*	160,210	2,356,888	408,812
Erie	1,901	26,579,608	6,713,810	35,818,026	3,347,389	7,186,837	796,068	12,284,206	789,141	24,403,641	11,414,385	216,923	1,012,677	10,618,631	3,575,552
Grand Rapids & Indiana	591	2,332,600	1,274,783	3,878,986	448,018	590,788	100,367	1,536,993	136,416	2,812,582	1,066,404	3,485*	210,796	852,123	119,777
Great Northern	6,960	33,002,300	8,991,627	44,631,158	7,630,309	5,422,130	592,565	12,382,289	839,674	26,866,967	17,764,191	177,676	2,087,342	15,854,525	547,285
Gulf, Colorado & Santa Fe	1,518	7,878,561	2,443,048	10,885,769	1,681,083	1,677,239	203,666	3,840,774	314,233	7,716,995	3,168,774	......	280,272	2,888,502	1,660,005
Illinois Central	4,518	30,316,698	9,091,384	45,057,787	5,127,412	10,003,865	977,266	15,614,279	959,151	32,681,973	12,375,814	*26,873	1,868,665	10,480,276	409,079
Kansas City Southern	827	5,493,280	1,087,405	7,256,614	788,907	836,814	220,366	2,308,023	274,847	4,428,957	2,827,657	......	271,591	2,556,066	178,008
Lehigh Valley	1,446	23,268,543	3,207,304	27,380,947	2,878,873	4,919,771	658,043	8,339,550	541,501	17,337,738	10,043,209	90,629*	910,000	9,042,579	‡515,977
Maine Central	931	4,129,024	2,304,968	6,892,516	990,496	977,335	73,439	2,512,411	227,607	4,781,288	2,111,228	22,066	313,072	1,820,222	‡147,418
Mobile & Ohio	1,098	6,033,151	1,011,994	8,185,192	908,577	1,318,929	278,421	2,811,335	296,899	5,614,161	2,571,031	22,144*	188,500	2,360,387	113,594
New York, New Haven & Hartford	1,998	21,818,173	18,920,859	44,758,598	5,252,585	5,299,650	241,514	18,771,748	935,262	30,500,759	14,257,839	1,014,211	2,902,000	12,370,050	1,138,426
New York, Ontario & Western	546	5,394,766	1,270,948	6,929,284	751,857	1,178,526	97,649	2,579,137	145,426	4,752,595	2,176,689	37,206*	149,417	1,990,066	19,561
Northern Central	461	7,374,985	1,653,598	9,580,997	882,870	2,035,774	126,188	4,305,475	195,393	7,545,700	2,035,297	5,916	220,376	1,820,837	‡222,867
Northern Pacific	5,695	39,523,191	14,039,964	56,861,083	6,011,815	6,674,110	714,060	16,595,793	910,436	30,906,214	25,954,869	373,719	2,300,375	24,028,213	‡237,562
Norfolk & Western	1,930	20,364,553	2,886,665	24,059,982	2,622,156	4,083,521	398,391	6,943,418	528,159	14,575,645	9,484,337	6,161*	844,200	8,633,976	915,740
Pennsylvania Railroad	4,048	83,038,549	23,819,961	114,536,263	13,335,941	23,158,272	1,522,244	40,355,319	2,850,254	81,222,030	33,314,233	*111,851	1,873,036	31,329,346	‡9,053,074
Pennsylvania Company	1,416	25,158,599	5,567,492	33,716,614	3,546,758	5,515,897	620,825	11,716,729	708,243	22,108,452	11,608,162	*29,963	1,515,598	10,062,601	294,462
Pere Marquette	2,341	8,125,020	2,796,013	11,826,882	1,367,383	1,729,797	276,193	4,770,313	296,798	8,440,484	3,386,398	2,311*	493,263	2,890,824	577,335
Philadelphia & Reading	1,006	26,367,959	5,016,869	32,743,437	2,627,595	6,313,681	352,966	9,948,176	553,748	19,796,166	12,947,271	347,630	610,022	12,684,879	437,822
Philadelphia, Baltimore & Wash'n	716	6,536,057	5,730,399	13,788,229	1,761,475	2,422,394	220,324	5,724,659	300,438	10,429,290	3,358,939	......	324,003	3,034,936	123,394
Pitts., Cin., Chic. & St. Louis	1,472	18,305,880	5,706,894	27,134,040	3,192,002	4,792,613	616,517	9,569,408	556,764	18,727,304	8,406,736	*5,179	1,191,755	7,209,802	193,458
San Antonio & Aransas Pass	727	2,313,990	723,832	3,206,681	472,579	372,153	43,132	1,243,248	89,189	2,220,301	986,380	......	87,200	899,180	215,149
Southern Railway	7,055	29,235,479	11,295,000	44,101,621	5,148,922	6,895,714	1,021,127	15,424,987	1,448,466	29,939,216	14,162,405	113,778	1,597,207	12,678,976	3,501,396
Southern Railway in Miss. (4 mos.)	280	188,701	102,226	316,336	86,044	24,735	7,691	131,535	11,383	261,392	54,944	......	18,009	36,935	......
Toledo & Ohio Central	441	2,845,923	504,555	3,468,072	474,776	588,947	53,033	1,153,394	53,148	2,323,298	1,144,774	24,894	136,847	1,032,822	‡32,954
Vandalia	829	4,705,161	1,818,732	7,356,454	1,072,550	1,224,159	211,092	2,842,541	170,666	5,521,008	1,835,445	......	250,530	1,584,915	‡73,214
Yazoo & Mississippi Valley	1,371	6,101,861	1,758,805	8,360,944	1,690,465	1,497,384	158,197	3,207,404	237,727	6,791,177	1,569,767	26,559	330,880	1,265,446	143,197

*Deficit. †Loss. ‡Decrease.

commodity rates 25 per cent. for the sole purpose of constructing the Spokane tariff, and, necessarily, tariffs to other interior points. To make this proposition plain I will use simple figures which, of course, have no relation to any existing rate, but at the same time illustrate clearly the result of a tariff so constructed.

"Assuming that the rate on a given commodity from New York to Seattle is $1 per 100 pounds and the local rate from Seattle to Spokane is 75 cents, thus, under the present method of tariff construction, making the rate from New York to Spokane $1.75, this gives the Seattle distributer a fighting chance in Spokane.

"Under the proposed plan, while the rate of $1 will remain in force between New York and Seattle, so far as shipments to the latter city are concerned, this rate will be reduced to 75 cents when shipment is destined to Spokane. Adding the local rate of 75 cents thereto we have the through rate New York to Spokane of $1.50, thus putting the Seattle jobber at a disadvantage of 25 cents per 100 pounds in competition with the New York jobber and effectually putting the former out of this business.

"Having thus given New York an advantage over Seattle with regard to Spokane business, the railways propose to apply the New York rate on business originating in Chicago where cost of production is the same, thus with respect to this business, picking Chicago up bodily and placing her upon the Atlantic seaboard inasmuch as she is given the benefit of New York's advantageous geographical location.

"This, however, is a situation which has for some time prevailed with regard to practically all business originating between the Atlantic seaboard and the Missouri river, and is, perhaps the best possible compromise between graded rates (i. e., lower rates from Chicago than are established from New York by reason of sea competition at that port) and trunk line arbitraries (i. e., higher rates from Chicago than from New York by the addition of the rate in force from Chicago to New York to the sea competitive rate prevailing at that seaport), and has, up to this time, been acceptable to the Pacific Coast distributers as a compromise only. As a matter of fact, the principle, once adopted as such, would be destructive to the prosperity of every Pacific Coast seaport and contiguous territory, inasmuch as it destroys the advantages inherent to such seaboard location when applied to east-bound shipments covering all Pacific Coast products and manufactures.

"Not content with applying this equalization of rates to all business originating in Chicago, the railways propose to arrange their tariff so that articles produced exclusively on the Atlantic Seaboard shall be handled by the Chicago jobber rather than by the Seattle jobber. Having established the rates from the Atlantic seaboard to Spokane in the manner described in their third proposition, they propose to still further assist the Chicago jobber by refunding to him the cost of bringing into his warehouse such articles of exclusively Atlantic seaboard origin as are later reshipped to Spokane. This is accomplished by deducting from the rate in force between New York and Spokane the rates applying to such articles between New York and Chicago, thus enabling the rate from Chicago to Spokane. For example, if the rate on such an article from New York to Spokane is $1.50 and the rate on the same article from New York to Chicago is 25 cents, this establishes a rate of $1.25 from Chicago to Spokane as against $1.75 if purchased through a Seattle jobber.

"Again, upon a plea from the Chicago manufacturer that his cost of production is higher than that of New York, the railways propose to equalize both his alleged manufacturing and commercial disadvantages by making his rate from Chicago to Spokane as much lower than that from New York as is necesary 'in order to concentrate the business in Chicago."

He says that if the proposed plan should be applied to the rates to Spokane, it would no doubt be applied in the readjustment of rates to Reno, Las Vegas and Albuquerque, N. M., Tucson, Ariz., and Salt Lake City, and that the eastern and central western jobber and manufacturer would be given the monopoly of the business of most of the West to the detriment of not only the Pacific Coast cities, but also of Spokane and other inland points.

Resolutions were adopted at a meeting of the various commercial associations of San Francisco on May 24. opposing the plan of readjustment suggested by the railways.

Committee on Uniform Classification.

The Committee on Uniform Classification, Chicago, desires to secure the following information about all commodities that enter into railway traffic: (1) Nature of article, (2) constituent elements, (3) uses, (4) value per unit of sale, (5) value per cubic foot, or gallon, etc., (6) weight per cubic foot, (7) loading weight per car, (8) styles of packing.

The readers of the *Railroad Age Gazette* are familiar with the work on which this committee is engaged. It is important both to railways and to shippers. The Freight Traffic Committee of the Chicago Association of Commerce, recognizing its importance to shippers, has issued a statement asking its members to co-operate with the committee in securing such information as is desired. The committee's work would be much facilitated if all commercial organizations would similarly co-operate with it. It is not engaged in any general revision of classes or rates, but is trying at present to adopt uniform definitions of all commodities, which must be the foundation of any uniform classification.

INTERSTATE COMMERCE COMMISSION.

A rate once lawfully published continues to be the lawful rate until it has been lawfully canceled. A subsequent tariff naming other rates without canceling the previous rates cannot carry the new rates into lawful effect; and the silence of a subsequent tariff cannot be accepted as a lawful cancellation of rates previously established. (16 I. C. C. Rep. 315.)

STATE COMMISSIONS.

W. E. Fitzgerald, chief clerk to the auditor of the Houston & Texas Central, has been selected auditor of the Railroad Commission of Texas, succeeding J. H. Bond, deceased.

The Indiana Railroad Commission has ordered a switching rate of $3 a car at the intersection of several roads at Bloomington. The rate heretofore charged at this point varied from $5 to $21 a car. The new rate ordered becomes effective June 1, and affects the Chicago, Indianapolis & Louisville and the Indianapolis Southern.

COURT NEWS.

See an item in regard to the New York, New Haven & Hartford under Railroad Financial News.

The Supreme Court of Missouri refused on May 29 to cite the Missouri, Kansas & Texas for contempt because it violated an injunction of Circuit Judge Williams, of St. Louis, restraining the road from raising its passenger rate from 3 cents a mile.

The Oregon Railroad Commission has brought suit in the name of the state against the Corvallis & Eastern (Southern Pacific) for $10,000 penalty because the company refused to obey the order of the commission for the erection of a station building at Lyons, Ore.

In the case of the Southern Railway against the Interstate Commerce Commission, wherein the road denied the lawfulness of the action of the commission in fixing a charge for the reconsignment of hay shipped from the West through St. Louis to southern states, the Supreme Court of the United States has decided in favor of the railway.

The St. Louis & Southwestern, the Chicago & Alton, the Frisco, the Rock Island, the Kansas City Southern, the St. Louis, Kansas City & Colorado and the Chicago, Milwaukee & St. Paul, have filed demurrers in the Supreme Court to the information by the Attorney-General charging them with violating the state and trust law by combining to raise their passenger rates.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. B. Udell has been elected Treasurer of the Houston & Texas Central, succeeding W. H. Field, resigned.

L. E. Katzenbach has been elected the Secretary of the Colorado & Midland, succeeding James S. Mackie.

William M. Barrett, Vice-President of the Adams Express Co., has been elected the President, succeeding Levi C. Weir, resigned.

R. S. Ege, formerly chief clerk to the Auditor of the Union Pacific, has been appointed Assistant Auditor, with office at Omaha, Neb.

The office of E. J. Chamberlin, Vice-President and General Manager of the Grand Trunk Pacific, has been moved from Montreal, Que., to Winnipeg, Man.

John F. Stevens, Vice-President in charge of Traffic of the New York, New Haven & Hartford, has resigned to accept service elsewhere. His former office has been abolished and the General Manager is to report to the President.

Harry E. Byram, whose appointment as an Assistant to the Second Vice-President of the Chicago, Burlington & Quincy, with office at Chicago, has been announced already in these columns, was born on November 28, 1865, at Galesburg, Ill. He began railway work in 1881 as call boy on the Burlington at Galesburg, since which time he has been consecutively to 1889 stenographer in the General Superintendent's office and chief clerk to the Superintendent of Terminals at Chicago; 1889 to 1894 out of railway service; 1894 to March, 1898, clerk in General Manager's office and chief clerk in Vice-President's office of the Great Northern at St. Paul, Minn.; March, 1898, to October, 1899, Assistant General Superintendent of the Montana Central at Great Falls, Mont.; October, 1899, to October, 1902, Superintendent of the Cascade division, Great Northern, at Everett, Wash.; October, 1902, to February, 1904, Assistant to First and Fourth Vice-Presidents, Chicago, Rock Island & Pacific at Chicago; February 1, 1904, to July, 1904, General Superintendent Southwestern district at Topeka, Kan.; September, 1904, until promoted General Superintendent Nebraska district, Chicago, Burlington & Quincy.

Operating Officers.

George B. Beale has been appointed the Superintendent of the Buffalo division of the Pennsylvania, succeeding Robert Bell, assigned to other duties.

S. J. Mulvaney, Trainmaster of the Atlanta division of the Southern Railway, has been appointed Superintendent of the Virginia & Southwestern, with office at Bristol, Tenn.

E. T. Lamb, Superintendent of the Southern Railway at Norfolk, Va., has been appointed the General Manager for the receivers of the Norfolk & Southern, effective June 15.

I. E. Ramsdell, Assistant Trainmaster of the Pittsburgh & Lake Erie, has been appointed the General Trainmaster, with office at Youngstown, Pa., succeeding Elias Reese, deceased.

J. E. Tussey, Superintendent of Maintenance of the Georgia, Florida & Alabama, has been appointed the General Manager, with office at Bainbridge, Ga., succeeding J. E. O'Dell, resigned.

H. A. Shepard has been appointed the Assistant Superintendent of Telegraph of the New York, New Haven & Hartford, with office at New Haven, Conn., succeeding W. H. D. Ford, resigned.

H. B. Earling, General Superintendent of the Chicago, Milwaukee & Puget Sound lines east of Butte, Mont., has had his jurisdiction extended over the lines west of Butte, and his office will be transferred from Miles City, Mont., to Butte.

The Buffalo division of the Pennsylvania will hereafter consist of the Union Terminal of Buffalo, N. Y.; those portions of the line of the Western New York & Pennsylvania from Buffalo to Emporium, Pa.; from Winchester to South Buffalo Ore Docks; from Buffalo to Oil City, Pa.; from Tryonville, Pa., to Lakeville, and from Titusville, Pa., to Pioneer, the Genesee Valley Canal Railroad; the Genesee Valley Terminal; the Rochester, New York & Pennsylvania, and the McKean & Buffalo. The Allegheny division will consist of the lines of the Allegheny Valley (with the exception of that portion included in the Conemaugh division); the Brookville Railway; those portions of the line of the Western New York & Pennsylvania from Oil City to Irvineton, and from Warren, Pa., to Olean, N. Y.; the Kinzua Railway; the Kinzua Valley Railroad; the Bradford Railway; the Olean, Bradford & Warren Railway, and the Olean, Bradford & Warren Railroad. The Chautauqua division will be abolished as a separate division. The office of the Superintendent of the Allegheny division will be located at Oil City, Pa.

Traffic Officers.

F. B. Peters has been appointed a Traveling Freight Agent of the Detroit, Toledo & Ironton, with office at Ironton, Ohio.

D. L. Melville has been appointed a Traveling Freight and Passenger Agent of the Baltimore & Ohio, with office at Seattle, Wash.

A. G. Payne has been appointed a General Agent of the Louisville & Nashville, with office at Jacksonville, Fla., succeeding H. G. Stewart, resigned.

H. T. Drane has been appointed a Soliciting Agent of the Louisville & Nashville, with office at Selma, Ala., vice A. G. Payne, assigned to other duties.

William B. Barr, whose resignation as General Freight and Passenger Agent of the Chicago Terminal Transfer to become Vice-President of the Traffic Service Bureau, with headquarters at Washington, D. C., has been announced in these columns, was born in 1854 at Washington, Ind., and has been in the service of various transportation companies for about 25 years. He was formerly Assistant General Manager of Street's Western Stable Car Line, with office in St. Louis, and has also been connected with the freight departments of the Baltimore & Ohio, the Cleveland, Cincinnati, Chicago & St. Louis and other roads. He became General Freight and Passenger Agent of the Chicago Terminal Transfer in December, 1889, which office he now resigns. Mr. Barr has prepared various reports on existing and proposed terminal systems in different parts of the country, and in the performance of these and similar duties has been a close student of industrial conditions. He has been a contributor for several years to newspapers and magazines on transportation and allied questions.

Wm. B. Barr.

Paul A. Rochester has been appointed the Freight Traffic Manager of the Hudson Navigation Co., with office at Pier 32, North river, New York, succeeding F. C. Earle.

Oliver T. Boyd, city passenger agent of the Pennsylvania at Washington, D. C., has been appointed the General Passenger Agent of the Hudson & Manhattan, with office at 30 Church street, New York.

E. M. Snyder, General Freight Agent of the Central of New Jersey, has been appointed the Assistant Freight Traffic Manager, with office at New York. This is a new position. Arthur Hamilton succeeds Mr. Snyder, with office at New York.

J. G. Love, Division Freight and Passenger Agent of the Chicago, Milwaukee & St. Paul at Des Moines, Iowa, has been appointed Assistant General Freight Agent, with office in Chicago, succeeding E. C. Nettels, resigned to engage in other business.

C. E. Hilliker, Commercial Agent of the Chicago, Milwaukee & St. Paul at Cleveland, Ohio, has been appointed a Division Freight and Passenger Agent, with office at Des Moines, Iowa, succeeding J. G. Love, promoted. T. H. Stoffel succeeds Mr. Hilliker, with office at Cleveland.

H. B. Kooser, Assistant General Freight Agent of the Missouri Pacific at Omaha, Neb., has been appointed the General Manager of the American Refrigerator Transit Company, with office at St. Louis, Mo., succeeding C. H. Holdridge, resigned to take service with another company.

C. E. Wagar, General Agent of the Missouri Pacific at Pueblo has been appointed the Assistant General Freight Agent, with office at Omaha, Neb., succeeding H. B. Kooser, resigned to enter service elsewhere. J. L. Amos, Contracting Freight Agent of the Missouri Pacific at St. Louis, succeeds Mr. Wagar.

Alvah N. Brown, whose appointment as General Freight and Passenger Agent of the El Paso & Southwestern System, with headquarters at El Paso, Tex., has already been announced in these columns, was born in Illinois in December, 1864. He received his education in the common schools and began railway work in 1885 with the Vandalia, with which he remained until 1887. From 1887 to 1897 he was in station service on the Atchison, Topeka & Santa Fe. From 1897 to 1899 he was Traffic Manager for the Receiver of the St. Louis, Kansas & Southwestern. From 1899 to 1901 he was Traffic Manager and Superintendent of the Kansas Southwestern. From 1901 to 1905 he was General Freight and Passenger Agent of the El Paso & Northeastern. From 1905 to May 1, 1909, he was General Freight Agent of the El Paso & Southwestern, and since May 1 he has been General Freight and Passenger Agent of the El Paso & Southwestern.

A. N. Brown.

Engineering and Rolling Stock Officers.

Howard R. Pratt, Engineer of Maintenance of Way of the Western Maryland, has been appointed Chief Engineer. This office has been vacant for about two years.

W. G. Seibert is appointed a Master Mechanic of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at Fort Scott, Kan., succeeding T. F. Carbery, assigned to other duties.

M. E. Hamilton has been appointed the General Air-Brake Inspector of the Atchison, Topeka & Santa Fe System, with office at Topeka, Kan. He will have full charge of all matters pertaining to air-brakes and Air-Brake Inspectors on instruction cars will report to him.

J. H. Rollo has been appointed the Supervisor of Bridges and Buildings of the Georgia, Florida & Albama, with office at Havana, Fla., and A. J. Anderson has been appointed the Roadmaster, with office at Bainbridge, Ga. The office of Superintendent of Maintenance and Construction has been abolished.

E. Fischer, formerly Engineer of Bridges and Buildings of the Missouri Pacific, has been appointed Resident Engineer of the St. Louis, Brownsville & Mexico at Brownsville, Texas, in charge of the construction of the bridge over the Denver & Rio Grande, which is being built jointly by the St. Louis, Brownsville & Mexico and the Mexican National.

Frank Lee Nicholson, recently appointed Engineer of the Norfolk & Southern, with office at Norfolk, Va., was born August 12, 1868, at Portsmouth, Va. After attending the Suffolk Military Academy for three years, from 1884 to 1887, he took a two years special course in civil engineering at the same time that he was engaged in railway work. He began railway work in 1887 as levelman on the Atlantic & Danville, now part of the Southern Railway. On August 1, 1888, he was made chief clerk and draftsman for the Chief Engineer, and a year later became levelman and transitman on the location work of the Wilmington, Newton & Norfolk, now part of the Atlantic Coast Line. In September, 1889, he was made Resident Engineer. By June 1, 1890, he had become Assistant Engineer of the Norfolk & Southern. On March 15, 1892, he was made Acting Engineer of Maintenance of Way, and on January 1, 1898, Engineer of Maintenance of Way, holding this position until his recent appointment. He is a member of the American Society of Civil Engineers, a charter member of the American Railway Engineering and Maintenance of Way Association, and vice-chairman of the Committee on Rules and Organization.

F. L. Nicholson.

OBITUARY.

George H. Harris, District Passenger Agent of the Lehigh Valley at Rochester, N. Y., died on May 22 at Rochester.

Joseph W. Drew, who died in Springfield, Mass., May 27, at the age of 84, was for many years a roadmaster on the Old Colony and was railway builder for General Sherman in Georgia, rebuilding the tracks in the country which was devastated on the march to the sea. Mr. Drew was born in Vermont and began his railway service as freight house laborer and brakeman in New Hampshire in 1845. He was a freight conductor on the Boston, Concord & Montreal and on the Boston & Maine. In company with Benjamin Bailey he was engaged in building the White Mountains Railroad, the Port Hope, Lindsay & Beaverton (Canada), the Passumpsic Railroad and a short railway in New Jersey. After the war he went to Boston and was roadmaster on the Old Colony for 37 years.

O. M. Shepard, General Assistant of the New York, New Haven & Hartford, died at his home in New Haven June 1 from acute gastritis. He was born in Cleveland, Ohio, in 1842, and began railway work in 1863 as despatcher in the United States military railway and telegraph service. By 1870 he had become Superintendent of Transportation and Assistant Superintendent of the Gilman, Clinton & Springfield, now part of the Illinois Central. In 1874 he was made Assistant General Superintendent of the St. Louis & Southeastern, now part of the Louisville & Nashville, and by 1880 had become Division Superintendent of the New York, New Haven & Hartford. He was made General Superintendent of the New York, New Haven & Hartford in 1886, and upon the reorganization and expansion of the road was made Superintendent of the New York division in March, 1890. In June, 1903, he was appointed General Superintendent and later was appointed General Assistant, acting in an executive capacity in the Operating department.

Railroad Construction.

New Incorporations, Surveys, Etc.

BENTON HARBOR-ST. JOE RAILWAY & LIGHT COMPANY.—Contract is said to have been given to McLane & Co., Detroit, Mich., for a 10-mile extension from Benton Harbor, Mich., northeast to Coloma. Contracts for material are said to be let as follows: Carnegie Steel Co., rails; Electric Service Supplies Co., overhead material; F. Cartwright, South Bend, Ind., poles; Lombard & Rittenhouse, Hastings, Mich., ties.

CANADIAN NORTHERN.—A contract for 25 miles on the Edmonton & Slave Lake, between Edmonton, Alb., and Athabasca Landing has been given to Malcolm McGrimmon, contractor, Edmonton. (March 19, p. 650.)

CANADIAN NORTHERN ONTARIO.—A subsidy contract has been entered into with the Canadian Government for building two lines of railway. One will run from Toronto, Ont., northwest, via the east side of Lake Simcoe to a point at or near Sudbury, 265 miles. The other line will run from Sudbury Junction, Ont., to Hutton Mines, 30 miles.

CENTRAL KENTUCKY TRACTION.—Contract is said to have been given to David Pepper, Jr., of Philadelphia, to build from Lexington, Ky., south to Nicholasville, 12 miles, and work is to be started at once by Smithurst & Allen, Philadelphia, Pa. J. B. Crawford, Genl. Mgr., and G. MacLeod in charge of construction, Lexington. (March 19, p. 652.)

EDMONTON & SLAVE LAKE.—See Canadian Northern.

ELK & LITTLE KANAWHA.—Contracts may soon be let to build from Gassaway, W. Va., on the Coal & Coke, west to a point near Rosedale, about 15 miles. C. F. Peyton, of Charlestown, W. Va., is the engineer in charge.

FITZGERALD & NORTHWESTERN.—Application will soon be made for a charter in Georgia to build about 80 miles of line from a point in Ben Hill county, north through Wilcox and Pulaski counties. W. R. Bowen, Pres.; J. G. Knapp and D. B. Jay, of Fitzgerald, and S. C. Price, of Douglas, are interested.

GRAND TRUNK PACIFIC.—Vice-President Wainwright is said to have definitely stated that work will possibly be started this summer on the branch from Melville, Sask., northwest to Prince Albert, and that the other branch lines north and south from Melville will be completed this summer. (May 7, p. 1007.)

GREAT NORTHERN.—According to press reports a branch is to be built from Wilsoncreek, Wash., south to Connell, at the junction of the Northern Pacific and Oregon Railroad & Navigation Co., about 60 miles.

IDAHO & WASHINGTON NORTHERN.—An officer writes that track laying will be started June 1 on the extension from Newport, Wash., north to Ione, 53 miles. (May 28, p. 1144.)

MISSOURI & NORTH ARKANSAS.—Preliminary surveys are said to be made for a branch from Letona, Ark., southwest to Whitman, about 15 miles.

MISSOURI INLAND & SOUTHERN.—The proposed route is from Rolla, Mo., south to Licking, 40 miles. Surveys to be started June 1 and construction to be under way this fall. (May 28, p. 1174.)

MISSOURI, KANSAS & TEXAS.—Press reports from Austin, Tex., indicate that W. B. Munson, of Dennison, Tex., representing the M., K. & T., has asked to be given a 90 days' option on the bonds of $100,000, which has been raised in San Antonio, for building a railway from that city to Brownsville. The report says that Mr. Munson and engineers will make a trip over the route of the proposed line and if their report is favorable its construction will be undertaken by the M., K. & T. interests. The proposed line will probably cross the Rio Grande at Rio Grande City and make connection with the Monterey-Matamoras branch of the National Railways of Mexico. (See Texas Roads, Feb. 19, p. 381.)

PORTLAND RAILWAY, LIGHT & POWER COMPANY.—Plans are said to have been made for building about seven miles of new line in Oregon this year.

QUEBEC, MONTREAL & SOUTHERN.—A subsidy contract has been entered into with the Canadian Government for building a line from Yamaska, Que., northeast to a point in the county of Lotbiniere, 70 miles, and another from Mount Johnson, Que., to St. Gregoire, 1½ miles.

ROME & NORTHERN.—Organized in Georgia, with $1,000,000 capital, to build from Rome north through Floyd, Chattooga, Walker, Whitfield and Catoosa counties to the Tennessee state line, about 80 miles. Contract said to be let to Burk & Joseph, of Cape Girardeau, Mo., for first 50 miles from Rome. Construction work is to be started at once. It is said some of the rails have already been ordered. Incorporators include R. G. Peters, R. A. Nickerson, J. R. Peters and R. H. Hoffman, of Manistee, Mich., and H. M. Smith, J. L. Bass, D. T. Haynes, H. H. Shackelton and others of Rome.

SAVANNAH & SOUTHWESTERN.—Application is said to have been made for a charter in Georgia to build about 400 miles of line from Savannah, Ga., west across the state of Georgia to Fort Gaines. C. M. Frank, F. R. Dunden, of Savannah; J. H. Perkins, W. G. Warnell and others are interested.

SHAWNEE ELECTRIC.—Incorporated in Oklahoma, with $100,000 capital, to build from Shawnee, Okla., northeast via Prague and Okmulgee to Muskogee, 120 miles; also from Shawnee northwest to Oklahoma City, 40 miles. The incorporators include R. E. Pugh, C. S. Edwards, W. S. Pendleton and others, of Shawnee.

SOUTH CAROLINA ROADS.—According to reports from Bennettsville, S. C., John Ickes is interested in a company which proposes to build from Bennettsville north to Lackingham, N. C., about 35 miles.

SPARTA-MELROSE ELECTRIC RAILWAY & POWER CO.—See Western Transportation Co.

TROY MERCANTILE MILLING & POWER COMPANY.—Incorporated in Oregon, with $20,000 capital, and office at Enterprise, Ore., to build an electric line from Troy, Ore., south to Hurricane creek, about 40 miles. R. W. Barkham and H. E. Merryman are interested.

VANCOUVER TRACTION.—According to press reports, surveys are now being made for an extension from Vancouver, Wash., east to Camas, 12 miles.

WESTERN TRANSPORTATION CO.—All the right-of-way has been secured by the Sparta-Melrose Electric Railway & Power Co. from Sparta, Wis., northwest via Angelo, Trout Falls and Cataract to Melrose, 28 miles. (March 19, p. 659.)

WESTMORELAND & REDBOILING SPRINGS (ELECTRIC).—Application has been made for a charter in Tennessee to build from Westmoreland, Tenn., east to Redboiling Springs, in Macon county, about 25 miles. A. R. Dean, E. K. Lamb, W. A. Smith, H. C. Smith and J. B. Kemp are interested.

WEST POINT & HOUSTON.—Organized in Mississippi with $500,000 capital to build from West Point, Miss., northwest to Houston, about 30 miles. A large part of the right-of-way has been secured. J. A. McArthur, Pres.; J. R. Brinker, V.-Pres.; W. F. Lagrone, Secy., and L. T. Carlisle, Treas., associated with J. M. Hardison, A. F. Fox, J. L. Smith, W. F. Walker, K. Chandler, W. S. Keyes and J. M. White, directors.

A consular report says that a road train is being brought to Rangoon, India, to demonstrate the practical utility of this method of transport. The secretary of the Renard Transport Corporation of India is now in Rangoon in the interest of the company. Each vehicle of a train is mechanically steered so that it follows in the exact track of the preceding vehicle, and is equally effective when traveling backward. A train can turn a complete circle in a space 30 feet in diameter, backward or forward. A train usually consists of an 80-horsepower motor, with four carriages or less, which may be for either passengers or freight, as desired. The train is fitted with eight different speeds and can ascend a grade of 18 per cent. fully loaded. Each freight carriage has a maximum carrying capacity of five tons, and each passenger carriage provides accommodation for 25 to 30 persons. The maximum speed of such a train fully loaded, on a fairly hard level road, is 12 miles an hour. The size of the train may be increased up to six carriages, but the speed will be proportionately less. The trains are built in England and France.

Railroad Financial News.

Atchison, Topeka & Santa Fe.—The company is offering to stockholders the privilege of subscribing at 104 for an amount of 4 per cent. convertible bonds equal to 12 per cent. of their respective holdings of stock.

Baltimore & Ohio.—See Cincinnati, Hamilton & Dayton.

Boston & Albany.—The Massachusetts Railroad Commission has approved the issue of $4,500,000 25-year 4 per cent. bonds the proceeds of the sale of which are to be used to pay for permanent additions and improvements.

Canadian Northern.—The Dominion Securities Corporation, Toronto, Ont., has bought $3,000,000 Canadian Northern, Winnipeg Terminal bonds.

Chicago, Lake Shore & Eastern.—The Elgin, Joliet & East ern has been leased to this road, the lease to go into effect on June 1 and run 50 years. Both roads are owned by the United States Steel Corporation and have many common officers, and it is said that the lease is made for the purpose of economy and convenience of management.

Cincinnati, Hamilton & Dayton.—The plan for the readjustment of the affairs of this company, either through a foreclosure sale or without foreclosure, has been made public and it has it is understood the approval of the directors of the Baltimore & Ohio, J. P. Morgan & Co. and the bond and noteholders' protective committees. If foreclosure is brought it is to be on the consolidated mortgage of 1905, under which $17,500,000 bonds were issued, of which $15,000,000 are held as security for $15,000,000 notes due September 1, 1908, and $2,500,000 of which are held as security for demand notes. The consolidated mortgage is subject to $23,729,425 underlying bonds, $11,557,000 refunding bonds of 1904, $2,141,000 receiver's obligations, $1,046,000 unpaid interest and six months material claims to the extent that these claims may be determined to be a prior lien. To pay the debt of the company and to satisfy the holders of the $15,000,000 4½ per cent. notes, it is proposed to authorize two new mortgages.

1. A first and refunding mortgage of July 1, 1909-1959, securing 4 per cent. bonds of a total authorized issue of $75,000,000, of which $27,500,000 are to be issued for the following purposes:

(a) For payment or adjustment of indebtedness	$7,500,000
(b) For improvements now needed	5,000,000
(c) For necessary working capital	2,000,000
(d) For collateral	13,000,000
Total present issue	$27,500,000

There is to be reserved for future use:

(e) For additions, improvements and betterments	$23,714,000
(f) For refunding underlying bonds	23,786,000

Of the bonds specified above (b), (c) and $5,500,000 of (a) are to be guaranteed principal and interest by the Baltimore & Ohio; (d) bonds are to be pledged to secure $11,557,000 notes due July 1, 1913, which notes are to be guaranteed by the Baltimore & Ohio, and the present 1904 refunding mortgage bonds are to be cancelled.

2. A general mortgage of July 1, 1909-1939 securing $20,000,000 bonds bearing interest as follows:

From July 1, 1909, to June 30, 1911, 4½ per cent. dependent on income.

From July 1, 1911, to June 30, 1914, 1 per cent. absolutely and 3½ per cent. additional dependent on income.

From July 1, 1914, to June 30, 1916, 3 per cent. absolutely and 1½ per cent. additional dependent on income.

From July 1, 1916, on, 4½ per cent. absolutely.

None of the interest dependent on income is cumulative.

The holders of the $15,000,000 4½ per cent. notes due September 1, 1908, are to receive for each $1,000 note $60 in cash [less than half the interest due and unpaid] and a new general mortgage bond for $1,000, and the Baltimore & Ohio agrees that in July, 1916, or if the B. & O. shall acquire the controlling stock of the C., H. & D. earlier than that time, it will then either purchase at 85 the general mortgage bonds or at its own option give new 4 per cent. coupon bonds guaranteed by the B. & O. in exchange at par. In consideration of its part in the reorganization, the Baltimore & Ohio is to acquire the controlling interest in the stock of the C., H. & D. in July, 1916, at a price then to be fixed by arbitrators, and during the seven years from 1909 to 1916 the stock is to be vested in three voting trustees, one of whom is to be the President of the Baltimore & Ohio. [J. P. Morgan is the second and these two have chosen E. H. Harriman as the third trustee.] It has been arranged that until the purchase by the B. & O. of the controlling interest in the stock of the C., H. & D., a nominee of the $15,000,000 noteholders' committee shall be a member of the board of directors of the Cincinnati, Hamilton & Dayton.

Elgin, Joliet & Eastern.—See Chicago, Lake Shore & Eastern.

Erie.—The company has sold the remainder, understood to be about $4,500,000, of the $15,000,000 6 per cent. collateral notes, which were issued in April, 1908, to provide for the refunding of obligations of the company maturing on or before July 1, 1909. The coupons due June 1 on $709,500 New York & Erie fifth mortgage 4 per cent. bonds of 1858-1928 and on $2,380,000 Buffalo, New York & Erie first mortgage 7 per cent. bonds of 1876-1916 were bought for cash and will be deposited as additional securities under the notes. Owing to the improved earnings of the company the issue of the $30,000,000 collateral trust bonds recently authorized by the New York Public Service Commission under certain specified conditions has been postponed indefinitely.

Great Northern.—The $3,638,000 St. Paul, Minneapolis & Manitoba 6 per cent. second mortgage bonds maturing October 1, 1909, are being redeemed at par, the holders having the privilege, however, of exchanging them dollar for dollar for consolidated mortgage 4 per cent. bonds of the St. Paul, Minneapolis & Manitoba.

See Union Pacific.

Kansas City, Mexico & Orient.—At the annual meeting in Kansas City, Mo., on May 16, the Board of Directors was re-organized, a number of changes being made. The directorate formerly consisted mainly of citizens of Kansas City, but as the ownership of the stock has become widely diffused it was decided to choose a number of directors living at other places. The new board is composed as follows: A. N. Belding, New York; A. Monroe, Lawrence, Kan.; P. W. Goebel, Kansas City, Kan.; D. W. Mulvane, Topeka, Kan.; H. A. Stilwell, Chicago; J. T. Odell, New York; E. Dickinson, Kansas City, Mo.; A. E. Stilwell, Kansas City, Mo.; W. W. Sylvester, Kansas City, Mo.; John F. Allen, Rochester, N. Y.; C. R. Huntley, Buffalo, N. Y.; H. S. Manning, New York; W. D. Baldwin, New York; Thomas Evans, Pittsburgh; Frederick Roebling, Trenton, N. J.; H. D. Estabrook, New York; Wm. H. McCord, New York; Chas F. Ayer, Boston; H. A. Bishop, Bridgeport, Conn.; E. D. Stair, Detroit, Mich.; Isodoro Dia Lombardo, Mexico City; Manuel Calero, Mexico City; Garcia Cuellar, Mexico City.

Minneapolis & St. Louis.—Tailer & Co. have bought $600,000 5 per cent. equipment bonds. The bonds mature $60,000 annually beginning 1910.

New York, New Haven & Hartford.—The Massachusetts Supreme Court has decided that the Park Square property in Boston, Mass., which was leased originally by the Old Colony Railroad from the Boston & Providence, belongs to the New York, New Haven & Hartford.

Northern Pacific.—See Union Pacific.

St. Louis, Iron Mountain & Southern.—See St. Louis Southwestern.

St. Louis Southwestern.—The Valley Line of the St. Louis, Iron Mountain & Southern, running south from St. Louis, 119 miles, which has heretofore been operated under a short-term trackage agreement by the St. Louis Southwestern, has been leased under an agreement, understood to be for 50 years, by the St. Louis Southwestern.

Union Pacific.—An arrangement has been made between the Northern Pacific, Union Pacific and Great Northern under which the Northern Pacific line running from South Tacoma, Wash., to Vancouver, about 135 miles, and the bridge over the Columbia river will be used jointly by the three companies. See this company under Railroad Construction.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Erie has closed a contract with the Fitz-Hugh, Luther Company to overhaul about 30 locomotives.

The Chicago & Eastern Illinois will repair 15 locomotives at its Danville shops for the St. Louis & San Francisco.

The Chicago, Rock Island & Pacific will overhaul 20 locomotives at its Silvis shops for the St. Louis & San Francisco.

The Harriman Lines have made a contract with the Baldwin Locomotive Works for building 105 locomotives. The numbers of each type and the allotments to the various roads are not yet decided. This equipment was referred to in the *Railroad Age Gazette* of May 28.

The Pennsylvania, as reported in the *Railroad Age Gazette* of May 7, is building at its Juniata shops 21 consolidation engines, 3 six-wheel switchers and 20 Atlantic locomotives.

General Dimensions.

Type of locomotive	Consolidation.	Switch.	Atlantic.
Weight on drivers	211,000 lbs.	144,100 lbs.	124,100 lbs.
Weight, total	238,300 "	144,100 "	188,600 "
Cylinders	24 in. x 28 in.	20 in. x 24 in.	22 in. x 26 in.
Diameter of drivers	62 in.	56 in.	80 in.
Boiler, type	Belpaire.	Belpaire.	Belpaire.
" wrk. steam press	205 lbs.	205 lbs.	205 lbs.
Heating surface, tubes	3,653 sq. ft.	1,762 sq. ft.	2,474 sq. ft.
" " firebox	187 "	106 "	166 "
" " total	3,839 "	1,868 "	2,640 "
Grate area	55.13"	31.62"	55.55"
Tubes, number	465	247	315
" outside diameter	2 in	2 in.	2 in.
" length	180 in.	163½ in.	180 in.
Firebox, type	Wide firebox.	Wide firebox.	Wide firebox.
" length	110¼ in.	69 in.	111 in.
" width	72 "	66 "	72 "
" material	Steel.	Steel.	Steel.
Tank, capacity	7,000 gals.	5,500 gals.	5,500 gls. (13) 7,000 gals. (7)
Coal capacity	35,000 lbs.	12,000 lbs.	25,000 lbs. (13) 26,000 lbs. (7)

Special Equipment.

Bell ringer	Hand only
Brakes	Penn. R.R.
Driving boxes	Penn. R.R.
Headlight	Penn. R.R.
Injector	Sellers and Nathan
Journal bearings	Penn. R.R.
Piston rod packings	Multi-angular metallic
Safety valve	Coale
Sanding device (Consolidation)	Leach, Sherburne and gravity
" " (Switch and Atlantic)	Sherburne and gravity
Sight-feed lubricators. (Consolidation)	½ Nathan and ½ Detroit; (Switch and Atlantic) Nathan
Staying	Penn. R. R.
Steam gages	Crosby; (13 Atlantic) American
Steam heat equipment (Atlantic)	Gold regulator and McLaughlin Joints
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The Philadelphia & Reading is in the market for 500 fifty-ton gondolas.

The St. Louis Southwestern will build 500 freight cars at its Pine Bluff shops.

The Philadelphia Rapid Transit has ordered 10 all-steel coaches from the Pressed Steel Car Co.

The Lehigh Coal & Navigation Co. has been figuring on specifications for from 25 to 50 coal cars.

The Central of New Jersey, as mentioned in the *Railroad Age Gazette* of May 28, is asking prices on 1,500 gondola and coal cars.

The Southern Cambria Railway, Johnstown, Pa., is said to have ordered 6 combination baggage and passenger cars from the Niles Car & Manufacturing Co. This is not yet confirmed.

The Grand Forks Street Railway Co., Grand Forks, N. Dak., is in the market for 4 second-hand single-truck trailers, 2 double-truck trailers and 1 double-truck motor, new or second-hand.

The Pennsylvania has been making contracts for some of the 121 steel passenger cars for the Lines West, mentioned in the *Railroad Age Gazette* of May 21, but as we go to press the allotments have not been definitely decided.

The Chesapeake & Ohio, which was mentioned in the *Railroad Age Gazette* of May 21 as having ordered 500 hopper cars from the Pressed Steel Car Co. and 500 from the Standard Steel Car Co., has ordered 500 additional from the Standard Steel Car Co.

The Oregon Railroad & Navigation, as reported in the *Railroad Age Gazette* of May 21, has ordered one motor car from the McKeen Motor Car Co., and the Oregon & California has ordered one. These cars will weigh 60,000 lbs. and seat 48 passengers; each will have a 12-ft. 9-in. baggage compartment. They will measure 57 ft. long, 9 ft. 8 in. wide and 12 ft. high, over all. Bodies will be of wood and underframes of steel. They are for delivery September 1.

The Buffalo, Rochester & Pittsburgh, as reported in the *Railroad Age Gazette* of May 28, has ordered from the American Car & Foundry Co. three combination passenger and baggage cars for delivery September 1. These cars will carry 42 passengers. They will measure 65 ft. 3⅜ in. long, 9 ft. wide and 8 ft. 10 11/16 in. high, inside measurements, and 71 ft. 11 in. long, 9 ft. 8 in. wide and 14 ft. 1/16 in. high, over all. The bodies will be of wood and the underframes of wood and steel. The special equipment includes:

Axles	Steel
Bolsters, body	Cast steel
Bolsters, truck	Cast steel
Brakes	Westinghouse
Brake-beams	Davis high speed
Brake-shoes	Lappin steel back
Brasses	B., R. & P. standard
Couplers	Janney
Curtain fixtures	Forsyth
Curtain material	Pantasote
Door fastenings	B., R. & P. standard lock
Door checks	Corbin
Draft gear	Westinghouse friction
Dust guards	Wood
Heating system	Consolidated
Journal boxes	Symington
Lighting system	Pintsch
Paint	Pullman standard
Platforms	A., C. & F. Co., design
Roofs	B., R. & P. pattern
Seat covering	Pantasote
Side bearings	Cast steel
Springs	Railway Steel-Spring Co.
Trucks	6-wheel, cast steel
Ventilators	Adjustable deck windows
Vestibules	Pullman standard
Vestibule diaphragms	Ajax
Vestibule trap doors	Edwards
Wheels	Solid steel
Window fixtures	Edwards

IRON AND STEEL.

The Copper Range has ordered 1,000 tons of rails from the Illinois Steel Co.

The Duluth, Missabe & Northern has ordered 1,250 tons of rails from the Illinois Steel Co.

The Lake Shore & Michigan Southern has ordered 15,400 tons of rails from the Illinois Steel Co.

The Grand Forks Street Ry., Grand Forks, N. Dak., is in the market for 360 tons of relaying steel.

The Chicago Western Indiana is reported in the market for about 1,000 tons of structural steel for bridge building.

The Chicago & Alton, reported in the *Railroad Age Gazette* of May 28 as being in the market for 10,000 tons of rails, has given this order to the Illinois Steel Company.

The Chicago, Rock Island & Pacific, reported in the *Railroad Age Gazette* of May 28 as being in the market for 22,000 tons of rails, has ordered about 26,000 tons from the Illinois Steel Company.

General Conditions in Steel.—One steel manufacturer is quoted as having said that the tariff question, as affecting the steel situation, has been lost sight of, due particularly to the low prices which have induced buyers to enter the market. It is suggested that consumers may themselves cause prices to rise in offering premiums for prompt shipments. The following statement, from the *Wall Street Journal*, probably best tells the conditions in general: "The United States Steel

Corporation is now producing at the rate of approximately 9,000,000 tons of finished and semi-finished steel, for sale, a year. This is the largest production in nearly two years. In 1907, an exceptionally good year, rolled and other finished steel products, for sale, aggregated 10,564,537 tons, so that the corporation is now operating within 1,500,000 tons of the total output of 1907. In 1908 the Steel Corporation produced, for sale, 6,206,932 tons, so that the present annual rate of production is about 2,800,000 tons in excess of what it was last year. The Steel Corporation is now operating about 77 per cent. of capacity. As capacity is much larger than it was in 1907, actual blast furnace production is within about 86 per cent. of the capacity in 1907."

RAILROAD STRUCTURES.

BOSTON, MASS.—The new grain elevator of the Boston & Albany at East Boston, which will form an important part of the new terminal, will be built by the Witherspoon-Englar Co., Chicago, at a cost of approximately $1,000,000. The new elevator, which will be located on the northerly side of the company's property, and bordering on the Marginal, will have a capacity of 1,000,000 bushels, and will be 269 ft. long, 73 ft. wide and 187 ft. high. It will be operated by electricity and will have two double belts serving the conveyors and capable of delivering grain to four vessels at the same time. The building will be fireproof steel construction, with all modern appliances. The work of demolishing the old store houses on the site of the new elevator will begin at once. Contract also calls for a new grain dryer, which will be in a separate building adjoining the elevator. This building will also be fireproof construction, 46 ft. long, 28 ft. wide, 51 ft. high.

CANADIAN, TEX.—The Atchison, Topeka & Santa Fe will rebuild the roundhouse recently destroyed by fire. The structure will be an exact duplicate of the former one. (May 28, p. 1148.)

CHERRYVALE, KAN.—The Atchison, Topeka & Santa Fe has given a contract to O. Swanson & Sons, Topeka, Kan., for a passenger station.

CLEVELAND, OHIO.—D. C. Moon, General Manager of the Lake Shore & Michigan Southern, has sent a letter to the city council regarding the proposed Union station in which he speaks for his road, the Pennsylvania and the Cleveland, Cincinnati, Chicago & St. Louis. The council adopted a resolution on March 15, 1909, expressing the opinion that certain property in Lake View Park was a bargain at $335 a front foot, aggregating the gross sum of $3,000,000, and intimating that the railways ought to acquire it for the purpose of building a union station. Mr. Moon, in his letter, which was read to the city council on May 24, said that the railways' necessities are not of such a nature as to require the amount of ground stated. The principal reason for suggesting the use of so much ground appeared to be that the city's "group plan" of magnificent buildings must be supplemented and completed by an elaborate and costly station, far beyond the needs of the public or the railways now or in the near future. Mr. Moon suggested that if the city wishes such monumental works it would seem proper that it should contribute the land needed, especially in view of the fact that it is practicable to make a reasonable reconstruction of the present station by the addition of a moderate area of land. He added that the railways have not adopted or agreed on a plan for a station.

LOGGIEVILLE, N. B.—Sealed bids will be received by M. J. Butler, chairman, Canadian Government Managing Board, Ottawa, until June 10, for a three-stall engine house, turntable, ring wall, freight shed, loading platform and a number of other additions.

MELBOURNE, WASH.—The contract for the first bridge for the Grays Harbor extension of the Union Pacific has been given to the Vulcan Iron Works Co., Seattle, Wash., at a cost of $10,000. The structure will be used as an overhead crossing at a public highway.

OTTAWA, ONT.—Work on the new Grand Trunk hotel and station was commenced May 27. The building will be 300 ft. long, 85 ft. wide and 40 ft. high. Foundations will be of blue limestone, main walls of brick, the cornices and faced work of sandstone and the approach canopy will be of iron and glass work. The main floor will have accommodations for mail, express and baggage departments, also the power-house and rest room for employees.

PEORIA, ILL.—The Illinois Traction System has given a contract to J. B. Jolst & Co., Peoria, Ill., for building a substation at Mackinaw. The company is also building 10 new depots and sub-stations combined on the system.

POND CREEK, OKLA.—The Chicago, Rock Island & Pacific will build a bridge across the Salt Fork river.

SAN ANGELO, TEX.—The Kansas City, Mexico & Orient will build a passenger station to cost about $30,000, and a freight depot, 30 ft. x 140 ft., to cost about $10,000. (April 23, p. 921.)

SPOKANE, WASH.—The Washington Water Power Co. will build a passenger station to provide better depot facilities for its interurban passengers. It will be a brick building 80 ft. long and two stories high.

TULSA, OKLA.—The Tulsa Street Railway Co. will build a car barn 80 ft. x 140 ft. The barn will have six tracks and store 24 cars. The company will also build a brick addition 50 ft. x 50 ft. to the present barn for shop purposes and install two new pits.

SIGNALING.

The New York State Public Service Commission, First district, has lately ordered automatic electric bells put up at a number of street crossings. One of these was on the New York Central in the village of Port Leyden, where citizens had asked to have the commission order flagmen or gates. The commission has lately ordered derails installed in the tracks of electric lines at certain crossings of steam railways. One electric railway thus using derails asked for permission to discontinue their use during the summer, but the commission declined to give such permission.

La Croix's Cab Signal.

On the Newark branch of the Erie Railroad last week experimental tests were made of a cab signal which had been fitted to an Erie engine by the Electrical Automatic Railroad Safety Signal Company, of New York. The acting president of the signal company is Jacob A. Cantor, formerly a Borough President in New York City. The inventor of the apparatus, Mr. La Croix, says that it "will make collisions impossible." The source of electricity is carried on the engine, and contact is made with the line wires by a shoe which comes in contact at proper points with a short piece of third rail. The apparatus is controlled, through suitable conductors, by track circuits, as in ordinary automatic block signaling. All of the vital circuits are normally closed, so that a break in the wire or failure of battery will give a stop signal. Mr. La Croix also has in the cab a recording instrument, by which he proposes to keep account of all operations and also of the time at which each operation takes place. The cab of the engine is also fitted with a telephone, which, when the engine is standing over a third rail, may be used to comunicate with stations to which the line wire runs.

FOREIGN RAILWAY NOTES.

Machine tools imported into Great Britain during March were valued at $37,108, as compared with $61,961 in March, 1908. Exports amounted to $223,836, as compared with $127,155 in March, 1908.

Consul Julean H. Arnold, of Amoy, has prepared a printed catalogue of American trade catalogues, business directories and trade journals received at that consulate in China. He has sent a copy of this index catalogue to each importing firm in that district, telling them that all trade catalogues, business directories and trade journals received at this consulate from American manufacturers and dealers are properly catalogued and placed in the commercial library of this office.

Supply Trade News.

The Isthmian Canal Commission asks for bids until July 1 on valves for controlling the main culverts of the canal locks, including structural material, castings, bolts, washers, rubber, etc.

W. R. Mason, of Detroit, Mich., has been appointed Manager of the Jeffersonville, Ky., plant of the American Car & Foundry Co., New York, taking the place of G. A. Scanland, who has resumed his duties as Traveling Auditor.

The American Steel Foundries, Chicago, is equipping its plant at Indiana Harbor, Ind., to make manganese steel castings. The company has been making manganese steel castings for some time, but it is now going into this line more extensively.

C. A. Strom, of Richmond, Va., has been appointed Manager of the Rogers plant of the American Locomotive Co., New York. Frederick W. Cooke, who has been in charge of both the Rogers and the Cooke plants, remains in charge of the Cooke plant.

The Gold Car Heating & Lighting Co., New York, has received orders for the heating apparatus for 83 passenger cars and 22 locomotives for the Kansas City Southern. These cars and engines are not new; the heating equipment is to replace other equipment.

Fred A. Ebert, Western Railway Representative of the Garlock Packing Co., Palmyra, N. Y., died on May 23 at his home at La Grange, Ill. Mr. Ebert was born at Clyde, N. Y., in 1869. He was in business in Rochester for a number of years and about eight years ago went to the Garlock company. He was a regular attendant at the Master Mechanics' and Master Car Builders' conventions.

The Bucyrus Steel Castings Co., Bucyrus, Ohio, recently made what is said to have been the largest steel casting ever poured by a single ladle full of metal. It was a 25-ton bedplate for a pumping engine. It measures 23 ft. 10 in. long, 72 in. wide and 64 in. high. The ladle contained 53,000 lbs. of basic open hearth steel and it took seven and one-half minutes to pour it. The casting was entirely successful.

The Federal Creosoting Co., Indianapolis, Ind., the incorporation of which was announced in the *Railroad Age Gazette* of May 7, was organized under the laws of Indiana for treating railway ties and timber for the Lake Shore & Michigan Southern by the Lowry creosoting process. The offices of the company are at 355 Dearborn street, Chicago. A plant will be built at or near Toledo, Ohio. Officers of the company are: President, Alvin T. Hert; Secretary and Assistant Treasurer, Harry W. Griffiths.

The H. W. Johns-Manville Co., New York, has taken the selling agency in the United States and Canada for the products of the American Hair Felt Co., which includes hair felt for all purposes. Baeder, Adamson & Co., Philadelphia, Pa., having discontinued the sale of hair felt, Henry J. Bellman, who for many years was connected with that branch of their business, has been appointed Manager of the hair felt department of the H. W. Johns-Manville Co., with headquarters at 100 William street, New York.

In the *Railroad Age Gazette* of May 21, page 1083, was an article by H. Herden, Chief Engineer of the Buffalo & Susquehanna Ry., entitled "A Suggestion for Tie Rods," in which was described and illustrated a simple device for preventing rails from spreading. Theodore Thomas & Co., Great Northern building, Chicago, advise that they are just now putting on the market an appliance called the Coover railway track brace, which is designed to serve the same purpose Mr. Herden describes, is built much along the lines suggested by him, and is already in successful use.

The April returns of the Western Electric Co., Chicago, make a slightly better showing than March, which was considerably the best month in the fiscal year to that time. April, 1909, is nearly 50 per cent. ahead of the returns for April, 1908. At present the Western Electric is operating at the annual rate of 65 per cent. of the record of 1906, when sales were $69,245,331, and about 85 per cent. of 1907, which was the second best year. The demand from railways for telephone switching service continues to gain and promises to become one of the most important branches of the company's operations. Demand for electrical supplies and electrical machinery is fully up to that of March, and the business in small and moderate size motors and generators is the best in the company's history.

R. H. Weatherly, formerly Third Vice-President in charge of sales of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has bought an interest in the Pilliod Company, Old Colony building, Chicago, maker of the Baker-Pilliod locomotive valve gear. This latter company has been reorganized and the following officers elected: President, R. H. Weatherly; Vice-President, A. D. Baker; Secretary and Treasurer, F. E. Pilliod; Chief Mechanical Engineer, C. J. Pilliod. Mr. Weatherly has spent nearly his entire life in the railway supply business and has a wide acquaintanceship among both supply men and railway men. After finishing his education in 1892 he went into the car seat business, where he remained for about six years. He was later connected with the Safety Car Heating & Lighting Company, New York, and with the Shickle-Harrison-Howard Iron Company. On the organization of the American Steel Foundries, Chicago, in 1902, he became Assistant to the Second Vice-President, with office in New York. From 1905 to 1907 he was Third Vice-President of the Scullin-Gallagher Iron & Steel Co., in charge of the Eastern district, and in February, 1907, he was given charge of the entire sales of the company, with office at St. Louis.

TRADE PUBLICATIONS.

Torque and Its Relations to an Upper Quadrant Signal.—This is the title of a paper by W. H. Lane, of the Hall Signal Co., New York, which has been issued by that company in pamphlet form.

Denver & Rio Grande.—The company has issued a folder on the Alaska-Yukon-Pacific Exposition, in which the exposition grounds are described and illustrated, and information is given on railway fares and points of interest to be seen in the Rocky Mountains. There is also a map of the Denver & Rio Grande.

Chicago & North Western.—A folder has been issued by the company describing two circuit tours from Chicago and the East via Yellowstone and Lander, Wyo., respectively, through Yellowstone National Park, conducted by the Bryant Yellowstone Camping Company. It also gives an account of the trip by days and a map of Yellowstone Park.

Chicago, Milwaukee & St. Paul.—A veritable gem of the advertiser's art is the 1909 publication of this road on the summer resort regions of Wisconsin and Minnesota. The descriptive matter was prepared by the well-known magazine writer, Forrest Crissey, and is charmingly written. The illustrations are half-tone engravings from photographs of this region. The front cover is embossed in green and gold, with a colored half-tone.

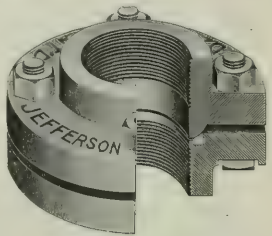
Great Northern.—A folder relating to the Alaska-Yukon-Pacific Exposition is being circulated. The exposition grounds are described and illustrated and brief facts given about the exposition, including information on railway fares. There is a map of the Great Northern system, another of the city of Seattle, a plan of the exposition grounds and buildings, and a topographical map of the Great Northern showing the scenic route through the mountains. The company has also issued a folder giving information regarding schedules on the system and information for travelers.

Atchison, Topeka & Santa Fe.—A folder on Colorado is being circulated, in which descriptions and illustrations of points of interest to be seen are given. There is also a list of Colorado hotels and boarding houses and information regarding railway fares. The company has also issued a folder on California, with illustrations and brief descriptions of interesting places. It gives a list of the principal hotels and information regarding railway fares. Another folder of this

company gives brief descriptions of places to be seen along the Great Lakes and also a map of the Santa Fe System.

A New Flange Union for Heavy Work.

The accompanying illustration shows a new flange union, designed for heavy work. It is made of air refined furnace malleable iron, heavily cast throughout. The seat is of brass, cut from drawn brass tubing, so as to be free from sand or blow holes, which are common in cast brass. The seat is forced into an annular recess under pressure, after which the spherical seat is cut to receive the ball face of the opposite member, to which it is thoroughly ground. This insures a tight, secure and lasting joint, under pressure as high as 3,000 lbs.



Jefferson Flange Union, Style D.

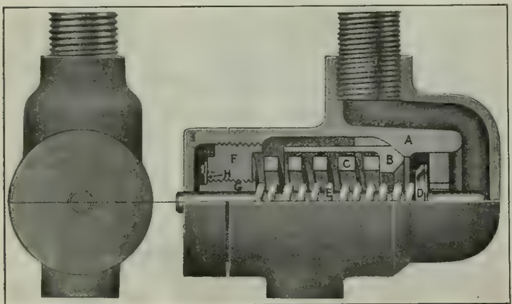
The sectional portion of the illustration shows the brass seat to be set within the iron away from the inner bore of the fitting, so as not to be affected by the different temperatures in the pipe. This prevents the seat from becoming loose, due to the difference in expansion and contraction of the two metals, incident to severe usage. This method of placing the brass seat is protected by patents.

As the joint is spherical, it adjusts itself to piping which is several degrees out of alinement. This fitting is made in all sizes from 1 in. to 10 in., by the Jefferson Union Company, Lexington, Mass.

Miller Automatic Drainage, Relief and Compression Valve.

The accompanying illustration shows an automatic drainage, relief and compression valve for locomotives. One of the principal advantages of this valve is in its use in relieving the cylinder of the water of condensation. The normal position of the drainage valve D is open, which always provides a clear passage through a 1¼-in. port and prevents any accumulation of water.

The valve is compact and simple in construction. It consists of a casing A, which has an inwardly extending portion, forming the seat of the abnormal, or high pressure, valve B, which is held in normal, or closed position, by the spring C, and opens when the pressure in the cylinder becomes excessive. The tension on the spring C is set slightly above boiler pressure. The seat of the drainage valve D is formed in the same casting with the valve B, which permits the valves to operate simultaneously when excessive pressure exists within the cylinder. The spring E operates to hold the drainage valve open when steam is shut off, and during drifting this valve is also open, thus reducing the vacuum and compression. It is claimed that this feature has demonstrated its usefulness in eliminating strains on the running gear of heavy, fast passenger locomotives equipped with Walschaert's valve motion and piston valves, especially when steam is shut off at a speed of 40 m.p.h., or greater. The valve springs C and E are adjusted by the nuts F and G, respectively. It is said that when the locomotive is running under a full head of steam the compression pressure keeps the drainage valve closed. In case of failure of the valve motion while running, such as the breaking of a rocker-box, the automatic action of the valve allows all steam to escape from the cylinder, and this prevents blowing out of the cylinder head.



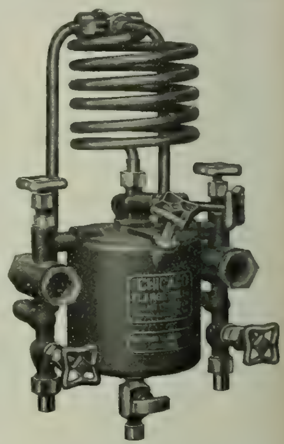
Miller Automatic Drainage, Relief and Compression Valve.

Notwithstanding rules to the contrary, cylinder cocks are often left closed after running the locomotive into the engine house. The water which collects in the piping and passages, is, if anything, detrimental, as it may be carried through the valves and cylinders. The Miller automatic valve allows all of this water to flow out as fast as it accumulates. A direct saving on this account is made in the oil and stuffing-box packings.

This device is patented by Franklin C. Miller, 20 Houghton street, Worcester, Mass., a New York Central engineman. He claims that these valves have been in continuous service on several locomotives, both passenger and freight, for the past six months, and that these locomotives have required less rêpairs than others not so equipped.

The Chicago Flange Oiler.

The Elliott system of flange lubrication was illustrated by a drawing in the *Railroad Age Gazette*, July 31, 1908, which explains its operation. This system of flange oiling is covered by patents which are controlled by the Ohio Injector Company, Chicago, and this company is now manufacturing the lubricator, and it is known as the Chicago flange oiler. They also supply the Chicago asphaltum flange oil, prepared especially for the purpose and found necessary for the successful operation of the lubricator.



Chicago Flange Oiler.

The Chicago flange oiler consists of a down drop feed cup, fitted with solid glasses for sight feeds and with the necessary valves to place the system entirely within the control of the engine man. It consumes a very small amount of steam, because the only resistance to be overcome is that due to friction in the pipes. In connection with the low consumption of steam attention is called to the fact that the consumption of Asphaltum flange oil is also very low, considering the results obtained. One gallon of this oil will lubricate the wheel flanges for 500 to 800 miles, according to service and conditions. This flange oiler system was originated on the Santa Fe, Prescott & Phoenix, where it has been used since June 1, 1906. This line has many sharp curves and an equipment of 22 locomotives, and they report that no driving wheel flanges have been turned on account of sharp flanges since that time. During the year 1906, when the oiler was used only the last six months, 63 pairs of tender wheels changed on account of sharp flanges. For the year 1907 the number was only 38, and for 1908, 21 pairs. The number of pairs of coach wheels changed in 1906 was 71, and the oiler reduced this to 29 in 1907 and 22 in 1908. The flange oiler is now being applied in large numbers by the Santa Fe, and is used experimentally by the Rock Island.

Section of Rail, Showing Coating of Asphaltum on Gage Side of Head.

The halftone shows the exterior view of the flange oiler. The illustration of the rail shows in black the uniform coating of alphaltum on the gage side of the rail, and the white spot indicates where this coating has been scraped off with a knife.

THREE STRONG AND SIMPLE PARTS COMPRISE THE TATE FLEXIBLE STAYBOLT

—THE CAP is of drop forged steel, carefully machined to seat itself on the sleeve bearing and make a steam tight joint without using gasket. It serves as a ready means of inspecting the bolt whose head is exposed when cap is removed.

—THE SLEEVE is of cold rolled steel special stock. It has provision for expelling all incrusted matter which might collect in the flaring mouth, or water space end. It has a machine made surface on the outer end for the cap bearing, and is recessed deep enough for the bolt head seat, to allow a clearance for the bolt head to free itself during incrustation and offers a means for longitudinal expansion. Made in three sizes to accommodate the several thicknesses of plate and angles.

—THE BOLT is of the best staybolt iron. It is of the round head type, with greater area to more safely resist the load due to pressure, less liable to break, and serves to more readily free itself under conditions of incrustation than the flat head bolt which becomes locked and frequently fractures by want of sufficient area to withstand the strain.

THE BOLT HEAD is carefully made—upset and instantly forged down by quick working hammers—so that the interior structure is as solid and as strong as the outer surface, and no machine work is done on the surface of the bolt to impair in any way its strength other than to thread the fire sheet end which is riveted over.

We'd like to tell you the reasons why you should specify the perfect staybolt. They are worth knowing and a line from you will bring them.

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R. S. CHISOLM, *Treasurer.*

The address of the company is the address of the officers.

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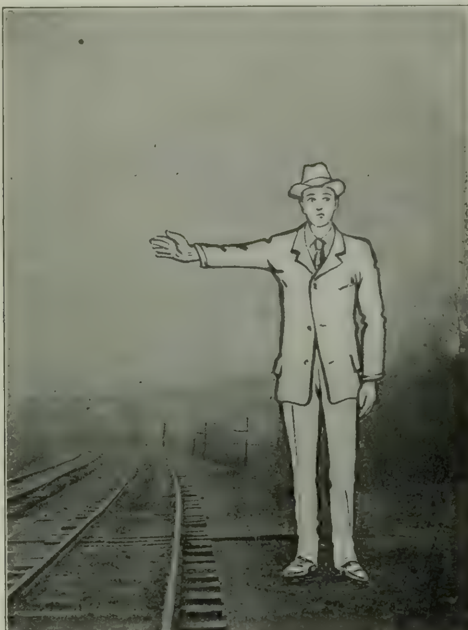
CONTENTS

The discussion in the Railway Signal Association in New York this week on Mr. Morrison's proposition to change the arrangement of the arms on semaphore signals, brought out quite clearly that a number of prominent members concede the soundness of his idea but doubt whether it is of enough importance to warrant them in adopting it. They are like the well known citizen of Maine in his attitude toward the venerable prohibitory law of that state: he was in favor of the law but agin its enforcement. These signal engineers believe in correct principles, but the railway officers' constant bete noire, the economy knife, prevents carrying them out. In theory Mr. Morrison's position is impregnable. The first position-signal used in railroading was, undoubtedly, a man. This man, standing in the most favorable position to be seen from an approaching engine, would naturally signal with his right arm; not simply because (usually) he is a right-handed man, but because his right is directly in front of the engineman, whereas his left arm, if extended horizontally at right angles to the track, points away from the engine. The arm extended horizontally is the most natural stop signal that can be given by a motionless arm. The old semaphores on the Boston & Albany, the New York & New Haven and the New York Central were therefore the most logical semaphores ever used. As long as the movement of the arm was downward from the horizontal there was some reason in the objection to this natural arrangement, because the man-semaphore would have to move away from the track in order to let his arm fall clear of the passing cars; and a wooden semaphore could not thus easily avoid getting its arm knocked off. But with the upward inclination this objection is removed, for the man-semaphore must, of course, be about 20 ft. high, and in raising his arm to indicate all-right he clears the cars nicely. This will be seen from the illustration given herewith, which shows a natural man, one who lived



The Earliest Type of Position Signal.*

and flourished before uniform caps and other official restraints had been thought of. Being natural, we may depend upon it that his actions will afford us a trustworthy guide. If he had been one of those artificial men who swing lanterns in the standard code, there is no telling what errors he might have led us into.

Economy, however, is not the only obstacle to the general success of Mr. Morrison's innovation; there was a good deal of talk about the unwisdom of changing standards too often. The ink is hardly dry on the resolution to make "upper right" the standard, and now it is proposed to adopt upper left. But, as was well said, no great question is settled until it is settled right; and signaling practice has a way of improving itself now and then, even if it does not get the permission of any association. Mr. Morrison has made the changes described in his paper in order to meet the new conditions imposed by his two styles of electric railway; and as it is quite possible that a dozen other roads may soon have to deal with similar conditions, he may have a considerable following, without much regard to what this or any other association may decide. While, as we have said, Mr. Morri-

*The very bad joint in the track was put in by the engraver without leave. It is supposed that he could not bear to depict a stop signal without showing some good reason why it was displayed. The very bad spot in the left-hand track will do no harm, as it has broken the track circuit and the automatic signal around the curve is now displayed at "stop."

son's ideals are peculiarly well fortified, his opponents who argue from the standpoint of economy are well fortified, too. His argument in favor of left hand to avoid buildings and rock cuts was met by one, perhaps equally good, in favor of right hand, to meet situations where the post could not readily be set out far from the track, as on bridges. Mr. Morrison had the best of it, however, for with his scheme signals might have arms lower right, upper left, or both (half of the arm on each side) and all be consistent with each other. It is only fair to add, however, that his success is due in considerable measure to his practice of keeping his signal blades always bright. The arm being bright, the most indifferent background will answer. Roads which have long been satisfied with signals dingy with smoke would object to the expense of so much soap and paint as the New Haven uses. Mr. Morrison has tried painting white the vertical members of the suspended signals (see Fig. 12 of his paper), but finds it no better than black. In short, he makes the blades bright partly because he cannot have good sky backgrounds; and, having made them bright, he finds the background question no longer important. Incidentally, it may be observed that the great value of sky backgrounds is disproved also by the use for many years of comparatively short posts on the Hudson division of the New York Central. The question of how the right-hand semaphore, with its shaky basis of logic, came to entrench itself so securely in the hearts of American railway men was informally discussed at the meeting, but was not satisfactorily answered. We venture the guess that the use of a single post for both eastbound and westbound arms—as at many of the early block stations on the Pennsylvania—had a great deal to do with it. Right and left arms would be assigned naturally to right and left tracks. The same arrangement was equally adapted to (and was used on) the left-hand railways of England.

THE TRAIN AUDITOR—A SUBTERFUGE.

The growth of the train auditing experiment within the past year or so has some rather interesting economic and sociologic aspects. The train auditor is employed on passenger trains, not because the conductor is too busy to collect tickets and fares, but because, amid the perplexities of his manifold duties, he does not always find time to turn in to the company all the fares which he collects. This is a direct and simple statement of the situation, untangled by the phraseology of diplomacy. The conductors have not done their work satisfactorily; hence additional men are employed to do it in their place.

It is true in all other businesses that a man who does not do his work satisfactorily will, before long, find somebody else employed to do it. But the extraordinary feature of this conductor situation is that the displaced men still retain their positions and their former pay. This is so different from ordinary commercial practice that it is worthy of discussion.

It is usually customary to bond fiduciary agents in all employments where considerable sums of money are handled by individuals. This is a commonplace with the bank clerk or with the state treasurer, but it is extremely difficult to apply in the work of conductors because of the absence of direct proof of loss. Where a conductor gives a receipt he does not steal the money; but there are ways to "knock down," in spite of the rule requiring receipts, and a dishonest conductor finds them. The only way that the superintendent can check petty pilfering of cash receipts is to send around a spotter, who rides on the trains, pays cash fares, and reports where he has ridden and what he has paid. If the general office fails to receive the vouchers for these payments there is the chance that the spotter and not the conductor has been the dishonest party. Proof is impossible.

Yet the fact is noteworthy that certain roads have found that they could increase their cash receipts as much as 25 per cent. by employing train auditors. Some roads that have tried this expedient temporarily have found that the aggregate of cash fares gradually fell off again after they discontinued the auditors' services.

The pay of passenger conductors averages around $150 a month, flat. Train auditors are generally paid $100 a month, plus $1 a day expenses. The conductor is presumptively a higher class man than the auditor, and hence less open to suspicion; but when the train auditor is suspected he can be discharged without formality. Unfortunately, the superintendent has no such power in the case of the conductor. The conductor belongs to a strong union, and must not be discharged without cause. Yet, as has been said, the specific proof of dishonesty which the brotherhood asks for is almost always impossible to obtain. Hence the curious anomaly has arisen of the employment of a lower grade man to do the fiscal part of the conductor's work, simply because he can be discharged on suspicion, whereas the conductor cannot be discharged. In spite of the fact that train crew wages are materially increased thereby, the saving has a good deal more than paid the train auditor's wages on the roads that have tried the experiment.

This situation is a very discreditable one. It is bad discipline and bad morals for a railway to continue in service a body of men which, as a body, it cannot trust. Moreover, this procedure casts a stigma on the large majority of conductors in the service—able, honorable men whose honesty is unquestioned. It looks as if the conductors' brotherhood ought to be considerably more interested in this situation than any other party to it. The brotherhood is not intentionally taking the position of shielding dishonesty, but this is what it comes to, and it is a very bad position to be in. The brotherhood has made it so difficult for an unfit man—even when he is conspicuously unfit—to be discharged on suspicion, that all of its members who run passenger trains, no matter how scrupulously honest, have to be classed as black sheep, and have to be denied the responsibility of handling company's funds! Can there be any possible doubt that it is to the interest of the conductors' brotherhood to find some way of removing this stigma?

GOVERNMENT SUPERVISION OF LOCOMOTIVE BOILER INSPECTION.

A correspondent discusses at length in this issue Bill No. 236, which is pending in the United States Senate, and which provides for government supervision and inspection of locomotive boilers. It is unfortunate that in the preparation of an Act intended to insure the safety of the public and in which the railways are so largely concerned, the mechanical officers of railways have not been called into consultation so that at least an intelligent view of the requirements could be obtained. As our correspondent clearly shows, most of the provisions and requirements of the bill are unpractical, unnecessary, and would be in their operation unduly expensive, both for the government and for the railways.

A good example of better practice in such legislation is seen in the railway law of the state of New York in regard to the inspection of locomotive boilers which went into effect September 1, 1907. The general direction of this inspection is placed with the public service commissioners, who formulate the rules governing the work and appoint a state inspector of locomotive boilers, who has direct supervision of the work throughout the state. Fortunately, the details relating to the rules for inspection were intrusted to one of the commissioners, who is an educated locomotive designer, and was a railway motive power officer. He was wise and fair enough to call into consultation two motive power officers of the principal roads in the state, and while these officers are not exactly satisfied with the inspection rules which became

a part of the law, yet they are the result of a compromise between competent and intelligent authorities, and are not subject to the same severe criticisms as the bill pending in Congress. We may, therefore, compare with some profit these rules with the provisions of Senate bill No. 236, and we will refer to the former as the "New York rules" and the latter as the "proposed Senate rules."

The proposed Senate rules require a hydrostatic test of 50 per cent. above maximum working pressure, while the New York rules require this test to be made at 25 per cent. above the working pressure, and the large experience of the railways has shown the latter to be ample. The Senate bill requires this hydrostatic test and other inspection to be made four times a year, while the New York law requires them to be made only once a year. The yearly inspection is now the general practice with railways, and the United States Government itself considers this interval between tests of marine boilers as not too great.

There is one point in which we differ from our correspondent, and that is the question of the necessity of the water glass. He argues at length against the requirement of this fixture and we are pleased to give his remarks as a good presentation of that side of the question. We are inclined to think, however, that the railways could well afford to concede this requirement as a compromise when there is no fully established practice relating to it. Many of the roads use the water glass and regard it as a necessity. It is true that the ordinary water glass is a dangerous fixture, but the improved ones made of flat, ribbed glass are seldom broken, and they must be a great convenience to the enginemen. When gage cocks only are used there is no indication of the water level unless they are operated by hand. When the engineer is busy looking for signals and watching the gages, and his hands are required for the operation of the reverse lever, the air brake and the throttle, it is a great help to have a visual indicator of the level of the water in the boiler and not be required to be constantly trying the gage cocks. When it is inconvenient to do this and the attention is occupied by other things, it is possible to neglect the gage cocks too long. The firemen too is busy shoveling coal or regulating the injector, and he does not want to be constantly testing the gage cocks. The modern water glass is of material assistance to the enginemen and the objection to its fluctuation when the water is foaming applies equally well to the gage cock. As a convenient assistance to the engineer it is worth what it costs, and its compulsory application cannot be regarded as a hardship. In such details the railways do not strengthen their cause by labored opposition, and they will be likely to gain more by conceding reasonable requirements and applying the strength of their opposition to those provisions in the bill which are manifestly absurd, unpractical and useless, than by opposing any legislation whatever.

The various provisions of the Senate bill which relate to "the dimensions for the passage of water and steam," "the space between and around the tubes," "pipes and tubes exposed to heat to be of proper dimensions and free from obstructions," are vague, indefinite and unwise. They are not necessary and offer invitation and opportunity for an unscrupulous inspector easily to work a hardship on the railway, or grant it immunity from such hardship for his own gain. The same is true of those provisions of the bill which relate to the design and construction and strength of materials. As our correspondent points out, the men who will be appointed inspectors may be competent to make an ordinary test and inspection of a locomotive boiler, but are not likely to be competent to decide questions as to the design of the boiler and the strength of its materials. Such provisions are not necessary, as it is to the interest of the railways to see that these matters are properly supervised by competent engineers, and the public safety is seldom, if ever, jeopardized by neglect in this particular.

CHANGES IN THE PACIFIC COAST SITUATION.

Two important announcements affecting the transportation system of the Pacific coast have been made within the past thirty days. Reference has already been made in our news columns to the opening of the Portland gateway through an agreement which will permit the Harriman interests to make through routings across the Columbia river bridge and over the Northern Pacific line between Vancouver and South Tacoma, Wash. This arrangement, of course, will necessitate double tracking this very busy piece of road, which has always been an important earner for the Northern Pacific. But, apart from this immediate physical effect, it will have the very important strategic result of wiping out the barrier to the north extension of the Harriman lines on the coast. Heretofore they have had their empire—and a very great one—south of the Columbia river, but Seattle is clearly marked for the great port of the Northwest, and the Harriman lines had no entry into Seattle nor into the whole Puget Sound region, with harbors nearer the Orient than any other accessible harbors in the country; with great timber resources, and with the base for the Alaska trade. The magnificent extension built jointly by the Northern Pacific and the Great Northern along the north bank of the Columbia river from Pasco to Portland clinched the argument; the Harriman lines felt their need of a share in the traffic of this country and were prepared to spend great sums to obtain it, by competitive building from some point on the Columbia to Tacoma. The Hill interests wisely figured that they would gain nothing by a fight to the end with such a conclusion clearly indicated, so they compromised by allowing joint use of their existing route from Portland north into the Puget Sound empire.

The other important news, announced this week, is the traffic agreement between the Chicago & Alton and the Kansas City, Mexico & Orient. The Kansas City, Mexico & Orient is building a long diagonal from Kansas City, across Kansas, Oklahoma, Texas and several Mexican states to Topolobampo, at the mouth of the gulf of California. It has actually built and is now operating something more than half of the 1,659 miles projected, and it has received from the Mexican government important subsidies and guarantees of immunity from competition. There is still some extremely difficult work to be done on the Mountain division of the road, between Sanchez, near the border line of the states of Chihuahua and Sinaloa, and Fuerte, 62 miles from the Pacific coast terminus. The distance between these points as projected is approximately 200 miles, and the difference between them in elevation is 7,700 ft., Sanchez being the high point in the Mountain division.

At best, this route will be subject to severe mountain grades, but it is not apparent that they will be materially worse than those with which the Canadian Pacific, Great Northern and Northern Pacific are now confronted. The distance from Chicago to Kansas City on the Alton is 483 miles. Add this to the 1,659 miles of the Kansas City, Mexico & Orient, and the total distance from Chicago to the coast figures at 2,142 miles. The distance from Omaha to San Francisco on the Union Pacific is 1,786 miles, and from Chicago to San Francisco by the same route and the Chicago & North Western, is 2,276 miles. Taking distances from Kansas City, the Kansas City, Mexico & Orient, with 1,659 miles to Topolobampo, compares with the Santa Fe, with 2,576 miles between Kansas City and San Francisco. In view of the fact that Topolobampo has an excellent harbor for deep-sea vessels, and that ocean freights on bulky goods are very low, it appears wholly likely that this route can be made to figure largely in the Pacific coast traffic situation. The Tehuantepec route is already an important factor, and for the transportation of bulky goods which have some urgency, as, for example, building materials, it has become widely used. One prominent builder on the Pacific coast recently stated that he was now

routing all his shipments that way, and the company is showing rapid increases in business.

It is understood that the Hamburg-American Packet Company will supply the steamer service on the coast to connect with the Topolobampo route, and the effect on the traffic situation of the coast will be awaited with great interest. There is little likelihood that the unfinished portions of the line can be put into operation within the next twelve months, but there is now every indication that they will be completed sooner or later, and the new traffic contract gives the Kansas City, Mexico & Orient a firm base and the Hawley system a long arm.

NEW PUBLICATIONS.

Seaboard Air Line.—Extracts from *The Evening Mail.* Distributed by Townsend, Scott & Son, Bankers, Baltimore, Md. 11 pages; 6 x 9 in.; paper.

This analysis of the Seaboard Air Line was written by Charles F. Speare, Financial Editor of the New York Evening Mail, and shows rather more clearly than any other discussion on the subject which we have seen, the present financial and traffic position of the Seaboard Air Line.

The Electric Power Station. By Calvin F. Swingle, M.E., 1909, Chicago. Frederick G. A. Drake & Co. 718 pages; 5¼ in. x 7⅝ in. Price, $2.00.

The equipment of the central power station, its boilers, steam engines, gas engines and dynamos is here described in a clear and elementary manner. The author deals mainly with the operation of these machines and their auxiliary equipment rather than their construction and erection, although the design and construction receives some attention.

The book is intended for the engineers and firemen connected with power stations and is well adapted to its purposes. After each chapter follows a series of questions and answers which serve to clear up and summarize the various subjects there treated. The treatment is unusually full and complete and the book is one of the best of the kind which has been published. The illustrations are numerous and appropriate. Considering the amount of material furnished the price must be considered moderate.

Morrison's Spring Tables. By Egbert R. Morrison. Sharon, Pa.: Morrison J. Martin. 84 pages; 6 in. x 9 in.; illustrated; cloth. Price, $1.

As its name indicates this book is formed of a series of tables of spring calculations, in which the size of the wire, the inside and outside diameters, length of wire per inch, free height per inch of solid height and capacity are given. It is suggested that the value of the tables would have been greatly increased if a direct reading of deflection per unit of weight had been given instead of placing such a determination dependent upon calculation.

In the opening pages there are given the series of formulas upon which the calculations are based, and these are stated both in general and specific terms. That is to say, the general formulas are applicable to any material, the proper constants having been supplied, while the specific refer to steel with the constants given. In this the calculations are based upon a fiber stress of 80,000 lbs. per sq. in. and with a modulus of elasticity of 12,600,000 for helical and 25,400,000 for elliptical springs. In the working out of the tables the springs have been grouped in two classes, the heavy and light. The light spring has been considered to be one whose bar, if a helical, is less than $\frac{7}{16}$ in. in diameter, or whose plate is less than $\frac{7}{16}$ in. thick if an elliptic. Where the corresponding dimensions are greater than this, the spring is considered to be heavy. The book will be of value in making rough and rapid determination of the capacity and weights of springs, though it is not quite clear whether an allowance in the weight has been made for the taper of the bar of helical springs; but, from the context, it is probable that no such allowance has been made.

Letters to the Editor.

THANKS!

San Francisco, Cal., May 25, 1909.

To the Editor of the Railroad Age Gazette:

Your issue of May 14 contains an editorial on transcontinental freight rates that covers the situation more completely and correctly than any article I have ever seen in public print on the same subject. It is a very complicated question and only those who are up against it continually or that give it some special study are able to understand it.

Please accept my congratulations. I am certain that the article will do considerable good. EDWARD CHAMBERS,

Assistant Freight Traffic Manager, A., T. & S. F.

JOURNAL BOX STANDARDS.

Baltimore, Md., June 5, 1909.

To the Editor of the Railroad Age Gazette:

In the preparation of or in the revision, from time to time, of standards of the M. C. B. Association the various committees could no doubt receive some assistance of value from the manufacturers of those railway specialties which of necessity must conform to the standards as established or revised. This plan does not seem to have been pursued to any extent by the M. C. B. Association, with the result, the writer ventures to suggest, that some standards have been adopted or revised without due consideration of all the service conditions affecting the detail construction of certain parts of freight and passenger equipment.

As the engineer of one of the largest manufacturing establishments in the United States producing M. C. B. journal boxes to-day, the writer has of necessity been a close observer of the changes recommended and adopted from time to time in this detail part of freight and passenger cars, and has noted certain changes which no doubt beneficial from one viewpoint, seem to leave entirely out of consideration other viewpoints.

The particular changes had in mind are the revisions made in 1907 and 1908 in the interior dimensions of journal boxes and width of openings through inside and outside dust guard walls.

The change in interior dimensions was recommended and adopted in order to increase the end clearances between the brass and the journal box and between the wedge and the box, taking into consideration that these parts are rough castings, and as such, subject to considerable departure from nominal dimensions. Granting the force of this reason for increase in end clearances, would not the same thing have been better accomplished by changing the dimensions of the brass and wedge rather than the box? Journal brasses wear out very much faster than journal boxes, and there are many hundreds of thousands M. C. B. journal boxes in service to-day which were made previous to the revisions of 1907 and 1908 and which must receive new brasses, and also wedges, from time to time. As long as replacements of brasses and wedges in such boxes are made, so long will the trouble with lack of proper end clearance continue; whereas, if the nominal dimensions of brass and wedge were changed to take care of unavoidable commercial variation from nominal dimensions, the many thousands of boxes in service are provided for as well as all new boxes which may be made in future.

Taking up the question of the increase in width of openings through dust guard walls, while undoubtedly this has proved a move in the right direction for journal boxes made of gray iron, yet a corresponding increase in the width of the dust guard slot seems to have been entirely overlooked. The obvious reason for the increase in width of openings referred to was to avoid the destructive lateral blow against the dust guard walls delivered by the dust guard seat of the axle due to quick application of brakes, shunting of unloaded cars, etc. As the dust guard must move with the axle, and the allowed

lateral movement of the dust guard is very much restricted by the very slight excess in width of slot over width of dust guard, it is obvious that the blow which the journal box now escapes is delivered directly against the dust guard, putting this wooden part very quickly out of working order.

In manufacturing malleable iron journal boxes for freight service it has been the practice of the Symington Company to adhere to M. C. B. dimensions for width of dust guard slot, but to restrict the allowed lateral movement each way between dust guard seat of axle and dust guard walls of box to from ¼ in. to 5/16 in. A malleable box being amply strong to take any lateral shock which it may receive from the axle, it seems good design to let it take the impact of the axle on the dust guard walls, and in this way protect the dust guard from destruction, this part being necessarily of somewhat weak construction.

If it is the intention to continue indefinitely the consideration of cast iron arch bar truck journal boxes in connection with M. C. B. standard dimensions, the writer shares the opinion of the committee on revision of standards that the width of openings through dust guard walls should remain as at present, but in a cast iron box a further revision should include a sufficient increase in the width of the dust guard slot to allow the dust guard the same amount of extreme lateral movement as the axle. For freight service the journal box of malleable iron is now so generally conceded as desirable and necessary from the standpoint of strength that the question presents itself whether cast iron boxes should not be eliminated altogether from consideration. This being done, the factor of breakage out of the way, the width of opening through the dust guard walls of malleable boxes need be only ½ in. or ⅝ in. in excess of the diameter of the dust guard seat of axle, thus avoiding the present wide rear opening and the greater opportunity for dust to enter at the back of the box.

A. H. WESTON,
Mechanical Engineer, The T. H. Symington Co.

GOVERNMENT SUPERVISION AND INSPECTION OF LOCOMOTIVE BOILERS.

To the Editor of the Railroad Age Gazette:

On March 22 there was introduced in the United States Senate a bill (No. 236) "to promote the safety of employees and travelers upon railroads by compelling common carriers by railroad to equip their locomotives with safe and suitable boilers and appurtenances thereto." A careful study of this bill shows it to be seriously objectionable, if not actually vicious, in almost every particular, and the railways should use every influence to prevent its adoption. I point out in the following the many bad features of this measure:

Section 1, page 1, lines 10-12 and page 2, lines 1-4:

"* * * the boiler of which is not equipped with a steam-pressure gage, safety valve, gage cocks or try cocks, a water glass showing the height of water in such boiler, and having a shut-off cock, or shut-off valve, at each end of such glass, and all such cocks and valves shall be so constructed and maintained that they can be easily opened and closed by hand; * * *"

The road with which I am connected does not use a water glass on locomotive boilers, considering it a source of danger, and our locomotive engineers do not advocate its use. Notwithstanding the fact that many of the men have had experience with it on other lines, they prefer to depend upon the gage cock as a sure means of carrying the water at the proper level. As a matter of fact, the percentage of risk of personal injury from broken water glasses is far greater than from boiler explosions. Recently, on a certain road, one man was killed and another was maimed for life, due to a broken water glass causing them to leap from a moving locomotive. I can personally recall several instances of engineers or firemen having eyes put out by the bursting of a water glass.

The glass is apt to become stopped up with sediment and, when in this condition, it may or may not show water to a height corresponding to the height of water in the boiler. This failure of the water glass to correctly indicate the height of water in the boiler has been the cause of low water and, thereby, the cause of the burning of a great many locomotive boilers. The water glass is especially deceptive as an indicator of the height of water in the boiler when the water is foaming.

With the gage cock, there is always full pressure of the boiler to dislodge any obstruction in the water passage or at the valve. When the gage cock is inoperative, the engineer is aware of the condition at the first trial, as there is no water or noise upon opening the same; but the water glass is silent and deceives the engineer. If there is any obstruction in the water glass, it does not properly indicate the height of water, but the full boiler pressure on the gage cocks is by all means the surest method of telling the amount of water in the boiler, when the cocks are used. Many men have been scalded and not a few have been painfully hurt, including the loss of an eye, due to the water glass exploding. On the modern locomotive there is very little room between the boiler and the side of the cab, and in case of an explosion the engineman is in a dangerous position. When an explosion occurs there are two passages open, the top valve for steam and the bottom valve for scalding water, and both at full pressure. They must be closed by the engineer and it is done by wearing gloves, covering the exposed parts of his person and heroically facing the ordeal.

It may be claimed that the water glass can be made safe by the use of metal fenders or by the use of flat, thick glasses. Metal fenders obstruct the view, and flat, thick glasses become non-transparent. Automatic stop cocks are on the market, but they are objectionable by reason of forming an additional obstruction to the free passage of the water and making the stopping of the glass the more certain.

The use of a water glass on stationary boilers is a different matter from a locomotive, as a boiler room is not so small, and the men around the boiler can stand farther away from the glass and are not so liable to injury if it explodes.

Section 1, page 2, lines 7-10:

"That such boiler shall withstand a hydrostatic test in the ratio of 150 lbs. to the square inch to 100 lbs. to the square inch of the working steam power allowed."

We apply this hydrostatic test not less than once a year and I understand the other roads do likewise. This is considered good practice by eminent mechanical men. When the hydrostatic test of 10 per cent. above the working steam pressure is considered good practice, why subject a boiler to 50 per cent. in excess of the pressure allowed and possibly weaken it at some point that is likely to result later in a serious accident?

The federal regulations governing steam water craft call for inspection and tests of boilers once a year. Why then should the same inspection and tests of locomotive boilers be required four times each year? We all know that a boiler explosion on a steamboat is a much more serious thing than the explosion of a locomotive boiler.

Section 1, page 2, lines 10-11:

"That such boiler and appurtenances are well made, of good and suitable material."

This prescribes something very indefinite and leaves open to controversy what is good and suitable material and who shall be the judge. The railway may consider that the materials are suitable, and the inspector have an opposite opinion. This bill has prescribed what tests the boiler shall stand and it would naturally follow that the boiler must be of good and suitable material; therefore, it is not necessary to make a provision of this kind, leaving everything so indefinite.

Section 1, page 2, lines 11, 12, 13 and 14:

"That the openings for the passage of water and steam are of the proper dimensions and free from obstructions."

This opens the question as to what is the proper design of a locomotive boiler and also the proper sizes for water passages in the water glass and gage cocks and all the valves on the boiler. The words, "and free from obstructions," would make it a penalty to operate a locomotive with the water-

glass lower passage or a gage cock stopped up. The stopping up is something that could happen at any hour, especially so in the rainy season when muddy water is used. It would also penalize the railways if mud should accumulate in the leg of the firebox or the shell of the boiler, yet this is the only place for mud to accumulate until it is removed by blowing out, or washing the boiler. A railway would always be at the mercy of the inspector as to what amount of mud might accumulate before it would be considered a penalty. Technically any accumulation would be an obstruction.

Section 1, page 2, lines 12, 13 and 14:

"All pipes and tubes exposed to heat are of proper dimensions and free from obstruction."

As the entire boiler and appurtenances are hot, they are, of course, exposed to heat, but it is my opinion that this portion of the proposed bill was intended to apply directly to the flues. This would impose a penalty for operating a locomotive with any of the flues stopped up by cinders at any time. The stopping up of flues by cinders occurs sometimes a few miles from the terminal, and on locomotives such as those switching for a week at a time around a mine, some of the flues are stopped up on the first day's work and remain so, as it is no element of danger. It only lowers the steaming efficiency of the boiler. This part of the bill is so drawn that if an inspector so elects, he can penalize a road for operating a locomotive with an obstruction in certain passages, when these obstructions occur in regular service and it is impracticable to avoid them. This is unfair and drastic. It makes it impracticable for railways to help being lawbreakers.

Section 1, page 2, lines 14 and 15:

"That the space between and around the flues is sufficient."

This is anotner matter that enters into a design of a boiler. Some boilers have a space between the flues of ⅝ in., others 1 in. There seems to be no definite rule to follow in determining the spacing between the flues. About ¾ in. is present average practice. But this is a matter of boiler efficiency and not of safety. If an inspector decided that ¾ in. space between the flues was the minimum for safety, it would condemn the flue sheets in nearly half of the locomotives in the United States.

Section 1, page 2, line 13:

"Tubes exposed to heat are of proper dimensions."

This is so worded that the inspector, if he so desired, could condemn almost any boiler flues.

Section 1, page 2, lines 15 to 23:

"That the boiler, flues, safety valves, fusible plugs, low-water indicators, feed-water apparatus, gage cocks, steam gage, water and steam pipes, low-water gages, means of moving mud and sediment from boiler, and all other machinery and appurtenances thereof are of such construction, shape, condition, arrangement and material that the same may be safely employed in the active service of such carrier in moving such traffic without peril to life or limb."

This can be construed to mean that the entire locomotive is subject to the inspection of a boilermaker. The words, "other machinery and appurtenances thereof," include the whole locomotive, and if its construction does not suit the inspector, he can refuse a certificate and tie it up almost indefinitely.

Fusible Plugs.—These are not generally used on locomotive boilers in the United States.

Low-water Indicators.—It is very uncertain as to what is meant by the low-water indicator. I do not know of any low-water indicator used on locomotive boilers, except that the fusible plug could be included under this term.

Feed-water Apparatus.—This includes injectors, injector throttles, injector checks and piping. I cannot conceive how this can be included in safety appliances. All the inspection that could be made would not eliminate occasional failures in this apparatus and a failure would not endanger life or limb.

Low-water Gages.—These would be of the same character as low-water indicators. I have never heard of a low-water gage as a specific device used on locomotives. This sounds like a term from marine practice.

Means of Moving Mud and Sediment from Boiler.—It is safe to say that not 1 per cent. of the locomotives in the United States have any means for removing mud and sediment from the boiler. The bill prescribes something which is not a part of the locomotive.

"All other machinery and appurtenances thereof are of such construction, shape, condition, arrangement and material that the same may be safely employed in the active service of such carrier in moving such traffic without peril to life or limb."

As before said, this may be construed to cover the entire locomotive. It specializes the "construction," "shape," and "material," and, furthermore, the relation of the parts of the locomotive are included under the word "arrangement." All of the foregoing is drastic, but the word "condition" makes it more so. If this bill is enacted into a law, railways will be at the mercy of the inspectors.

Section 2 pertains entirely to the purchase of locomotive boilers and the markings on them, prescribing that it shall be necessary for the purchaser to notify the seller that the boiler is to be used for locomotive service. There is no objection to this provision.

This section also provides that:

"It shall be unlawful for the seller of such boiler, after having been so notified, to sell such boiler to such carrier without each plate thereof is distinctly and permanently stamped by the manufacturer, and, if practicable, in such place that the marks shall be left visible, with the name of the manufacturer of such plate, the place where manufactured, and the number of pounds of tensile strain it will bear to the sectional square inch."

Having the plates stamped with the manufacturer's name and the place of manufacture has nothing to do with the safety of boilers, as the same manufacturer makes many different kinds of plates.

This Section also provides that the plates shall be stamped, showing the number of pounds of tensile strain it will bear to the sectional square inch. No one knows the number of pounds a sheet will bear to the sectional square inch until the sheet has been tested to destruction. At the best, the number that might be stamped on the sheet would be only an estimate, as it is well known to those experienced in testing sheet that the same sheet does not always have a uniform tensile strength throughout, and, furthermore, if the number of pounds designated as the tensile strength were known (and it is not known) it would be only a factor and would not designate the strength of the boiler to resist explosions, as a boiler is always rated at its weakest point. This weakest point may be in the rivets and not in the sheet. A sheet of the highest tensile strength could be made weak by the improper placing of rivets, or the improper punching of rivet holes, which cannot be detected by inspection after the boiler is built. To me, it seems that Section 2 is nonsense.

Section 3, page 3, lines 18 to 20:

"Once in every three months, at least, cause a careful inspection of each boiler and the appurtenances thereof of each such locomotive used in moving such traffic."

There is nothing provided in this proposed bill as to where the inspection shall be made. I suppose that it would be at a terminal point, and that it would require at least one day per boiler, and if it were practicable to have a boiler ready for test on exactly the three months' period, there would be only four inspections per year. As a matter of fact, it would be necessary to make the inspection in less than three months, in order that the engine might be returned from the road to the terminal and be inspected at a time consistent with the work in hand. If the inspector so elected, he could require the boiler to be stripped of all the lagging, the dome cap to be removed and possibly many of the flues. He could tie up an engine a week and put the company to an expense of $200 or $300.

There are many times in the last month's service of a set of flues that they leak more or less. This is no element of danger. Sometimes during the last month's service of a firebox it leaks. This also is no element of danger.

It is quite certain that should the inspection of an engine fall due near the time of renewal of flues or repairs to the firebox the inspector (to keep from being criticised) would refuse to issue a certificate. This would make it necessary to shop

the engine, when it was good for an additional four to six weeks' service. The result would be an increase in cost of locomotive repairs.

The bill is so drawn that an inspector could pass at any time on the construction of the boiler, and if it did not suit him he could condemn the boiler and a new one would have to be applied, as it is impracticable to remodel old boilers. The compilers of this bill should have made provision for a boiler to be inspected for construction and have a perpetual certificate issued for its use, as far as its features of construction are concerned, as it does in marine practice. If this were done it would make all subsequent inspections for safety only. It would be a great menace to the railways if their boilers were to be subject to the various opinions of different inspectors as to the constructional features.

On a basis of inspection at least every three months I estimate that each of our locomotives would be out of service four 24-hour working days each year. One of these four days would be taken care of by our regular general inspection, leaving three additional inspection days, which, for 1,000 locomotives, would make a total of 3,000 days a year of dead time due to this additional inspection. There are over 55,000 locomotives in the United States. This would mean on the same basis 165,000 additional days of dead time for all the locomotives in the country. This is equivalent to 420 locomotives tied up for one year. This many locomotives at an average of only $12,000 each is $5,040,000 added to investments in equipment. To this must be added the cost of at least $10 to the railway for each boiler inspection by the federal inspectors.

Each of our locomotives receives an inspection at least every 30 days for staybolts. This consumes about three hours per locomotive, and when there is nothing defective found it does not delay the engine. This inspection would have to be made in addition to the federal inspection, unless the latter inspection came on a monthly period. If each locomotive boiler were not inspected for staybolts oftener than the maximum three months' period prescribed in the proposed bill, it would not generally be considered safe, but it does not follow that a boiler should be subjected to a severe general test more often than once a year.

Section 3, page 3, lines 21 to 25.

"When the inspection of such boiler and appurtenances has been completed and the inspector thereof is satisfied that they will meet all the requirements of this act and may be used with safety to life and limb, he shall approve the same by making and subscribing under oath a certificate."

From the foregoing it would seem that a certificate must be issued every time the boiler is inspected. We found it necessary to have boilers inspected at least every 30 days for staybolts, and if this interpretation is acted upon it will require a very large number of federal inspectors, one or more at every shop, and we would never be sure of the service of a locomotive, as it would depend upon the issuing of a certificate.

Section 3, page 4, lines 8 to 17:

"That if after such inspection has been completed such inspector is not satisfied that such boiler and appurtenances meet all the requirements of this act and that they may be used with safety to life and limb, he shall disapprove their use, giving to the carrier operating such locomotive his reasons therefor in writing; and it shall thereafter be unlawful for such carrier to use such locomotive until the boiler and appurtenances thereof meet all of the requirements of this act and have been approved in accordance with the provisions of this section."

This section of the bill puts absolute power in the hands of the inspector. There would be no appeal from his decision except to the courts. Nothing is said about referring the matter to a board of arbitration or to any other disinterested party.

Section 3, page 4, lines 18 to 21:

"That the inspector of locomotive steam boilers shall be a person who has been a practical boilermaker of at least four years' experience in the construction and repair of locomotive steam boilers."

It is reasonable to estimate that to comply with the requirements of this bill it would be necessary to have at least 600 inspectors for the United States. To intelligently pass on the strength of boilers it would be necessary for the inspectors to have an education and knowledge of mathematics that is seldom found in practical boilermakers. Few practical boilermakers can make computations relating to the strength of boilers. It is exceptional to find one who does not consider matters of strength, from the standpoint of experience or by guess. Boilermaking is a very undesirable vocation, and educated men do not enter it. Therefore, it would be very hard to draw from this class of practical men those who are able to pass intelligently on the construction and strength of boilers as proposed by this act.

This section of the proposed bill goes so far into detail as to mention that the inspector, from his experience, should be able to form a reliable opinion of "arrangement of any part of such apparatus for steaming." The steaming qualities of the boiler have nothing to do with the hazarding of life or limb, being a matter of efficiency, and the question of safety does not enter into the case.

After carefully considering this proposed bill from an operating and mechanical point of view, the question can well be asked: Would government supervision and inspection of locomotive boilers as provided for in this bill afford the employees of railways or the traveling public any greater protection than they already enjoy? And would such protection be in any manner commensurate with the cost thereof?

The Statistics of Railways issued by the Interstate Commerce Commission for the fiscal year ending June 30, 1906, contains the following summary of persons killed and injured during the year covered by the report:

	12 months ending June 30, 1906.	
	Killed.	Injured.
Railway employees	3,929	76,701
Passengers and others	6,689	21,005
Total	10,618	97,706

The commission reporting to the senate under date of January 22, 1909, per Senate Document No. 682, shows the following casualities and injuries chargeable to actual locomotive boiler explosions for the 12 months ending July 31, 1906:

	Killed.	Injured.
Railway employees	39	126
Passengers and others	...	1
Total	39	127

While there is a difference of one month in the period covered by the documents from which the data were obtained, the same number of months are covered. It is, therefore, not unfair to use the data thus obtained for the purpose of comparison.

Of the 3,929 railway employees killed during the year, 39 casualities were chargeable to locomotive boiler explosions, or 1 per cent. of the whole number killed. Of the 76,701 employees injured, 126 were chargeable to boiler explosions, or 1.6 per cent. of the whole number injured. Of the 6,689 passengers and others killed *not a single one* lost his life on account of a boiler explosion. Of the 21,005 passengers and others injured but *one* was injured on account of a boiler explosion.

According to the statistics of the commission for the year ended June 30, 1907, there were then 55,388 locomotives in the United States. As a basis for arriving at the number of government inspectors that would be required to properly inspect and test each of the 55,000 locomotive boilers—using round numbers—once every three months, or four times each year, we will assume that one inspector and one assistant could care for 100 locomotives without steriously delaying the power. On this basis, the total force of inspectors and assistants required to test and inspect 55,000 locomotives would be as follows:

Inspectors	550	at $1,500 per annum
Assistants	550	" 750 " "

(A very conservative estimate of salaries.)

Total for inspectors and assistants, per annum, $1,237,500

This calculation does not take into account the cost of supervision, traveling and other absolutely necessary expenses that would have to be incurred by the government in order to carry out the provision of this bill. This expense would doubtless equal, if not exceed, the estimated salaries for the inspectors

and assistants. Assuming that it would be equal, the total cost of the service would, therefore, be $2,475,000, or $45 for testing and inspecting each locomotive four times per annum, or $11.25 for each inspection. It is fair to assume that the extra expense to the railways would be an equal amount, making the grand total about $5,000,000.

Conceding that the value of a human life should not be measured by dollars and cents, there is no getting round the fact that the system of inspection proposed would be very costly to the government, yet it might be justified if there was any positive assurance that the loss of life due to the explosion of locomotive boilers would be entirely prevented, but, it being well known that locomotive boiler explosions are frequently due to carelessness or neglect on the part of the men operating them, it must be admitted then that no system of inspection that can be devised by the government or the railways will entirely eliminate this source of trouble.

During the fiscal year ending June 30, 1908, with a total of almost 1,000 locomotives in service on this system, there was not a single boiler explosion—in fact, there have been but three actual boiler explosions on this system during the past 28 years, which attests to the efficiency of the existing system of boiler inspection. Notwithstanding this fact, during the year mentioned above, we had the boilers of 40 of our locomotives damaged by low water, due to the carelessness or neglect of the men operating them, which proves very clearly that the element of risk due to carelessness or neglect of operatives is many times greater than that due to inefficient inspection.

SUPERINTENDENT OF MOTIVE POWER.

Contributed Papers.

THE INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.

The fifth annual convention of the "International Railway General Foremen's Association" was held at the Lexington Hotel, Chicago, June 1 to 5.

At the opening session, after the address by the President, E. F. Fay (Union Pacific), Robert Quayle, Superintendent of Motive Power and Machinery, Chicago Northwestern, addressed the meeting on the subject of cordial relations between officers and employees. There was also a short address by Angus Sinclair.

A report on "Air Brake Equipment" was presented by C. H. Voges, Chairman. The report considered the subject under three headings: First, the advantages of equipping engines in heavy passenger and freight service with two 9½-in. air pumps. Second, straight air equipment and its advantages. Third, the triple valve cleaning and repairing.

In the discussion of the first item there was a general sentiment in favor of the use of two 9½-in. pumps for heavy passenger and freight service in preference to one 11-in. pump. The report states that the average life of a 11-in pump in heavy brake service before it requires repairs is from 5 to 7 months, and the average maintenance cost per year is $32 per pump. The maximum capacity of this pump with 100 lbs. air pressure and 200 lbs. steam is about 57 cu. ft. of free air per minute. Under the same conditions two 9½-in. pumps will compress 70 cu. ft. per minute and the steam consumption per cu. ft. is practically the same in each case. The two 9½-in. pumps can be kept in service 18 months and the cost of maintenance per year for the two pumps is $20.

Regarding the use of straight air.—This also was generally favored, and it was shown that it could be used with safety on grades to advantage and that it greatly reduced tire wear. It permits the brakes to be released on long trains without danger of the slack running out suddenly and breaking them in two. It is very efficient in slowing up or stopping trains where the brake work required is not heavy. This reduces the pump work, the number of stuck brakes while sliding and the break-in-twos incident to the endeavor to start long trains with brake shoes dragging or stuck brakes at the rear. The straight air is a great factor in making smooth stops with passenger trains and in holding passenger trains on grades after automatic brakes are released. It decreases the wear of locomotive valves and cylinders by eliminating the need of reversing when in motion, which is found necessary with the automatic brake because of its comparatively slow recharging properties.

The report favored the repair of triple valves only in the air brake department and only by expert men. When cleaning is necessary the triple should be taken from the engine and replaced by a repaired triple. When the piston bushing needs renewing the triple valve should be returned to the manufacturers for repairs, as they are better equipped for this work than most railway shops.

As a result of the discussion a resolution was adopted as a sense of the meeting, first, that the subject of the use of two 9½-in. pumps, or their equivalent be recommended for further investigation; second, that the dual use of automatic straight air on engines be recommended; third, that the triple valve and the air pump should be maintained in the highest state of efficiency.

Under topical discussions a paper was read on "The Best Method of Arriving at the Cost of Repairs," by H. D. Kelly. The principal point in this paper was that foremen should be advised of what repairs are necessary before an engine is sent to the shop, and that foremen's meetings should be held regularly once a week.

In the discussion the question of the best method of detecting broken driving axles was brought up. One member said that on the lighter power he made a practice of moving the driving wheel off the axle about 1 in. in order to see if there were any seams or cracks directly inside the fillet at the wheel side, and often discovered them in that way. The representative of the Illinois Central said that this road had a rule of limiting the mileage of axles to 250,000 miles, or wear ⅜ in. in diameter. The Big Four makes the mileage limit 400,000 miles.

At the meeting on June 2 a paper was read on the "Coaling of Engines and Mechanical Devices," by W. H. Clow, General Foreman of the Erie, at Hammond, Ind. This paper reported the use of a crane and clamshell bucket which had handled 40,000 tons of coal from a pile on the ground to engines and cars at a cost of 2 cents per ton. This required two crane engineers and two firemen and two men on the ground to follow up the machine. At Hammond, Ind., the crane has been used for three years, and the cost has been from 5 to 7 cents per ton, including the loading of ashes. At 47th street roundhouse, Chicago, two machines are used by the Chicago & Western Indiana at a cost of 7.6 cents per ton, and the amount handled is from 9,000 to 10,000 tons per month. This cost includes the wages of the shop yardmaster, one-half a hostler's time for handling shop engines, switching coal and cinder cars, two clamshell operators' wages, one day and one night, and the repairs of the clamshell.

At the same session a paper was read on the "Best Method of Handling Engines at Terminals," by T. H. Ogden, General Foreman of the Santa Fe, at Dodge City, Kan. This paper favored the hot water system of washing boilers as the most economical in saving time, labor and material. It reported that very large engines are turned in 4 hours and 45 minutes, including a thorough washing of the boiler. The average cost of handling an engine at Dodge City for mechanical work was $1.70 per engine handled. The average cost for knocking fires, cleaning ash pans, including the loading of cinders in cars, all done by hand, was 30 cents per engine handled. The average cost for all handling of engines, including hostlers taking coal, sand, water, removing and replacing supplies and cost of drying sand, is 35 cents per engine. The paper favored the merit system as an incentive for every man to put forth his best efforts to do his work quickly, thus increasing his pay

and increasing the output and going a great way toward solving the problem of handling engines at terminals.

On the morning of June 3 three papers were read on the advisability of installing a hot water boiler washing and refilling system. The first paper by E. A. Murray, Chesapeake & Ohio, Covington, Ky.; the second by R. W. Wood, Chesapeake & Ohio, Clifton Forge, Va.; and the third by Luther H. Bryan, Duluth & Iron Range, Two Harbors, Minn. All these papers pointed out the advantages of the hot water system for washing out where large storage tanks are used. Probably the most important advantage of this system is the rapidity with which the work can be done, as the engine can be got into service from 2 to 3 hours quicker than is possible with the cold water system. The hot water method requires only about two hours, while the cold water method requires from 6 to 8 hours. By the hot water method the noise of blowing off is reduced so that it is hardly noticeable. The water for washing out and filling is heated without extra cost for fuel. The papers concluded that the saving obtained by this method would be good interest on the investments. In the discussion there was a general sentiment in favor of hot water washing, and it was considered of sufficient importance to continue the subject until next year.

Mr. White, of the National Boiler Washing Company, was invited to explain this company's system. He exhibited a fine photograph of the plant recently installed on the Santa Fe at Newton, Kan., and pointed out the different details of the apparatus and its method of operation. He reported that the New York Central has 17 plants, the Big Four 18 plants, and the Santa Fe 3 plants for washing out by this system.

In the afternoon the subject of acetylene welding was discussed. A representative of the Great Northern explained a system which it is using with success, and after adjournment the members were taken to see a demonstration of acetylene welding by the Chicago Welding Company. The welding of the boiler works in place was regarded as somewhat experimental, and it was thought advisable to continue the subject for discussion at the next convention.

A paper on the casting of the brass in a driving box was read by A. O. Berry, of the Lake Shore, and an explanation given of the method used. At the Elkhart shops of this road the boxes are slotted with dove-tailed grooves and the brass is cast in with the hubliner included. This method has already been explained in the *Railroad Age Gazette*, April 16, 1909, page 862, in an article about the Alton shops at Bloomington. Under this subject reference was made to the method used by the Chicago & North Western in which the driving journal brass is slipped into the box when the wheels are in place, and is held by a long tapered key or wedge. The device is known as the Markle removable driving box bearing, and is quite generally used by the North Western, and is illustrated in the *Railway Age*, October 25, 1907, page 598.

At the morning session on June 4 it was suggested that car foremen and car repairers be given more prominence in the association; that papers and discussions relating to car repairs form a part of the proceedings. It was also suggested that it was advisable to arrange, if possible, that the place of meeting be the same as that of the Master Boiler Makers Association, and that the two associations meet the same week. A paper was presented on the best method of getting work through the shop with economy and despatch, W. C. Stears, Chairman. The paper recommended that the work should be specialized. The rod work, steam chests, links, rocker boxes and pistons should be handled by different gangs with working foremen. It was also recommended that all these details should be maintained as standard for the different classes of engines. A stripping gang of handy men should be organized who should do sufficient stripping to get the engines off the wheels; namely, drop pedestals, binders, rods and brake rigging. All other stripping should be done by the machinists working on the engine.

The next paper on the programme was on the best arrangement of ash pans so that cleaning would be done in conformity with the federal "ash pan law." Two papers on this subject were read, one by E. C. Hanse, and the other by W. E. Dunkerley. Mr. Hanse stated that the Seaboard Air Line has adopted the slide bottom ash pan as a standard on all its engines with hopper pans. This is regarded a successful device. The cost is $15 per engine. The same line has equipped engines with low ash pans with a blow pipe in the front section. An inch and a quarter globe valve is fitted into the boiler head on the left end side below the water line and an inch and a quarter pipe is run down through the deck and reduced to 1 in. in the pan. A shield of ⅛ in. tank steel is fastened to the frame between the main pedestals, far enough back to clear the eccentric and far enough forward to allow the front damper to open. The object of this shield is to protect the machinery from the clinkers blown out of the pan. This device can be applied to an engine for about $5. It is found of great advantage on fast trains where the coal is bad, as the firemen can keep the pan clean without any delay, and it can be worked from the cab with safety. On other engines the end of the blow pipe is fitted with an oblong casting about 6 in. wide, which forms a broad nozzle and spreads the water in the pan.

In the discussion of the subject there seemed to be some confusion in regard to the requirements of the law with respect to the use of the pans on the road and at clinker pits. Some members thought that it would not be unlawful for men to go under the engine at clinker pits, and that an ash pan might be used which would not clear large clinkers without being removed by hoe at the clinker pit. The law is very definite in this respect, as it says that it is "unlawful for a railway to use any locomotive in moving interstate or foreign traffic not equipped with an ash pan which can be dumped or emptied and cleaned without the necessity of an employee going under such locomotive." The discussion disclosed the fact also that there is quite a diversity of opinion and practice as to the best design of ash pan for this purpose. Some roads have adopted slide bottom ash pans, while others have adopted drop bottom pans. For the slide pans steel castings for the guides and frame work were recommended, as they do not break so easily as cast-iron when the pan is warped. The majority of roads using slide bottom ash pans have them equipped with steam heaters.

A motion was adopted instructing the Secretary to request members to send drawings, showing the kind of improved ash pans they are using in order to conform to the law, and that copies of these prints be sent to the railway technical papers for publication so that the members may be informed as to the practice on different roads.

It was decided to hold the next meeting of the Association at Cincinnati, Ohio. The following officers were elected for the ensuing year: President, T. H. Ogden (A. T. & S. F.); First Vice-President, C. H. Voges (C., C., C. & St. L.); Second Vice-President, P. F. Griffin (C., C., C. & St. L.); Third Vice-President, William Hall (C. & N. W.); Fourth Vice-President, J. A. Boyden (Erie); Secretary and Treasurer, Luther H. Bryan, Duluth & Iron Range.

The following is a list of exhibitors, together with an enumeration of the articles and devices that they had on display, and the names of their representatives:

Adreon Manufacturing Co., St. Louis, Mo.—Campbell graphite lubricating system; Westinghouse universal ball joints; American gravity couplings; Security back up valves and Security bell ringer. Represented by William Miers.

Ajax Valve Co., Chicago, Ill.—Ajax metal valves. Represented by A. C. Ricksecke and C. G. Poirier.

American Locomotive Sander Co., Philadelphia.—Sanders. Represented by Morris P. Brewster.

American Steel Foundries, Chicago.—Simplex couplers, brake-beams; Andrews side-frame and Simplex trucks. Represented by W. G. Wallace, H. K. Shaw and C. C. Hopkins

Armstrong Bros. Tool Co., Chicago.—Armstrong tool holders. Represented by Paul Armstrong.

Charles H. Besly & Co., Chicago.—Represented by C. A. Knill.

S. F. Bowser & Co, Fort Wayne, Ind.—Bowser system of oil storage. Represented by J. L. Handy and W. T. Simpson.

Buda Foundry & Manufacturing Co., Chicago.—Locomotive and car jacks. Represented by A. R. Dyer and Lawrence Hamill.

Celfor Tool Co., Chicago.—Tool steel. Represented by J. J. Dale.

Chicago Railway Equipment Co., Chicago.—"Creco" hollow brake-beam. Represented by G. N. Sweringen.
Detroit Lubricator Co., Detroit, Mich.—Detroit sight feed air cylinder lubricator for lubrication of the air cylinder of locomotive air-brake pumps. Represented by A. D. Howard and W. O. Bryant.
Joseph Dixon Crucible Co., Jersey City, N. J.—Dixon's graphite productions. Represented by B. B. Worley.
Fairbanks, Morse & Co., Chicago.—The Duff-Bethlehem forged steel hydraulic jack. Represented by R. E. Derby.
Firth-Sterling Steel Co., McKeesport, Pa.—Represented by William Nelson.
Flannery Bolt Co., Pittsburg, Pa.—Tate flexible staybolts. Represented by W. M. Wilson, Chicago.
Garlock Packing Co., Palmyra, N. Y.—Packings. Represented by J. P. Landreth.
Gold Car Heating & Lighting Co., New York, N. Y.—Combination pressure and vapor system of car heating. Represented by F. M. Ivers.
Goldschmidt Thermit Co., New York, N. Y.—Thermit process of welding, and ash pan to meet requirements of federal law. Represented by Henry S. Mann and A. M. Guenther.
Greene, Tweed & Co., New York, N. Y.—"Palmetto" and other packings. Represented by F. E. Ransley.
Grip Nut Co., Chicago.—Grip nuts and Universal window fixtures. Represented by E. R. Hibbard, Herbert Green and B. S. McClellan.
Hunt-Spiller Manufacturing Corporation, South Boston, Mass.—Gun iron for locomotive castings. Represented by J. G. Platt.
Jenkins Bros., New York.—Valves and fittings. Represented by B. J. Neely.
H. W. Johns-Manville Co., New York.—Packing. Represented by J. C. Younglove, F. F. M. Gilmore and Fred Jacob.
The Leslie Co., Lyndhurst, N. J.—Leslie reducing valve for steam or air. Represented by J. J. Cizek.
Marshall & Huschart Machinery Co., Chicago.—High speed shop tools. Represented by H. W. Jones, J. R. Porter and J. G. Klaiber.
Nathan Manufacturing Co., New York.—New "Bulls Eye" lubricator; Reflex water gage and "Simplex" patent locomotive injector, type "R." Represented by C. A. Nathan.
National Boiler Washing Co., Chicago.—Photographs. Represented by E. B. White.
The National Malleable Castings Co., Chicago.—Sharon coupler. Represented by Roy Wright.
The Ohio Injector Co., Chicago.—Locomotive lubricators. Represented by F. W. Edwards.
The Pilliod Co., Chicago.—Pilliod locomotive valve gear. Represented by Henry J. Pilliod.
Pyle-National Electric Headlight Co., Chicago.—Electric headlight. Represented by Mark A. Ross, H. B. Bayley and J. W. Johnson.
Safety Car Heating & Lighting Co., New York.—"Pintsch" single mantle lamp and car heating appliances. Represented by D. W. Bergstrom.
Scully Steel & Iron Co., Chicago.—Simplex jacks, valves and Wrangler rotary beveling shears. Represented by H. H. Gilbert.
Spencer Otis Co., Chicago.—Illustrations of the Detroit car door. Represented by Carter Blatchford.
U. S. Metallic Packing Co., Philadelphia.—Packings. Represented by Morris P. Brewster.
Horace L. Winslow Co., Chicago.—Clark blow-off system for removing sludge, stop foaming and preventing scale. Represented by H. L. Winslow.

COMPARISON OF LOCOMOTIVE BUILDING IN THE UNITED STATES, GERMANY AND FRANCE.*

BY MARCEL BLOCH,

Motive Power Inspector of the Paris-Orleans Railway.

During the last few years French railways have purchased in Germany and in the United States a certain number of locomotives at more satisfactory prices and deliveries than those offered by French builders.

It is the purpose of this article to investigate the various causes that justify this difference in price and delivery by comparison of locomotive building methods and conditions in the United States, Germany and France. We will consider the questions of earlier delivery and lower factors separately, although it is clear that both are inseparable factors. A company crowded with work will naturally demand higher prices than one lacking orders, and, of course, the delivery will be earlier for the latter than for the former.

The requirements of each country have been responsible for the erection of shops whose size is proportionate to the local demand. Considering only standard gage locomotives, it would appear that the United States, with two large companies and a few of minor importance, has an average yearly capacity of over 5,000 locomotives; the 14 German locomotive works can deliver each year 2,000, while in France, with 6 builders, only 400 engines are built yearly.

Consequently, although, in the United States and Germany it is possible for the locomotive industry to be specialized, this is not the case in France, where all builders of locomotives find it necessary to engage in other work at the same time. For example, the *Société Alsacienne* builds stationary engines, electric motors, turbines and looms; the *Fives-Lille* Company builds turbines, sugar refining machinery, bridges; the French Mechanical Construction Co. builds bridges, freight and passenger cars, shop machinery, etc., without mentioning the Creusot Company, the Batignolle Works and the French-Belgian Company, which are all in the same condition. The locomotive is a somewhat difficult machine to build, for prices are very closely discussed in France and inspection is very severe, and these requirements naturally cause French builders to devote themselves preferably to other mechanical work. This peculiar situation appears to influence both price and delivery to a very great extent.

Having thus briefly exposed the purpose of this article, the writer will now consider in detail the methods pursued in the three countries, with illustrations taken from actual observation in different shops. The comparison being based only upon the construction of a locomotive of the French type, the writer need not take into account the great advantage possessed by American and German builders when building locomotives of their own standard type, frequently duplicated.

EARLY DELIVERY.

Every locomotive building plant consists of the same number of departments—namely, main offices, drawing room, power house, pattern shop, foundry, blacksmiths' shop, boiler shop, machine shop and erecting shop.

These departments will be considered successively in the above order, without going into details familiar to most readers, and the writer will note only the characteristic differences of execution obtaining in the different countries:

Main Office.—Americans, being men of action, always wish to accomplish things rapidly; they think and act rapidly and always seek the shortest way of reaching the desired result. It is always more important in the mind of an American to obtain results rapidly, even if in some cases better results could be obtained by slower methods. This accounts for the rapidity of execution in all American offices, so surprising to a European. As an example, take the handling of incoming mail at the Schenectady Works of the American Locomotive Company. The letters arrive at 7.30 a.m., brought by one of the company's messengers from the post-office. They are immediately opened in the mail room and distributed by boys 13 to 15 years old to the various departments, where such replies as can be decided immediately are dictated at once to stenographers. When a reply requires careful deliberation the clerks at once obtain the desired information, and as soon as received dictate the letters and send them up ready for signature. All the higher employees are authorized to sign for the manager, and write the latter's name with their initials after it. Outgoing mail is then carried to the mail room and posted. Extensive use is made in America of the telegraph and telephone, which are much more readily accessible than in Europe on account of the greater number of lines and competing companies. Americans appear to use them, regardless of cost, which is much higher than in France. All large plants have their own telegraph operator, and generally lease a special wire, connecting them with New York or Chicago, according to their location. With such an organization it is easy to understand how rapidly replies can be received, particularly when the use of the signature is distributed among so many different employees. Replies are often made over the telephone or telegraph. Papers, letters, etc., are carried from and to the various departments by messenger boys, 13 to 15 years old, one of whom is assigned to every foreman's office.

Both in France and Germany the office system is much more complicated. Confidence in the ability of subordinates is much more limited and individual responsibility is less general than in America. In the latter country each man is responsible for his own actions, while in Germany and France the chief of the department bears the full burden; this method necessitates a large amount of checking, inspecting, corrections, etc., which, while they have their advantages, naturally greatly lengthen the time required.

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*Translated from the *Revue Generale des Chemins de Fer.*

From the point of view of rapid production the American system certainly presents very great advantages.

DRAFTING DEPARTMENT.

American drawing rooms are organized in a very remarkable manner, and always greatly impress the European who has occasion to visit them. The work is gotten out in the following order, when, as generally practised in America, the builders furnish their own working drawings and design their locomotives themselves:

The chief draftsman gives the principal data of the engine to be designed to one of his leading draftsmen, and the latter, with one or more assistants, establishes the design and passes it on to one of the detail draftsmen, each one of which completes the design of that part which is his specialty. Detail draftsmen are divided in departments, as follows:

1. Boiler, ash pan, firebox.
2. Frames and crossties.
3. Cylinders, steam pipes.
4. Rods, pistons.
5. Motion work.
6. Suspension, wheels.
7. Tenders.
8. Runboards, cabs, pilots, etc.

For the delivery of these drawings to the different shops each one of the above departments follows a rigorously established order issued by the superintendent of the drawing room. This order, in tabulated form, gives the maximum number of days which must elapse between the delivery of drawings to the shop and the complete termination of the first engine of lot. The delivery of these drawings is therefore based upon the delivery of the first engine. Each draftsman makes his own tracings, which saves him from completely finishing his pencil drawings; being in possession of all details it is easy for him to finish his tracing even from a mere rough sketch. In this way the position of tracer is suppressed, with corresponding saving of time and force. Lastly, a very complete system of classification by numbers of all drawings permits the draftsmen to refer with great facility to previous similar drawings for guidance. A great number of fittings such as cocks, small shafts, etc., does not vary from one type to another, and for such there exists a collection of "standard drawings" which greatly facilitate the work.

In Germany and France, two or three draftsmen get up the design of a locomotive complete. Their drawings are not transmitted to the tracers until they are complete in every detail. The only difference existing between French and German drafting methods is the more extensive use in Germany of the standard drawings. This is accounted for by the fact that the German locomotive is much simpler than the French and that German builders, being allowed a much greater latitude in the matter of details, generally base new designs upon those of locomotives built, thus enabling an entire design to be gotten up in much less time.

MATERIAL ORDERS.

It is clear that the greater a country's production of raw material, the easier it is for builders to obtain their supplies. In this matter there is an enormous difference between the United States, having an annual production of 25,000,000 tons of cast iron, Germany with 10,000,000 tons per year, and France with only 3,000,000. It is clear that French builders, all other conditions being equal, are greatly handicapped by long delays in the delivery of raw materials.

In all three countries as soon as the draftsmen have finished their work, the chief draftsman receives from them a complete statement of raw material required, which is transmitted to the purchasing department.

The rapidity in getting out drawings, as well as the small amount of checking and inspecting to which American work is submitted, permits them to get these material sheets out much sooner than their European colleagues. The purchasing department immediately gets in touch with makers of material, in Europe as in America. But the centralization of similar industries in the large New York and Chicago office buildings singularly facilitates and expedites the transaction between builders and supply houses. A single building in New York, for instance, such as the Hudson Terminal building, contains the offices of the American Locomotive Company, the Carnegie Steel Company, the Worth Brothers Company (steel plates), the Railway Steel Spring Company, etc. In a few minutes orders can be placed for plates, axles, tires, wheels, etc., after short interviews with the manufacturers, and without exchanging letters or telegrams. The rapidity with which these orders are placed is further enhanced by the extraordinary capacity of American shops, which can obtain from the manufacturers contracts for a certain period of time, enabling them when placing the order simply to state the amount and delivery required. The Pratt & Letchworth Company and the Union Steel Casting Company may be quoted as examples; these companies furnish the American Locomotive Company's steel castings almost exclusively. In Germany some of the locomotive builders, such as Henschel and Borsig, are manufacturers of their own raw material. Others obtain theirs from the manufacturers in Ruhr and Schleswig and must bargain with the latter for prices and deliveries.

In France, with the exception of the Creusot Company, no builders produce their own materials, and it appears that every order placed must be specially negotiated with the manufacturers.

These different conditions naturally have a great influence on the dates of deliveries. As a general impression, I should say that in the United States the capacities of plants are designed not for supplying the average demand of the country for such products, but for maximum requirements, when the country is in full prosperity. It is therefore clear that orders placed during a time of medium prosperity can be executed very rapidly by companies thus equipped. Of course, the execution of the recent order placed by the Paris-Orleans Railway with the American Locomotive Company for 30 Pacific type locomotives cannot be taken as a conclusive demonstration of the early deliveries possible in America, for it was placed during a period of general depression, when orders were lacking everywhere. It is, however, interesting to note that the Worth Brothers Company started rolling the steel boiler and tank plates for this order on the same day that the telegram giving them the order was received, and that the entire order was executed in three weeks' time. Mr. Garbe, General Manager of the Prussian State Railways, says in his recent work, "Die Lokomotive der Gegenwart," that when rush orders are placed American locomotive builders can be in receipt of the boiler steel within five days, and that four days later cast steel side-frames can be ready for slotting.

In Germany these deliveries are much less rapid. The large orders placed by the navy often crowd manufacturers to their full capacity. For such builders as Henschel and Borsig this difficulty is avoided, as they can place their orders ahead of others, being the owners of their own material supply shops. The following example may be quoted: A number of plates having been ordered from the Borsigwerk (Schleswig) the latter was able to submit for inspection 30 boiler plates which had been rolled during the night. This happened during a period of great activity and was only rendered possible by the issuing of special orders to the works to get these plates out ahead of any other orders they might have on their books. As a general rule, however, German manufacturers are able to deliver their material in good time and night work is always done during prosperous times.

In France the mills are less well equipped than in Germany. In normal times they are able to offer satisfactory deliveries, but as soon as orders increase become congested with work and the shipments are delayed, often for several months. For boiler and frame plates the shipments vary from three weeks to four months, according to the amount of work in hand.

SHOP PRACTICE.

It is not the writer's object to go into intricate details of shop construction; this varies very greatly and is entirely dependent upon local conditions. For instance, the American Locomotive Company has been able to extend its works at Schenectady, having ample property at its disposal, while the Baldwin Locomotive Works, being hedged in at Philadelphia, has been obliged to seek additional shop space by superposition of several stories. However, on account of their larger capacities, American and German builders have been able to expand their shops much more than it was possible in France.

(*To be continued.*)

THE GALVESTON CAUSEWAY.

BY F. E. LISTER,
Associate Editor, *Railroad Age Gazette.*

Previous to the storm at Galveston, Texas, on September 8, 1900, when some 6,000 lives and about $17,000,000 in property were lost, three railway trestles—used by the Galveston, Houston & Henderson, the Galveston, Harrisburg & San Antonio and the Gulf, Colorado & Santa Fe—and a county highway bridge, linked the island and the main land, which are, at this point, more than 10,000 ft. apart. During the height of the storm, an ocean liner broke away from its anchorage at one of the piers, was carried up the bay with such terrible force that it plowed through the trestles and county bridge. One of the railway trestles, that of the Gulf, Colorado & Santa Fe, was less seriously damaged that the others—which were completely demolished—and it was rebuilt in nine days. Since that time, all of the railways entering Galveston have used this single track pile bridge, which has a Howe truss swing draw at the channel to permit small sailing vessels to go up the bay. The accompanying half-tone shows the general appearance of this trestle, and in the distance may be seen what remained of the other trestles after the storm.

Present Single Track Trestle Across Galveston Bay.

Over two miles long. Only connection between main land and island. Piles of another trestle, destroyed during the storm, seen in the distance.

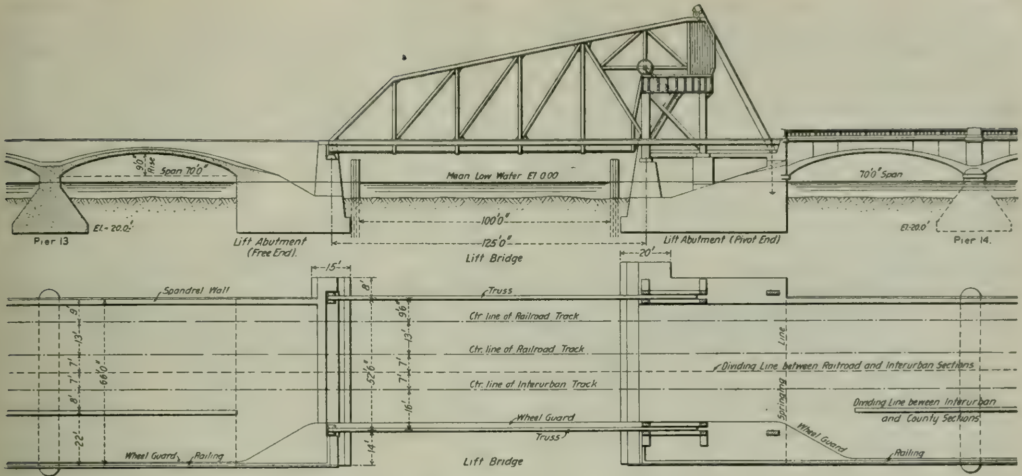
There are three separate railways entering Galveston; the Galveston, Houston & Henderson—which affords trackage rights from Houston to the International & Great Northern and the Missouri, Kansas & Texas—the Gulf, Colorado & Santa Fe and the Galveston, Harrisburg & San Antonio. The Trinity & Brazos Valley uses the G., C. & S. F. tracks to Virginia Point at the main land end of the bridge, but has its own terminals in Galveston. The G., C. & S. F. owns and operates the bridge, the expenses being borne, on a wheelage basis, by all the railways using it. The staff system of operation is used, passenger trains requiring 10 minutes and freight trains 15 minutes in crossing. An operator at Virginia Point has charge of all train movements. As there is but a single track, there is always more or less delay, although passenger trains are seldom delayed more than five minutes, while freight trains are often seriously so, especially those which reach the bridge between 7.30 and 9 a.m., and between 4.30 and 6.30 p.m., when passenger trains are numerous. During the busy season from 60 to 75 trains cross the bridge daily, while the regular bay bridge time car, which went into effect on May 3 last, shows 45 trains scheduled per day. This, however, is undoubtedly the schedule of the summer months, the quiet period of the year, the busy season being during the cotton moving time, from the latter part of August to March.

The building of the causeway to connect Galveston Island and the main land of Texas, near Virginia Point, is by no means a new idea, but has been agitated with more or less vigor by the city ever since the storm. On September 1, 1904, the *Galveston News* said: "It is understood that plans are being perfected for the construction of this causeway and certain authorities known to be interested in the movement have stated that everything is working smoothly and that some definite announcement may be expected very soon." On April 26 last proposals to contractors were published from the office of John M. Murch, Auditor of Galveston county, and bids will be received until June 28.

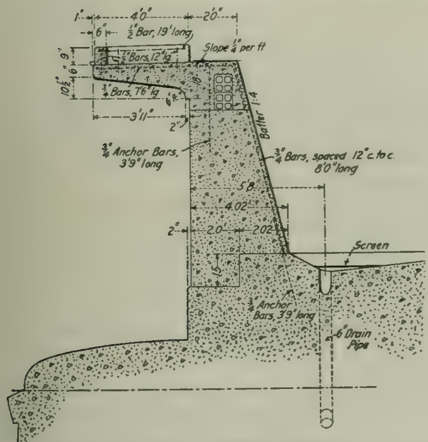
The center line of the causeway will be located, beginning at a point 314.2 ft. southwest of the Galveston end of the present trestle, and end 82.4 ft. southwest of the main land end of the trestle. The entire structure will consist of a concrete-steel arch bridge, a bascule or lift bridge and a roadway. The lift bridge located near the center of the arch bridge, having a clear opening of 100 ft., when closed will have a span of about 125 ft. between supports. The arch bridge will have a total length of 2,472 ft., from back to back of end abutments. That part of the roadway at the Galveston Island end of the causeway will be about 4,530 ft. long, while that part of the main land end will be about 3,640 ft. long. The entire causeway will be 10,642 ft. long. The roadway will be 119 ft. wide at top, the arch bridge will be 66 ft. wide, and the lift bridge will be about 52 ft. wide, between center lines of outside trusses. Reference to one of the accompanying cross sections of the structure will show that provision is made for two steam railway lines, one interurban line and a county roadway.

The bascule bridge, as seen on the plan, is 14 ft. narrower than the arch bridge and this difference is taken off of the county roadway section. The one shown in this elevation is not the final design, but merely shows the general appearance of the lift which will be used. The end piers under the bascule span are seen to be combined with the abutments of the arches. The line loading assumed for the structure is Cooper's E-50 for each track, and 150 lbs. per. sq. ft. of roadway for the highway portion. The structure is in general, designed according to the specifications of the American Railway Engineering & Maintenance of Way Association for steel bridges and structures. The bascule will be a thorough structure carrying two steam and one interurban track and the county road. On account of climatic conditions, when metal work rusts rapidly, care must be exercised in the use of closed or box sections or any detail where moisture can collect.

The lift bridge will be protected by an all-electric interlocking plant, in accordance with specifications of the Signal Association, dated October, 1908. The specifications for the



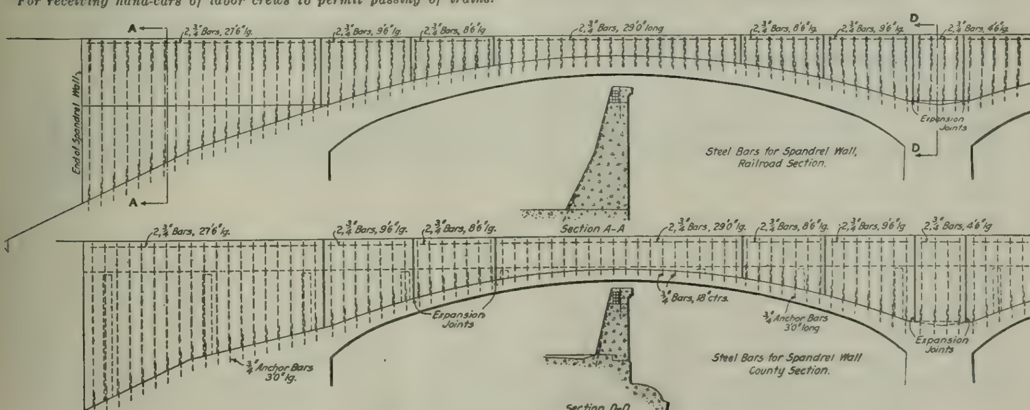
Plan and Elevations at Bascule Bridge.
The pile foundations of piers are not shown. Height of base of rail above M. L. W. is 16.5 ft.



Cross Section of Refuge Platform.
For receiving hand-cars of labor crews to permit passing of trains.

bascule bridge and the interlocking plant were made by A. F. Robinson, Bridge Engineer System, A. T. & S. F., Chicago.

The foundations for abutments, piers and abutment-piers will be placed upon barked, yellow pine, vertical and batter piles, as shown in the illustrations. These piles will be between 12 in. and 16 in. in diameter at the large end, not less than eight in. in diameter at the bottom, and 30 ft. long. These piles will be driven until the butt end projects 18 in. above the bottom of foundations. Jetting of piles will be permitted only in case the required penetration cannot be secured by other methods. The last four feet of penetration will be sufficient in all cases, but where greater lengths are found necessary they will be used. About 40 borings were made along the line of the causeway to determine the nature of the foundation soil. From these borings it is expected that yellow clay, with occasional sand pockets, will be found overlying hard red clay in all foundation pits, and that red clay will have been reached at the bottom, as it is intended to rest all foundations on red clay. Suitable cofferdams, made of tongued and grooved sheeting, will be built for the piers and abutments. The 28 arches of the arch bridge are divided by the abutment-piers into four series of seven each. On account of the flatness of the arches, no centering under any arch of any one

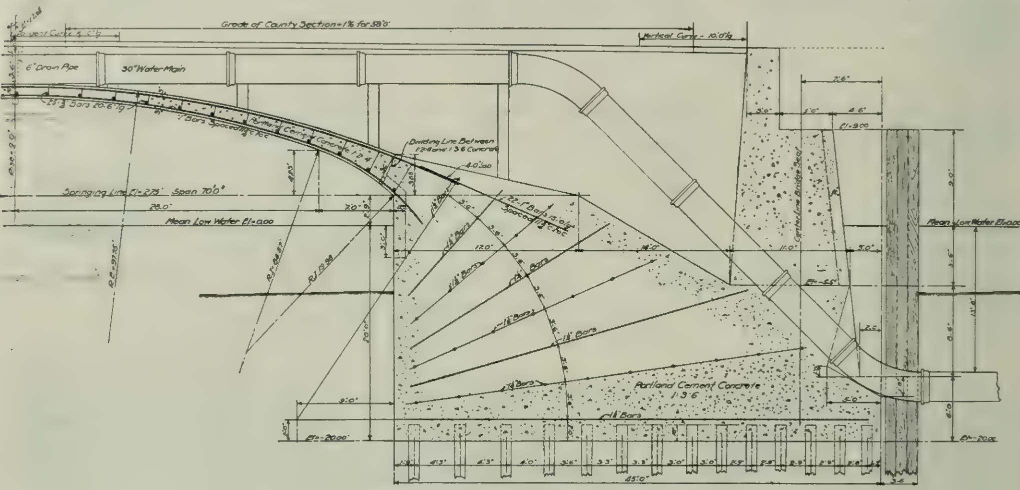


Sections and Elevations of Spandrel Walls.
Showing method of reinforcing. Railway section above and county section below.

series shall be struck until at least 28 days after the completion of all seven arches of that series, and not until the spandrel filling has been put on. Each arch will have approximately the following dimensions: Span, 70 ft.; rise, 9 ft.; height of soffit above M. L. T., 12 ft.; height of base of rail above M. L. T., 16.5 ft., and extreme width over spandrels, or headwalls, 66 ft.

In order to obtain a smooth and satisfactory finish on all concrete surfaces exposed to view, the forms will be plastered above the elevation of the bottom of wire ducts and for all parapet walls and railings. Grade "b," 1-3-6-mix, for foundations, abutments, abutment-piers, piers, spandrel walls, and all other concrete.

Steel ribs will be embedded in the concrete of the arches, spaced at equal distances apart. Each rib will consist of two deformed bars, connected by radial connecting rods. Diagonal connecting rods will be used for holding the ribs in position. All connecting rods will be plain steel bars provided with

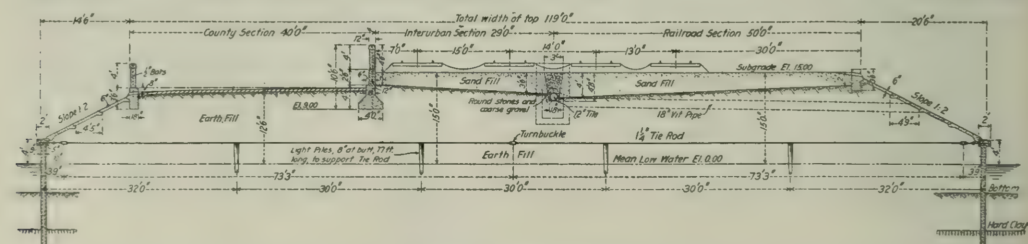


Section at Lift Abutment Pier.

Showing fall of 30-in. water main to cross the ship channel.

to a smooth finish with rock plaster, stucco, or other plastering material. Before the concrete is deposited against the forms, the plastered surfaces will be painted with a mineral oil, sufficient to prevent the plaster from sticking to the concrete. All cement used will be established brands of high grade Portland cement, which have been in successful use for at least three years, under similar conditions to the work proposed, and also have been seasoned or subjected to aeration for at least 30 days before leaving the mill. The sand used for mortar or concrete will be clean, hard, sharp and coarse, or coarse and fine mixed, free from sewage, mud, clay and all foreign matter. The broken stone used will be of assorted hooked ends, while all other bars used for reinforcing the concrete will be deformed bars.

A filling of sand, or sand and gravel, will be used for the spaces over the arches, piers, abutment-piers and abutments between spandrel and retaining walls, and a vertical plane along the end faces the abutment retaining walls. This filling will be thoroughly compacted by ramming, rolling saturated with water, or other effective means, and finished to the proper subgrades to receive the pavement or ballast, except that portion of the arch bridge which is to be used as a road by the county, which will not be paved until some time later. The filling over the arch will not be put in until at least one



Typical Roadway Section.

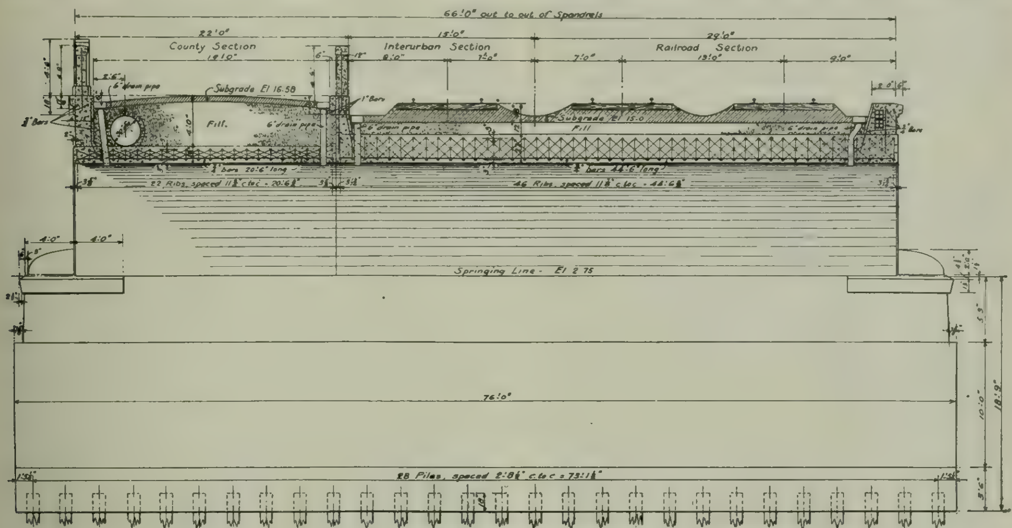
sizes, clean and hard, broken into approximately cubical pieces, and free from long thin scales.

Two grades of concrete are to be used. Grade "a," 1-2-4-mix, in concrete for arches between skewbacks; for the concrete shell one foot thick forming the outside portion of all piers and abutment-pier shafts between pier footings and arches; for a similar shell one foot thick around all abutments where exposed to the sea water; for all copings and cornices; for that part of the southeasterly spandrel walls week after the arch and spandrel walls have been completed. Provision for draining the fill and for surface drainage shall be made at each pier and at the crown of each arch.

The city of Galveston obtains its water supply from artesian wells, located at Alta Loma, Tex., on the Santa Fe, 18.2 miles from Galveston. The water is carried to the city through a pipe line, which crossed the bay on the county bridge before the storm and has since been placed in the bay. A 30-in. water main, laid along the southwesterly spandrel wall of the arch

bridge, as shown in the illustration, will carry this water supply. At the lift bridge opening, the 30-in. main will drop into the water, cross the opening between the walls of sheet piling, at a depth of 13 ft. 6 in. below mean low water and rise again to the arch bridge on the other side. Two lines of 4-duct, 9-in. multiple vitrified duct conduits, running the full length of the arch bridge, will be laid in the northeasterly spandrel wall.

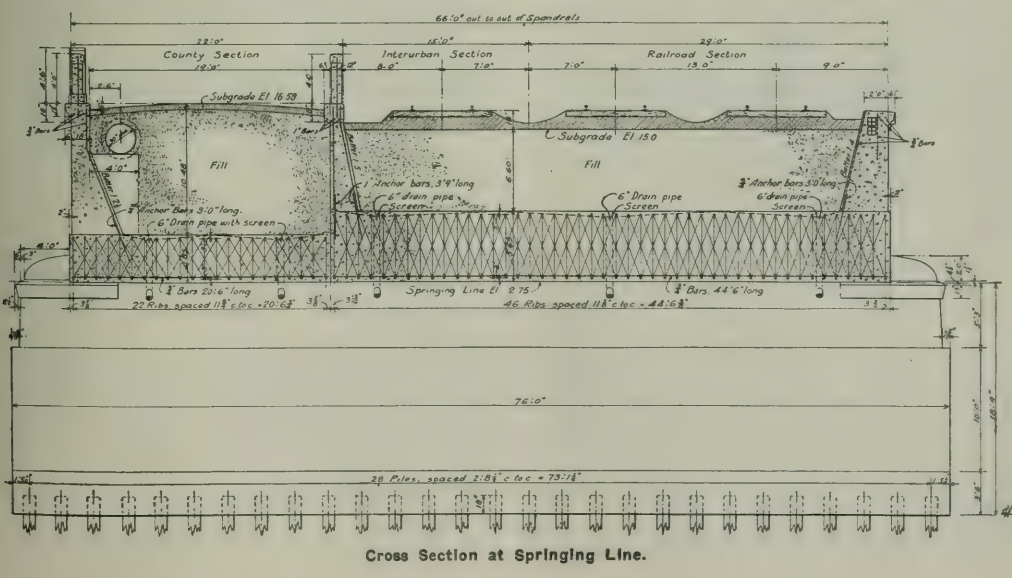
and the unprotected part will be 1,000 ft. long. The reinforced concrete piles used will be made of grade "a" concrete, with the same kind of reinforcing bars as used in the arches. The lower end of each pile, for a length of five ft., will be provided with tongue and groove, and the upper end of each pile will have two grooves on opposite sides. After piles are driven, the grooves of adjacent piles will form a cylindrical open space, which will be filled with mortar, composed of one



Cross Section at Crown.

The roadways will in part be retained by concrete sheet piling, the slopes being protected by the concrete slabs. The remaining part of the roadway will be an embankment of unprotected slopes. The protected part of the roadway on the Galveston Island end of the causeway will be 3,530 ft. long, and the unprotected part will be 1,000 ft. long. The protected part of the roadway on the main land end will be 2,640 ft. long,

part Portland cement and two and one-half parts sand, to form a dowel between adjacent piles, and to calk the joints. The sheet piles will, 24 hours after casting, be kept wet or under water for ten days. All sheet piles will be driven approximately five ft. deep into solid clay bottom. It is expected that 18-ft. piles will be sufficiently long to meet this condition, but if not so longer piles will be used. No piles will be driven be-

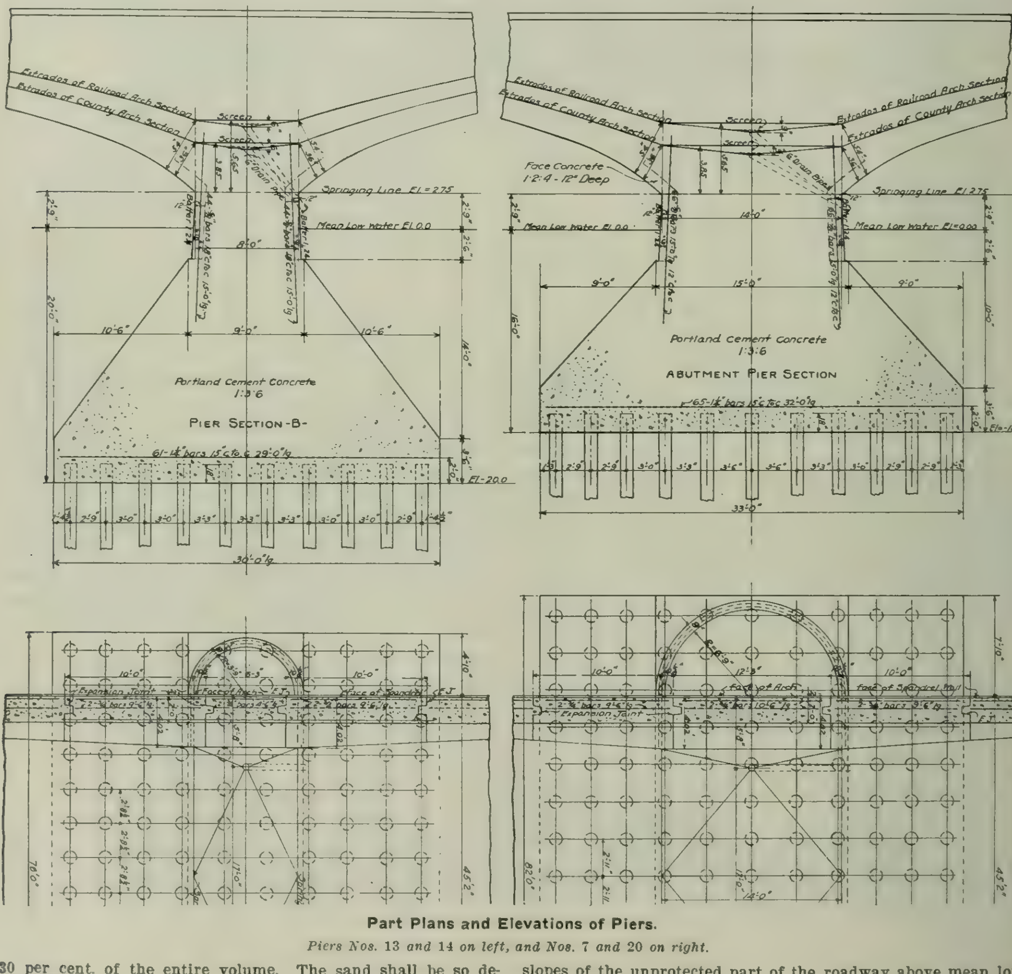


Cross Section at Springing Line.

fore they are two months old and no jetting will be permitted in driving them.

The filling for the roadway will probably consist entirely of sand. If sand in sufficient quantities cannot be secured near thework to makea sand filing feasible, this filling may be made of clay and sand, with the exception of a layer of a few feet of sand. This material will be obtained by dredging from the bay or from borrow pits. No excavation is to be made deeper than one-twentieth of the distance from either the causeway or the present water main which crosses the bay, nor closer that 200 ft. to either. If a mixture of sand and clay has to be used for filling, the sand will constitute at least be water-borne to its place of deposit, but will be compacted by flooding until no further shrinkage can thus be produced. The filling for the unprotected part of the roadway shall in all respects be similar to that for the protected part, except that it will be allowed to spread to a slope of one vertical to six horizontal.

The slopes of the protected part of the roadway will be covered by concrete slabs, made of grade "b" concrete, cast on the ground. The slopes shall be carefully graded and wet before the concrete is deposited. All joints between slabs will be waterproofed by inserting strips of two-ply tarred felt, and the concrete slabs will not be placed until the filling is settled. The



Part Plans and Elevations of Piers.

Piers Nos. 13 and 14 on left, and Nos. 7 and 20 on right.

30 per cent. of the entire volume. The sand shall be so deposited that it will be fairly uniformly distributed throughout the filling, it being the intention to have the voids between the clay lumps filled with the sand to reduce the shrinkage and its period to a minimum. The filling may thus be carried up to the subgrade of the county road, but for that portion of the roadway which is to be used by the steam and electric railways, clay and sand filling will be carried only to within from two to four ft. below subgrade, and the remaining space to subgrade shall be filled with sand to facilitate surface drainage, as shown on the plans. All material for filling will slopes of the unprotected part of the roadway above mean low water will be sodded with live Bermuda grass with good roots embedded in the soil or loam, in tufts about three in. in diameter on intersecting diagonals two ft. apart. Soil or loam of such consistency as not to be affected by the wind, will be spread uniformly over the slopes about four in. deep, exclusive of the sodding.

The Concrete-Steel Engineering Company, Park Row Building, New York, are the consulting engineers on this work, to whom we are indebted for the data and blueprints used in connection with this article.

GRAIN HANDLING IN THE UNITED STATES.

BY SAMUEL O. DUNN,

Western Editorial Manager, *Railroad Age Gazette*.

II.

ELEVATOR ALLOWANCES.

The three hearings in the matter of allowances to elevators, which the Interstate Commerce Commission conducted, grew out of a contract between the Union Pacific and the Peavey Grain Company, under which the railway agreed to transfer land at Kansas City and Council Bluffs to the grain company on which to build two large terminal elevators, and to pay 1¼ cents per 100 lbs. on all grain transferred at Kansas City and Council Bluffs from cars on the Union Pacific to cars on other roads. The testimony showed that the Peavey Company had about 500 country elevators in North Dakota, South Dakota, Minnesota, Iowa, Nebraska and Kansas, and large terminal elevators at Council Bluffs, Kansas City, Duluth, Minneapolis and Chicago, and that it handled about 60 per cent. of the grain shipped from stations on the Union Pacific. The object of the Union Pacific in making this contract was to secure the construction of large terminal elevators at Council Bluffs and Kansas City, in which grain could be unloaded from its cars so that they would not have to be sent eastward off its own rails, which would reduce the available equipment on its line when an ample supply of cars was most needed. The allowance was attacked upon the ground that it was a rebate. In its first decision, in 1904, the Commission upheld the entire allowance. In its second decision, in 1907, it upheld the legality of giving an allowance, but reduced it to 1 cent. In its third decision, in 1908, it held that conditions had so changed that any allowance by the railway to the Peavey Company in its capacity as an elevator company amounted to a rebate to it in its capacity as a grain dealer, and therefore gave it an unfair advantage over its competitors.

For competitive reasons, other roads had granted similar allowances to other concerns or had given them what were regarded as equivalent reductions in freight rates. The Commission's last decision held in effect that all such arrangements were illegal under the Hepburn act.

A good example of the relations existing between the railways and the elevator companies doing business on their lines was afforded by the testimony regarding an arrangement between the Chicago, Rock Island & Pacific and the South Chicago Elevator Company at South Chicago, Ill. It was shown that J. C. Shaffer, a Chicago grain merchant, had bought two large terminal elevators at South Chicago from the Counselman estate for $700,000, and had soon afterwards sold them to the Chicago & Rock Island Elevator Company, which, it is assumed, represented the Rock Island railway, for $1,000,000. They were then leased to the South Chicago Elevator Company, in which Mr. Shaffer is the controlling factor. Under the conditions of the lease the South Chicago Elevator Company was to get the use of the elevators for practically nothing if it handled a specified very large amount of grain over the lines of the Rock Island annually. If it failed to ship the required amount of grain over this road it was to pay a rental which grew rapidly higher in proportion as the amount of the traffic grew smaller. It was shown also that the Rock Island had made an arrangement with the Rosenbaum Grain Company under which this company was to build a large terminal elevator at Kansas City. When the elevator was finished the road was to pay for it what it cost with $5,000 additional as compensation for the service rendered in erecting it. This $5,000 compensation was to take the form of a deduction of 15 per cent. from the freight charges accruing on the Rosenbaum Company's grain until the obligation had been satisfied. The contract also provided for an allowance of 1¼ cents per 100 lbs. to the grain company for elevating and transferring its own grain, but provided that this clause would be waived if the allowance was found illegal by the Interstate Commerce Commission. The traffic officers of the Rock Island stated that, as the contract indicated, it was made to put the Rosenbaum Grain Company on an equal footing with the Peavey Company at Kansas City, in order that the Rock Island might be able to meet the competition of the Union Pacific for grain traffic.

These contracts are not cited as exceptional but as illustrative of arrangements into which many railways have entered with numerous grain concerns. In every case the object of the road evidently was not to discriminate in favor of any particular shipper or dealer, but to get for itself the largest grain traffic possible, and to reduce to a minimum the delays to its equipment, especially in busy seasons.

DEVELOPMENT OF ELEVATOR SYSTEM.

How greatly the various conditions and arrangements referred to have stimulated the development of the elevator system is indicated by the magnitude which it has attained. At 25 large terminal markets or exporting points in the United States there are 428 elevators with an aggregate capacity of 260,541,000 bushels. These points, with the number of elevators they have and their capacity in bushels, are as follows:

	No. of elevators.	Capacity, in bush.
Chicago	87	58,945,000
Minneapolis	48	40,890,000
Duluth	23	30,175,000
Buffalo	28	24,190,000
Milwaukee	21	13,960,000
New York	18	13,230,000
St. Louis	39	12,080,000
Kansas City	38	11,290,000
Toledo	10	6,250,000
Omaha	15	6,040,000
New Orleans	9	5,180,000
Baltimore	5	5,100,000
Detroit	14	4,540,000
Montreal	10	4,150,000
Galveston	4	3,800,000
Philadelphia	4	3,100,000
Louisville	7	3,000,000
Newport News	2	2,550,000
Boston	4	2,200,000
Cincinnati	12	2,010,000
Indianapolis	9	1,955,000
Cleveland	6	1,916,000
Nashville	5	1,700,000
Seattle	2	1,550,000
Evansville	8	740,000

The corn crop of the United States in 1908 was 2,668,651,000 bushels; the oat crop, 807,156,000 bushels, and the wheat crop, 664,602,000 bushels. The terminal elevators at the centers referred to have, therefore, a storage capacity equal to considerably more than one-third of the total wheat crop, or to almost one-third of the total oats crop, or to one-tenth of the total corn crop. And of course this takes no account of the thousands of country elevators, one of which is to be found at almost every country station of any importance, and of which there sometimes are as many as eight or even 12 at an important station in the grain belt. If the storage capacity of all the country elevators were added to the storage capacity of all the terminal elevators, it would be found that together they would hold a very substantial part of the total annual grain crop.

The number of terminal elevators that is now both owned and operated by the railways themselves is relatively small. The Chicago, Milwaukee & St. Paul operates one at Minneapolis; the Santa Fe one at Chicago; the Lake Shore one at Toledo: the Boston & Maine and the New Haven one each at Boston; the Baltimore & Ohio two at Baltimore; the Northern Central one at Baltimore, and the New York Central one, the West Shore two, and the Pennsylvania Railroad one at New York City. The number operated by companies which the railways control is substantially larger, but a large majority of the total is run by private concerns.

The terminal elevators at most points are divided into two classes—public and private. The private elevators handle only grain bought and sold by their proprietors, and are equipped with machinery for grading, blending, etc. Public elevators transfer and store grain for everybody who tenders it, and the

owners are not allowed to handle grain belonging to themselves. They have no machinery for treating the commodity, and are required always to keep the same grade in the same bins. Of the 87 elevators at Chicago, 13, having a capacity of 22,500,000 bushels, are public, and the rest, with a capacity of 36,445,000 bushels, are private. The storage rate at Chicago is three-quarters of 1 cent per bushel per day for the first 10 days and $^1/_{40}$ of a cent for each additional day.

FARMERS' ELEVATORS.

Up to ten years ago practically all of the grain handled in bulk in the United States was sold by the farmer to dealers and shipped by them to the large central markets. In recent years there have been built at country stations numerous so-called "farmers' elevators," which are owned by corporations, the stock of which belongs to the farmers in the surrounding country. In numerous cases these elevators have proven unprofitable. In others, it is said, they have yielded their owners good returns. It was formerly complained that the railways discriminated in the furnishing of cars in favor of the so-called "regular" elevators and against the farmers' elevators. There has been no such complaint since the fall of 1907, as since then the railways have been able to furnish plenty of cars to everybody who has applied for them.

GRAIN HANDLING IN SACKS.

While the system of handling grain in bulk through elevators has become almost the only method used in the Middle West, the system of handling it in sacks has grown up and is still the prevalent method in the extreme Northwest. There the farmer sacks his grain in the field when it is threshed, and it is hauled in sacks to a flat warehouse at the country station instead of to an elevator. It is also hauled in sacks by rail, and when it reaches the large markets on the Pacific seaboard, it is put into large flat warehouses in sacks. Some of these warehouses have a capacity of as much as 2,000,000 bushels.

Before the Northern Pacific was built to Puget sound all grain docks in the Northwest and the ground occupied by them were private property. When the Northern Pacific reached Tacoma its officers considered it necessary, in order that it might get its share of the grain business, to build its own warehouses, and it did so and leased them to private firms that were in a position to give it traffic. Competition between the Northern Pacific at Tacoma and the Oregon Railroad & Navigation Company at Portland caused the latter to lease water front property belonging to it at Portland to large grain concerns. Competition compelled the Great Northern to make similar terms with concerns at Seattle and Everett. No grain warehouses have been built in Portland or on Puget sound with private capital since the railways thus interested themselves in the business, although a number that were there before are still there and in operation.

There has been a prolonged controversy in the Northwest over the question of whether or not the introduction of bulk shipments into that territory would be to the advantage of all concerned. About a year ago W. H. Reed, of Tacoma, Wash., a member of the Washington State Grain Commission, wrote an open letter in which he presented the case in favor of the adoption of bulk shipments. He argued that the cost of shipping wheat in bulk from the threshing machine to Liverpool would be less than is the cost of shipping it in sacks and that in the long run the farmer, if bulk shipment were adopted, would gain the difference in cost. At the threshing machine in sacking there is a "sack jigger" who is paid $3 a day and two sack sewers who are paid $4.50 each per day, making $12 a day. If 2,300 bushels be threshed in a day, the wages of these men aggregate ½ cent per bushel. This expense, Mr. Reed pointed out, would be avoided if the wheat were run from the thresher spout into a galvanized iron or steel tank or bin at each sitting. The farmer could then store his crop on his place until he got ready to sell. He would have no insurance to pay on the grain because it could not burn in the tanks and there would be no possibility of damage to it by stock getting into the field and tearing the sacks. The field could be used for feeding stock as soon as the thresher pulled out. There would be no damage by rain before hauling, which could be done at any time when teams and men were not required for other work. By handling the grain in this way, he contended, the farmer would save 1½ cents a bushel. He could mix his grain in his own bins and profit an additional cent and a half a bushel on that which was light weight. It would cost him less to load his wagons with bulk than with sack grain and a wagon load of bulk grain could be dumped and weighed at the elevator in five minutes, whereas to unload sack grain requires a great deal more time.

The aggregate saving up to this point would be 3½ cents a bushel. The farmer gets at the station 3 cents a bushel more for his wheat in sacks than in bulk and his sack costs him a little more than 3 cents a bushel; so it seems possible, Mr. Reed argued, for him to handle the grain to the station about 3½ cents a bushel cheaper in bulk than in sacks. Mr. Reed also said that the loading of a 1,000-bushel car of sacked grain at the country warehouse takes two men two hours, while it can be loaded in bulk by one man in five minutes. The railway freight on bulk grain is the same as on sacked grain; in other words, the transportation of the sack has to be paid for at the same rate as the transportation of the grain. At tidewater it takes 12 men, including the weigher, one hour to unload and pile a car of 1,000 bushels in sacks. In bulk three men can sweep out a car, unload the grain and bin it in from 5 to 10 minutes. It takes 15 men four and a half days of eight hours each to load a vessel with 125,000 bushels of sacked grain. In bulk the same quantity of grain can be loaded in three or four hours by one-half as many men. Mr. Reed contended that all of the extra expenses involved in the handling of grain in sacks—including the freight that must be paid on the sacks—must ultimately come out of the pocket of the farmer, who, because of these extra expenses, gets a lower price for his crop than he would if it were shipped in bulk. He said that the real reason why the grain merchants on the Pacific coast continue to argue in favor of the continued handling of wheat in sacks is that they know that the introduction of the bulk system would destroy the value of their large warehouses. He predicted that the Chicago, Milwaukee & St. Paul and other new roads that are building into Washington would build elevators on their lines and force the exporters to handle grain in bulk.

GRAIN FOR EXPORT.

While some railway officers who have investigated the subject regard the argument in favor of bulk handling as conclusive, others think that there is much to be said in favor of handling in sacks. The main reason, undoubtedly, why the system of handling in sacks has held its own is that a very large proportion of the grain grown in the Northwest is exported to Europe and Asia. The amount exported fluctuates greatly from year to year according to the size of the yield, the Oriental market for grain and the proportion of the total crop absorbed by the flour mills, and the proportion taken by the flour mills depends upon the condition of the export flour trade, particularly to the Orient. Six years ago it was believed that the export shipments of wheat from the Northwest would soon become unimportant and that the entire part of the crop exported would be converted into flour before leaving North Pacific ports. But these expectations were disappointed. There was a large increase in the production of wheat in Manchuria and a heavy decline in the flour trade to China. Japan adopted a tariff to protect Japanese millers. Large additions were made to the Russian and Japanese milling capacity. The consequence in 1907 was a large increase of export shipments of wheat as compared with export shipments of flour. The indications are that plans for the future handling of the crop of Washington, Oregon

and Idaho should provide for the probable exportation of 50 per cent. of the surplus crop in the form of wheat.

Now, the wheat exporters on the coast do not favor bulk shipments by sea or bulk handling of wheat from the country railway stations to terminals. Grain making the long voyage from the North Pacific coast to Europe must cross the equator twice, and it is claimed that when shipped in bulk it will heat and reach Liverpool in bad condition. In answer to this, it is stated on good authority that there has been no actual trial of bulk wheat shipments from the Pacific coast to Europe via Cape Horn. The Northern Pacific Elevator Company made a partial experiment 20 years ago when it loaded 10 sailing ships, but only one-third of the cargo was in bulk owing to rules of the underwriters. The advocates of bulk shipments contend that steamships could carry bulk wheat and get it to Europe in good condition if it were perfectly dry when loaded, and that the underwriters would, under proper conditions, modify their rules so as to permit such shipments.

Another objection to bulk shipments is that so many varieties of wheat are grown in the Northwest—eight distinct varieties being produced in eastern Washington alone—that it is impossible to make a full cargo of any one kind. This objection could be overcome only by reducing through some means the number of kinds grown. It is claimed that Pacific coast smut is much worse than eastern smut, and that smut balls are easily broken in bulk handling and cannot be blown out in the original cleaning process on farms or at country stations. The farmer, however, can get rid of it if he will use chemicals prescribed by experts.

The exporters claim that the necessary investment in elevators both at country stations and terminal points is so much greater than in the flat warehouses that they could not successfully compete with the flat warehouses unless the railways charged a higher freight rate on sacked wheat, in which event the net return to the farmer would be decreased. The farmer, it is argued, pays from 6 to 10 cents for a sack that will hold two bushels of grain. He can get 2½ to 3 cents per bushel more for wheat in sacks at country stations than for wheat in bulk. Consequently, he pays not more than 2½ cents per bushel for the *use* of a sack and often less. It is claimed that in order to save this he could not afford to provide necessary facilities for bulk handling and pay the higher storage charges to which bulk wheat stored at country stations would be subject.

BULK SHIPMENT VERSUS SACK SHIPMENT.

The average crop of wheat of a farmer in the Pacific Northwest is 10,000 bushels; tank wagons, capacity 100 bushels, cost $20 each; a granary with a capacity of 10,000 bushels, about $250. The investment for bulk handling on the farm is, therefore, not large. But scarcity of labor and teams in harvest time prevent the same saving in cost that is made by eastern farmers who haul directly from the threshing machine to the receiving elevator. It is estimated by defenders of shipment in sacks that it would cost a Washington farmer 1 or 2 cents a bushel more to put wheat in his granary, later haul it to the station, etc., than to sack it, pile it in the threshing field, protected from stock by a temporary fence and by straw from the weather, and leave it there until it is convenient to haul it.

Country storage rates in the far Northwest are now 50 cents per ton to January 1 and 10 cents per ton per month thereafter. The storage rates of elevators in Minnesota and the Dakotas are 1 cent per bushel per month for the first three months and one-half a cent per bushel per month thereafter. On account of bad winter roads wheat must be hauled in a large part of the Northwest before December 1 or after April 1, and therefore the need for large storage facilities at country stations is greater than in the more easterly states, and the higher storage rate on bulk grain would be felt more in the Northwest than farther east.

One of the strongest objections urged against bulk shipments is that they would endanger the boats in which they were exported. It is said that even under the present system of stowing grain in sacks and securing it by boards to prevent it from shifting to one side of the boat in a heavy sea in a manner impossible with bulk grain, no season passes without some of the grain fleet being damaged or lost through the shifting of the cargo in the heavy seas met in the vicinity of Cape Horn. It is argued that the seas encountered by ships carrying grain from the Pacific coast to Europe are so much heavier than any encountered by vessels carrying grain in bulk from the Atlantic coast to Europe that it cannot be assumed, because bulk shipments from the Atlantic seaboard are successful, that such shipments from the Pacific coast are feasible.

From the railway standpoint, the handling of grain in sacks has one great advantage. Bulk grain must be handled in box cars, while all kinds of freight cars are available for sack shipments. The railways in the Northwest have sometimes hauled as much as 30 per cent. of the entire crop in flat cars and stock cars. As many of the flat cars that are used to haul lumber shipments eastward might but for the sack grain shipments have to go westward empty, the claims against the railways for damage to grain hauled in open cars are usually small, it is said, compared with the saving in cost of operation.

Owing to the comparatively low rates of storage in the Northwest and the fact that the farmers are uncommonly prosperous and have a tendency to speculate with their wheat the proportion of sales immediately after harvest is less than in states farther east. In consequence, the movement of the grain to market after harvest is much less rapid than in such states as Minnesota, the Dakotas and Kansas. The result is that the railways in the Northwest find that the congestion of traffic caused by the movement of grain on the western part of their lines is usually less in the fall than on the eastern part. They have, in consequence, been able, as already indicated, to a large extent to adjust the westward movement of grain to the westward movement of otherwise empty cars for lumber.

The arguments of those who contend that handling grain in sacks is best adapted to the conditions and needs of the Northwest have thus far been sustained by the logic of experience. The number of elevators in that section has increased substantially within recent years. The late F. H. Peavey some years ago built numerous fine elevators at important wheat shipping points in Oregon and Washington on the Harriman Lines. The number of elevators on the Northern Pacific west of Spokane is gradually increasing, having grown from four in 1902, with a capacity of 190,000 bushels, to 17 in 1907, with a capacity of 667,000 bushels. In 1906 and 1907 the Farmers' Grain & Supply Company, a co-operative concern, built several elevators on this road. But it seems that no great progress has been made in getting farmers to adopt bulk shipments. During the season of 1906 one elevator concern built a number of wagon tanks, the use of which it furnished free to the farmers. It also paid them for bulk grain within 2½ cents per bushel as much as they could get for sacked grain. In this way it succeeded in getting a considerable quantity of bulk grain. But the next season the farmers went back to sacks. Even the concerns that handle large quantities of grain through elevators receive a large proportion of it in sacks.

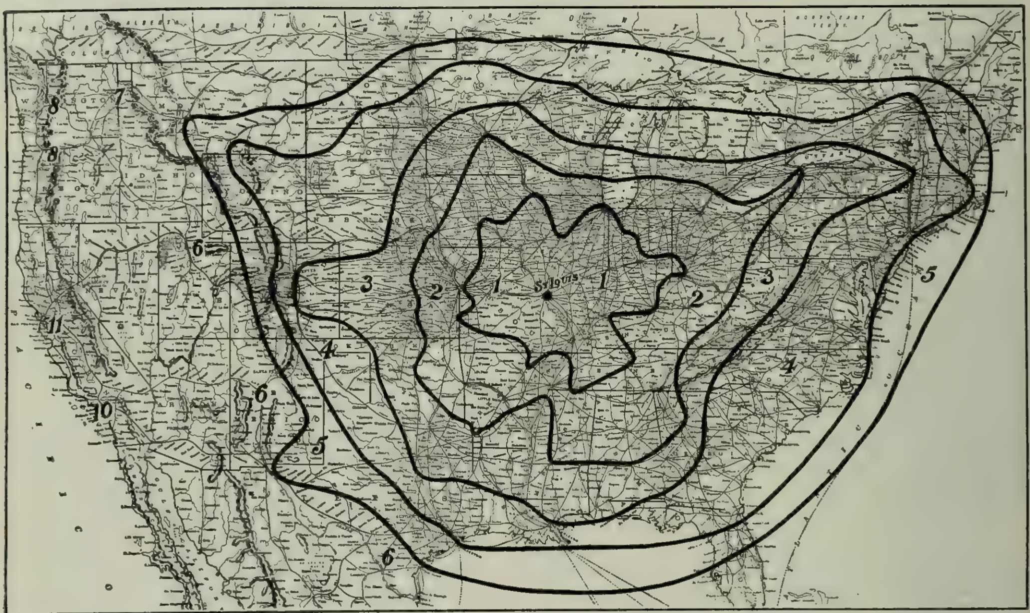
The 40 to 50 elevators at points on the Oregon Railroad & Navigation Company which were built by F. H. Peavey & Company, and which are now owned by the Pacific Coast Elevator Company, are, it is said, being operated satisfactorily both to their owner and to the railway on whose lines they are. It seems to be the judgment of experts that ultimately grain will be handled in bulk to Pacific coast terminals as it is to other large terminal points, but this will involve such a

complete revolution in the methods of farmers and grain merchants that if it is ever brought about it will be accomplished gradually.

PACKAGE CAR SERVICE FROM ST. LOUIS.

The Freight Bureau of the Businessmen's League of St. Louis is issuing the third edition of its pamphlet showing exact details of the package car service from St. Louis, as a center. The accompanying map is intended to show approximately the number of days required to make delivery of merchandise shipments from St. Louis to the principal points within the zone described.

At the present time 674 package cars leave St. Louis daily, with less than carload shipments, sealed to distant break-bulk points, and handled in through fast trains. Eighty-five per cent. of these cars are handled on schedule time. The railways, recognizing the earnest spirit of co-operation manifested by the Businessmen's League, furnish the League with monthly statements showing in detail the actual movements of these package cars. They are constituting an increasingly important part of the transportation system of the country.



Days Required for Delivery; Package Car Service from St. Louis.

Consul T. J. Albert, of Brunswick, in reporting that the German Aerial Navigation Co., Frankfort-on-Main, has established the first permanent airship lines in Germany, gives the following details: It is the purpose of the company at the start to connect fully 20 cities. It has already received patents for its turn halls for motor balloons, and it will erect the first halls in Berlin, Munich and Strassburg in Alsace. The extensive plans of the company have aroused the liveliest interest on all sides, and their execution appears to be financially assured. The first line of connection planned is Munich to Dresden by way of Nuremberg, Plauen and Chemnitz. The second line is from Munich to Cassel by way of Ulm, Stuttgart, Mannheim, Mayence, Coblenz, Cologne, Düsseldorf, Elberfeld and Paderborn. The third line is from Berlin to Lübeck by way of Bremen and Hamburg. The fourth line is from Berlin to Königsberg by way of Stettin and Danzig. The fifth line is from Strassburg to Berlin by way of Metz, Trier, Mayence, Frankfurt, Erfurt, Leipzig, Halle and Magdeburg.

RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY,
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CHAPTER IV.—*Continued.*

Another interesting example of the difficulty of bringing about a change in rate adjustment is afforded in the transcontinental field. For some years a general agreement seems to have been adopted as a sort of a compromise between the various conflicting interests. Under present conditions Chicago and all points east of the Mississippi from Maine to Florida enjoy precisely the same rate to the Pacific coast.* Chicago has at various times contended before the Interstate Commerce Commission for graded rates which should recognize, for instance, that being 1,200 miles nearer San Francisco than Boston on the basis of distance it should have proportionately lower freight rates. Apparently some of the transcontinental roads, such as the Great Northern, have been willing to make this concession. They could not, however, take any action without first obtaining the consent of every railway and steamship company with which they compete. Inasmuch as almost every railway in the country participates in transcontinental business, an agreement was practically impossible. Entirely aside from the merits of this particular intricate question, it must be borne in mind that there is no such thing as independence of action on behalf of any single carrier. It becomes exceedingly easy for one road to play a dog-in-the-manger part. The shipper may be subjected to an extortionate

*This is described in Ripley, Railway Problems, pp. 405-441.

policy, not dictated by the road over which he ships, as a matter of fact, but by roads operating perhaps a thousand or more miles away.

Praiseworthy as is the elasticity of railway rates in the United States, there is nevertheless much to be said in support of the contention that at times this has been carried to an extreme. Stability and certainty have been treated as of secondary importance. Particular shippers have been aided, but the general interests of trade have suffered some injurious consequences. It is not entirely clear whether the advantage gained from elasticity has at all times been worth the cost. Certain of the disadvantages of instability of rates seem to have been overlooked.

In the first place railway tariffs have in the past undoubtedly been too voluminous and complex. The number of these filed with the Interstate Commerce Commission is extremely large. Eleven railways alone during the year to November 30, 1904, filed 30,125. The total schedules of all American railways filed during the year to November 30, 1907, was 220,982. One single carrier had 15,700 tariffs in force at the same time. The New York Central & Hudson River in December, 1899, had no less than 1,370 special commodity rates in force. There were endless contradictions and conflicts. Secret rates were hidden in devious ways in this mass of publications. Special tariffs "expiring with this shipment"; rates quoted not numerically but by numbered reference to tariffs of other carriers and applicable by different routes; agreements to meet rates of any competing carriers, were among the irregular methods of concealment adopted. Although literally complying with the law by publicly filing all tariffs, conditions were often such that not even an expert in rates could discover in this maze of conflicting evidence what the rate at any time actually was. The door was opened wide to personal discrimination and abuses of all kinds. Those conditions are not necessary, They do not obtain on the best roads in other parts of the world. Nor is such instability found in respect of some important lines of trade. No agricultural product fluctuates in price more abruptly or widely than raw cotton,—from five to seventeen cents a pound. Yet the rates on that commodity have remained quite undisturbed throughout the southern states for many years.

The second disadvantage of too great elasticity in freight rates is that it may at times promote rather than lessen that state of economic unrest inevitable in all business, especially in a new country. Under a continual disturbance of rates, the merchant is unable with security to enter into long-time contracts. Rates are sometimes changed, not to suit the shipper but to serve the railway's interests. Sometimes traffic may be diverted from its natural channels. The spirit of initiative and self-reliance on the part of shippers may be undermined. Persistent titilation of competition may be pleasant for a time, but its final results may be injurious. Constant appeal to the traffic manager of his road for aid and comfort may quite naturally divert the shipper's attention from an aggressive commercial policy which would render him independent of minor changes in freight rates. The more responsibility the traffic manager assumes the more may be put upon him. And it must always be remembered that each move by one road to protect a client will probably be checkmated by the tactics of rival lines. Economic peace, not warfare, should be encouraged by the services of common carriers. One of the positive advantages of governmental regulation of railway rates is that it contributes to stability. That this view is shared by experienced railway men appears from the following testimony of President Mellen of the New Haven road.* "I think that great trouble comes to the business of this country through the fact of these little breaks in rates. During November two new railways were opened into the city of Denver. They sought to make themselves popular by lowering rates, and rates went down very low. They went down legally, but they went down very low. Just before the rates went down the merchants of the city had stocked Denver with goods and the lowering of the rates demoralized their prices; they lost a large amount of money and dissatisfaction was caused from Chicago to Denver. Lowering of rates demoralized business generally. I think if those roads had known that the rates which they made had to remain in force thirty days they would have hesitated before they lowered them. I would increase the time required before rates could be reduced."

*Senate Committee on the Transportation Interests of the United States and Canada, 1890, p. 362.

The foregoing consideration suggests still another argument in favor of stability of freight rates even at the expense of a certain amount of flexibility. Special rates which create new business should be carefully distinguished from special rates which merely wrest business from other carriers or markets. Any expedient which will make two blades of grass grow where one grew before; which puts American wheat into Liverpool in competition with India and Argentina; which cheapens California fruit on the eastern markets; which offers a wider choice of building stone for Chicago; which will establish new industries for the utilization of local raw materials, deserves the greatest encouragement. Our country has been unprecedently developed in consequence of the energy and progressiveness of its railway managers. But thousands of other special rates have no such justification, even where they are public and open to all shippers alike. These are the expression of railway ambition to build up trade by invading territory naturally tributary to other railways or traders. A significant feature of commercial competition is the utilization of distant markets as available "dumping grounds" for the surplus products left over from the local or natural market. In the St. Louis Business Men's League case* the Pacific coast jobbers complained that the large distributing houses in the middle west thus invaded their territory. Having met their fixed charges from their own natural territory, they invaded the remotest districts by cutting prices to the level of actual production cost per unit of new business. The Florida orange growers' protest against the relatively lower rate on California fruit, which is carried twice the distance for less money per box. This, it is urged, enables the western grower, having glutted his natural market in the middle west, to "dump" his surplus into the eastern field to which alone the Florida orange is restricted. This line of argument is the same as that which upholds the systems under which lower rates are given for exported or imported commodities than those on goods for domestic consumption. It is always alleged that such sales at long reach actually benefit the consumer or producer near at hand, inasmuch as they contribute something toward the fixed expenses of the business, which must be borne in any event. This raises at once the much broader question as to what constitutes a "natural market" or the "natural territory" which rightfully belongs to any given economic agent. It is, however, too extended an issue to be discussed at this time.

Too many special commodity rates, intended to meet the needs of particular shippers instead of increasing new business, may merely bring about economic waste through exchange between widely separated markets or by causing an invasion of fields naturally tributary to other centers.† Whenever a community producing a surplus of a given commodity supplies itself, nevertheless, with that same commodity from a distant market economic loss results. Numerous instances could be cited where identical products are redistributed after a long carriage to and from a distant point in the very area of original production. Dried fruits may be distributed by wholesale grocers at Chicago in the great fruit-raising regions of the West and South. Cotton goods made by southern mills may be shipped to New York or Chicago, and then sent back again for final distribution with the addition of a middleman's commission and a double freight rate. The Colorado Fuel &

*Ripley, Railway Problems, pp. 405,441.
†Discussed in detail in Ripley, Railway Problems, p. 496.

Iron Company seeks special rates in order to sell goods over in Pittsburgh territory; while its great competitor, the United States Steel Corporation, has an equal ambition for the trade of the Pacific Slope. In another case it appeared that a sash and blind manufacturer in Detroit was seeking to extend his market in New England. Manufacturers of the same goods in Vermont were simultaneously marketing their product in Michigan. The Detroit producer did not complain of this invasion of his home territory, but objected to the freight rate from Boston to Detroit, which, probably because of back loading, was only about one-half the rate on his own goods from Detroit to the seaboard. Is not this an economic anomaly? Two producers, presumably of equal efficiency, are each invading the territory naturally tributary to the other and are enabled to do so by reason of the railway policy of "keeping everyone in business." The New England railways are compelled by reason of the remoteness to their territory to defend this policy. As President Tuttle, of the Boston & Maine, expresses it, "I should be just as much interested in the stimulating of Chicago manufacturers in sending their products into New England to sell as I would be in sending those from New England into Chicago to sell. It is the business of the railways centering in Chicago to send the products from Chicago in every direction. It is our particular business in New England to send New England products all over the country. The more they scatter the better it is for the railways. The railway does not discriminate against shipments because they are east-bound or west-bound. We are glad to see the same things come from Chicago into New England that are manufactured and sent from New England into Chicago." No one questions for a moment that the widening of the sphere of competition by transportation agencies is a service of incalculable benefit to the country. But it should also be borne in mind that superfluous transportation is economic waste. The industrial combinations in seeking to effect a strategic location of their factories in order to divide the field have apparently come to a full recognition of this fact.

A fourth objection to undue development of special commodity rates is that they may entail increased burdens upon the local constituency of each railway. The proportion of such special rates is 50 per cent. greater in America than in the United Kingdom. It is plain that each shipment which fails to bear its due proportion of fixed charges, even though contributing something thereto, leaves the weight of interest and maintenance charges upon the shoulders of the local shipper. To be sure, those special rates which permanently create new business operate otherwise. But in the vast complex, each railway often wrests from competing carriers only about as much tonnage as it loses. It invades rival territory, but its own constituency is invaded in retaliation. Thus there is rolled up an inordinately large proportion of such special traffic, leaving the regular shipments and the local trade to bear the brunt of fixed charges. Momentous social consequences may result. Not only the cost of doing business, but the expense of living in the smaller places is increased. One of the most dangerous social tendencies at the present time is the enormous concentration of population and wealth in great cities. Increased efficiency and economy in production are much to be desired; but social and political stability must not be sacrificed thereto. Is it not possible that a powerful decentralizing influence may be exerted by checking this indiscriminate and often wasteful long-distance competition, through greater insistence upon the rights of geographical location?

Finally an abnormal disregard of distance, which is always possible in the making of special rates to meet particular cases, may bring about a certain inelasticity of industrial conditions. This may occur in either one of two ways. The rise of new industries may be hindered; or the well-merited relative decline of old ones under a process of natural selection may be postponed or averted. The difficult problem of fairly adjusting rates on raw materials to finished products in order that the growth of new industries may take place, while at the same time the old established ones shall not be cramped or restricted, has already been discussed. It is equally plain that at times there may be danger of perpetuating an industry in a district, regardless of the physical disabilities under which it is conducted. One cannot for a moment doubt the advantages of a protective policy on the part of railways; safe-guarding industry against violent dislocating shocks. An inevitable transition to new and perhaps better conditions may perhaps be rendered easier to bear. To New England, constantly exposed to the completion of new industries rising in the West, this policy has been of inestimable value. On the other hand, it is incontestable that in the long run the whole country will fare best when each industry is prosecuted in the most favored location, conditions of marketing as well as of mere production being always considered. If Pittsburg is the natural centre for iron and steel production, it may not be an unmixed advantage to the country at large, however great its value to New England, to have the carriers perpetuate the barbed wire manufacturer at Worcester. If California can raise a finer or more marketable variety of orange, and at a lower cost, than Florida, it would be a backward step to counteract the natural advantage of the western field by compelling the southern railways to reduce their rates to an amount equal to the disability under which the Florida grower works. The principle laid down by the so-called "Bogue differentials" in the lumber trade* bears upon this point. In order to equalize conditions between a large number of lumbering centres sending their products to a common market, certain differentials between them were allowed under arbitration, "to enable each line to place its fair proportion of lumber in the territory." Did this mean that the disability of any place in manufacturing cost shall be compensated by a corresponding reduction in the ensuing transportation cost? This was the view of some of the carriers who were zealous to keep the market open to all on equal terms. Yet it is evident that, carried beyond a certain point, such a policy would not only nullify all advantages of geographical location, but it would also reverse the process of natural selection and of survival of the fittest, upon which all industrial progress must ultimately depend. Each particular case, however, must be decided on its merits. Our purpose is not to pass judgment on any one, but merely to call attention to the possible effect of such practices upon the process of industrial development.

Centralization, or concentration of population, industry and wealth is characteristic of all progressive peoples at the present time. Great economic advantages, through division of labor and cheapened production, have resulted; but on the other hand, manifold evils have followed in its train. Sometimes it appears as if American railway practices in granting commodity and flat long-distance rates so freely, operated in some ways to retard this tendency. But the influence is not all in that direction. Many staple industries, utilizing the raw material at their doors, might supply the needs of their several local constituencies were it not that their rise is prevented by long-distance rates from remote but larger centers of production. Denver, in striving to establish paper mills to utilize its own Colorado wood pulp, is threatened by the low rates from Wisconsin centers. Each locality ambitious to become self-supporting is hindered by the persistency of competition from far away cities. This is particularly true of distributive business. The overweening ambition of the great cities to monopolize the jobbing trade, regardless of distance, has already been discussed. And it follows, of course, that the larger the city the more forcibly may it press its demands upon the carriers for low rates to the most remote hamlets. The files of the Interstate Commerce Commission are stocked with examples of this kind. The plea of the smaller cities and the agricultural states—Iowa for example—for a right to share in the distributive trade naturally tributary

*Ripley, Railway Problems, pp. 209 and 219.

to them by reason of their location, formed no inconsiderable element in the recent popular demand for legislation by the Federal government.

The marked difference between competition in transportation and trade has long been recognized in economic writing, but has not as yet been accorded due weight in law. The most essential difference arises from the fact already fully set forth, that a large proportion of railway expenditures are entirely independent of the amount of business done. This involves as a consequence the exemption of carriers from the fundamental law of evolution. Survival of the fittest does not obtain as a rule in railway competition. The poorest equipped, the most circuitous and most nearly insolvent road is often able to dictate terms to the standard and most direct trunk lines. This has been exemplified time and again in the history of rate wars the world over. The bankrupt road having repudiated its fixed charges has nothing to lose by carrying business at any figure which will pay the mere cost of haulage. The indirect line having no business at the outset has nothing to lose, and everything to gain. The Canadian Pacific, for example, was perhaps originally built without any expectation of being able to participate in San Francisco business; and yet, like the Grand Trunk, it has always been an active factor in the determination of transcontinental tariffs.

The fact is that cost of production, while in trade fixing a point below which people may refuse to produce or compete, in transportation may merely mark the point at which it becomes more wasteful to stop producing than to go on producing at a loss. Hadley's classic statement is so admirable that it cannot be improved upon. "Let us take an instance from railway business, here made artifically simple for the sake of clearness, but in its complicated forms occurring every day. A railway connects two places not far apart, and carries from one to the other (say) 100,000 tons of freight a month at 25 cents a ton. Of the $25,000 thus earned, $10,000 is paid out for the actual expenses of running the trains and loading or unloading the cars; $5,000 for repairs and general expenses; the remaining $10,000 pays the interest on the cost of construction. Only the first of these items varies in proportion to the amount of business done; the interest is a fixed charge, and the repairs have to be made with almost equal rapidity, whether the material wears out, rusts out or washes out. Now suppose a parallel road is built, and in order to secure some of this business offers to take it at 20 cents a ton. The old road must meet the reduction in order not to lose its business, even though the new figure does not leave it a fair profit on its investment; better a moderate profit than none at all. The new road reduces to 15 cents; so does the old road. A 15-cent rate will not pay interest unless there are new business conditions developed by it; but it will pay for repairs, which otherwise would be a dead loss. The new road makes a still further reduction to 11 cents. This will do little toward paying repairs, but that little is better than nothing. If you take at 11 cents freight that cost you 25 cents to handle, you lose 14 cents on every ton you carry. If you refuse to take it at that rate, you lose 15 cents on every ton you do not carry. For your charges for interest and repairs run on, while the other road gets the business."

Another peculiarity of railway competition, distinguishing it from competition in trade, is that there is no such thing as abandonment of the field. This is tersely expressed by Morawetz in his Corporation Law. "It should be observed that competition among railway companies has not the same safeguard as competition in trade. Persons will ordinarily do business only when they see a fair chance of profit, and if press of competition renders a particular trade unprofitable, those engaged in that trade will suspend or reduce their operations, and apply their capital or labor to other uses until a reasonable margin of profit is reached. But the capital invested in the construction of a railway cannot be withdrawn when competition renders the operation of the road unprofitable. A railway is of no use except for railway purposes, and if the operation of the road were stopped, the capital invested in its construction would be wholly lost. Hence it is for the interest of the railway company to operate its road, though the earnings are barely sufficient to pay the operating expenses. The ownership of the road may pass from the shareholders to the bondholders, and be of no profit to the latter, but the struggle for traffic will continue so long as the means of paying operating expenses can be raised. Unrestricted competition will thus render the competitive traffic wholly unremunerative, and will cause the ultimate bankruptcy of the companies unless the operation of their traffic which is not the subject of competition can be made to bear the entire burden of the interest and fixed charges." So profoundly modified in short are the conditions of railway competition in contrast with those in industry that it is clear beyond a shadow of doubt that a railway is essentially a monopoly. This requires no proof so far as local business in distinction from through or competitive traffic is concerned. It is equally true in respect to all traffic of sufficient importance to bring about pooling agreements or a division of the business in order to forfend bankruptcy and consolidation. To attempt to perpetuate competition between railways by legislation is thus defeating its own end. The prohibition of pooling agreements which refuses to recognize the naturally monopolistic character of the business, can have but one result, namely, to compel consolidation as a measure of self-preservation. Such legislation defeats itself, bringing about the very result it was intended to prevent.

(To be continued.)

TRACK TESTING APPARATUS.

The roading department of the Pennsylvania Railroad has installed an interesting piece of apparatus on the grounds of the South Altoona foundry to test the bearing qualities of different kinds of roadway and ballast. The particular ballast or sub-grade to be tested is placed in a heavy box that extends

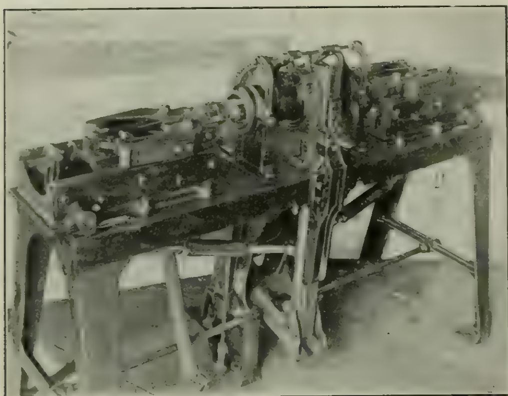
Pennsylvania Track Testing Apparatus.

across the track and has sufficient depth to serve the purpose. The track crosses this on a level and extends out on either side, terminating in a short and sharp incline. A four-wheel car on this track is loaded with pig metal to obtain any desired weight on the wheels. This car is also equipped with electric motors. A shed built across the track carries an overhead rail, from which a motor current is obtained, and a contact shoe is on the car. When current is turned on the car moves out to the end of the conductor rail, and here, as the contact is broken, the power of the motor is shut off. The car runs on until stopped by the adverse grade, and meanwhile a trip reverses the current connections to the motor. Stopped by the grade the car runs back, beneath the current rail, when its motor drives it to the other end, where the movement is again reversed. In this way the car is made to travel back and forth automatically over the track until the desired results are obtained, the number of trips being automatically regis-

tered upon a counter, so that after starting the work requires no attention or attendance. The object of the work is to obtain comparative results in a short time and under conditions that can be kept constant.

AIR-BRAKE HOSE MOUNTING MACHINE AT BRAINERD SHOPS OF THE NORTHERN PACIFIC.

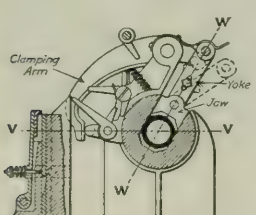
The machine for inserting couplings and nipples in air hose here illustrated has been in use at the Brainerd, Minn., shops of the Northern Pacific Railway for some time. The object



Rear View, with Coupling Inserted; Northern Pacific Air-Brake Hose Mounting Machine.

of the device is to insert the two fittings simultaneously while giving to the hose a rotary movement to avoid injury to the inner tube.

As shown by the illustrations, the hose is held in a cylindrical casting at the middle of the machine. This casting is journaled at each end and has a gear, cast integral therewith, at the center. The hose is held near each end by jaws which are pivotally connected to a yoke. This yoke is held in place by two springs bearing on its top, one at each end, which are riveted to brackets secured to the cylinder. The yoke and jaws may be removed readily by withdrawing the former from under these springs. In addition to the holding jaws just mentioned, expanding jaws are provided at each end of the cylinder for holding the ends of the hose. These are connected to the cylinder by springs which allow the end of the hose to expand as the fitting is forced in.

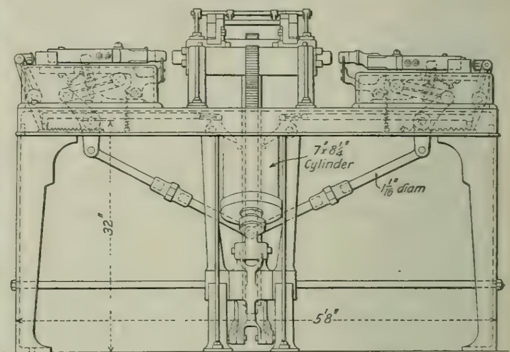


Cross-Section Through Cylinder and Rack Bar.

The hose is firmly clamped during the operation by an arm at each end of the cylinder, pivotally mounted on the same brackets to which the yoke-holding springs are riveted. The short end of this arm bears upon a block resting on the jaw and secured to the yoke. The long end of the clamping arm is raised and lowered by a short arm secured to a dog mounted on the back of the air-hose cylinder and actuated by a suitable shoulder on the rack-bar. All of this is plainly shown in the sectional views of the device.

The cylinder is rotated by the vertical rack-bar at the back of the machine, which is moved by an air cylinder beneath the machine. The initial upward movement of this bar locks or clamps the hose. Means are provided for holding the bar in the raised position when it has reached the end of its travel; also the necessary dogs and pawls are provided for releasing the pressure on the hose and restoring the parts to their normal positions when the rack-bar descends.

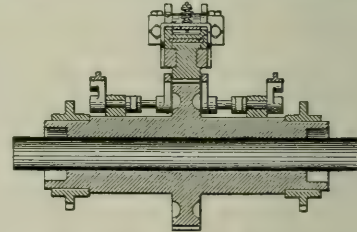
The mechanism for clamping and inserting the fittings is plainly shown by the illustrations. The parts for the nipples and for the couplings are substantially alike. The carriage on which the clamp is mounted is moved by levers from the air cylinder so that it will advance and insert the fitting as the cylinder, and therefore the hose, is rotated by the rising rack-bar. The clamp is two pivoted levers with toggle links at one end to force the jaws at the opposite end together to hold the fitting. Suitable means are provided for breaking



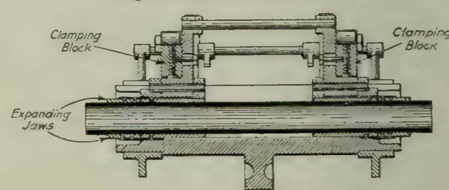
Front Elevation; Air-Brake Hose Mounting Machine.

the joint formed by the toggle links before the carriage begins its return movement.

The operator of the machine at Brainerd averages about four hose a minute, or 240 an hour, without undue exertion. The cost per hundred for this work is 8 cents. Hose mounted on this machine, on being cut apart, show no injury whatever to the inner tube by the fittings. The machine, which is



Longitudinal Section on V. V.



Longitudinal Section on W. W.

patented, is the invention of D. K. Fullerton, A. Ousdahl and E. Kronberg, of Brainerd shops, the first-named being foreman of the car department.

A bill for the construction of a railway in Java from Tjikampak to Cheribon has been passed unanimously in the Netherlands States-General.

RAILWAY SIGNAL ASSOCIATION.

The regular meeting of this association was held at the Engineering Societies' building, 39th street, New York City, on Tuesday of this week, about 200 persons being present, nearly all of them members. The chair was occupied by Vice-President H. S. Balliet. The chairmen of the principal committees made brief statements of the progress which they have made since the annual meeting.

Mr. Rudd, for Committee No. 1, reported that the members or groups of members had held in all eleven meetings. The sub-committee on aspects, by a majority vote, has endorsed the scheme of aspects which has been before the last two annual meetings, with the exception of Nos. 8 and 12. Of the schemes presented at the last meeting (Chicago) Nos. 2 and 3 have been rejected by a majority vote of the entire committee, though eight members were absent. Scheme No. 1 is preferred, because it can be more easily developed from present practice. Scheme No. 3 is held to be entirely adequate. By next month the committee expects to agree on a scheme of secondary aspects and then will formulate its report for the annual meeting. The committee will probably present designs for castings for upper quadrant semaphores, including semaphores for bracket signals and bridge signals.

Mr. Kelloway, for Committee No. 2, mechanical interlocking, reported that the time of that committee had been spent mostly in work designed to harmonize the conclusions of committees 2, 3 and 4. Mr. Allen, for Committee No. 3, power interlocking, reported progress. Mr. Elliott, for the committee on wires and cables, reported that three meetings had been held of the committee or of parts of the committee. The manufacturers have been requested to make 30-day tests of insulation resistance in water; also voltage tests of insulation. The committee expects to report in October. The same is true of the committee on storage batteries, Mr. Yocum, chairman.

Mr. Morrison then read his paper proposing modifications in the semaphore signal, which is printed on another page. The reading of Mr. Morrison's paper was followed by a long discussion.

W. H. Elliott (N. Y. C.).—No doubt the main reason for adopting the semaphore with the arm to the right of the post was because of the difficulties, on the left side, in clearing cars and engines. The upper left quadrant arrangement is probably the best, but can we reasonably make such an extensive change? It is comparatively easy for those who still move their signals in the lower right-hand quadrant, but not for those of us who have decided to use the upper right. Before the association acts we should see how much has been done toward the adoption of upper right, which has been definitely endorsed by the association. With the three-position signal the spindle supporting the arm must be 2¾ in. to one side of the post, which means that Mr. Morrison's proposal involves an expensive change and probably the reversal of the motor mechanism. The change would have to be made on a whole division at one time, for changing at random, while all-right in the day time, might be inconvenient at night on account of the possibility at interlockings of mistaking a green light when changing from two-position signals to three-position.

C. E. Denny (L. S. & M. S.).—On elevated roads where signals need not be very high all the semaphores would have to be changed and made high enough to clear the tops of the cars. I should not like to use the two kinds of signal on the same division, and therefore the change would have to be made on a whole division at a time. It does not seem worth while.

A. H. Yocum (P. & R.).—As we have miles and miles of line where the telegraph poles interfere with the view of our signals (as shown in one of Mr. Morrison's illustrations), I am favorable to placing the arm on the left of the post.

A. H. Rudd (Penn.).—Although Mr. Morrison emphasizes the simplicity of changing the signals by merely pushing along the blade in the casting, it is to be observed that his casting is a new design, not now in general use, so the change would require practically new spectacles everywhere. The merits of the upper left-hand movement were not neglected when the association's committee considered aspects preparatory to the report of 1906. I fully recognize its advantages. As one of the disadvantages of not having it, I may say that in some cases we have had to erect bridges for signals on a two-track road, because we could not move the telegraph poles back.

H. M. Sperry (Gen. Ry. Sig. Co.).—Mr. Morrison's paper is a valuable contribution. He has had to meet very unusual conditions due to the introduction of electric traction on his road, and he has been successful in meeting these conditions. He has made out a strong case. The Standard Code of the American Railway Association does indeed require that the governing arm shall be displayed to the right of the mast, but this requirement does not harmonize with the association rules for hand signals. These rules provide that the hand, flag and lamp signals shall be given by a man facing the approaching train and using the *right* arm. In other words, the association recognized, and has always recognized that hand signals must be made *across* the track or *toward* the track. These rules all confirm the position taken by Mr. Morrison. The signal across the track is undoubtedly the logical signal, and one important line—the Boston & Albany—formerly used left hand signals. To-day, when we want to make sure that a signal will not be disregarded, we place the signal arm across the track, as in the case of a draw bridge or "smash" signal.

J. M. Waldron (Int. R. T. Co.).—Why should we keep revising our standards? If we wish to retain the respect of the railway world we must weigh well our decisions before promulgating them. It is not necessary to change standards everywhere merely to accommodate special conditions here and there. Let us devote more time to standard apparatus so as to cheapen installations. This association very much needs an art commission, such as exists in New York city, to supervise municipal engineering works. The first we know there will be such a confusing variety of signals as to dwarf the æsthetic nature in the rising generation. Mr. Eck (So. Ry.) agreed with Mr. Waldron.

F. Rhea (Gen. Elec. Co.).—In the committee work three years ago we did not recommend upper left because we believed it impossible to make the change except by whole districts. Perhaps we were wrong; but uniformity is a desideratum, and we must take care about approving the idea that each road can ask the approval of the whole country for changes which are necessary to suit its own local conditions. The electric lines are likely soon to do a good deal of signaling, and the question of uniformity throughout all lines, both steam and electric, should not be ignored.

C. C. Anthony (Penn.).—One of the principal objections to Mr. Morrison's proposal is that the arm in the vertical position might deceive an engineman coming from the opposite direction, but it does not look as though this would be serious. On a bridge, surely every engineman can readily pick out his own signal, having the best possible opportunity to quickly differentiate between right and left, etc., while with bracket signals, set outside of all tracks, the eastbound and westbound signals are so far apart that there should be no excuse for mistaking one for the other. Still, Mr. Morrison has a problem in connection with the aspect shown in his Fig. 7, where the arm *before* the change is on the left of the post.

As to the merits of the scheme generally, it seems on the whole desirable. The change would not cure all of our difficulties in locating signals, but probably would cure most of them. I can see no serious danger in changing, and therefore the difficulty is only a commercial one. Probably the change

would have to be made on a whole division at a time. As to the reputation of the association, and the danger likely to be incurred by recommending changes too often, we have a good excuse for the present change because of the rise of electric roads, which now are beginning to introduce good signaling here and there. A prominent member of the Interurban Railway Association is now recommending signal practice different from that of steam roads, because their practice is not what he wants. If we aim at uniformity throughout all lines, steam and electric, we are justified in acting without waiting simply to preserve appearances.

H. C. Williams (N. Y. C.).—We have a trolley wire on a considerable length of our road, and we have had to use offset posts in order to properly locate the signals, yet the result is not quite satisfactory. Now is the time to change, as not many roads have adopted upper-right.

J. V. Young (B. & M.).—I think we ought to adopt the upper left. I have recently put up 1,700 signals and have found numerous cases where the use of upper left would have obviated difficulties.

Mr. Sperry.—Why discuss theory? Mr. Morrison has actually met the conditions. He has electric roads of two styles and had to adapt his practice to each. If a change is right this association is strong enough to make it.

The discussion was closed by the passage of a resolution to refer Mr. Morrison's paper and the discussion to Committee No. 1, and to request all members to inform that committee what they have done toward changing to upper right and what they think about the use of upper left.

The afternoon session was taken up by a carefully prepared and luminous paper by W. K. Howe, Chief Engineer of the General Railway Signal Co. on the use of alternating current in railway signaling. Mr. Howe went very thoroughly into the elementary conditions of track circuits on electric railways. His paper was illustrated by 12 diagrams showing the different arrangements now in use. The discussion on this paper dealt principally with the question of the desirability of using alternating current on tracks which are not electrified. Most railways have some trouble from interference of foreign currents with the action of automatic signals. For this trouble the alternating current is a sure cure. Mr. Elliott and others held, however, that the use of two relays in each section, one at each end, was a sufficient safeguard; therefore, the expense of alternating current, where it is not needed for other purposes, is unwarranted. The provision of a plant which can be depended upon to give an uninterrupted supply of electricty from a power house for a line of railway is a costly undertaking; there must be duplicate sets of apparatus and inspectors always on hand. The a.c. track circuit is more difficult to keep in adjustment. If you put in a.c. apparatus to-day there is small chance that when your road is electrified, say two years hence, your plant will be found adapted to the requirements.

H. A. Logue (Cumb. Val.) told of his experience with alternating current on a steam line. He has eight miles of double track equipped. The current is supplied from a point two miles outside the signaled territory. The power costs him three cents per k.w. hour, and the total cost thus far has been about $5 per signal per year; but the plant is yet new. Each signal has a second fixed arm so that there are two lights on each post.

Mr. Rhea pointed out that while the use of current from a power station and the use of electric lights made it unnecessary to have lampmen and batterymen, still the economy in wages is limited because there must be attendants enough to deal quickly with all emergencies.

Mr. Balliet, replying to a question, said that in the two years during which electric signals have been used in the electric zone of the New York Central there had been one failure of the power supply which affected the signals. With good supervision, power failures would be exceedingly rare.

OUR ENGINEERING EDUCATION AND THE MEN IT PRODUCES.*

A few years ago a couple of Junior students were secured from the school that claims to be the foremost engineering school in the United States to work one summer on a western railway. These young fellows were specially recommended by their teacher to do the work at which they were put. They worked for three days in a vain attempt to connect two tangents out on an open prairie by a simple 3 deg. curve. Instead of getting the work done they brought in a demonstration purporting to show that the tangents could not be so connected. The same two men ran a line of levels four miles long several times and never once came within 3 ft. of the true result, nor did any two trials give results within 3 ft. of each other. I should like to give you a lot of individual experiences I have had with new college men where their lack of thoroughness in the very things they were supposed to know best has dearly cost the railway companies employing them and me, and caused the young men to be set back instead of forward in their profession, but time forbids.

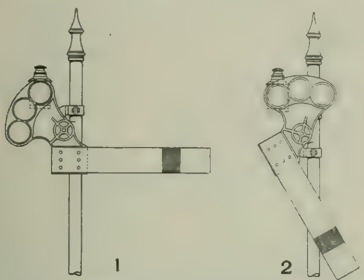
The college needs to teach such students how to be men as well as how to think. And no small part of its duty is to teach them how to fight and how to stand up for one's own. And when I say they need to be taught to fight and stand up for their own, I, of course, don't mean that they should do this in any brutal or unmanly way. But it is too often the case that young men are discredited because they do not know how to assert themselves in a firm and dignified way that commands attention. It is true that "faint heart never won fair lady," nor any of the other prizes of this life. The possessor of the "faint heart" may ultimately win a title to the "mansions in the skies," but he won't win any mansions here below until the hoggishness of mankind is removed, and there seems as yet to be a good deal of this commodity left. Young men don't need easy lecture courses in our colleges where they can sit on the benches and fold their little hands in ecstacy and say "how beautiful." They must have mental and physical work to do in anything else than homeopathic doses. They ought not to have too much leeway in choosing their own work, else they tend to choose it with teachers who deal too freely in flowers and pyrotechnics, or they choose a subject because it is well known as "a snap." I like authority, and I like discipline, and the good old hickory switch for bad boys and something very like to it for obstreperous young men. There are few real men developed in this world who have not been well exercised by both, by discipline and authority.

I could give you many an instance where young men have failed to accomplish the results expected of them for lack of the qualities named in my third charge above; and yet young graduate engineers who fail as I have indicated often wonder why, in railway work, brakemen, telegraph operators, section foremen and station agents, men oftentimes who have not enough education to solve a problem in the rule of three, are promoted ahead of them. The reason is clear to the railway manager. He knows that while the college man was attending the woman-taught high school, and going to college where he sat up late at night and ruined his health by eating indigestible suppers, and where he listened to easy lectures that appealed to him intellectually only in a dim and distant way, the brakeman and the telegraph operator had been learning, by getting down close to sweating humanity, the lesson of how to "get there." And now when the railway needed men to get things done, it wanted men who had brushed up hard against other men until they knew how to act like men.

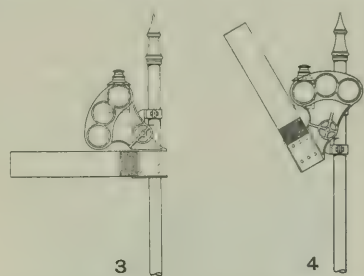
*From a lecture by W. D. Taylor, Chief Engineer of the Toledo, St. Louis & Western and Chicago & Alton railways, and formerly Professor of Railway Engineering at the University of Wisconsin; delivered before the Engineering Club of the University of Illinois, February 25, 1909, and repeated by request before the senior classes in engineering at the University of Wisconsin, March 29, 1909.

THE SEMAPHORE; UPPER LEFT VS. UPPER RIGHT.

At the meeting of the Railway Signal Association in New York on Tuesday of this week, C. H. Morrison, Signal Engineer of the New York, New Haven & Hartford, presented a paper discussing the merits of different arrangements of semaphore signals, speaking particularly of the advantage of moving the arm of the signal in the upper left-hand quadrant; referring, of course to American railways, where trains on double-track lines run on the right-hand track and where the engineman is on the right-hand side of the locomotive cab. A number of signals arranged in this way are in use on Mr. Morrison's road. Between East Hartford, Conn., and Vernon, the semaphores are so arranged because of a line of telegraph poles close to the track which would seriously interfere with the view of the semaphores if their arms projected to the right of the post. One of these signals was shown in the *Railroad Gazette* January 17, 1908. On the New York division (four track), where signals are attached to the overhead bridges which support the electric power wires, the signal arms are pivoted near their centers because of the narrow space in which they have to be placed in order to clear the roofs of the cars.

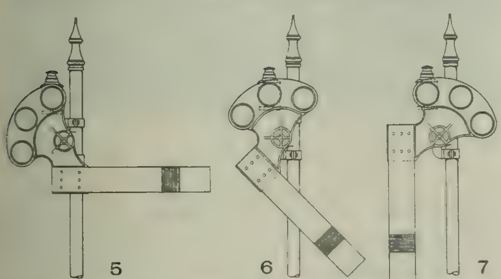


Figs. 1 and 2—Two-position Signal with Arm Extended to the Right.

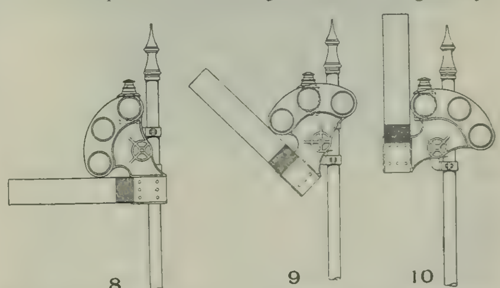


Figs. 3 and 4—Two-position Signal with Arm Extended to the Left.

Mr. Morrison began by giving a brief review of the history of the introduction of the semaphore signal in England and in America, pointing out some of the inconsistencies of the common practice and emphasizing the disadvantages incident to the use of the counterweight. Continuing, he said:



Figs. 5, 6 and 7—Three-position Signal with Arm Extended to the Right.



Figs. 8, 9 and 10—Three-position Signal with Arm Extended to the Left.

While the signal engineers have long desired to change the signal so as to give the proceed indication in some other position than in the lower right hand quadrant, it was never seriously considered by the Signal Association until 1905, when a special committee was appointed, and after a letter ballot it was the opinion of the majority of the members voting, that they preferred to have the proceed indication given in the arc of the upper quadrant instead of the lower quadrant, and at the annual meeting of the association in October, 1906, it recommended changing the signal so as to give the proceed indication in the upper right hand quadrant.

The association certainly made a step in the right direction in recommending the upper quadrant for the proceed indication, but did it go far enough when it decided to give the proceed indication in the right hand upper quadrant? The change recommended was radical and it would not have been any more radical to recommend the upper left hand quadrant. By recommending the upper right hand quadrant the association certainly overcame the objections of the old signals, but did it gain all the advantages that could have been gained by the radical changes? Some think it did not, and that therefore the question should be re-opened, and if the association is wrong it should rectify its mistake before going too far.

How many signal engineers have not found it difficult to locate signals where they can be plainly seen when the right of way is narrow and the telegraph pole line is close to the tracks? In cities where originally the railways owned sufficient right of way it has been found necessary to expand until the signals have been crowding over against high buildings, and it has been necessary to erect off-set poles to bring the signal from the building. Often long and deep cuts are made either through rock or long retaining walls are built, making it very difficult to locate signals through the cut without the use of off-set poles. A dark background such as is given by a building, water tank or trees, often obscures the view of the signal to such an extent that an off-set pole is used to bring the blade out where it can be seen. It is often very difficult to locate a signal on the inside of a curve on account of the short chord obtained for a view of the signal arm.

All the above-mentioned difficulties can be greatly mitigated, if not entirely overcome, by extending the blade to the left of the post and the post with the off-set will be almost entirely done away with and thereby save expense.

It may be claimed that the semaphore with the arm extended to the left when in the stop position, might be mistaken for the rear side of a signal of the old type for the opposite direc-

tion. On the majority of railways the signal blades are painted so as to be able to determine the front or the back and therefore a careful engineman ought not to make the mistake.

The benefits obtained by extending the signal arm to the left are certainly deserving of consideration by the association.

How is this change to be made? On the accompanying sketches are some suggestions as to how it could be easily made. The arm plate casting can be used for a signal with its arm extended to the right or left, either one. The scheme would be to change the arm plates on a section and at a predetermined time shift the blades frcm one end to the other. During the time that the arms are extended to the right, a movable counter-weight should be attached to the arm plate so it could be easily removed when the blade is shifted. Figures Nos. 1 and 2 show the two-position signal with the arm extended to the right. Figures Nos. 3 and 4 show the same signal with the arm extended to the left. Figures Nos. 5, 6 and 7 show the three-position signal with the arm extended to the right, and Figures Nos. 8, 9 and 10 show the same signal with the arm extended to the left. The signal with the arm to the right giving the proceed indication in the lower right hand quadrant can be changed to a signal with the arm to the left, giving a proceed indication in the upper left hand quadrant by simply moving the blade.

Fig. 11—Centrally Pivoted Semaphore near East Hartford.

Is the aspect of a signal moved in the upper left hand quadrant radically changed from what we have to-day? We have the same vertical post, we have the blade inclined in the same direction (the right hand end low) and the stripe is in relatively the same position with respect to the blade. The right hand end can be pointed, forked, round or square as desired; in fact, the only change is to put the blade to the left of the post. This change in aspect is certainly not so radical as moving the blade in the upper right hand quadrant.

There is a condition of signaling that is fast approaching that the signal engineers will be required to meet and that is the installation of block and interlocking signals on electrified lines or interurban electric railways where the trolley poles are spaced about 100 feet apart and their face about six feet from the gage of the nearest rail. Figure 14 shows how a situation of this kind was cared for on one of the New York, New Haven & Hartford Railroad Company's electrified lines. If the railways are willing to make a radical change in their signal system to increase safety and obtain a better signal system, why should not the association recommend a signal that will furnish the greatest advantages without materially changing the aspect? The arrangement here proposed will be uniform as well as save expense in making the change, as the proposed signal does not require changing the stroke. With the same stroke, arm plate and blade, you can have a signal as used to-day or a signal with its arm moving in the upper left hand quadrant. If the association was wrong, and some think it was, in recommending the arm to move in the upper right hand quadrant, let us get together and rectify our mistake and withdraw our recommendation before we go too far; and recommend the upper left hand quadrant in its stead.

Fig. 11 shows one of the signals between East Hartford and Vernon, referred to above. This is a part of the main line of the old New England Railway. It is now electrified for a few miles to accommodate the trolley cars of an interurban line controlled by the New Haven.

Fig. 12 shows signals on the New York division of the New Haven road, west of Stamford, where the line is electrified, and where the signals are fixed to the bridges which support the power line. We have added this four-track picture to those which appeared with Mr. Morrison's paper for two purposes: First, to show suspended signals with blades pivoted about midway between their two ends, and, second, to show how well semaphore arms appear without visible posts. In the second purpose, however, we have failed, because it is impossible to photograph the colors and because in this particular picture there is a sky background. At many of these bridges the thing that the observer actually sees is a bright red (or yellow) arm against a composite dark background; and a really good effect is produced, practically, without a post. That is to say, the vertical member on which the arm is pivoted, being dull black, in many situations presents no distinct shape, except at very short range; and yet the aspect of the arm—the difference between one that is vertical and one that is inclined—is as clear as could be desired. It must be borne in mind, though, that this satisfactory effect depends on having light-colored blades. With blades covered with smoke, signals hung beneath a bridge in this way (which usually impairs or obliterates the sky background) would be effective only at very short distances.

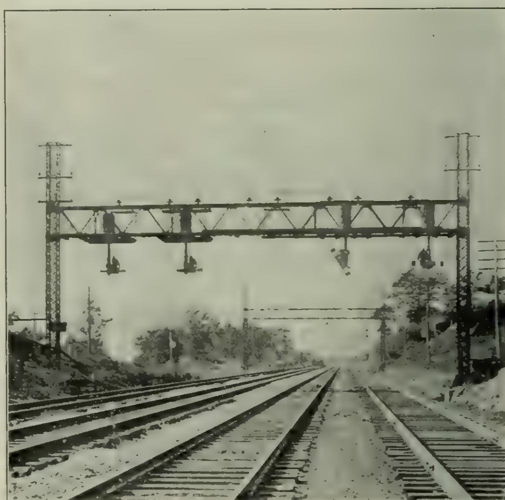


Fig. 12—Centrally Pivoted Semaphores on Electrified Section of New York Division.

General News Section.

Texas papers report that the International & Great Northern is preparing to have "train auditors" to collect tickets and fares on its trains.

The Pennsylvania has finished lining with concrete its tunnels under the Hudson river and Bergen hill, and they are now ready for laying track and installing signals.

The Northern Pacific is trying a McKeen motor car in short distance passenger service to and from Duluth. If it proves satisfactory for the service intended for it, more such cars will be used by the Northern Pacific.

The New York Public Service Commission, First District, has asked the Board of Estimate to appropriate $1,500,000 for lengthening station platforms in the Interborough Rapid Transit subway, so as to accommodate ten-car express trains.

The Continuous Securities Co., which has applied to the New York State Public Service Commission for authority to build moving platforms or sidewalks in New York City, has among its directors Edward P. Ripley, President of the Atchison, Topeka & Santa Fe.

The Santa Fe will appeal from the decision of the Federal court at Chicago by which it was fined for working telegraph operators in "broken tricks" in alleged violation of the hours of labor laws. (See *Railroad Age Gazette*, April 23, 1909, page 913, and April 30, page 954.)

H. I. Miller, President of the Chicago & Eastern Illinois, has been decorated by the Emperor of Japan with the Order of the Sacred Treasure as a token of esteem for services rendered by him to a commission of the Japanese government which visited the United States two years ago for the purpose of getting suggestions and information as a basis for re-organizing the railways of Japan.

Percy R. Wooley, a fireman on the Central of New Jersey, has received from the company the gift of a gold watch in recognition of his devotion to duty in stopping a passenger train on April 24. While the train was running at high speed near Hamilton, N. J., an accident in the cab disabled the engineman and made it impossible for the fireman to get into the cab, but he quickly climbed down behind the tender and opened the air-brake pipe, thus stopping the train.

The Pennsylvania Railroad, co-operating with the Pennsylvania State College of Agriculture, on June 1 ran a farmer's special train from Lemont to Lewisburg, Pa. This movement differs from other similar ones in that the railway is using a "follow-up" system to create added interest in scientific farming. On March 10 a special train running from Lewisburg to Lemont collected the station agents between those points and took them to State College, Pa., that they might see the work which is being done there, and return to their homes as missionaries in the cause of better farming. The next step is this farmers' special. This will give the professors from State College a chance to instruct the farmers in fundamental principles, which, if applied, will increase the crops of the farms. Following the farmers' special, the railway will on June 10 run an excursion from points between Montandon and Lemont to State College. This will afford the farmers an opportunity to visit the experiment station and to witness the results that have been accomplished by the practices which they have been urged to adopt.

A bill to incorporate "the Boston Holding Railroad Company" has been passed by the Massachusetts Senate. The bill makes Walter C. Baylies, Robert M. Burnett, Frederic C. Dumaine, and successors, a corporation with the name of the Boston Holding Railroad Company for the sole purpose of acquiring and holding the whole or any part of the capital stock, bonds and other securities of the Boston and Maine, and of voting stock so acquired. Section 2 fixes the stock of the new corporation at $100,000, and gives the corporation power to increase or reduce the stock, with the approval of the railway commissioners. It further says that a majority of the Boston and Maine directors and the directors of the new corporation shall be citizens of Massachusetts. Section 3 says that the Boston and Maine stock acquired by the new corporation shall not be sold without express authority of the legislature, and the railway commissioners shall report on the expediency of any proposed sale. Securities of the Boston and Maine, which may be acquired by the new company, shall not be sold or pledged by it without approval of the railway commissioners. Section 4 says that any railway incorporated now under the Massachusetts laws may guarantee the principal, dividends and interest of securities of the new company and may hold its stock and bonds, provided that the shares of the new company shall not be sold until such guarantee has been given. Any railway which acquires this stock shall not sell it without the authority of the legislature. The state may at any time, by act of the legislature, take by purchase or otherwise, the securities of the new company, provided it takes them all, the manner of determining the compensation being the same as now fixed by law.

Proctor Tunneling Machine.

The Terry, Tench & Proctor tunneling machine was described in the *Railroad Age Gazette* of September 11, 1908, page 929. A revolving head carrying 25 piston drills, driven by compressed air, chips away the face of the rock, the muck being carried to the rear of the machine by a belt conveyor. During the past week this machine has been at work driving an 8-ft. sewer in the Grand Central Station excavation in New York. So far it has only been in operation for short periods of about 15 minutes each. In such periods it has driven the tunnel heading at the rate of about 18 in. an hour, with air pressure varying from 55 to 70 lbs. and averaging not much over 60. The machine is designed for 100 lbs. pressure and should have at least 80. The latter pressure is the maximum that is available at the Grand Central at present. The rock is hard, being the lower part of the mica schist outcrop which forms Manhattan island. It also has some quartz in it. The muck was quite fine, the rock coming off in very small chips and powder. The Terry, Tench & Proctor Tunneling Machine Co., 131st street and Lexington avenue, New York, is back of the machine.

Missouri Electric Headlight Bill Vetoed.

Governor Hadley of Missouri has vetoed the bill passed by the legislature of that state requiring the railways to equip locomotives with electric headlights of 1,500 candle power.

Following the passage of this bill various headlights were tested at Jefferson City by representatives of the railways and of the railways' employees who had asked for this legislation, and an agreement was entered into in which the executive officers of the Missouri lines pledged their companies to "equip and keep equipped for use on all locomotives used in main-line service, headlights of power that will outline the figure of a man on or adjacent to the track, plainly visible at a distance of 800 feet, preceding the locomotive. The visibility herein mentioned is understood to be measured by and under ordinary night conditions, and for the normal sight of a person having the usual visual capacity required of a locomotive engineer at his place in charge of a moving locomotive. The conditions of this contract are to be carried out on or before June 1, 1910."

Governor Hadley had indicated that he would veto the act if the roads and their employees could reach an agreement. In his veto message he said:

"In taking this action I wish to call attention to the fact that if other controversies between the railway companies and the public could be dealt with in the same spirit of fairness with which this question has been met and decided, we would hear much less complaint about unjust legislation and much less complaint about unfair treatment from the railway companies. It is both the right and duty of the people, through the officers whom they have chosen to represent them,

to regulate the operation of roads in such a way as to secure reasonable and equal rights and a safe and proper service. This power should be conservatively exercised, and in such a way as to give the railway companies at all times a reasonable return on the value of their investment.

"That much of the legislation enacted along these lines is inadvisable and unfair is unquestionably true. That the railway companies are themselves responsible for the enactment of much of this legislation is also unquestionably true, and if the conflicting interests between the public and the railway companies could be dealt with by a board composed of men trained and experienced in this work, I am satisfied that far more satisfactory and beneficial results would be secured both to the people and the railway interests."

Railway Legislation in Wisconsin.

The legislature of Wisconsin at its recent session passed a law providing that no freight rate shall be increased without previous notice of 30 days to the railway commission, and giving the Commission power to suspend the application of any proposed rate until the railway shall have satisfied the Commission as to its reasonableness.

Another act empowers the Commission to order changes in highways when these are necessary in connection with elevation or depression of tracks, and to assess damages and divide expenses due to such changes.

Another act provides that where the distance between a station platform and the lowest step of a passenger car exceeds 19 in., a portable step must be provided.

Capacity of the N. Y. C.

On the New York Central 297,634 more carloads were handled this May than last. The total is a little under that of the same month in 1907. Our roads are to-day able to handle at least 20 per cent. more traffic than they handled during the boom times of 1907. Even now, with our loaded car movement only a little behind that of 1907, you would scarcely know that there was any freight moving through the yards, so smoothly and regularly does it pass through. Our fast freight trains are now on time just as regularly as the Twentieth Century.

Since the time of the great congestion on our lines, which was almost wholly due to conditions on the Boston & Albany and the Boston & Maine, we have spent $20,000,000 on the lines east of Buffalo.—*W. C. Brown in Wall Street Journal.*

A South Carolina View of the Georgia Strike.

A despatch from Atlanta referring to the unsettled points in the issue between the Georgia Railroad and the employees, says: "There are several reasons why the Georgia Railroad is considered a home institution. It employs Georgia men only. Its firemen and engineers and conductors and even its brakemen are all natives of towns and villages through which its trains run. These men have intermarried until nearly whole communities are related. * * * Many come from old and highly respected families and the idea of working with a negro is abhorrent to them."

We are not prepared to say whether this is the "reason" for the differences given by the railway men, but we are prepared to declare and to prove such alleged "reason" to be tommyrot. If that "sentiment" has developed along the line of the Georgia road it has been manufactured. It is not normal, either in Georgia or in the South. A fireman is regarded as the engineer's helper, the engineer's man, and in the South, where a white man prefers "bossing" a negro rather than one of his own color, there is, or there certainly was, a preference by white engineers for negro firemen.

The engineers on the Georgia road may belong to "highly respected families," but in engines on other roads and in thousands of private and in corporation blacksmith shops and foundries in the South white men have negro helpers in relations just as close as that between engineer and fireman. Neither the white mechanic, the white farmer, nor the engineers on other railways of the South are "horrified" at "the idea of working with a negro."—*Columbia State.*

Prizes for Engineers.

The Engineers' Society of Pennsylvania, E. R. Dasher, Secretary, Harrisburg, asks architects, electrical and civil engineers, and others, to compete for prizes, to be paid from a fund established by the society, for the best design of ornamental poles for the support of lights and trolley wires. Plans, specifications and estimates of cost must be submitted. The competition is to close July 15. For information address Paul A. Cuenot, Chairman, Harrisburg, Pa.

The Baldwin Twins.

The two 430,000-lb. articulated compound locomotives, built by the Baldwin Locomotive Works for the Southern Pacific, and illustrated in the *Railroad Age Gazette*, April 30, last, are being tested in regular service on the heavy grade divisions east of Sacramento. An informal report telegraphed from Sacramento, June 4, is as follows:

"The Baldwin twins are doing fine. Engine 4001, out from Roseville this morning, pulled a train of 1023 tons, an average of 11.6 miles per hour on the 2.2 per cent. grade to Goldrun, 46.7 miles; consumed 1883 gallons of fuel oil; receiver pressure, 75 lbs.; receiver temperature, 340 degrees; combustion chamber, 560 degrees; smoke arch, 360 degrees; feedwater, 300 degrees. This engine will handle 1,250 tons on a 2.2 per cent. grade or 30 per cent. more tonnage than two of the standard consolidation engines at a speed of eight miles per hour, with both engines steaming exceptionally free."

A Costly Municipal Ferry.

The Staten Island municipal ferry is costing the city of New York about $1,600 a day. Including interest charges, its operation for the year 1908 showed a deficit of about $600,000, and with the opening of the Stapleton branch and the calls for two new boats the cost to the city will be greatly increased. The actual operating expense last year was $1,064,060, and the receipts only $667,928.

The receipts were $11,883 less than they were in the preceding year. Through this ferry deficit the Borough of Richmond is practically eating up all that it contributes to the common purse in taxes.

The old Staten Island ferry, with its ramshackle equipment managed to break just about even in the operation of the ferry, and in those days the treasury of the city received a minimum revenue of $43,500 a year from the private owners of the ferry. Under the municipal ownership plan this income of $43,500 has been converted into an annual $600,000 deficit to give the Borough of Richmond (Staten Island) its improved facilities.—*New York Sun.*

Crop Conditions.

The crop reporting board of the department of agriculture estimates as follows:

The area sown to spring wheat is about 18,391,000 acres, or 1,183,000 acres (6 per cent.) more than sown last year. The condition of spring wheat on June 1 was 95.2, as compared with 95.0 on June 1, 1908, 88.7 on June 1, 1907, and 92.6 the June 1 average of the past ten years.

The condition of winter wheat on June 1 was 80.7, as compared with 83.5 on May 1, 1909, 86.0 June 1, 1908, 77.4 on June 1, 1907, and 80.5 the June 1 average of the past ten years.

The condition of rye on June 1 was 89.6, against 88.1 on May 1, 1909, 91.3 on June 1, 1908, 88.1 on June 1, 1907, and 89.4 the June 1 average of the past ten years.

The area sown to oats is about 32,422,000 acres, or 78,000 acres (0.2 per cent.) more than the area sown last year. The condition of the crop on June 1 was 88.7, as compared with 92.9 on June 1, 1908, 81.6 on June 1, 1907, and 88.4 the June 1 average of the past ten years.

The area sown to barley is about 6,881,000 acres, or 235,000 acres (3.5 per cent.) more than the area sown last year. The condition of the crop on June 1 was 90.6, as compared with 89.7 on June 1, 1908, 84.9 June 1, 1907, and 90.6 the June 1 average of the past ten years.

M. C. B. Train Lighting Circular.

The equipment of passenger cars with electric lights, either by the straight storage or axle-lighting system, is being rapidly extended by a large number of railways. In the interchange of these electrically lighted cars, some trouble is experienced in charging the batteries or operation of the systems, by reason of lack of information concerning the make, type, charging rate, etc.

It has been suggested that the Master Car Builders' Association prepare a form of card to be pasted in the interior of all such electrically lighted cars to assist in the proper operation of the electric-light equipment. The executive committee believes the suggestion to be a good one, and in order that it may be made operative at as early a date as possible, would recommend that the members of the association owning or operating such cars at once take steps to place in each car so equipped a placard containing complete information regarding the system used and the batteries.

Street Railway Association of the State of New York.

The twenty-seventh annual convention will be held at Fort Henry Hotel, Lake George, N. Y., June 29 and 30. J. H. Pardee, 611 W. 137th street, New York, is secretary.

There will be reports of committees on: Electric Express and Freight Service; City Rules; Classification of Accounts; Use of Curtains in Car Vestibules; Signaling Interurban Cars at Way Stations, and Carrying Musical instruments on Passenger Cars. The papers will be: Electric Railway Accounting, School of Trainmen and Latest Developments in Electric Railway Apparatus.

International Association for Testing Materials.

The fifth congress of the International Association for Testing Materials will be held on September 7-11, 1909, in Copenhagen, Denmark. With the exception of delegates from public bodies, only members of the association will take part in the congress.

Among the papers and reports to be presented are some on the following subjects: Metallography; Special Steels; Heat Treatment of Spring Steel; Hardness Testing; Impact Tests; Testing Metals by Alternating Stresses; Testing of Cast Iron; Influence of Increased Temperature on the Mechanical Qualities of Metals; Nomenclature of Iron and Steel with a Definition of Their Microscopic Constituents; International Specifications for Testing and Inspecting Iron and Steel; Conclusions Drawn from Studies on the Qualities of Rails, as Basis for Conditions of Tender for Rails; Testing Steam, Gas and Water Pipes; Spark Method for Grading Steels; Reinforced Concrete; Progress in the Methods of Testing Cement; Cement in Sea Water; Weathering Resistance of Building Stones; Oils; Wood; Paints on Metallic Structures.

International Railway Fuel Association.

The first annual meeting of the International Railway Fuel Association will be held at the Auditorium hotel, Chicago, on June 21, 22 and 23. The session on the first day will be called to order at 9:30 A. M., at which time members will proceed to dispose of necessary business as provided in section 5 of the by-laws. The following papers will be presented.

"Proper Method of Purchasing Fuel. Also the Permanent Interests of the Producer When Located on the Consumers' Rails." Committee, Chairman, Thomas Britt (C. P.); G. R. Ingersoll, (L. S. & M. S.); H. R. Lloyd, (C. M. & St. P.)

"Standard Type or Types of Coaling Stations." Committee, Chairman, J. H. Hibben, (M. K. & T.); S. L. Yerkes, (Queen & Crescent); C. F. Richardson, (St. L. & S. F).

"Best Method of Accounting for Railway Fuel." Committee, Chairman, J. P. Murphy, (L. S. & M. S.); C. G. Hall, (R. I.-Frisco); W. H. Grassman, (N. Y. C. & H. R.).

"Difference in Weights; Legitimate Shrinkage Allowable." Committee, Chairman, F. C. Maegly, (A. T. & S. F.); W. J. Jenkins, (M. P.); Chas. Keith, President Central Coal & Coke Co., Kansas City, Mo.

"Difficulties Encountered in Producing Clean Coal for Locomotive Use." Committee, Chairman, Carl Scholz, (R. I.-Frisco); J. Van Houten, (St. L. R. M. & P.); J. R. Ryan, G. M., Corona Coal & Iron Co., Corona, Ala.

"Briquetted Coal and Its Value as a Railway Fuel," C. T. Malcolmson, Briquetting Engineer, Roberts & Schaefer Co., Chicago, Ill.

On June 22, through the courtesy of the United States Steel Corporation, the members and their wives will visit the new steel plant at Gary, Ind. Transportation to Gary and return will be provided by the executive committee which has chartered the new steel passenger steamship "United States." The boat will leave the Indiana Transportation Co.'s docks at the south end of the Clark street bridge, Chicago, at 9:30 A. M. There will be music and refreshments on board and the return trip will end at about 4:30 P. M. Admission to the steamer will be by card and members are requested to advise the secretary, D. B. Sebastian, 327 LaSalle Station, Chicago, at once, giving the names of members who expect to make the lake trip so that passes may be issued.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers. A. G. Thomason, Scranton, Pa.

American Assoc. of Local Freight Agents' Ass'ns. G. W. Dennison, Penna. Co., Toledo, O.; June 22-25; Albany, N. Y.

American Institute of Electrical Engineers. –R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—S. F Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.

American Railway Industrial Association.—R. E. Wilson, Ry. Exchange, Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.

Association of Railway Claim Agents. –E. H. Hemus, A., T. & S. F., Topeka, Kan.

Association of Railway Telegraph Superintendents. P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club. –H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D Vought, 95 Liberty St., New York.

International Railway Fuel Association. D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg, Chicago.

Iowa Railway Club. –W B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St, Boston, Mass.; 2d Tues. in month, ex. June, July, Aug and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St, New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn. 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa., 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug; St. Louis.

Society of Railway Financial Officers.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.

Southern Association of Car Service Officers. –J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

For traffic agreement between the Kansas City, Mexico & Orient and the Chicago & Alton see editorial columns.

The American Express Co. has petitioned the Superior Court of New Hampshire to annul the order recently made by the State Railroad Commission reducing the express company's rates.

A cargo of freight arrived in New York City on May 31, which left Hongkong April 8, and came across the Isthmus of Tehuantepec, making the time 53 days. A steamer of the Mexican-Oriental Steamship line made the Pacific trip, delivering the freight at Salina Cruz, Mexico, the western terminus of the Tehuantepec Railway, and the goods were taken from the Atlantic terminus of the railway by the American-Hawaiian Steamship Co.

Beginning with June 20 the New York Central Lines will have a 25-hour train from Chicago to Boston, and will put through cars on the westbound afternoon fast mail from New York, No. 21, so as to have virtually a second westbound Lake Shore Limited. The Chicago-Boston train will leave Chicago on the Lake Shore at 8:25 a. m. (train No. 4), and arrive in Boston at 10:30 a. m. Train No. 21, leaving New York at 5:20 p. m., will have sleeping cars for Toronto, Cleveland and Chicago, and will run to Chicago in 24 hours 40 minutes. The midnight express, No. 59, will leave New York at 12:07 a. m., and run to Buffalo about two hours quicker than at present.

More than 700 Virginia farmers of Middlesex, Caroline, Westmoreland, King George, Richmond, Lancaster and Essex counties heard the lectures delivered on the Farmers' Special Instruction Steamboat operated on the Rappahannock river on June 4 and 5 by the Maryland, Delaware & Virginia Railway. The Educational Steamer left Fredericksburg at 6 o'clock Friday morning. Owing to the fact that the farmers along the Rappahannock river have a soil that is adapted to truck farming, their attention was directed especially to that feature of agriculture. W. W. Sproul, of Staunton, a successful potato grower, made thirty-minute talks at every wharf visited by the special. He instructed the farmers in methods for preventing "blight," and gave them the benefit of his experience of the last ten years.

New Southern Pacific Steamship.

The Newport News Shipbuilding & Dry Dock Company has taken a contract to build for the Southern Pacific Company four passenger and freight steamers to run between New York and ports on the Gulf of Mexico, the contract aggregating $3,000,000. The steamers are to be 450 feet long and will have a speed of 15¼ knots an hour.

Demurrage Hearing at Washington.

The hearing on the Demurrage Rules proposed by the sub-committee of the National Association of Railway Commissioners (printed in the *Railroad Age Gazette* May 21) was held in Washington June 4 and 5. Commissioner Lane, chairman of the sub-committee, presided. Commissioners Eaton, of Iowa; Gothlin and Sullivan, of Ohio, and others were present. The hearing room was crowded with representatives of railways and shippers. The American Railway Association had arranged for a sort of steering committee, which consisted of Arthur Hale, General Agent, as Chairman; Clyde Brown (New York Central) and E. B. Boyd (Missouri Pacific).

Among the other railway men present were Mr. Voorhees, of the Reading; Mr. Huntington of the Central of New Jersey; Mr. Trump, of the Pennsylvania; Mr. Phelps and Judge Trabue, of the Louisville & Nashville; Mr. Bierd, of the New Haven; Mr. Starr, of the Pennsylvania Company; Mr. Daly, of the Illinois Central; Mr. Ballantine, of the Rock Island; Mr. Jackson, of the C. & E. I. There were 50 or 60 representatives of shippers also present, including Mr. Moore, of the Republic Steel Co.; Mr. Belsterling, of the American Bridge Co.; Mr. Montgomery, of the International Harvester Co.; Mr. Ives, representing the New England Chamber of Commerce, and Mr. Seeds, representing the Illinois shippers.

Mr. Lane opened the proceedings with a brief address, in which he called attention to the necessity of a practical demurrage plan for securing full use of cars and the advantage of uniformity in demurrage rules. The railways, through their committee, presented a memorandum covering the general principles which should be embodied in any demurrage plan, as follows:

"The general principles that should govern the formulation of demurrage rules are as follows:

"1. The prompt release of loaded cars and the prompt loading of empty cars are essential to the efficient operation of railways in the interest of both shippers and carriers.

"2. The undue retention of cars by consignees or consignors prevents the distribution of empty cars to other patrons and causes car shortages in times when business is prosperous.

"3. The service to be rendered by the carriers in consideration of the freight charges does not include the use of the cars for storage purposes by the consignee.

"4. The occupancy of cars by consignees or consignors is of value to them and a cause of expense to the railways.

"5. The only method of preventing the undue detention of cars by consignees or consignors is by the imposition of charges for their occupancy and that of the tracks upon which they stand, and these charges are fully justified by the conditions as stated above in 1, 2, 3, and 4.

"6. These demurrage charges should be uniform under practically similar conditions of service in order to avoid unjust discrimination."

The rules were then discussed seriatim, and almost every rule was criticized, the criticisms coming from both shippers and railway companies. There were a great many pleas for additional time on certain commodities and much argument for and against the average rule, but practically no objection was made to the theory of car demurrage, and before adjournment there was what was essentially an agreement between the shippers and the railways to this effect.

The question of reciprocal demurrage was raised only once, and the chairman decided that it could not be considered in connection with these particular rules.

In view of the pressure for the inclusion of an average rule it was stated, for the railways, that there was less objection to an average agreement which covers only one kind of cars than to the usual average agreements which cover all kinds of cars; and it was intimated on the part of the sub-committee that it might prefer an average rule to a "bunching" rule.

The railways appeared to be a unit in favor of the old private car rule, which exempts from demurrage rules only private cars on the tracks of their owners, and none of the shippers objected to this excepting the representatives of the independent tank lines who advocated the exemption of tank cars at all points, on the plea that tank cars are so entirely and completely private cars that the general public has no interest in them. If this were admitted it would be hard to see what jurisdiction the various commissioners could have over them.

We understand that when the sub-committee has finally passed upon these rules they will next be considered by the full committee on car demurrage, which will report to the National Association of Railway Commissioners in October. If they are approved by that body there will be a chance for the American Railway Association to act on them in November.

Rebate Fines on the Missouri Pacific.

Judge Trieber, of the United States District Court, last week fined the St. Louis, Iron Mountain & Southern Railway Co. $15,000 for paying grain rebates in the latter part of 1907. The company pleaded guilty. At the same time Wade H. Ellis, United States Assistant Attorney General, made the following explanatory statement:

"It appeared from the investigation that the payments were made by the direction of the former traffic manager of the company not only without the direction or knowledge of the superior officers of the railway, but in direct violation of express orders given by Vice-President C. S. Clarke, who upon assuming control of the property in St. Louis gave explicit orders that no rebates of any character should be given and no preferences of any kind shown to any shippers."

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1909.
(See also issue of June 4.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atlantic Coast Line	4,468	$1,616,721	$509,118	$2,310,603	$312,480	$273,833	$34,492	$740,582	$62,302	$1,423,689	$886,914	.....	$103,013	$783,901	$150,169
Atlanta, Birmingham & Atlantic	642	144,829	30,577	186,026	25,647	32,953	11,962	85,793	12,478	168,833	17,193	.....	8,000	9,193	‡16,203
Boston & Maine	2,242	1,943,067	1,037,405	3,242,023	253,031	424,763	40,851	1,381,902	91,954	2,192,501	1,049,522	$3,404	150,033	902,893	231,937
Central of Georgia	1,916	513,885	196,556	791,264	127,133	179,324	26,619	257,992	37,044	628,111	163,153	4,900	40,500	127,553	35,697
Central of New Jersey	668	1,593,085	343,231	2,045,823	166,675	300,032	24,210	503,523	41,782	1,036,222	1,009,601	788*	76,374	932,439	123,653
Central of Vermont	411	205,542	62,774	292,797	16,842	25,405	7,447	136,931	7,418	194,042	98,755	392	12,500	86,647	22,867
Chicago & Alton	998	579,208	284,613	947,340	124,183	97,402	38,059	317,684	28,225	605,553	341,787	1,568*	35,000	305,219	3,551
Chicago, Rock Island & El Paso	111	40,668	22,116	68,035	8,175	8,609	663	18,830	1,662	37,939	30,096	328	2,492	27,933	13,518
Chicago, Rock Island & Gulf	527	180,581	59,932	252,247	20,705	17,970	6,028	102,400	7,650	154,753	97,494	253*	6,261	90,980	36,189
Chicago, Rock Island & Pacific	7,414	2,788,775	1,212,328	4,297,729	595,538	440,506	113,658	1,738,069	131,335	3,019,106	1,278,623	15,500*	172,124	1,090,999	333,991
Cincinnati Northern	248	87,470	12,448	103,953	21,114	22,210	2,685	33,521	2,848	82,378	21,575	.....	4,100	17,475	17,193
Cleveland, Cin., Chic. & St. Louis	1,982	1,388,704	501,052	2,109,204	270,410	396,452	69,770	851,103	44,480	1,632,215	476,989	4,252*	74,000	398,737	141,844
Delaware & Hudson	845	1,500,654	187,191	1,735,832	123,344	237,756	14,140	591,537	38,160	1,004,938	730,894	453*	35,000	695,441	187,081
Denver & Rio Grande	2,516	1,282,993	367,344	1,723,952	224,270	317,619	39,367	615,471	44,384	1,241,111	482,841	965	61,000	422,806	3,297
Florida East Coast	584	258,568	110,535	440,083	25,167	36,666	5,573	100,723	8,050	176,479	263,604	.....	12,350	251,254	82,248
Fort Worth & Denver City	454	223,103	116,283	356,631	58,682	63,612	6,542	132,060	15,536	276,432	80,199	497	9,319	71,377	16,606
Galveston, Harrisburg & San. Antonio	1,338	564,239	203,868	803,893	100,113	122,459	21,653	312,482	26,485	583,192	220,701	515*	28,179	192,007	28,588
Houston & Texas Central	789	284,712	99,896	412,830	58,633	76,798	21,211	177,181	19,330	353,153	59,677	.....	19,632	40,045	‡2,371
Lake Erie & Western	724	273,343	52,484	346,619	63,947	77,125	11,031	137,364	9,083	298,850	47,769	.....	17,000	30,769	58,238
Lake Shore & Michigan Southern	1,511	2,206,451	699,994	3,336,855	464,185	552,826	80,311	1,109,082	58,566	2,265,270	1,071,585	8,140*	125,000	938,445	80,568
Long Island	392	270,109	383,847	682,494	91,880	107,943	10,599	296,020	22,911	529,353	153,141	46,273	27,236	172,178	‡5,071
Louisiana Western	198	97,909	48,587	154,130	14,082	18,424	4,084	40,682	6,856	84,128	70,002	871	5,000	65,873	2,164
Louisville & Nashville	4,388	2,592,008	765,166	3,619,650	451,454	654,142	85,783	1,187,800	75,811	2,457,990	1,161,660	10,066*	112,700	1,038,894	414,045
Michigan Central	1,746	1,503,325	474,292	2,190,467	291,060	316,628	63,098	840,498	35,753	1,547,037	643,430	6,026*	94,000	543,404	‡3,858
Morgan's La. & Tex. R.R. & S.S. Co.	351	209,346	92,220	320,843	37,265	35,508	7,356	124,525	11,954	216,608	104,235	3,237	16,000	91,472	9,074
New York Central	3,587	4,339,085	2,150,233	7,306,452	858,513	1,781,153	174,656	2,581,757	168,908	4,961,987	2,344,465	18,482	385,211	1,977,736	612,193
New York, Chicago & St. Louis	556	711,551	117,922	858,730	71,890	121,122	49,982	334,977	13,478	591,449	267,281	1,692*	26,000	239,589	46,952
Oregon Short Line	1,456	1,075,963	359,967	1,517,817	163,857	130,897	18,840	270,778	30,213	614,585	903,232	680*	50,000	852,552	21,587
Peoria & Eastern	351	155,011	49,029	223,373	33,494	34,458	5,635	89,608	4,802	167,997	55,376	.....	8,800	46,576	25,161
Rutland	468	138,071	76,823	242,737	37,024	31,762	6,280	85,665	5,629	166,360	76,377	.....	8,763	67,615	16,101
St. Louis & San Francisco	4,726	1,938,391	664,133	2,828,138	298,061	253,932	80,115	973,159	98,798	1,704,065	1,124,073	.....	120,781	1,003,292	213,605
St. Louis Southwestern	773	393,876	88,457	508,006	93,968	100,636	20,695	127,490	22,266	365,055	142,951	755*	14,827	127,369	6,979
St. Louis Southwestern of Texas	697	166,137	53,086	238,201	91,038	79,642	9,542	113,912	15,424	309,558	71,357*	209*	8,333	79,899†	8,616
San Pedro, Los Angeles & Salt Lake	1,099	456,275	228,155	721,509	69,418	99,639	27,378	228,840	16,759	442,034	279,475	2,338*	23,143	253,994	108,568
Texas & Pacific	1,885	738,604	268,535	1,073,908	164,509	206,557	14,241	511,998	34,908	932,213	141,695	673	38,000	104,368	48,942
Toledo, St. Louis & Western	451	223,851	32,899	275,042	32,241	27,448	6,405	92,618	7,666	166,378	108,664	.....	12,200	96,464	38,001
TEN MONTHS OF FISCAL YEAR.															
Atlantic Coast Line	4,468	15,398,332	4,951,514	21,958,462	2,963,195	2,990,195	356,710	7,085,310	615,336	14,010,746	7,947,716	.....	913,013	7,034,703	1,931,619
Atlanta, Birmingham & Atlantic	642	1,271,206	371,864	1,747,675	225,556	305,852	101,257	688,584	76,172	1,397,421	350,254	.....	71,000	279,254	‡7,476
Boston & Maine	2,242	19,049,050	11,186,729	32,739,889	3,556,733	3,851,302	391,728	14,870,509	798,093	23,463,365	9,276,524	84,086	1,474,526	7,886,084	841,943
Central of Georgia	1,916	6,490,159	2,298,993	9,624,768	1,325,352	1,804,753	263,682	2,952,832	365,467	6,712,086	2,912,682	49,779	403,758	2,558,703	318,125
Central of New Jersey	668	13,946,577	3,514,245	18,469,477	1,730,861	3,050,447	251,805	4,967,519	379,490	10,380,123	8,089,354	229,454	824,391	7,494,417	191,333
Central of Vermont	411	1,877,229	805,626	2,908,509	368,172	443,523	74,313	1,372,936	71,373	2,330,317	578,192	7,547	100,675	485,064	1,334
Chicago & Alton	998	6,536,836	3,196,902	10,601,864	1,019,617	1,184,496	392,457	3,417,106	300,705	6,314,381	4,287,483	10,378*	305,000	3,972,105	588,876
Chicago, Rock Island & El Paso	111	372,255	209,636	634,762	71,271	83,546	6,001	204,767	16,012	381,597	253,165	53*	24,867	228,245	9,787
Chicago, Rock Island & Gulf	527	1,793,440	619,815	2,535,891	483,980	199,859	60,637	968,498	84,908	1,797,882	738,009	1,675*	41,077	695,257	‡90,733
Chicago, Rock Island & Pacific	7,414	30,890,865	14,003,230	47,829,850	7,124,914	6,075,469	1,127,127	18,081,459	1,282,921	33,692,890	14,137,960	117,541*	1,799,762	12,220,657	907,876
Cincinnati Northern	248	735,502	166,878	946,780	181,407	240,207	26,785	331,621	24,647	804,667	142,113	.....	39,217	102,896	49,432
Cleveland, Cin., Chic. & St. Louis	1,982	13,883,096	6,695,657	21,646,903	2,365,066	3,897,214	696,083	8,658,405	439,913	16,056,681	5,590,222	36,165*	707,348	4,846,709	613,995
Delaware & Hudson	845	12,875,048	2,286,616	15,640,417	1,116,023	1,794,973	177,556	5,589,953	392,650	9,071,155	6,569,262	1,492*	346,749	6,221,021	‡462,897
Denver & Rio Grande	2,516	12,512,273	3,983,067	17,268,952	1,954,333	2,967,880	382,356	6,085,462	501,281	11,891,312	5,377,640	37,035	645,750	4,768,925	‡875,271
Florida East Coast	584	1,288,474	998,032	2,681,911	371,811	385,356	56,298	928,951	83,303	1,825,719	856,192	.....	112,750	743,442	316,751
Fort Worth & Denver City	454	2,611,794	1,419,458	4,219,990	656,927	619,970	71,120	1,336,340	144,809	2,829,166	1,390,824	4,697*	88,814	1,297,313	159
Galveston, Harrisburg & San. Antonio	1,338	6,235,448	1,837,858	8,498,143	1,102,614	1,095,352	228,414	3,333,089	268,604	6,028,073	2,470,070	15,012*	205,402	2,249,656	742,188
Houston & Texas Central	789	3,556,710	1,174,025	5,042,927	671,219	722,155	160,206	1,877,461	195,059	3,626,100	1,416,827	.....	134,169	1,282,660	86,121
Lake Erie & Western	724	2,788,134	641,911	3,626,126	513,307	739,383	107,156	1,429,353	101,214	2,890,413	735,713	.....	170,760	564,953	14,186
Lake Shore & Michigan Southern	1,511	22,254,568	7,833,288	34,364,684	3,964,661	5,189,448	820,649	11,078,105	581,029	21,633,892	12,730,792	35,047*	1,273,647	11,422,098	559,060
Long Island	392	2,230,141	4,156,934	6,653,031	846,649	1,033,865	130,538	3,062,346	181,121	5,254,519	1,398,512	704,688	272,357	1,830,843	626,239
Louisiana Western	198	1,103,973	460,179	1,645,694	153,106	195,323	48,977	443,365	67,234	908,005	737,689	6,315	50,727	693,277	45,029
Louisville & Nashville	4,388	27,414,576	8,432,624	38,250,289	4,304,628	6,727,456	838,580	12,261,922	782,633	24,915,219	13,335,070	91,292*	1,124,825	12,118,953	4,133,832
Michigan Central	1,746	14,085,563	5,174,473	21,139,577	2,479,015	2,998,058	599,059	8,196,695	350,604	14,623,432	6,516,145	50,987*	941,694	5,523,463	‡451,380
Morgan's La. & Tex. R.R. & S.S. Co.	351	2,785,041	881,014	3,915,485	646,934	411,717	83,443	1,437,584	125,314	2,704,992	1,210,493	13,131	161,115	1,062,509	192,323
New York Central	3,587	42,259,015	22,532,031	72,400,279	8,377,363	12,686,803	1,759,208	27,100,406	1,671,553	51,595,333	20,804,946	113,974	3,803,026	17,115,894	1,927,891
New York, Chicago & St. Louis	556	6,397,404	1,173,279	7,828,458	769,173	876,259	435,943	3,189,568	131,213	5,402,156	2,426,302	12,209*	289,510	2,124,583	‡296,426
Oregon Short Line	1,456	10,471,922	3,309,365	14,650,750	1,272,842	1,382,063	184,774	2,805,379	299,634	5,944,692	8,706,058	2,152*	498,048	8,205,858	1,582,950
Peoria & Eastern	351	1,603,789	554,469	2,354,936	290,960	385,275	52,035	925,181	45,860	1,699,311	655,625	.....	89,012	566,613	‡18,589
Rutland	468	1,273,337	834,633	2,374,034	345,193	327,131	62,581	904,121	60,671	1,699,697	674,337	.....	91,235	583,102	128,608
St. Louis & San Francisco	4,726	19,970,735	7,609,916	29,886,761	4,149,538	3,720,051	668,543	10,277,737	934,988	19,750,857	10,135,904	.....	1,259,829	8,876,075	549,942
St. Louis Southwestern	773	4,446,920	998,444	5,690,038	797,308	951,339	212,183	1,393,909	203,468	3,558,207	2,131,831	5,721*	150,205	1,975,905	54,625
St. Louis Southwestern of Texas	697	2,161,250	727,404	3,098,456	863,950	677,295	88,407	1,351,978	153,922	3,135,552	37,096*	2,465*	71,596	111,157†	154,246
San Pedro, Los Angeles & Salt Lake	1,099	3,538,580	2,075,222	5,997,256	861,363	825,792	249,794	1,969,632	169,306	4,075,887	1,921,369	25,463*	238,331	1,657,575	775,851
Texas & Pacific	1,885	8,531,147	3,113,000	12,478,334	1,491,420	1,928,282	151,879	4,886,162	335,445	8,793,188	3,685,146	18,742*	538,389	3,128,015	335,891
Toledo, St. Louis & Western	451	2,268,341	385,892	2,850,386	315,295	365,203	57,944	977,272	78,882	1,794,596	1,055,790	.....	115,700	940,090	‡9,364

*Deficit. †Loss. ‡Decrease.

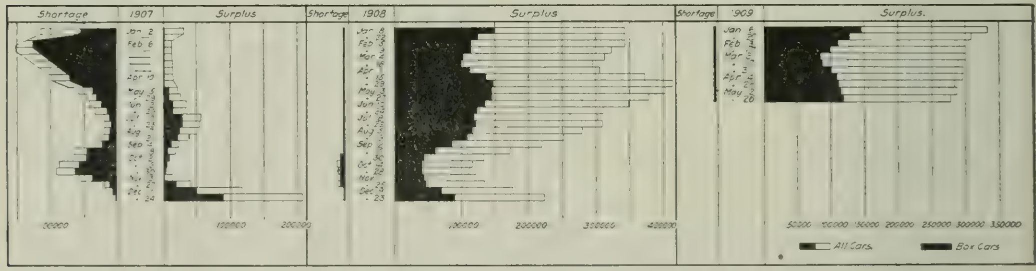
Car Surpluses and Shortages.

Arthur Hale, General Agent of the American Railway Association, in presenting the bulletin giving a summary of car surpluses and shortages by groups from February 19, 1908, to May 26, 1909, says:

"A decrease is shown from our last report of 10,589 in the number of surplus cars, bringing the total down to 273,890. Box cars show an increase of 4,656, while coal and gondolas decrease 8,678. There are also decreases of 1,634 in flats and 4,933 in miscellaneous. The largest decreases are in groups 3 (Middle) and 6 (Northwestern), while groups 1 (New England), 5 (Southern) and 9 (Southwestern) report slight increases."

CAR SURPLUSES AND SHORTAGES, FEBRUARY 19, 1908, TO MAY 26, 1909, INCLUSIVE.

		Surpluses.					Shortages				
	Number of roads.	Box.	Flat.	Coal. gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal. gondola and hopper.	Other kinds.	Total.
May 26, 1909	158	118,257	14,940	97,006	43,687	273,890	83	99	1,011	47	1,240
May 12, 1909	158	113,601	16,574	105,684	48,620	284,479	78	4	22	83	187
April 28, 1909	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
April 14, 1909	163	108,291	17,692	122,982	47,698	296,663	80	135	109	19	343
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249



Car Surpluses and Shortages in 1907, 1908 and 1909.

The accompanying table gives surpluses and shortages for the period covered by the report and the chart shows surpluses and shortages in 1907, 1908 and 1909.

Spokane Rate Question Arranged.

As a result of the conference Wednesday between attorneys of the Harriman lines and representatives of Spokane business interests, arrangements were reached as to the rates—both class rates and commodities rates—to be effective July 1 next. The agreement is to the effect that the class rates laid down in the decision of the Interstate Commerce Commission in the Spokane case are to become effective July 1 next. The commodities rates as laid down in that decision are to be suspended pending a hearing which the commission will accord early in the fall, probably at Spokane. The greater part of the freight in this territory moves on commodity rates.

Railroad Commissions.

The coal rate schedule issued by the Railroad Commission of Missouri, effective on May 1, and which was suspended until June 10, has been again suspended until July 10.

INTERSTATE COMMERCE COMMISSION.

Rates on Yellow-Pine Lumber.

Chicago Lumber & Coal Co. et al. v. Tioga Southeastern et al. Opinion by Commissioner Clements.

Complainants manufacture yellow-pine lumber in Arkansas and northern Louisiana and snip it over defendants' lines to markets in central freight association territory. By simultaneous action the defendants established rates of 16 cents per 100 lbs. to Cairo, Ill., from the entire producing territory, resulting in an advance of 2 cents per 100 lbs. on lumber originating in complainants' territory, but in other portions of the producing territory the rates remained stationary and there were material reductions in some quarters. Complainants attacked the advance as unreasonable and discriminatory. The rates were not unreasonable *per se* and, under all the circumstances, there is no reason for interfering with the present adjustment.

The fact that the advance was the result of conference and understanding between the carriers is entitled to be duly considered in connection with other circumstances bearing on the reasonableness of the rates under consideration, but this fact does not of necessity establish the unreasonableness of such rates. Each case must be decided upon its own merits. A substantial dissimilarity in transportation conditions are found to exist in the producing territories east and west of the Mississippi river. Where competitive conditions among shippers are the leading considerations that induce a complaint, the commission in determining the reasonableness of rates must have due regard to transportation conditions and the rights of the carriers as well as the interests of shippers. The movement of traffic is encouraged and increased when carriers adjust their charges to meet mercantile interests, but they are not obliged in adjusting their charges to equalize the value of commodities in their final distribution. A carrier is not guilty of discrimination because it does not afford as favorable rates as others serving a different territory, though the products carried by each are brought to the same market.

The law does not deal with carriers collectively as a single unit or system, but its commands are directed to each with respect to the service which it is required to perform.

The decision of the commission must be based upon broad principles of justice, keeping in view the welfare of the public as well as the interests of carriers and shippers in the entire territory involved, and under the facts and circumstances of this case it should not be limited to those interests located in a restricted part of the producing territory. Blanket or group rates in many cases, especially with reference to particular commodities, are of great advantage to the public without serious injustice to any interest, though there is of necessity more or less disregard of distance and varying degrees of inequality.

STATE COMMISSIONS.

The Nebraska State Railway Commission held in the case of Florence Lumber & Coal Co. v. Chicago, St. Paul, Minneapolis & Omaha, that the statute creating the commission did not give it the power to award reparation.

The Nebraska State Railway Commission has held that where a higher rate is charged for the shipment of horses that are to be used in the speed ring than on horses that are to be exhibited in the show ring, there is an apparent discrimination, but since the carriers have voluntarily given a reduced rate on certain classes of freight, namely, the horses for use in the show ring, the commission cannot compel the carriers to extend this reduced rate to other classes of freight.

The Railroad Commission of Louisiana has adopted a rule providing that shipments, including freight returned for repairs, loaded on open cars, are subject to a minimum charge equal to that for 5,000 lbs., at first class rate, for each car used. Any article too large to be loaded through the side door of a 36-ft. box or stock car or too long to be loaded through the end window, shall, unless otherwise specified in the classification, be charged actual weight for the class rate, provided that in no case shall the charges for the entire shipment be less than for 5,000 lbs. at the first class rate.

The New York Public Service Commission, Second district, has appointed William L. Derr inspector in its division of transportation, succeeding Edmund Van Hoesen, resigned to accept a position with the State Engineer and Surveyor. For a number of years Mr. Derr was engaged with the Erie, being at different times Superintendent of the Jefferson, Delaware, Susquehanna and New York divisions, and finally Acting Chief Engineer. Later he was Superintendent of the Hartford division of the New York, New Haven & Hartford, and then became Superintendent of the Chicago & Alton Lines in Illinois. He was for a year General Superintendent of the Metropolitan Street Railway of New York. His salary is to be $3,000.

G. F. Grattan, attorney for the Railroad Commission of Kansas, has filed with the commission a motion that it shall rescind the order issued by it about a year ago requiring an average reduction of 25 per cent. in freight rates in the state, and the board has acted favorably on the motion. The commission thus concedes the defeat of the state in the litigation in the Federal court growing out of the rate order referred to. Mr. Grattan gave two reasons for filing the motion. One was that the United States Circuit Court had indicated that the commission lacked jurisdiction to establish the jobbers' rates provided for in its order, and that the class and commodity rates provided for, without the jobbers' rates, would not be for the best interests of the state at large and would be especially injurious to its commercial interests. The second reason given was that after the decision of the court the commission presented to the legislature a schedule of reasonable maximum rates which was enacted into a law and which the railways have announced they will put into effect.

New York. Loading and Unloading Freight at Rochester.

Moseley & Motley Milling Co. et al. v. New York Central & Hudson River et al. Opinion by Commissioner Decker.

The long existing practice on the part of railways of having tallymen assist owners in loading and unloading carload package freight on the station team tracks was abrogated on January 1, 1909, by amendment of rule 8-B of the Official Classification which as amended reads: "Owners will be required to load and unload freight in carloads when carried at carload rates."

Prior to January 1 the rule read: "Owners will be required to load and unload freight in carloads, except that the carriers reserve the right to load and unload at their convenience."

The rule as amended was construed by the carriers to forbid such assistance in loading and unloading by tallymen. It appeared in the cases that the increased cost to shippers and consignees through forbidding assistance of the tallymen is large, while under the new rule the operating cost of the carriers is not materially diminished. Immediately after January 1 the carriers, because of competition or local conditions, put in exceptions at various large cities, including Buffalo, New York, Toledo, Cleveland, Cincinnati, Chicago, St. Louis, and also at Fulton, N. Y. Under these exceptions such assistance by tallymen is permitted or privileges respecting loading and unloading of equal or greater value are afforded. No such exceptions were put in effect at Rochester or Troy.

The commission holds that the former existing practice should be restored at Rochester and Troy. Such practice was merely an incidental modification of the carriers' rule requiring owners to load and unload carload freight, and it may be restored by suitable tariff or classification amendment without materially affecting general application of the rule itself. No important discrimination would result from a return to the old rule, and such rule would obviate both the present and future real discrimination caused by exceptions in force at designated cities, the discriminations resulting from probable non-observance in future of the present rule as construed by the carriers, and the present unnecessary and great aggregate cost laid upon shippers and consignees.

COURT NEWS.

Judge Trieber, of the Federal court, rendered a decision at Little Rock, Ark., on June 5 in the case of Watson v. the St. Louis, Iron Mountain & Southern sustaining the constitutionality of the employers' liability act, passed by Congress in 1908.

The United States Circuit Court at St. Louis issued an injunction on June 7 restraining the Interstate Commerce Commission from enforcing its order requiring the Northern Pacific to join with the Harriman lines in establishing a through route for passengers going to or from points on Puget Sound via Portland. The order of the commission is attacked upon the ground that reasonable through routes to Puget Sound already exist via the Hill lines.

In the United Circuit Court at New York City, June 4, Judge Lacombe made permanent the injunction, which was granted several months ago, forbidding the enforcement of the order of the Interstate Commerce Commission, directed to the Delaware, Lackawanna & Western, regulating the manner of dealing with carload shipments made up by a forwarding agent and consisting of numerous small shipments for different consignees. The complainant, the Export Shipping Co., appears to have gone into bankruptcy and to have neglected to appear in court. In default of such appearance the perpetual injunction was issued.

The report of the auditor appointed by the Supreme Court of Georgia holds that the full 5 per cent. interest on the second and third mortgage income bonds of the Central of Georgia was payable out of earnings of the fiscal year ended June 30, 1907. The report renders judgment in favor of bondholders for $288,970 interest unpaid, since in 1907 but 3.729 per cent. was paid on the $7,000,000 second income bonds and nothing on the $4,000,000 third income bonds. The Central of Georgia controls, through ownership of the entire stock, the Ocean Steamship Co., and the auditor's report holds that the surplus earnings of this Ocean Steamship Co. should have been included as earnings available for payment of dividends on the income bonds. In the fiscal year ended June 30, 1908, no dividends were paid on these income bonds.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

D. A. Sortwell has been elected the President of the Barre Railroad, succeeding A. D. Morse, resigned.

O. H. Nance, Treasurer of the Trinity & Brazos Valley, has been appointed the Auditor of the St. Louis, Brownsville & Mexico, with office at Kingsville, succeeding W. I. Church, resigned.

Richard A. Jackson, President of the Rock Island Company and Vice-President of the Chicago, Rock Island & Pacific, has been elected also General Counsel of the Chicago, Rock Island & Pacific, General Counsel of the St. Louis & San Francisco, Vice-President of the Chicago & Eastern Illinois, and Vice-President of the Evansville & Terre Haute.

Operating Officers.

W. L. Derr has been appointed to a position under the New York Public Service Commission, as noted under State Commissions.

J. E. Thurston has been appointed Assistant Trainmaster of the Allegheny division of the Pennsylvania, with office at Oil City, Pa.

D. W. Orr has been appointed the Superintendent of the Arkansas River division of the Atchison, Topeka & Santa Fe, with office at La Junta, Colo., succeeding G. C. Starkweather, transferred.

W. F. Schaff, Trainmaster of the Cleveland, Cincinnati, Chicago & St. Louis at Cleveland, Ohio, has been appointed Assistant Superintendent of the Lake Shore & Michigan Southern at Cleveland, Ohio.

Charles W. Buchanan, Trainmaster of the Cleveland, Cincinnati, Chicago & St. Louis at Bellefontaine, Ohio, has been appointed Trainmaster at Cleveland, Ohio, succeeding W. F. Schaff, resigned to go with another road.

C. J. Larimer, Superintendent of the St. Louis Southwestern of Texas, has been appointed the Assistant Superintendent of the St. Louis, Brownsville & Mexico, with office at Gainesville, Tex. He succeeds P. J. Signor, who had the title of Trainmaster, and who resigned to engage in other business.

G. Davis, Superintendent of the Minnesota division of the Chicago, Rock Island & Pacific, has been appointed the Superintendent of the St. Louis division, with office at Eldon, Mo. W. H. Given, Superintendent of the Des Moines Valley division, succeeds Mr. Davis, with office at Cedar Rapids, Iowa. A. W. Kelso, Superintendent of the St. Louis division, succeeds Mr. Given, with office at Des Moines, Iowa.

The jurisdiction of W. T. Caldwell, Superintendent of the Cincinnati, New Orleans & Texas Pacific, with office at Danville, Ky., has been extended over the entire road. C. E. Rickey, Superintendent of the Cincinnati division, with office at Lexington, Ky., has been appointed the Superintendent of Terminals, with office at Cincinnati, Ohio, with jurisdiction from Cincinnati to Erlanger inclusive, and his former office has been abolished. He will report to the Superintendent.

The territory of C. T. Mason, Assistant Superintendent of the St. Louis & San Francisco at Amory, Miss., has been extended to include the entire Southeastern division from Memphis to Birmingham, exclusive of Birmingham Terminals and the Bessemer branch. J. F. Liston, formerly Chief Train Despatcher, has been appointed Trainmaster of Birmingham Terminals, including the Bessemer branch, with office at Birmingham, Ala. A. B. Woodward succeeds Mr. Liston as Chief Train Despatcher, with office at Birmingham.

Traffic Officers.

J. L. Hawley has been appointed the General Freight and Passenger Agent of the Gulf & Ship Island, with office at Gulfport, Miss. This is a new office.

Edward M. Horner has been appointed a District Passenger Agent of the Lehigh Valley, with office at Rochester, N. Y., succeeding George H. Harris, deceased.

A. P. Morrison, formerly chief clerk to the Passenger Traffic Manager of the Atchison, Topeka & Santa Fe, has been appointed an Assistant General Passenger Agent, with office in Chicago.

A. E. Buck, Commercial Agent of the St. Louis, Brownsville & Mexico at Houston, Tex., has been appointed a Traveling Freight Agent of the International & Great Northern, with office at Houston, Tex.

H. W. Steinhoff, formerly the Assistant General Passenger Agent of the Wisconsin Central, has been appointed the Michigan Passenger Agent of the Chicago, Milwaukee & St. Paul, with office at Detroit, Mich., succeeding Robert C. Jones, deceased.

H. C. Moran, Commercial Agent of the St. Louis, Brownsville & Mexico at Corpus Christi, Tex., has been appointed a Commercial Agent, with office at Houston, Tex., succeeding A. E. Buck, resigned to enter the service of another road. H. J. Neff, formerly Traveling Freight Agent of the Trinity & Brazos Valley, succeeds Mr. Moran.

Robert N. Collyer, whose election as Chairman of the Committee on Uniform Classification has already been announced in these columns, was born on October 8, 1866, at Stockton, Eng. He received his education in the grammar schools in Bayonne, N. J., and began railway work on August 11, 1881, in New York, with the "Bee Line," now part of the Cleveland, Cincinnati, Chicago & St. Louis. He was in the passenger department of this road until 1885, when he entered the freight department of the Chicago, Burlington & Quincy as a clerk, and served successively as Traveling Freight Agent and Contracting Agent. In 1889 he became city freight agent and Assistant General Eastern Agent of the Wabash at New York. In 1899 he became Division Freight Agent at Detroit. In 1906 he became General Agent at Buffalo and in 1907 was appointed Assistant General Freight Agent at St. Louis. He left the service of the Wabash in 1908 to become a member of the Committee on Uniform Classification, being one of the representatives of the Official Classification lines.

Robert N. Collyer.

Engineering and Rolling Stock Officers.

T. H. Kruttschnitt has been appointed an Assistant Roadmaster of the Siskyou district of the Shasta division of the Southern Pacific, with office at Weed, Cal.

H. A. Genung, Roadmaster of the International & Great Northern, has been appointed the Engineer in charge of Maintenance of Way and Water Service, with office at San Antonio, Tex.

E. W. Holmes has been appointed the Master Carpenter of the Allegheny division of the Pennsylvania, with office at Oil City, Pa., succeeding J. Leibengood, assigned to other duties.

R. G. Turnbull has been appointed a Master Mechanic of the Missouri Pacific, the St. Louis, Iron Mountain & Southern and leased, operated and independent lines, with office at Osawatomie, Kan., succeeding M. M. Myers, resigned.

T. F. Carberry, Master Mechanic of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, at Fort Scott,

Kan., has been appointed the General Foreman of the shops of these roads, with office at St. Louis. Mo.

G. W. Robb, Assistant Master Mechanic Grand Trunk Pacific at Rivers, Man., has been appointed Master Mechanic, in charge of Motive Power, Cars and Shops, with office at Rivers, succeeding Wm. Gell, resigned on account of ill health.

Henry Montgomery has been appointed the Master Mechanic of the Allegheny division of the Pennsylvania, with office at Oil City, Pa. H. R. Brigham has been appointed the Road Foreman of Engines of the Buffalo division, with office at Buffalo, N. Y., succeeding G. O. Taylerson, assigned to other duties.

C. E. Chambers, Division Master Mechanic of the Central of New Jersey at Ashley, Pa., has been appointed the General Master Mechanic and will have charge of the assignment of motive power over the entire system and perform such other duties as may be assigned to him by the Superintendent of Motive Power. Roundhouse foremen, road foremen and traveling firemen will report to him direct.

The jurisdiction of T. O. Sechrist, Master Mechanic, with office at Ferguson shops, Ferguson, Ky., has been extended over the entire Cincinnati, New Orleans & Texas Pacific. J. H. Murphy, the Master Mechanic at Ludlow, Ky., has been appointed the General Foreman at Ludlow shops, with jurisdiction over the Mechanical department forces from Cincinnati to Lexington, inclusive, and his former office has been abolished.

H. E. Warrington, Chief Engineer of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern, having resigned, the office of Chief Engineer is abolished. Curtis Dougherty has been appointed the Engineer Maintenance of Way, with office at Cincinnati, reporting to the General Manager. B. Herman has been appointed the Engineer of Bridges, with office at Cincinnati, reporting to the Engineer Maintenance of Way.

OBITUARY.

Arthur Murphy, Supervisor of the Louisville division of the Illinois Central, died June 1 at Central City, Ky., after an illness of several months.

Madison M. Hurley, General Southern Agent of the Star Union Fast Freight Line of the Pennsylvania, died at Louisville, Ky., June 1, from heart disease.

Charles W. Douglass, formerly a Superintendent of the Delaware division of the Erie and later Superintendent of the South Side Railroad of Long Island, died at Wayne, N. J., on May 31.

James A. Richmond, formerly president of the Broadway Surface Railway of New York, and for a number of years prominent in the traction affairs of New York, died in Paris, France, on June 8.

John Elphick, who died at Poolville, Madison county, N. Y., May 5, at the age of 97, is spoken of as the first railway brakeman in the United States. He worked for the Mohawk & Hudson, running between Albany and Schenectady, and began work in October, 1830. From an article in the *Utica Saturday Globe* of May 15, which appears to be based on authentic information obtained from Mr. Elphick's daughter, it appears that he came from England to this country in the spring of 1830. His first work on the Mohawk & Hudson was for the contractors who were building the road. As a laborer here his pay was 37½ cents a day; the foreman of the gang receiving 50 cents. At that time they worked 12 hours a day. Elphick was the brakeman on the first passenger train that was run—the train which has been made a familiar sight everywhere by the widely published picture of it, purporting to show it on the day of the opening excursion (1831), and by the full-size models of the engine and cars, which were built by the New York Central in 1893 and exhibited at the World's Fair in Chicago that year. Elphick soon after went to work on the Chenango canal, and it does not appear that he was ever again in the railway service.

Railroad Construction.

New Incorporations, Surveys, Etc.

ADA TERMINAL.—Organized in Oklahoma, with $30,000 capital, to build a terminal line from the Oklahoma Central into the city of Ada, Okla. The incorporators include D. Carter, Pursell, Okla.; T. Hope, A. K. Thornton and A. L. Beck, of Ada; H. P. Douglas and P. A. Morris, of Shawnee.

ALGOMA CENTRAL & HUDSON BAY.—Sealed bids will be received until June 15 by C. N. Coburn, Ch. Engr., for clearing, grading and ballasting eight miles of the Manitoulin & North Shore.

ARIZONA & SWANSEA.—Incorporated in Arizona, with $500,000 capital, to build from a point on the Arizona & California, near Bouse, Ariz., to the new mining camp of Swansea, where the Clara Consolidated Mining Company's property is being developed. The incorporators include G. Mitchell, T. J. Carrigan and E. D. Olsen, of Los Angeles, Cal.; R. E. Morrison and A. Hill, of Prescott, Ariz.

ATCHISON, TOPEKA & SANTA FE.—This company is planning to build 600 miles of new line and to spend a large amount of money on extensions, repairs, improvements, ballasting and new steel within the next few years.

CANADIAN NORTHERN.—William Mackenzie, Pres., is reported to have said that during the present year the company will build 1,500 miles of line in Alberta and Saskatchewan, 600 miles in Ontario and 200 miles in Manitoba.

CHAMPLAIN & SANFORD.—The New York Public Service Commission, Second district, has granted the application for a change of motive power and route. The road may now be operated with either electrical power or oil-burning locomotives. (May 14, p. 1051.)

DENVER & RIO GRANDE.—Press reports from Salt Lake City, Utah, indicate that this company will soon ask bids for double-tracking the line between Colton, Utah, and Nolan, seven miles.

GILMORE & PITTSBURGH.—An officer writes that the route of this line will be from Armstead, Mont., west via Grant to Junction, Idaho, with a branch from Junction northwest to Salmon and another southeast to Gilmore. Work is under way by MacArthur Brothers Construction Co., New York. (Jan. 29, page 235.)

GRAND TRUNK PACIFIC.—President Charles M. Hays is quoted as saying that the western end of the line is to be opened for operation by September 1 on 1,365 miles, from Fort William, Ont., west to the end of the prairie section at Wolf creek, which is 120 miles west of Edmonton, Alb. A mixed train service is now in operation from Winnipeg, Man., west for 700 miles. It is expected that the first 100 miles from the western terminus at Prince Rupert, B. C., east to the Copper river will be opened about October 1.

Announcement is expected within a few days as to the successful bidder for the branch from Melville, Sask., north to Yorktown, 40 miles; also regarding the contract for the branch from Biggar, Sask., north to Battleford, 35 miles. Bids are about to be asked for the branch from Melville, Sask., southwest to Regina, 25 miles. (May 7, p. 1007.)

HUDSON & MANHATTAN.—The Board of Estimate and Apportionment has approved the extension of this company's subway, from Thirty-third street and Sixth avenue, Borough of Manhattan, New York City, to the Grand Central Station at Forty-second street. Work can be started as soon as the necessary consents of property owners are obtained. (May 7, p. 1007.)

INDIANAPOLIS UNION RAILWAY.—Contracts are said to have been let to the McClintic-Marshall Construction Co., New York, for the work of elevating this company's tracks at East Washington street. Contract price is said to be $153,000.

LEXINGTON & INTERURBAN.—This company has sold notes to finance the extension being built from Lexington, Ky., south to Nicholasville, 20 miles.

MANITOULIN & NORTH SHORE.—See Algoma Central & Hudson Bay.

MARSHALL & EAST TEXAS.—An officer writes that location has been made for 12 miles on the extension projected from Marshall, Tex., south. Grading has been finished on five miles and two miles of track are laid. Grading is well advanced on the remaining seven miles and track laying is being pushed. The line is being built with 65-lb. rails, rolled by the Illinois Steel Co., and there are 3,040 white oak ties being laid to the mile. The frogs and switches are being furnished by the St. Louis Frog & Switch Co. Maximum grade is $^5/_{10}$ per cent. and maximum curvature 4 deg. (May 28, p. 1144.)

MINIDOKA & SOUTHWESTERN.—See Oregon Short Line.

OREGON SHORT LINE.—According to press reports a map has been filed of the projected branch from Twin Falls, Idaho, south to the Southern Pacific main line near Cobre, Nev., about 120 miles. Construction work is under way. The Minidoka & Southwestern amended its charter to cover this survey. (March 19, p. 656.)

PARAGOULD & MEMPHIS.—An officer writes that this company is now operating a line from Cardwell, Mo., east thence south to Manila, Ark., 21.29 miles; also from Cardwell south to Macey, Ark. A line is being built west by the company's men, on which about six miles are yet to be built to reach Paragould, Ark.

PECOS VALLEY SOUTHERN.—Incorporated in Texas, with $45,-000 capital, with headquarters at Pecos, in Reeves county. The incorporators include J. F. McKenzie, J. G. Love, F. W. Johnson, M. L. Swinehart, W. D. Cowan, B. R. Stine and W. P. Brady, of Pecos; H. Robbins, of Saragosa; C. W. Griffin, of Toyahvale, and E. D. Balcome, of Balmorhea.

ROGERS, PEA RIDGE & NORTHERN INTERURBAN.—An officer writes that franchises have been secured, preliminary surveys made and work is now under way. The projected route is from the electric springs in the suburbs of Rogers, Ark., via Rogers, north to Pea Ridge, 11 miles, thence east six miles to the Elkhorn battlefields. A. R. Potter, Pres., Rogers. (May 28, p. 1145.)

ROME & NORTHERN.—Contract is said to have been given to Burke & Joseph, of Cape Girardeau, Mo., to build from Rome, Ga., north to Gore, 10 miles. The line is projected north to the Tennessee state line, a total of about 80 miles. H. M. Smith, Ch. Engr., Rome, Ga. (June 4, p. 1187.)

ST. LOUIS, OKLAHOMA & TEXAS.—According to reports, M. J. Healy, Commercial Club, Tyler, Tex., wants to hear from construction companies and contractors who will furnish bond for $100,000 to build the first section of 30 miles from Tyler, Tex., north. M. J. Smith, Ch. Engr., McAlester, Okla. (May 7, p. 1008.)

SAN DIEGO & ARIZONA.—According to press reports construction work has been started on the first section from San Diego, Cal., south. E. J. Kallright, Ch. Engr., Union building, San Diego. (May 21, p. 1099.)

SOUTHERN PACIFIC.—See Oregon Short Line.

TEXAS ROADS.—According to press reports, the North & South Railway Promotion Co., of which W. M. Fly, of Gonzales, Tex., is president, and W. C. Barrickman, of Cuero, is secretary, has been organized to confer with committees from the various counties to secure the building of a line north from Aransas Pass, Tex., to a connection either with the Missouri, Kansas & Texas at Smithville or the Gulf, Colorado & Santa Fe at Somerville. Surveys are to be started at once. It is said that two construction companies are willing to build the line. About $100,000 is already available to carry out the project.

WEST POINT & HOUSTON.—An officer writes that the route of this road will be from West Point, Miss., northwest via Abbott and Caradine to Houston, 30 miles. The company is also considering a route from Caridine to Woodland, 8.5 miles south of Houston, thence to Hohenlinden and Calhoun City. This latter route will make a line 50 miles long. J. A. MacArthur, Pres., West Point, Miss. (June 4, p. 1187.)

Railroad Financial News.

ATCHISON, TOPEKA & SANTA FE.—The new convertible 4 per cent. bonds offered to stockholders to the extent of 12 per cent. of their holdings (June 4, page 1188) have been underwritten by J. P. Morgan & Co. The bonds mature June 1, 1959, and are convertible prior to June 1, 1918, into common stock at par. The new issue, which is part of an authorized issue of $98,000,000, of which $26,056,000 are outstanding, is limited to $35,000.000. Only $26,377,000 is needed to supply stockholders on the basis of 12 per cent. of their holdings, but since the convertible bonds formerly issued may be converted into stock and the rights thus acquired be used to subscribe for additional new bonds, the company has provided sufficient bonds to meet this possibility.

BERKELEY SPRINGS & POTOMAC.—The property of this company, whose road runs from Berkeley Springs, W. Va., to Hancock Station, six miles, has been ordered sold within 30 days from May 11 unless a judgment in favor of the Baltimore & Ohio for $129,853 is paid. The road has been operated as a branch of the B. & O.

BOSTON & MAINE.—See New York, New Haven & Hartford, and see also an item in regard to this company in Court News.

CENTRAL OF GEORGIA.—See an item in regard to this company under Court News.

CHESAPEAKE & OHIO.—See Chicago, Cincinnati & Louisville.

CHICAGO & ALTON.—See Kansas City, Mexico & Orient and also Chicago, Cincinnati & Louisville.

CHICAGO, CINCINNATI & LOUISVILLE.—Reports say that the Hawley interests, which recently acquired control of the Chesapeake & Ohio, and which also control the Chicago & Alton and the Toledo, St. Louis & Western, have bought a large amount of the securities of the C., C. & L., which is now in the hands of a receiver. It is said that when the road is recognized it will be used as a connecting link between the Chesapeake & Ohio and the Chicago end of the Clover Leaf-Alton system.

CHICAGO GREAT WESTERN.—Blair & Co., New York, are buying at par the coupons due June 1 on the first mortgage 4 per cent. bonds (12,000,000 outstanding) of the Mason City & Fort Dodge. The M. C. & F. D. is controlled through ownership of the entire stock by the Chicago Great Western and its property is leased for 100 years to the Chicago Great Western on the basis of a guarantee of interest payments on the bonds and preferred stock, any surplus earnings being held in trust by the C. G. W. for the payment of future interest coupons.

CHICAGO, INDIANA & ST. LOUIS.—A semi-annual dividend of 1⅝ per cent. was declared on June 3 on the common stock. This is at the rate of 3½ per cent. annually as compared with 3 per cent. paid annually from 1905 to 1908 inclusive. The regular dividend of 2 per cent. on the $5,000,000 preferred stock was also declared. The Louisville & Nashville and the Southern Railway own 93 per cent. of the common stock and 77 per cent. of the preferred stock, which has been deposited as security for joint collateral trust bonds.

CHICAGO, MILWAUKEE & ST. PAUL.—This company has bought the property of the Yellowstone Park Railway, which enters the park by way of Clark's Ford and runs to Bridger, 30 miles.

GALVESTON, HARRISBURG & SAN ANTONIO.—The Southern Pacific has been made a party to the suit brought by certain holders of the $6,354,000 Western division second mortgage (income bonds) of the Galveston, Harrisburg San Antonio to foreclose the mortgage because of failure to pay interest thereon. No decision as to the merits of this suit itself has been rendered as yet.

KANSAS CITY, MEXICO & ORIENT.—A traffic arrangement has been made between this company and the Chicago & Alton for an interchange of freight and passengers and the running of through trains over the Chicago & Alton and the

Kansas City, Mexico & Orient. Reference to this agreement is made in the editorial columns of this issue.

KANSAS CITY SOUTHERN.—Stockholders are offered the privilege of subscribing at par until June 24 for $10,000,000 proposed new refunding and improvement bonds to the extent of 19.60 per cent. of their holdings. (May 7, page 1009.) The proceeds of the bonds are to be used as follows:

1. To pay off the collateral gold note on July 1, 1909....	$5,100,000
2. To reducing grades to ½ of 1 per cent. on three full operating divisions, aggregating 41 per cent. of the total length of the line	1,250,000
3. To rearranging four division terminals to permit of better and more economical operation under the 16-hr. law, and to provide more adequate facilities for taking care of the power and traffic..........	1,000,000
4. To ditching, ballasting, new rail, improvements to track and bridges	1,000,000
5. The balance to be used for the improvement of terminal facilities at Kansas City and Port Arthur; for facilities for securing new business and for other corporate purposes.	1,275,000
Total	$9,625,000

The bonds have been underwritten by Ladenburg, Thalmann & Co., New York.

METROPOLITAN STREET RAILWAY (NEW YORK).—The receivers of the New York City Railway and the Metropolitan Street Railway have sold to the Central Trust Co. and Wm. A. Read & Co., both of New York, a new issue of $3,500,000 4½ per cent. receivers' certificates due June 15, 1910, the proceeds to be used to take up $3,500,000 5 per cent. receivers' certificates issued in 1908 and due June 15, 1909.

MISSOURI PACIFIC.—Stockholders are to vote on August 6 on the proposal to consolidate the following companies, whose properties make the Missouri Pacific system exclusive of the St. Louis, Iron Mountain & Southern:

Missouri Pacific.	Fort Scott Central.
Kansas & Colorado Pacific.	Kanopolis & Kansas Central.
Central Branch.	Kansas Southwestern.
Rooks County.	Leroy & Caney Valley Air Line.
Nevada & Minden.	Kansas City & Southwestern.
Nevada & Minden of Kansas	

The proposed new corporation will be the Missouri Pacific Railway Co.

NATIONAL RAILWAYS OF MEXICO.—Kuhn, Loeb & Co., Ladenburg, Thalmann & Co., Speyer & Co. and Hallgarten & Co., all of New York, have prepared a circular describing the $24,000,000 prior lien 4½ per cent. sinking fund bonds of 1907-1957 of the National Railways of Mexico which they are offering at 95. The circular describes the purpose of the issue and the security behind the bonds.

NEW YORK CITY RAILWAY.—See Metropolitan Street Railway.

NEW YORK, NEW HAVEN & HARTFORD.—The bill permitting the incorporation of the John L. Billard Co. to take over the Boston & Maine stock owned by Mr. Billard has been passed by the house of representatives of Connecticut. This stock was acquired by Mr. Billard from the New York, New Haven & Hartford. See item in regard to Boston & Maine in Court News.

ST. LOUIS SOUTHWESTERN.—Directors have declared an initial dividend (semi annual) of 2 per cent. on the $19,890,000 outstanding 5 per cent. non-cumulative preferred stock.

SOUTHERN PACIFIC.—The directors have authorized the issue of 100,000,000 4½ per cent. 20 year bonds or debentures.

The outstanding preferred stock ($74,863,400) has been called for redemption on July 15. Holders of the preferred stock have the privilege of:

(1) Exchanging their stock for new 4½ per cent. bonds at par and receiving in addition $20 per share in cash. [This means that a holder of ten shares of stock will receive in exchange a $1,000 bond and $200 in cash.] Or.

(2) Of converting their stock into common stock at par; or

(3) Of surrendering their stock and receiving $115 cash per share.

Since both the common stock and the preferred stock are at present selling above 130, preferred stock owners will, it would seem likely, either exchange their stock for new bonds or for common stock. The preferred stock has been paying 7 per cent. dividends and the common stock is paying 6 per cent. dividends. See Galveston, Harrisburg & San Antonio.

YELLOWSTONE PARK RAILWAY.—See Chicago, Milwaukee & St. Paul.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Austrian State Railways will soon ask bids on about 150 locomotives.

The Mobile, Jackson & Kansas City is said to be in the market for locomotives. This item is not confirmed.

The Tientsin Pukow, T. K. Tow, Imperial Chinese Telegraphs, The Bund, Shanghai, is asking bids on mogul locomotives up to June 29.

The Texas Central has ordered three 10-wheel passenger locomotives, cylinders 18 in. x 24 in., total weight 130,000 lbs., from the American Locomotive Co.

The New Canadian Company has ordered two 10-wheel freight locomotives, cylinders 18 in. x 24 in., total weight 109,000 lbs., from the American Locomotive Co.

The Kansas City, Mexico & Orient has ordered from the American Locomotive Co. five consolidation locomotives, cylinders 22 in. x 30 in., total weight 207,000 lbs., and four six-wheel switchers, cylinders 19 in. x 26 in., total weight 139,000 lbs.

CAR BUILDING.

The Rio Grande & Eagle Pass is in the market for 20 freight cars.

The St. Louis & San Francisco has ordered 250 fifty-ton oil tank cars.

The Northern Pacific is in the market for from 1,000 to 2,000 box cars.

The Lehigh Valley has ordered 155 all-steel coaches from the Standard Steel Car Co.

The Northern Pacific is said to have ordered 70 steel passenger cars. This item is not yet confirmed.

The Mobile, Jackson & Kansas City is said to be in the market for cars. This item is not confirmed.

The Northwestern Elevated, Chicago, is said to be in the market for 20 cars. This is not yet confirmed.

The Chicago & North Western is said to have ordered 100 steel passenger cars. This is not yet confirmed.

The Harriman Lines are in the market for from 5,000 to 6,000 freight cars, including a number of box cars.

The Austrian State Railways will soon ask bids on about 384 passenger cars, 190 service cars and 1,365 freight cars.

The Argentine Government Railways ask bids up to June 26 on 35 tank cars, and up to July 1 on 190 flat cars, 35 tank cars and 30 covered trucks.

The Canadian Pacific will build 4 store supply cars, 2 horse cars, 54 box, 1 stock and 1 Hart ballast car at its Angus shops and 32 vans at its Farnham shops.

The Canadian Northern is said to have ordered 27 refrigerator and 100 flat cars from the Crossen Car Manufacturing Co. This item is not yet confirmed.

The Puget Sound (Electric), through the Stone & Webster Engineering Corporation, Boston, Mass., is in the market for one 55-ft. motor car and one 55-ft. trail parlor car.

The Chicago Railways Co., reported in the *Railroad Age Gazette* of February 12 as being in the market for 350 pay-as-you-enter cars, has ordered them from the Pullman Co., including trucks.

The Chicago, Rock Island & Pacific is in the market for 69 passenger cars. These cars will be duplicates of those ordered some months ago, as reported in the *Railroad Age Gazette* of February 12.

The Fort Worth-Dallas Interurban is soon to draw up specifications on four interurban car bodies. The equipment will be bought through the Stone & Webster Engineering Corporation, Boston, Mass.

The Tacoma Railway & Power Co. is soon to draw up specifications for four large combination city cars. The equipment will be bought through the Stone & Webster Engineering Corporation, Boston, Mass.

The Pennsylvania is said to be in the market for 1,000 freight cars and 214 passenger cars, in addition to the 121 passenger cars mentioned in the *Railroad Age Gazette* of June 4. This item is not yet confirmed.

The Interborough Rapid Transit has placed contracts for the 100 elevated cars, mentioned in the *Railroad Age Gazette* of May 14, as follows: Barney & Smith Car Co., 40; Wason Manufacturing Co., 20; St. Louis Car Co., 20, and Jewett Car Co., 20.

The St. Louis & San Francisco, reported in the *Railroad Age Gazette* of May 28 as being in the market for 60 coaches, has ordered 10 coaches, 70 ft. long; 10 baggage cars, 66 ft. long, and 10 chair cars, 70 ft. long, from the American Car & Foundry Co. All will have six-wheel trucks.

The Northern Texas Traction Co., Fort Worth, Tex., has ordered through the Stone & Webster Engineering Corporation, Boston, Mass., twelve 28-ft. closed car bodies and one 21-ft. closed car body from the Cincinnati Car Co. The larger cars will have Standard Motor Truck Company's trucks and four-motor General Electric equipments and air-brakes.

The Western Pacific has ordered from the American Car & Foundry Co. 1,500 forty-ton box cars, 250 fifty-ton flat cars and 500 forty-ton stock cars, mentioned in the *Railroad Age Gazette* of May 21, and 60 caboose cars from the Haskell & Barker Car Co. The road may place orders for 200 refrigerator cars. Contracts for passenger equipment are not yet closed.

The Houston Electric Co., Houston Tex., has ordered through the Stone & Webster Engineering Corporation, Boston, Mass., five double-end and 15 single-end 21-ft. closed car bodies from the Cincinnati Car Co. The double-end cars will have Standard Motor Truck Company's single trucks and the other cars will have Brill trucks. They will be equipped with two-motor General Electric equipments.

The Lehigh Coal & Navigation Co. has ordered from the Standard Steel Car Co., for July delivery, the 35 fifty-ton steel coal cars, mentioned in the *Railroad Age Gazette* of June 4. These cars will measure 30 ft. long, 9 ft. 5½ in. wide, 6 ft. 10¼ in. high, inside measurements, and 31 ft. 6 in. long, 10 ft. wide, 12 ft. high, over all. The special equipment includes:

Axles	Steel
Bolsters, truck	Gould
Brakes	Westinghouse
Brake-beams	Davis
Brake shoes	Am. Brake Shoe & Fdy. Co.
Couplers	Gould
Doors	Drop
Journal boxes	Gould
Paint	Nobrac
Springs	Union Spring & Mfg. Co.

IRON AND STEEL.

The Northern Pacific is in the market for about 15,000 tons of rails.

The Mobile, Jackson & Kansas City is reported in the market for rails.

The Isthmian Canal Commission asks bids up to June 21 on 25 split switches for 70-lb. rail. (Circular No. 514.)

The South American Road is about to order 12,000 tons of 60-lb. rails. (Inquiry No. 3484, Bureau of Manufactures, Washington, D. C.).

The Grand Trunk has ordered 700 tons of structural steel from the Pennsylvania Steel Co. and 1,400 tons from the Wisconsin Bridge Co.

A European State Railway will soon ask bids for rails for several hundred miles of road. Some of them may be bought in the United States. (Inquiry 3468, Bureau of Manufactures, Washington, D. C.).

The Tientsin-Pukow Railway, China, is asking bids on 321 spans of deck girders and five spans of through girders. Inquiries will be received by Baker & Hurtzig, 2 Queen Anne's Mansion, Westminster, S. W., England.

General Conditions in Steel.—Current reports indicate an increasing activity in all finished steel products. Numerous small orders have made a heavy aggregate, but probably not up to the accustomed May transactions. It is said that car shops and locomotive builders are specifying more freely on contracts for shapes and plates and are also making considerable purchases to cover prospective business. The present activity in railway equipment orders will undoubtedly result in increased operations at the steel mills. The Pennsylvania Steel Company is said to have announced that the wage scales at its various plants, which were cut 10 per cent. on April 1, will be restored in all departments from July 1. This order will affect 7,000 men.

RAILROAD STRUCTURES.

ALAMOSA, COLO.—The Denver & Rio Grande is building new shops. They will be of brick and concrete and 115 ft. x 351 ft. A freight house 30 ft. x 100 ft., oil house 30 ft. x 30 ft., and office and store house 40 ft. x 150 ft. also will be built. The new passenger depot has been completed at a cost of $16,000.

BLOOMINGTON, IND.—The Chicago, Indianapolis & Louisville has given a contract to the Strobel Steel Construction Co., Chicago, for the steel work on 10 bridges to be built near Bloomington, Ind.

BROWNSVILLE, TEX.—According to press reports the United States War Department has authorized the building of the bridge across the Rio Grande river and the work of construction will now be rushed. The bridge is to be built jointly by the St. Louis, Brownsville & Mexico and the National Railways of Mexico; contract for the substructure let to the Foundation Company, New York, and for the superstructure to the Wisconsin Bridge & Iron Company, North Milwaukee, Wis. (March 12, p. 528.)

CAYUGA, N. Y.—See Geneva, Waterloo, Seneca Falls & Cayuga Lake under Railroad Construction.

CHICAGO, ILL.—The Chicago & Western Indiana is receiving bids for the construction of a steel bascule bridge over the Calumet river.

The Chicago & Western Indiana and the Belt Railway will build stockyards occupying about three acres of land at Seventy-fifth and Rockwell streets in order to provide a place where cattle in transit to the union stockyards can be unloaded, fed and watered, and violations of the federal 28-hour law thereby avoided.

HOUSTON, TEXAS.—The Houston Belt & Terminal Co. has adopted plans by Warren & Wetmore, New York, for a passenger terminal and station and will begin building at once. The structure will be three stories high, foundation to be capable of supporting an eight-story building 250 ft. long. The train sheds will provide for six tracks. The total cost will be $475,000. In connection with the station the company will build a roundhouse, machine shops and an electric light plant for lighting both passenger and freight terminals. (Feb. 12, p. 334.)

INDIANAPOLIS, IND.—The Belt Railway has given the contracts for the steel and concrete work in connection with the elevation of the Belt tracks. The steel contract was given to the McClintic-Marshall Construction Co., New York, and the concrete work to the American Construction Co., Indianapolis, Ind. The structure will provide for six tracks.

NEW ORLEANS, LA.—The Railroad Commission of Louisiana has ordered the Texas & Pacific to build in New Orleans east of the Mississippi river at some point convenient to the traveling public a comfortable and modern passenger depot.

The company must file plans for the proposed depot for the approval of the commission before June 27.

New York.—The Interborough Rapid Transit Co. has filed plans for a new car inspection shed for the Manhattan Railway branch at the corner of Third avenue and 129th street. The building will be 53 ft. x 440 ft. and will cost about $20,000.

North Yakima, Wash.—Bids are being asked on the new $75,000 passenger station of the Northern Pacific. (Aug. 28, p. 829.)

Quebec, Que.—According to a semi-official announcement from Ottawa the engineering commission appointed by the government to prepare plans for rebuilding the Quebec bridge has completed these plans. Should these be approved bids may be asked and the contract let at an early date. It is stated that the present piers, which cost $1,500,000, will be utilized for the new bridge. It will have a span almost as great as the 1,800-ft. span of the wrecked bridge. The present piers will probably be duplicated on the river side, thereby reducing the central span to about 1,600 ft. The structure will be on the cantilever principle, and will be built of nickel steel. (Aug. 21, p. 782.)

Regina, Sask.—The city and the Canadian Pacific have agreed regarding the building of a concrete subway under the company's tracks. The estimated cost is $160,000.

San Antonio, Tex.—The San Antonio & Aransas Pass will build a passenger station.

Sauk City, Wis.—The Chicago, Milwaukee & St. Paul will build a new steel bridge across the Wisconsin river.

Spokane, Wash.—The Chicago, Milwaukee & Puget Sound will replace a number of temporary wooden bridges with steel and concrete arches.

Toronto, Ont.—The Canadian Board of Railway Commissioners has decided that the Canadian Pacific and the Grand Trunk must, within two years, build a four-track viaduct across the water front at Toronto. The former company is ordered to elevate its two passenger tracks from Berkeley street to Queen street and to build a bridge at Easton avenue. Bridges must also be built at John street and Spadina avenue, over the viaduct tracks. It is provided that no damages are to be paid to the city for property taken or injured by building the viaduct, and for all damages to land other than that of the city and the railway companies, the city must pay one-third and the companies the remainder. The city is also ordered to pay one-third of the cost of building the viaduct and of the track elevation, the erection of bridges at John street and Spadina avenue, and the sub-structure for the elevation of the tracks at the proposed new union station. The City Engineer of Toronto estimates the cost of the viaduct, exclusive of the union station, at $2,000,000. The railway companies estimated the union station to cost about $2,000,000. It is understood that the railway companies will contest the right of the commission to enforce them to elevate their tracks.

Tyler, Tex.—The St. Louis Southwestern is having plans made for the enlargement and improvement of its machine shops and the installing of new machinery.

Two Harbors, Minn.—The Duluth & Northern Minnesota has given a contract for the building of new docks at Knife river, to cost about $40,000, to Barnett & Record, Minneapolis, Minn.

Wellington, Kan.—The Atchison, Topeka & Santa Fe has authorized to be built, as an addition to its terminal and repair plant, a new car shop 60 ft. x 100 ft., also a new power and blacksmith shop.

SIGNALING.

The electric train staff is now in use on the Bessemer & Lake Erie between Horne, Pa., and Black's Run. These stations are about three-fourths of a mile apart, and between them runs the Allegheny river, across which the railway is carried on a bridge 3,700 ft. long and 169 ft. high.

Supply Trade News.

The Cardwell Manufacturing Co., Chicago, has had its draft gear specified for the 3,000 cars ordered by the New York Central Lines.

George L. Wall, who has been Mechanical Engineer of the Lima Locomotive & Machine Co., Lima, Ohio, was appointed Assistant General Manager on June 1.

Franklyn M. Nicholl, formerly St. Louis, Mo., representative of the O. M. Edwards Co., Syracuse, N. Y., has become a traveling representative of the Dayton Manufacturing Co., Dayton, Ohio.

The Inter-Ocean Steel Co., Chicago Heights, Ill., has let contracts said to aggregate $500,000 to the Cambria Steel Co., Philadelphia, Pa., and other Pennsylvania concerns for equipping the plant.

The New York Central Lines have specified Andrews sideframes for 3,000 cars ordered from the American Car & Foundry Co., Simplex couplers on 1,000 of the same lot and American Steel Foundries' cast-steel truck bolsters on 1,500.

The Chancery Division has decided in favor of the British Westinghouse Electric & Manufacturing Co., Ltd., Trafford Park, Manchester, England, the appeal from the decision of the Controller of Patents, who had revoked the Westinghouse company's patents for the manufacture of Bremer arc lamps in England.

The Isthmian Canal Commission asks bids up to July 19 on machinery for a central pumping station, including centrifugal pumps, pipe, motors, engines, boilers, etc. (Circular No. 516). Bids are asked until June 21 on pumps, hose, valves, packing, belting, switches, lubricators, one lathe and miscellaneous machinists' supplies. (Circular No. 514.)

J. W. Cowper, for a number of years with James Stewart & Co., general contractors, has severed his connection with that firm and is now Vice-President of the Worden-Allen Co., 115 Adams street, Chicago, general contractors for fireproof construction and manufacturers of steel construction. The shops of this firm are at Milwaukee, Wis., and Buffalo, N. Y.

The Barney & Smith Car Co., Dayton, Ohio, held its annual meeting June 1. All the old directors were re-elected with the exception of Colonel J. D. Platt, who retired and who was succeeded by his son, Frank Platt. A. M. Kittredge was elected President; H. M. Estabrook, Vice-President and General Manager; J. F. Kiefabar, Secretary and Treasurer, and E. A. Oblinger, Assistant Secretary and Treasurer.

The Atlas Locomotive Ashpan Co., Fort Wayne, Ind., has been incorporated with $200,000 capital to make and sell a locomotive ashpan invented by J. A. Schwartz and T. P. Whelan, two New York, Chicago & St. Louis enginemen. The pan is said to be in use on New York, Chicago & St. Louis engines and to be adapted to any style of engine. The incorporators are: N. C. Meyers, H. O. Cowing, L. E. Merriman, J. A. Schwartz and T. P. Whelan.

Irving Loveridge, General Superintendent in Europe of the Western Electric Co., Chicago, died on June 3 in Berlin. Mr. Loveridge was 48 years old. He graduated from the University of Rochester in 1882 and at once went into the Western Electric Co. By 1892 he was performing the duties of purchasing agent, and at that time he was sent to Antwerp, Belgium. In 1906 he was made manager of the London branch and a few months ago was promoted to the position he held at the time of his death.

The Stoever Foundry & Manufacturing Co., Myerstown, Pa., with sales office at 140 Cedar street, New York, reports the sale of 12 No. 12 type H pipe-threading and cutting-off machines, motor-driven, capacity 4 in. to 12 in., to Spang, Chalfant & Co., Pittsburgh, Pa., for equipment of their new mill. This order was received through the Pittsburgh agents, the Brown & Zortman Machinery Co. The Stoever company advises that it is running full at the factory and has very few, if any, machines in stock.

The Gulick-Henderson Co., Pittsburgh, Pa., Inspecting Engi-

neers, has retained Samuel E. Duff, Empire building, Pittsburgh, Pa., to advise and direct its inspectors in matters of engineering, erection and fabricating shop methods. Mr. Duff will continue his general engineering practice and will also be represented at the Chicago and New York offices of the Gulick-Henderson Co. The company has opened an office in New York at 30 Church street. Henry Gulick will have direct charge of the office and will be assisted by T. W. Cohill.

The capital of the Baldwin Locomotive Works, application for charter for which will be made to Gov. Stuart, of Pennsylvania, on June 3, will be $20,000,000, all in one class of stock. The new company, which will take the place of the unlimited partnership of Burnham, Williams & Co., Philadelphia, Pa., will have no bonded debt. The stock will be entirely held by the present members of the firm, who will constitute the new directorate. They are: George Burnham, John H. Converse, William L. Austin, Samuel M. Vauclain and Alba B. Johnson.

Charles L. Harris, who recently resigned the office of Manager of the lubricating department of the Waters-Pierce Oil Company to accept the office of the Third Vice-President and Sales Manager of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., with office in St. Louis, was born in Boston and completed his education at the Massachusetts Institute of Technology. He began railway work in the office of the Chief Engineer of the Burlington & Missouri, now part of the Chicago, Burlington & Quincy, at Omaha, Neb. He was later Superintendent of the Land Department of the California Southern at San Diego, Cal.; then he was connected with the engineering department of the Atchison, Topeka & Santa Fe at Kansas City, Mo., and then with the traffic department of the same road at Topeka, Kan. Leaving railway service he went into the grain business at Omaha and at St. Joseph, Mo. In 1904 he engaged in the railway supply business at St. Louis, becoming Southwestern Agent of the Carbon Steel Co., Pittsburgh, Pa.; the Latrobe Steel Co., Latrobe, Pa., and the A. French Spring Co., Pittsburgh, Pa. Since that time he has been an active factor in the railway supply trade of St. Louis and the southwest.

Charles L. Harris.

TRADE PUBLICATIONS.

Steel Cars.—The Joliet Steel Mfg. Co., Joliet, Ill., has issued a booklet in which it gives a description of the Campbell-Olden steel side-dump car illustrated by a drawing showing the construction and mechanism of the car.

Denver & Rio Grande.—The company is distributing an attractive little booklet entitled "Among the Rockies." It is a complete guide to the principal attraction in the Rocky mountains as seen from the train on the lines of the system.

Export Trade Directory.—The National Business League of America, Chicago, has published "Practical Suggestions for Development of the American Export Trade." It includes directories of the chief cities of Brazil, Chili, Panama and southeast Africa, furnished by consular officers in these countries.

Cold Drawn Seamless Steel Locomotive Flues.—The Detroit Seamless Steel Tube Co., Detroit, Mich., is distributing a pamphlet quoting the experience with cold-drawn seamless steel locomotive flues of B. F. Sarver, of the Pennsylvania Lines, submitted to the International Master Boiler Makers' Association at the convention in Louisville, Ky., last April.

Chicago & North Western.—The company has issued a folder on the summer resorts in the Lake Superior country. Descriptions and brief facts are given in regard to points of interest, including information on railway fares, a list of the principal hotels and a map of the Lake Superior country.

Chicago, Burlington & Quincy.—A handsome 72-page book on "Scenic Colorado" contains a map of Colorado showing every geographical point and every topographical feature, with a reference index thereto. The company has also issued a pamphlet with schedule of through trains from Chicago to Seattle, and another with schedule of through trains to Denver. Another folder describes tours to Yellowstone Park, with fares and a map of the park.

Gasolene Locomotives.—Publication No. 100 of the Milwaukee Locomotive Manufacturing Co., Milwaukee, Wis., describes gasolene-driven locomotives. The design and construction of the engines is covered in detail, with illustrations, and there is interesting data on capacities, fuel consumption, tractive effort, etc., tables being given of the sizes and capacities of the various types of locomotives. There are a number of illustrations from photographs of these locomotives in different kinds of service.

Track and Railway Supplies.—General catalogue No. 30 of the Kalamazoo Railway Supply Co., Kalamazoo, Mich., maker of track and railway supplies, is being distributed. It is a 272-page book, 4½ x 7, with flexible leather cover. The large line of products of the company is fully illustrated and described, and a complete index facilitates quick reference to the various devices. There are 16 pages of useful information in the back and a number of blank pages for memoranda. W. K. Kenly Co., Chicago, is Western Representative for the concern.

FOREIGN RAILWAY NOTES.

In building a railway in China recently native engineers thought to overcome the necessity of sinking a pier far below water by the simple method of building an island and founding the pier on that, and were very much astonished to find island, pier and all fall victims to the first flood.

Mr. Almagia, an Italian contractor in Alexandria, Egypt, has asked the Ottoman and Egyptian governments to allow him to make plans for a railway line by way of El Arish to Jaffa. The idea is that the line, after crossing the Suez canal, should run along the coast to the frontier at El Arish and then on to its terminus at Jaffa, where it would connect with the Jerusalem railway.

Press reports from St. Louis, Mo., say that W. S. Dawley, C.E., has signed an agreement with the Chinese government at $25,000 a year to build a railway in China, 400 miles long. Chen Tong and Wu Tze Yum represented the Chinese government in the negotiations. The proposed railway will traverse the province of Yunnan. The initial survey will be made by Mr. Dawley, who will have the title of chief engineer to the Chinese government in the province of Yunnan and also entire charge of the construction work. The project is financed entirely by Chinese private capital, backed by a substantial appropriation from the government, which will have control of its affairs.

The Trans-Baikal *News* states that the annual receipts of the Trans-Baikal railways for the year 1908 were $4,892,500 and the expenditure about $12,875,000, leaving a deficit of about $7,982,500. As a result of the reduction of railway freight rates on beans, the export of this article from Manchuria via Vladivostok is growing. At the end of March two steamers were loading beans at Vladivostok and more were expected from Japan to get similar cargoes. Between February 11 and 20, 1,033 carloads of foodstuffs were transported over the Chinese Eastern railway to Vladivostok from Pogranetchnaia, Manchuria, of which there were 943 carloads of wheat, 18 of flour and 72 of bean cakes. On February 20 the following carloads (one carload weighs 12 tons) were at the port ready for shipment: Beans, 2,072; bean cakes, 191; bran, 21; kiolan (Chinese grain), 51; oats, 18; maize, 1; assorted, 24.

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CONTENTS

It is possible that some hasty readers may have got a wrong impression from the comment in these columns two weeks ago on the Pennsylvania's method of making public details of train accidents. That method is believed to be the best that can be devised for attending to the first duty. When people are killed and wounded, newspaper readers feel that they have a right to know as quickly as possible and from day to day every essential detail the reporters can get. Then there is the race for news, alike by careful and by careless papers. A reporter gets a denial from the engineman who over-ran his signal, or from the switchman who threw his point and there is wickedly unjust censure. With some exceptions we tend to believe what we see in print. The Pennsylvania's method is designed not only to simplify the reporter's work and give him copy, but also to give him more quickly than he can otherwise get it the facts in the case as fast as they can be ascertained. The switchtender's or engineman's evidence is liable to be contradictory; it is pretty sure to be dangerously *ex parte*. The Pennsylvania's method loses no time. The developed facts flow in a continuous current to the superintendent's office, where trained men of long experience can be relied on to sift out the truth. From this office they offer the fullest information to all enquirers. We can rely on them to be fair. Character counts for something. Subsequent dealing with the matter is an entirely distinct subject. The company's investigating committee may add greatly to the weight of its verdict by the Union Pacific's admirable plan of inviting the help of non-railway citizens, but it is a pity we can not have the British governmental system of open and expert inquiry.

The shifting of locomotives from one division to another on a railway causes the transportation department constantly to be asking the engineering department concerning the strength of bridges on the divisions affected, and their ability to carry these locomotives. On the Rock Island this matter has been treated systematically. In order that all of the men of the transportation department that may need this information may have it in permanent and convenient form for quick reference, Mr. Barry, Chief Engineer, has had prepared charts of the several general superintendents' districts of the system, classifying the lines according to the strength of the bridges, Cooper's method of locomotive rating being used. In a column under each such rating are entered the numbers of all the locomotives, separated according to their type, which may be run over the line; that is to say, these locomotives may be run over lines having this rating or over any one that has a higher rating. The chart has a map of the district with the different lines marked to correspond to the rating. The map also shows what of the company's lines that connect with that district may be used to detour trains in emergencies, so that the officer may know what engines he can run over these lines, which are in another officer's territory. Thus, a superintendent or train despatcher with one of these charts before him can tell at a glance whether it will be safe to send a certain locomotive over any given section of the road. The heavier car weights are also entered under the proper classification numbers.

Edward Payson Weston, the veteran expert pedestrian, is walking across the continent, and writes back regularly to the New York *Times*. One of these letters, from Medicine Bow, Wyoming, says: "The conditions for walking since I left Kansas have been the most difficult in my forty-five years' experience as a pedestrian. * * * The towns are from 15 to 25 miles apart. Between these towns I find a lonely section house, usually filled to its capacity with section hands; nationality, Greeks, Italians or Japanese. The Union Pacific Railroad officials give me every possible consideration. * * * When walking is possible the Union Pacific Railroad bed makes an excellent path, it being perfectly safe, as I understand the block signals. These are about one mile apart, and they indicate when there is a train approaching three miles away. After making twelve miles yesterday against a gale blowing steadily at the rate of 70 miles an hour, I was compelled to put up for the night at Ridge. * * *"

This is the best advertisement of the kind that has appeared since James Charlton printed a testimonial from a tramp—with the tramp's portrait, life size—to the effect that the Chicago & Alton was the rockiest road that he had ever walked over. Rock ballast was not so common then as now, and needed louder advertising. As Mr. Weston has, presumably, no apparatus for shunting the track circuits it is to be hoped that he has a competent "hind-end man"; for the Union Pacific's automatic signals being all "normal clear," the protection on which he so confidently depends is not infallible except as against opposing trains—which he can see. However, when he reaches the snowsheds he will be as safe as safe can be; for he can borrow the electric train staff—provided Mr. Kruttschnitt's officers continue their friendly attitude.

The reciprocal demurrage law, which was recently passed in California, and which was briefly noticed in these columns May 14, page 1,044, is one of the stiffest documents of the kind that we have seen; but, like all others, it is so rigid that it will very likely break down by reason of its own brittleness. Un-

fortunately, however, the railways which have to work under laws of this kind usually find it politic to submit to their provisions more or less gracefully, however imperfect the law may be, because of the incidental disadvantages of standing up for their rights. As stated in the press despatches, the California law imposes a penalty of $5 a day on the railway which fails to furnish cars promptly to shippers, and this is supplemented by a clause requiring the carrier to bear all actual damages sustained by the shipper. But, on the other hand, the applicant is required to deposit in advance one-fourth of the estimated freight charges on the goods which he proposes to ship, and to pay $6 a day penalty if he does not load the car. Moreover, he must pay any actual damages sustained by the railway, in consequence of the loss of the use of its car. The railway has a lien on the deposit for the damages or penalties which may become due to it, and the law makes the regular demurrage rate, assessable against consignees, *six dollars a day* after 48 hours, and nothing in the law shall prevent railways from charging $3 a day after 24 hours, or from enforcing necessary demurrage rules. A shipper who brings suit against a railway for penalties must prove that when he called for cars he had on hand the necessary merchandise to fill them; and both railway and shipper are excused from penalties when their failure to comply with the law is due to strikes, washouts, accidents, etc. The first section of the law has the usual provision, giving a longer time for furnishing a large number of cars than for a small number. If it could be tried systematically when cars are very scarce, a six-dollars-a-day demurrage charge might be worth something as an educational feature, for oftentimes a car is worth that, and more, and it would be a good thing to burn that truth into the minds of shippers, even at some cost. But a demurrage law is, at best, exceedingly crude, and fluctuations in supply of and demand for cars are at all times liable to be violent; moreover "reciprocal" demurrage is in every case utterly inequitable, as has often been pointed out; therefore we may expect that in California, as has been the case in certain other states, both the shippers and railways will probably be glad to let the law lie dormant. Demurrage charges at best have to rest on a rather arbitrary basis; and arbitrary impositions should always be as mild as possible.

A passenger may now ride from the Atlantic Ocean to the Pacific under the protection of automatic block signals—almost. That is to say, this statement is now justified, except that there are (1) a 20-mile stretch in Nevada, where the signaling work is postponed because of slight changes to be made in the line, and (2) a few short pieces elsewhere, which are explainable on similar grounds. This interesting statement is made possible by the completion, on May 29, of the block signaling on 117 miles of the Chicago & North Western between Boone and Logan, Iowa. With this installation the North Western now has automatic (disk) signals from a point 1,700 ft. west of the train shed at Wells street, Chicago, to its junction with the Union Pacific at Council Bluffs, on the Missouri River, with the exception of the drawbridge over the Mississippi. This drawbridge, lately completed, will have interlocking signals controlled by the signalman; and the same statement is true concerning the 1,700 ft. at the Chicago terminus. The Lehigh Valley is equipped with automatic signals from its terminus at New York harbor to Buffalo, 448 miles, all double track. The Lake Shore & Michigan Southern is equipped with automatic signals from Buffalo to Chicago, 525 miles, except for the 4½ miles between One Hundred and First street, Chicago, and Grand Crossing, where plans are in hand for elevating the tracks. This 4½ mile stretch is now divided into two manual block sections. The whole line from Buffalo to Chicago is 2-track or 4-track. From the Lake Shore station to the North Western station, in Chicago, the passenger goes by elevated railway, omnibus, carriage or on foot. The length of the North Western from Chicago to Council Bluffs is 487 miles, all double track. The Union Pacific from Council Bluffs to Ogden, 1,003 miles, is completely equipped with automatic signals. The Southern Pacific is completely equipped with automatic signals from Ogden to Oakland, with the exception of about six miles on the causeway across Salt Lake, where, in consequence of frequent disturbance by salt spray, the track circuits cannot be depended on; 20 miles in Nevada, between Wells and Deeth, where the line is to be changed, as before noted; 94.3 miles in the Sierra Nevada mountains, where the electric train staff (controlled manual block system) is used; and the one mile across Sacramento river at Benicia, where there is a break in the railway and trains are carried across on a boat. The Chicago & North Western is different from all the other roads mentioned in having disk block signals (enclosed) throughout its line. There are some disk signals also on the Lehigh Valley and a few on the Union Pacific, and the Lake Shore; but with these exceptions the semaphore type is used. From Council Bluffs to Oakland the line is single track nearly all the way. This composite monument to American mechanical and electrical genius is about 3,245 miles long, as follows:

		Miles.
Lehigh Valley..........	Jersey City to Buffalo............	448
Lake Shore & Mich. South.	Buffalo to Chicago..............	525
Chicago & North Western.	Chicago to Council Bluffs.........	487
Union Pacific..........	Council Bluffs to Ogden..........	1,003
Southern Pacific	Ogden to Oakland.	782
		3,245

Lengths of line, not automatic, to be deducted from the foregoing:

	Miles.
Lake Shore & Michigan Southern	4.5
Chicago & North Western	1.3
Southern Pacific	6.0
———	20.0
———	94.3
———	1.0
Total	127.1

THE UNIONS, THE RAILWAYS AND THE PUBLIC.

Because railways are engaged in a public service special duties and requirements are imposed by law and public opinion not only on the corporations themselves, but also on their officers and on certain of their employees. If the auditor fails to keep his accounts as prescribed by the Interstate Commerce Commission he can be punished. If anyone, from the president down to an agent at a small country station, gives a rebate, he can be fined and imprisoned. These are recognitions of the principle that not only the corporation that engages in a public business, but every one who enters its service, legally may, and morally ought to be, subjected to such public regulation and control as will cause the public to be well and fairly served.

Mr. Fagan's articles on "The Industrial Dilemma," which have been appearing in the *Atlantic Monthly* since February, call attention forcibly to the fact that while this wholesome principle is applied to the officers of railways and to employees in the traffic department, it is not applied where it could do the most good, viz., to the army of organized employees in the operating departments. Violations of the law against discrimination in rates give some shippers and communities unfair advantages. Violations by railway employees of the rules of efficient and safe operation increase the economic cost of transportation and cause thousands of people to be killed or injured every year. It is important that the railways shall be required to give each shipper and community a "square deal." But if the saving of thousands of persons from being annually injured or killed is still more important, then press, public officers and public should give a larger part of their attention and energy to bringing organized railway employees to a proper sense and performance of their duty.

It may be said that this is the business of railway officers. But Mr. Fagan asserts that the labor unions, favored by a public sentiment hostile to the roads, have so deprived the railways of the control over the men that the manager has become helpless to enforce obedience to rules and secure good

work. This is an extreme statement, but it is not without basis. Not all railway managers are helpless, and not all grievance committees are constantly overbearing. Many superintendents are victims of the feeling of helplessness when a little "sand" would dispel their fears. But there seems to be pretty good evidence, from railway officers themselves, that on far too many roads Mr. Fagan's description of the attitude of the unions is substantially correct; that there exists a situation which seemingly cannot be permanently remedied without a struggle in which public officers and public sentiment shall back railway officers in their efforts to recover the authority necessary to enable them to so run the roads as to render the public good service.

For some years public sentiment has been hostile to railway managements. The union leaders have taken advantage of this to make demands ever more arrogant and unreasonable. If a conflict between the managements and the union employees should be caused by an attempt to exercise stricter discipline and compel more efficient work public opinion, ignorant of the true conditions, doubtless would side with the unions; and in such a struggle victory usually perches on the banners of those who are supported by public opinion. Consequently, before the managements can hope to establish proper relations with their union employees the public must be shown where its true interest lies. It must be shown how the successful insistence by the brotherhoods on promotion according to seniority instead of according to merit, and their successful resistance to attempts to base wages on work done and not on mere time consumed in doing it, cause the most incompetent employees to be advanced as fast as the most competent, and put a premium on carelessness and a discount on alertness and industry, thereby reducing the amount and deteriorating the quality of labor that the railway gets for each dollar of wages and ultimately increasing what the public must pay for transportation. The public must also be shown how the constant and commonly successful interference by representatives of the unions with the enforcement of necessary discipline causes many employees to look to their unions, rather than to the railway managements, for the retention of their places and to be very scrupulous in keeping in good standing in the brotherhoods while in the performance of the duties of their employment they are careless and sometimes even reckless in their disregard of the rules of safe operation.

How is an intelligent public sentiment regarding these matters to be formed? The Harriman Lines have made a good start and set a good example by adopting a system of giving publicity to the facts about accidents. (*Railroad Age Gazette*, October 3, 1908, page 1031, and May 7, 1909, page 984). How publicity can be used otherwise very effectively in administering discipline was illustrated recently on one of the Harriman Lines in Texas. An employee cursed his superior officer, who had reprimanded him for a violation of the rules, and he was discharged. The representatives of his brotherhood insisted on his reinstatement, and this being refused, submitted to a vote of the members of the brotherhood the question of a strike. Thornwell Fay, Vice-President and General Manager of the Harriman Lines in Louisiana and Texas, promptly published a full statement of the facts which was addressed to the employees but evidently was intended as much to influence public sentiment as the action of the brotherhood. The result of the vote has not been made public, but there has been no strike, and there seems now no probability of one. The attitude of the leaders of the union was so palpably unreasonable that it is understood their followers refused to support them after the facts were given publicity. We doubt if there is anything that has directly and indirectly brought on American railways more unjust odium or caused them heavier losses financially than the disposition of their managers to be secretive and mysterious about things that the public has a right to know and that it would be advantageous to the railways for it to know.

In an article in the *North American Review* for May, entitled "The Crisis in Unionism," Henry White, organizer and formerly General Secretary of the United Garment Workers of America, says that the mistakes and excesses of the unions have weakened their hold practically everywhere *except on the railways*. There is food for reflection in that statement. If true, does it mean that the leaders of unionism on the railways have been more skilful in dealing with the employees than have the leaders of other unions, or that the managers of railways have been less skilful in dealing with employees than have any other class of employers? The manufacturers of the United States have waged courageous, relentless war in the courts and through the press against unreasonable union demands and domination for some years. Meantime, the railways, engaged in a struggle against shippers and politicians to protect their revenues, have sought to conciliate their employees by conceding to them everything in reason and many things beyond all reason. These facts doubtless largely explain the different positions unionism finds itself in on the railways and in the factories.

The existing state of things on the railways ought to be ended. The railways cannot perform their duty to the public unless employees also perform their duty to the public by performing their duty to the railways. The roads are willing to pay high wages. They are paying much higher wages than any other large industry. They have a right to insist on the most energetic and faithful work in return, but they are not and for years have not been getting it. If high wages and relatively easy and attractive conditions of employment will not cause the union employees to do their full duty they must be influenced or forced to do it by the combined strength of the managements, public sentiment and the law.

PROFESSIONAL ECONOMISTS AND RAILWAY REGULATION.

The *Yale Review* for February discusses in an editorial the question: "Are Economists Wasting Their Time?" We have given a good deal of thought to that question during the wave of discussion and legislation on railway subjects in the past three or four years. Muck-rakers, politicians and shippers have been roundly denouncing the railways for practices asserted to be inimical to the economic welfare of the country, and demanding and receiving all manner of drastic regulatory legislation. Railway managers, while pleading guilty to some of the charges against them, have contended that for whatever offenses they have committed the evil importunities of shippers, and conditions beyond the control of any man or set of men, have been mainly responsible, and that most of the remedies proposed or applied are economically indefensible and dangerous. In these circumstances, might we not reasonably have expected to find the economists in our universities better equipped, better situated and more effective in analyzing and fixing responsibility for the conditions, mistakes and offenses complained of, and in prescribing remedies, than any other class of men? Self-interest does not come in to bias their views. Their study and training, it would seem, are adapted to give them accurate knowledge and capacity for reasoning to correct conclusions. Their former pupils, scattered throughout the land, following every profession, including politics, engaged in every line of business, should, it would seem, be much influenced by their arguments. Yet we are constrained to think that the economists have done very little, in proportion to their number, learning and opportunity, to prevent economically unwise legislation from being passed, or to give shape to the legislation, wise and otherwise, that has been passed.

If the view here taken be correct, does it not reflect on professional economists as a class? Economics, as much as medicine or engineering, is a science that is properly judged by its fruits. Its proper fruitage is enlightened public opinion and wise public action regarding economic questions. Is there an economist of reputation who will say that public opinion

and public action in most of the states regarding railway economic questions have been intelligent or wise?

The *Yale Review* remarks that there are different ways that economists may serve the public. The following summarizes its views:

"They may act by influencing public opinion on important questions and thus ultimately determining the character of legislation." . . . They "may apply their training to the problems of administration and this way do really effective work in the service of the public." But "there are difficulties that come from the nature of political action. It is always slow. . . It takes time to permeate the public mind. . . . The economist has two channels by which he can reach the legislator. He may directly influence him and public opinion back of him by his books and articles, or he may indirectly exercise an influence through his pupils. The latter is slow but probably more sure . . . an economist may be both a thinker and a journalist, but the chances are that most of the work of economists . . . will lose in real influence if they turn aside from working on strictly scientific methods with the tools which they can best wield, in order to earn the applause of the galleries."

Is not the remark that political action "is always slow," the statement of a theory that is disproved by patent facts? It is true, political progress is slow; progress toward the solution of the railway problem, for example, has been made with leaden feet. But surely political action cannot truly be said to be always slow, when hundreds of laws have been passed in this country within the past four years for the regulation of a single industry. And political *progress*, as regards the regulation of railways, has been so slow, largely because political action has been as hasty as generally it has been ill-advised.

A tendency to avoid, or not to seek, constant, familiar contact with actual facts and conditions, and a tendency to avoid popular discussion of public questions, if persisted in, will always make the public benefits conferred by the work of economists smaller than they ought to be. The newspapers and magazines for several years have been crowded with articles discussing railway and other economic questions by ignoramuses, charlatans and quacks, incdluding some public men we could name. Men such as these, most of them possessing no more real knowledge of economic facts and principles than a hod-carrier would pick up about a labor union headquarters, but wielding breezy, sensational styles, often acquired in the school of yellow journalism, have been disseminating broadcast half-truths, falsehoods and half-baked economic and sociological doctrines that have widely poisoned the public mind. Many of the trained economists in our universities, who ought to be the best and quickest physicians to administer with authority the antidote of truth and correct principles, have been meantime so busily engaged in cudgelling one another's heads with arguments about marginal utility and whether capital is a fund or a flow, that they have lacked time and energy to treat the patient.

No one would say that economists should abandon the deep study and erudite discussion of their subject and cultivate the lurid literary style of the muck-raker. But many of them would be much more effective in and out of the class room if they would seek the thorough knowledge of actual business methods and conditions that would enable them to frame more practical and useful theories, and to point every argument with apt, accurate illustrations, and would cultivate the high-class journalist's art of lucid, interesting statement, so that more of their writings would be welcomed by the editors of the newspapers and magazines of general circulation and by their intelligent readers. President Hadley, of Yale, formerly did editorial work, and in the preface to his "Economics" he makes the significant remark: "In a professional experience which has been about equally divided between the editorial room and the lecture room, I have generally found that, barring certain necessary differences of form and presentation, what is good teaching in one place is good in another." Have economists such as Dr. Hadley and J. Lawrence Laughlin, of the University of Chicago, been accused of seeking the applause of the galleries, or have they lost in real influence, when they have courageously and clearly discussed for public consumption such intricate and important matters as railway economics and the currency problem?

Not only, it would seem, ought the economists in our universities to be more lucid and courageous in discussing the subject of regulation of railway rates, capitalization, etc., both inside and outside the class rooms, but there would seem to be a field of great usefulness for many of them in the actual work of regulation of railways, if they would thoroughly inform themselves on the subject of railway economics and have the courage to take an entirely independent attitude. Most of the state railway commissions employ engineers—frequently professors of engineering in the state universities—to advise them on engineering questions. Now, most of the commissions know just as little about railway economics as they do about railway engineering. The number who have studied the great authorities on railway economics—Acworth, Hadley, Johnson, Noyes, Taussig—must be very small judging by their official opinions and acts. They need consulting economists as much as consulting engineers, although, unfortunately, most of them do not feel the need poignantly as they should. Whether the commissions could be induced to employ and be guided by consulting economists seems rather doubtful. But whether in that capacity, or merely as professional teachers of correct views on economics, the economists in the various universities, especially in the western state universities, by studying railway questions at closer range, and by clearly, perseveringly and courageously exposing the quackery and fallacies that now largely shape the policy of railway regulation, could do much to check tendencies, which, if not arrested, are going to cause an incalculable amount of injury to the country.

Letters to the Editor.

THE NICKELIZED CAR WHEEL.

Pittsburgh, Pa., June 3, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

During the year past there has been much discussion among intelligent railway motive power superintendents and very practical car wheel makers of a national reputation, as to the necessity that has been developed by increased loads for an improved cast iron car wheel.

With but one exception, they all expressed the hope, and some expressed the belief, that a better mixture might be found, and the present very economical and simple car wheel practice be maintained. It would seem unnecessary to go into detail either as to railway use or foundry practice after such experts as Mr. Muhlfeld and Mr. Griffin have so intelligently stated the case. Without further comment I therefore proceed to give the results of making 300 car wheels which are now going through the final test of use in service. I might add that these experiments were finished before I read the discussion referred to in regard to car wheels, and were, of course, in no way influenced by that discussion. I was therefore the more gratified when the results so manifestly confirmed the opinion of those who believed that a better mixture might be found, and the present foundry plants continue to be operated.

Experimental Test.

Nickelized Car Wheels, March 23, 1909.

200 33-in. car wheels. 100 36-in. car wheels.

4,000-lb. charge in two 60-ton cupolas discharging into a reservoir.

Mixture.—45 per cent. car wheel scrap and gates; 25 per cent. coke iron; 10 per cent. nickel rails, 3½ per cent. nickel; 20 per cent. charcoal iron; nickel alloy, 3½ per cent., making .70 nickel, or 14 lbs. per 2,000 lbs.

3 tensile tests, 1 hr. apart; 1:30 o'clock to 4.

3 transverse tests, 1 hr. apart; 1:30 o'clock to 4.

Sample chill tests every ½-hr; ¾ to ⅞ chill.

Results of transverse and tensile tests upon the test bars obtained in connection with the nickelized wheels cast on the 23d ultimo.

Three sets of these bars were poured during the heat at hourly intervals beginning with 1.30 p.m. The transverse bars had a sectional area of 1½ in. square and were broken on supports 12 in. apart, load applied at the middle. The

tensile test pieces conformed to those adopted by the A. S. T. M. The respective results were as follows:

Transverse Test.

1st Set.—1st bar—Not broken at 10,000 lbs.; 2d bar—Broke at 10,000 lbs.

2d Set.—1st bar—Not broken at 10,000 lbs.; 2d bar—Not broken at 10,000 lbs.

3d Set.—1st bar—Broke at 10,000 lbs.; 2d bar—Broke at 8,795 lbs.

Tensile Test.

1st Set.—41,910 lbs. ultimate strength, lbs. per sq. in.
2d Set.—42,550 lbs. ultimate strength, lbs. per sq. in.
3d Set.—43,698 lbs. ultimate strength, lbs. per sq. in.

Showing that the claim of the steel wheel makers of 5 to 1 in favor of the steel wheel over the chilled iron wheel has been reduced to less than 3 to 1, while as shown by the Brinnell test below the chilled iron wheel has 2½ times the wearing surface of the steel wheel while Mr. Muhlfeld's statistics show that the steel wheel proves defective in use on the same lines as the chilled wheel.

Brinnell.

	Test—First.	Second.	Third.
Wheel without nickel.........	485	495	...
Nickelized tread	557	498	508
Schoen tread.	223	Hub.	203

Thermal tests were made on the 8th and 18th wheels, in other words, every tenth wheel cast on each separate floor, as well as upon a few of the lower tape sizes, the numbers of which were selected at random. Beginning with the 36-in. wheels, the information derived from this test is as follows:

No. of wh'l.	Tape size.	Character of break.	Time required for development. min.	sec.	Chill. Throat.	Tread.
7118	228	Circumferential 14 in. under rim	3	35	3/8-in.	7/16-in.
7128	229	Circumferential 16 " under rim	4	15	3/8-in.	7/16-in.
7143	228	No crack	..	..	3/8-in.	7/16-in.
7153	228	Circum. 15 in. close under rim..	2	10	7/16-in.	1/2-in.
7343	228	" 16 " under rim.......	3	45	3/8-in.	7/16-in.
7353	228	" 15 " " "	3	10	7/16-in.	1/2-in.
7368	229	" 15 " " "	2	35	3/8-in.	7/16-in.
•7378	228	" 16 " " "	3	10	7/16-in.	1/2-in.
		33-in. Wheels.				
7093	161	No crack	..	..	3/8-in.	7/16-in.
7103	161	Circum., 12 in. at intersection...	4	50	7/16-in.	1/2-in.
7168	161	" 14 " " " ...	5	20	3/8-in.	7/16-in.
7178	161	" 15 " " " ...	3	35	3/8-in.	7/16-in.
7203	161	" 14 " " " ...	3	30	3/8-in.	7/16-in.
7228	161	" 12 " " " ...	6	20	3/8-in.	7/16-in.
7243	160	" 15 " " " ...	2	5	3/8-in.	7/16-in.
7253	161	No crack	..	..	3/8-in.	7/16-in.
7278	161	" "	..	..	7/16-in.	1/2-in.
7293	161	" "	..	..	3/8-in.	7/16-in.
7303	160	Circum., 15 in. through intersec.	2	45	7/16-in.	1/2-in.
7318	161	" 12 " " "	6	..	3/8-in.	7/16-in.
7328	161	" 10 " " "	4	40	7/16-in.	1/2-in.

Drop Test.

Weight, 140 lbs. Drop, 12 ft.
33-in. Wheels.

				Chill	
No. 7127	Tape 228	Wheel broke	41st blow.	3/8-in. and	7/16-in.
" 7354	" 228	" "	62d "	7/16-in. "	1/2-in.
" 7376	" 227	" "	131st "	7/16-in. "	1/2-in.
" 7384	" 226	" "	163d "	7/8-in. "	11/16-in.
" 7385	" 226	" "	141st "	13/16-in. "	5/8-in.
" 7132	" 227	" "	193d "	7/16-in. "	5/8-in.
" 7134	" 226	" "	39th "	13/16-in. "	5/8-in.
		33-in. Wheel.			
" 7308	" 158	Not broken at........	300 "	5/8-in. "	11/16-in.

Analysis.

Car wheel:	Sil.	Sul.	Mang.	Phos.	Cc.	Nickel.
Mixture without nickel	.60	.13	.60	...	...	...
Nckl in gray irn of whl	.442	.131	.467	.343	.78	.687
Nickel in chilled tread.	.441	.110	.483	.342	3.339	.687
Schoen steel wheel	.094	....	.870	.012	.690	...

From the above it is evident that the nickel reduces the silicon and manganese as well as the sulphur. As confirming the Binnell test of the Schoen wheel, the chill tread has 5 times as much carbon in it as the Schoen wheel and only one-half as much manganese.

In comparing the nickelized wheel with the steel wheel it is important to remember that the steel wheel has more traction than the chilled face wheel and on heavy grades and with heavy loads will develop more friction with the steel rail than the chill wheel does. This involves additional motive power. It is a well known principle in mechanics that two surfaces of the same kind develop more friction than where the surfaces are radically different. Hence we revolve steel shafts or axles in journal boxes of brass or babbitt. The same thing holds good in this connection. Railway men would not think of using a chilled face rim on a locomotive driver because they want to avail themselves of friction with the rail. But the reverse is true in connection with a heavily loaded steel car. Then they want the freest possible contact with the rail. In other words they would prefer to haul a train of cars mounted on chill wheels up a heavy grade, rather than a train of locomotives mounted on steel drivers, without any steam up, and as a dead load with the weight the same in both cases. Chilled wheels will require less motive power, and cause less wear of rails than steel wheels.

The nickelized car wheel involves no change of any kind in present foundry plants. The nickel is charged with the heat, and in actual practice in the wheel foundry, shows wonderfully uniform results. Its affinity for combined carbon is very remarkable and chill tests taken every half hour showed very uniform results in depth of chill.

In the nickel car wheel makers are not using a new alloy Nickel has been in use for years, and its qualities are well known in the manufacture of steel:

1. It adds to the rigidity and stiffness when the materials are subject to wear or abrasion.

2. The influence of nickel on the elastic limit and ultimate strength increases with the percentage of combined carbon present.

3. It has a lower co-efficient of expansion than any other alloy known.

4. As it enters into the chilled surface of the car wheel tread, it toughens and strengthens it and consequently makes it less liable to crack.

These are all desirable qualities in a car wheel. Chilled hammer dies used for breaking down hot steel billets have been in use for twelve months without showing any cracks on the surface. This is the same kind of test as the friction on the tread of a car wheel, that is, heating up and cooling down, only very much more severe.

Nickel is just as readily handled as manganese, in fact it adds nothing new to present foundry car wheel practice. As the nickel is not like titanium, but is indestructible, it comes back to the maker in the scrap wheel.

One of the difficulties dwelt upon in getting a better mixture for car wheels by the persons who discussed the car wheel situation, was the fact that the car wheel maker was between the "upper and nether" millstone; that is, the purchasing agent who wanted wheels at the lowest price and the inspector who wanted certain physical results.

The use of nickel would seem to solve the problem. Why not have the purchaser furnish the nickel and pay the royalty? The car wheel maker would be required to furnish an analysis showing that the percentage of nickel went into the wheel, just as makers of nickelized axles are accustomed to do, while the maker would be protected from unfair competition by the fact that his rival would be liable to infringement if he used nickel without warrant. This would leave the question of furnishing a new wheel for an old one in just the position it is now, as the car wheel makers would not be subjected to any additional cost.

In conclusion, with a mixture showing 75 per cent. increased tensile strength, 25 per cent. transverse strength, 150 per cent. increased Brinnell test over the Schoen steel wheel and coming within the M. C. B. tests in every respect, the necessity for a steel wheel, except perhaps as drivers on the front truck of a trolley car, is indefinitely postponed. ROBERT C. TOTTEN.

RAILWAY OPERATING ORGANIZATIONS.

New York, June 7, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

It was the writer's privilege to be "among those present" when Mr. Julius Kruttschnitt addressed the New York Railroad Club at the last meeting (May) on the subject of the operating organization of the Union Pacific and Southern Pacific systems.

To the "middle classes" of the railways—the "men behind the guns" who stand between the higher operating officers and

the rank and file—the remarks of the vice-president and director of maintenance and operation of the Harriman lines bring promise of the dawning of a better day for those roads still afflicted with an ultra-departmental organization and a preponderance of unpractical general or special staff of officers with a disposition to interference with the workers.

These thoughts of the most prominent operating officer in American are not new; they have been uttered, iterated and reiterated by practical and experienced operating men since the beginning of systematic transportation, and *in theory* have been advanced by almost all general officers, the practical as well as the unpractical ones. It remained, however, for Messrs. Harriman, Kruttschnitt, Mahl and Hine—one or all of them—to put into actual and effective practice what others did only in theory or in their minds; and these men are deserving of the gratitude of the railway world for the courage and intelligence which they have contributed to this cause.

It is to be hoped that the *Railroad Age Gazette* will give the subject all possible publicity and provoke a thorough discussion of this most advanced idea in railway organization and management.

The essential features of Mr. Kruttschnitt's organization are:

Home rule—i.e., divisional organization.

Assistance to and co-operation with division officers while carefully avoiding interference.

Statistical information compiled by and for the division operating officers.

Broadening out and equipping all officers for their duties by a liberal educational course, including visits to other roads.

Individuality of officers; encouragement of the initiative.

Publicity and more intimate relations between the road's officers and the general public.

Frequent conference of officers on different divisions.

Rotation of officers.

The application of these thoughts by the Harriman management is new; the theories—the fundamental ideas—are not new. Major Hine in his "Letters from an Old Railway Official to his Son," published five years ago, says, among other things:

> The Auditor's statements do not tell us why we lost certain traffic. Figures must be fought with figures, and many a good operating official has had to lie down in the face of the Auditor's fire, because, from lack of intelligent study of statistics on his own part, he had no ammunition with which to reload.
>
> Some men have to go to another road to be fully appreciated. . . .
>
> If the division engineer is under the superintendent, why, in sending papers into the next room to him, write a letter and burden your files? Why not have one chief clerk and one set of records for the whole outfit? . . .
>
> Common sense is a pretty good safeguard. . . . Avoid interference with the man on the ground. Rules on blanks will amount to little if they are continually discounted by special messages. Disobedience and indifference are sometimes due to the feeling that the impossible is expected . . .

In Droege's "Yards and Terminals," published three years ago, statistics and organization are dealt with, in part, as follows:

> It is apparent on many roads that the report and record business is overdone. This seems to be due to an increasing demand for information by shippers and traffic officers. The easy abuse follows, by which department heads ask for another report by wire, or mail, or both, weekly, daily and ofttimes at several specified times daily. The result is to demoralize or confuse the organization and overload the local forces with a mass of detail serving no good end. The information asked for is usually already made up and sent in, in some form. . . .
>
> Of honest, open, intelligent and constant supervision too much cannot be had; there is usually too little. This supervision carries with it constant and untiring education of employees. . . .
>
> The age of the "specialist" in railway work has been reached . . . By placing these expert observers in position to ignore or harass the local division officers, however, and having them report direct to general officers, the effect may in some instances be bad. They (the specialists) may be able to claim credit for good results while evading responsibility for failures.

The Harriman organization, according to Mr. Kruttschnitt, is essentially divisional. "It is intended that a superintendent shall be general manager of his division." If the writer's memory serves him correctly, the organization of the Pennsylvania Railroad defines the duties of the division superintendent briefly by assigning to him the authority of the General Superintendent. The most successfully operated railways in this country are those working under the divisional organization; and they are likewise those on which harmonious relations are usually maintained. This is a natural outcome; the divisional organization's success depends on and encourages harmony, while the departmental organization obstructs, and produces friction in the very nature of things. In the divisional organization the various departments come together under one head on the division; in the departmental, they combine under some general officer—and not infrequently that general officer is the president. There are functionaries at the heads of various departments whose toes are being trodden upon, or, if not, who are living in fear that they may be.

Take a practical application. A private enterprise desires a side track built, for which there is a traffic necessity, and the enterprise is ready to pay the cost; and there are no physical difficulties to be overcome. The superintendent, under the divisional organization, confers with his engineers and with the local traffic representative; the recommendation goes to the general officer in charge combining the recommendations of all departments interested on the division. It is then only necessary to act and authorize the construction or reject it. Under the other system, the superintendent recommends the construction to the General Superintendent or General Manager. It is then turned over to the head of the maintenance or construction department, who returns it to the local engineer, whose office may be next door to that of the superintendent where the proposition originated. After some further delay the engineer again sends it to the general officers, several hundred miles away, and it next finds its way into the hands of the general officer in charge of traffic who returns it to the originating point for the investigation and recommendation of the local traffic officer who, in turn, after consuming a few weeks on his part of it, sends it to general headquarters. It is then ready to go to the President or other general officer in charge for final approval, provided no flaws have developed in the meantime, and the papers have not become lost, mislaid, divided or worn out. Many little technical details will probably arise during the negotiations, making it necessary to pass the papers back and forward several times between the various department heads and between those heads and the division officers, which would doubtless have been disposed of by a few minutes' conference by the division officers, on the ground, under the divisional organization.

A certain road operated on the departmental plan was congested with freight. The Superintendent of Car Service wired a division superintendent, some six or eight hundred miles away, asking why one of his terminals had not been cleaned up. The reply was that the master mechanic had been requested to furnish 20 freight locomotives during the day but that only 15 were delivered. The Superintendent of Car Service requested the Superintendent of Motive Power to explain; he, in turn, wired the master mechanic of the division and elicited the information that he could not furnish all engines ordered because the transportation department had sent engines back to him in bad shape; damaged, dirty fires, etc. Beyond much telegraphic correspondence of an interesting nature little was accomplished. On a divisional organization just one message would have been sent—to the superintendent—and his reply would have covered the whole situation.

There are many objections to the departmental organization. The opportunity exists for a division engineer to estimate costs excessively and to deprecate an improvement which is desired

for economical operation. He cannot or will not do this so readily if confronted on the ground by the superintendent with his arguments. I recently saw ashes and other material wasted where it could be of no practical benefit; had the superintendent controlled the situation he would have had the material dumped at points where sidings would eventually be required.

Of Mr. Kruttschnitt's requirement of inspectors and special representatives that they exercise no authority but may "observe, inquire, investigate, confer, advise, suggest and report" too much cannot be said. This is well worthy of emulation everywhere.

One of the best features of the Kruttschnitt plan of organization is the compiling, filing and using of statistics in the offices of the division superintendents. Many superintendents' offices—usually seriously handicapped by a lack of efficient office help—are required to prepare a mass of statistical information, arranged solely with a view to the wishes of the general officer demanding it, and of little or no service to the division offices; and this work has to be done to the exclusion of statistical matter which is desirable and necessary for use on the division itself.

While it was not specifically stated by Mr. Kruttschnitt, it may safely be inferred that on his roads the superintendents are not overloaded with a mass of unnecessary detail. I am confident that they are not required to "personally affix" their signatures to every report, requisition for a pint of oil or a dozen lead pencils, trip passes, etc. I do not believe that some 12 or 15 general officers are firing papers into the superintendent's office from all directions with enough requests to "personally" interview, visit or investigate to keep four men busy.

This is evidently not Mr. Harriman's idea of successful handling of a railway or he would not have made the remark about the officer whom he found behind a desk piled high with papers: "I want to find him leaning back in his chair with his feet on the desk—thinking! thinking!" D. A. J.

Contributed Papers.

PAINTING STEEL CARS.

BY GEORGE L. FOWLER,
Associate Editor of the *Railroad Age Gazette*.

The Master Car Builders' Association has a committee that is to report on the proper painting and protection of steel cars. Without intending or being able to anticipate the recommendations of that report in any way, it may be well to call attention to a few points in the usual practice of such work that go far toward accounting for the poor results that are so frequently obtained.

These poor results are not always so much the fault of the materials that are used, or the class of labor employed, as in the neglect of a few precautions that seem to be well worth while. The ordinary method of procedure is to run the riveted car into the paint shed and start the gangs at work. The men are unskilled laborers and they are watched simply to see that they cover all parts and do not put the paint on too thick. Of course they are cautioned not to paint on dirt, and if they do they not only forfeit their pay for the car so treated but are fined in addition. But even these meager precautions might be made to give far better results than they do.

It is well known that rust is one of the greatest enemies to paint that there is. It will cut through paint, no matter where the point of contact. If the paint is spread over it the rust will cause it to peel off, blister and disintegrate.

If there is a paint where the metal is exposed and the rust is allowed to trickle down over the outside surface, the paint will be attacked and soon cut through. It is therefore quite essential that the presence of rust should be avoided at the start.

It is, perhaps, too much to expect that cars will be sand blasted before painting. This is what we all know ought to be done, but it is not probable that the net economy resulting from the work would pay; still, it ought to be possible so to protect shapes and bars after they have been rolled that they are free from rust at the time they are put into the car. If this were to be done the paint on these parts would have a correspondingly longer life. As it is, it is not an uncommon thing to see angles, channels and plates rusted in a manner that will insure the rapid deterioration of the paint as soon as it is applied. In the case of a recent order for coal cars the corner posts, top angles, sills, pressed steel diagonal braces, and even many of the side sheets were badly rusted when the cars received their first coat of paint. What chance has the paint to give good service and show an adequate length of life under such circumstances? And yet, apparently, not a single inspector raised his voice in protest.

Another cause of paint failure is to be found in paint itself. It is a common item in specifications to require that all joints shall be given a coat of red lead before being bolted up and riveted. The red lead is applied with a liberal hand, so liberally, in fact, that much of the adjacent metal beyond the limits of the joint is smeared with it. This would not be so bad if it were not left in such thick masses that it will not dry. Of course, the painters are given a knife and are told to scrape off all red lead before painting, but who can watch every man every minute to see that he obeys instructions? The men work by the piece; they do not realize the importance of doing exactly as they are told, with the result that they have every inducement to scamp the work, and so cover these thick masses of undried red lead with paint that still further delays the drying, and we have a soft putty-like mass ready to be wiped off at a touch and leave an exposed spot of metal to rust and play havoc with all the paint in the immediate neighborhood.

In the laying of the paint also there is ample room for improvement. The men are told not to paint over dirt or paint skins, so they dust off the parts; but unfortunately they do the dusting with the same brush with which they apply paint. Hence it comes about that the wet brush wipes up all of the small particles and hides them among its bristles, while only the coarse material is swept away and falls to the floor. Then when the knife is used, the brush is laid down on any convenient place, and that place may be a sill or the floor that is gritty with the dirt upon it. This done, the brush is in first-class condition to distribute a fine collection of grit and dirt upon the surface with which it next comes in contact. This is not the fault of the man, for no one has ever told him to do better. And, finally, the work is frequently done with brushes that are worn out and unfit for use.

Then, in addition to the red lead besmirching, we have the castings that are dipped. Dipping may be a very cheap and expeditious method of applying paint, but it is certainly extravagant in the use of material and fails to give a properly adherent coating, because all of the recesses and pockets are so filled that thorough drying is out of the question, and to paint over the skin-coated liquid, for it is frequently in a liquid condition when the paint is applied, is a farce of the first order.

These are physical conditions that go far toward helping along in the deterioration of the paint, but there are other things in the way of application that are of the same character. For example, the painting shed is frequently a long, poorly-lighted structure. The windows are few and small, and artificial light is necessary even on the brightest of days. And, then, the artificial light frequently furnished is utterly insufficient to make it possible to work by it, and the men have to resort to torches. Sometimes a man will be found working vigorously on the side of a car and depending solely on the faint light of a miner's lamp stuck in his cap to see what he is doing. Or, he will have to depend upon a smoky torch that either befouls the surface to which the paint is to be

applied or one that has been freshly painted. In either case it does no good to the lasting qualities of the covering.

Finally, we have to contend with the rush and push to get out work that calls for a quick delivery and minimizing of the time allowable for all operations. And this minimizing strikes at the root of a good paint by demanding that it shall be quick drying. Instead of allowing twenty-four hours for the coats to dry, the time is cut to eight or ten. The paint manufacturers know and urge that this is too short, but they are told that it must be done or the order will go to the firm which will meet the demand, and so nearly all car paints are loaded with dryers, and even then one coat is applied before the preceding one is thoroughly dry. So the merry war against durability and effectiveness goes on.

These are all little things, but any one of them is quite sufficient to ruin the lasting quality of what would otherwise be good paint. The expense of avoiding these difficulties would not be very great. Perhaps the most serious item would be the protection of the metal from rust before it is put in the car. This would require careful handling and the maintenance of shelters. Whether it could be done economically or not could only be told after a careful investigation of the subject in all its details. But when it is considered that the results of the rust are certain and rapid deterioration, the investigation at least seems worth while.

The painters are paid by the piece, and in making the price it is evident that cleaning the surfaces from red lead and dirt has to be taken into consideration. It ought not to add anything to the cost to have this work done in advance of the painter. He would then have no excuse for covering dirt or mixing it with his brush.

The proper lighting and ventilating of the shop is a matter that would add to the economy of the work rather than detract from it, and might well be demanded by the customer, even if the builder were indisposed to grant it, on the ground that it is a necessary accompaniment to a proper inspection and supervision. Under present conditions inspection drops to the realm of an absurdity, for an inspector who can work efficiently with a smoky torch as the only source of light must have eyes that are "double gas microscopes of hextra power," and a faculty of insistence in the performance of his duties that are more than remarkable.

Of course there are paints and paints, but it is respectfully suggested that if these seemingly insignificant details were to receive the attention they deserve and the sources of troubles accompanying them were to be removed, there would be no difficulty in obtaining a paint that would have a life unparalleled at present, and there would be little occasion for further work on the part of the committee referred to, beyond the choice of proper vehicles and pigments.

In making these selections it must be constantly borne in mind that the inert pigments, such as graphite, silica and the like, are the best because they are absolutely resistant to the action of acids and gases, and serve not only to protect the metal but the very paint itself from rapid deterioration. Not only must care be exercised in actual selection, however, but the materials must be so combined as to produce desired results. In the case of the two pigments cited, it is by a combination rather than by the use of either alone that a resistant paint of value is obtained. This has actually been found to be the case in some recent tests, in which a microscopic examination showed that while the vehicle film had been cut away by an acid action to which the paint had been subjected, the lower portions were coated with a dense layer of the pigments which seemed to be protecting it from further action.

The vehicle should be of such a character that, when dry, the film is firm yet elastic. In this there is a wide difference in car paints. Some dry with this feature well developed, while others become hard and brittle and, if an attempt is made to scrape them off, they demonstrate their condition by crumbling into a powder, and it is impossible to obtain the faintest semblance to a skin because they have no tenacity or coherence. Others can be peeled off, even after hard service, as a soft pliable film. In laying and preserving paint it is absolutely essential that the coat should be continuous. If the paint skin is broken at any point through which water and air can get in to the surface of the metal, corrosion will be sure to follow. This corrosion will then be apt to attack the paint from both sides. The formation of the rust spot tends to creep along beneath the skin of the paint and thus loosen and destroy it, and this will surely happen unless the paint is very closely adherent. At the same time the particles of rust carried by the water and deposited upon the outer surface of the paint make a direct and vigorous attack upon the outside. Indeed it is in this direction that the greatest danger of deterioration seems to lie. The rust appears to communicate its own corrosive action to the paint, and will soon destroy it.

Next to cracks in the paint, the presence of sharp projecting corners are most conducive to deterioration. It is impossible to lay the paint as thickly over a sharp angle as upon a flat surface, and it may easily happen that there is no paint at all at the angle, even though the flat surface may be well covered. When this is the case, or when the coat is very thin, it is soon broken through and rust starts at once, with the bad effect of streaking the paint. The most obvious means of meeting this difficulty is to use shapes with rounded corners, and if such shapes were to be rolled for steel car work it is possible that the life of all paints would be greatly prolonged. The same principle requires that all flat or curved surfaces should be smooth.

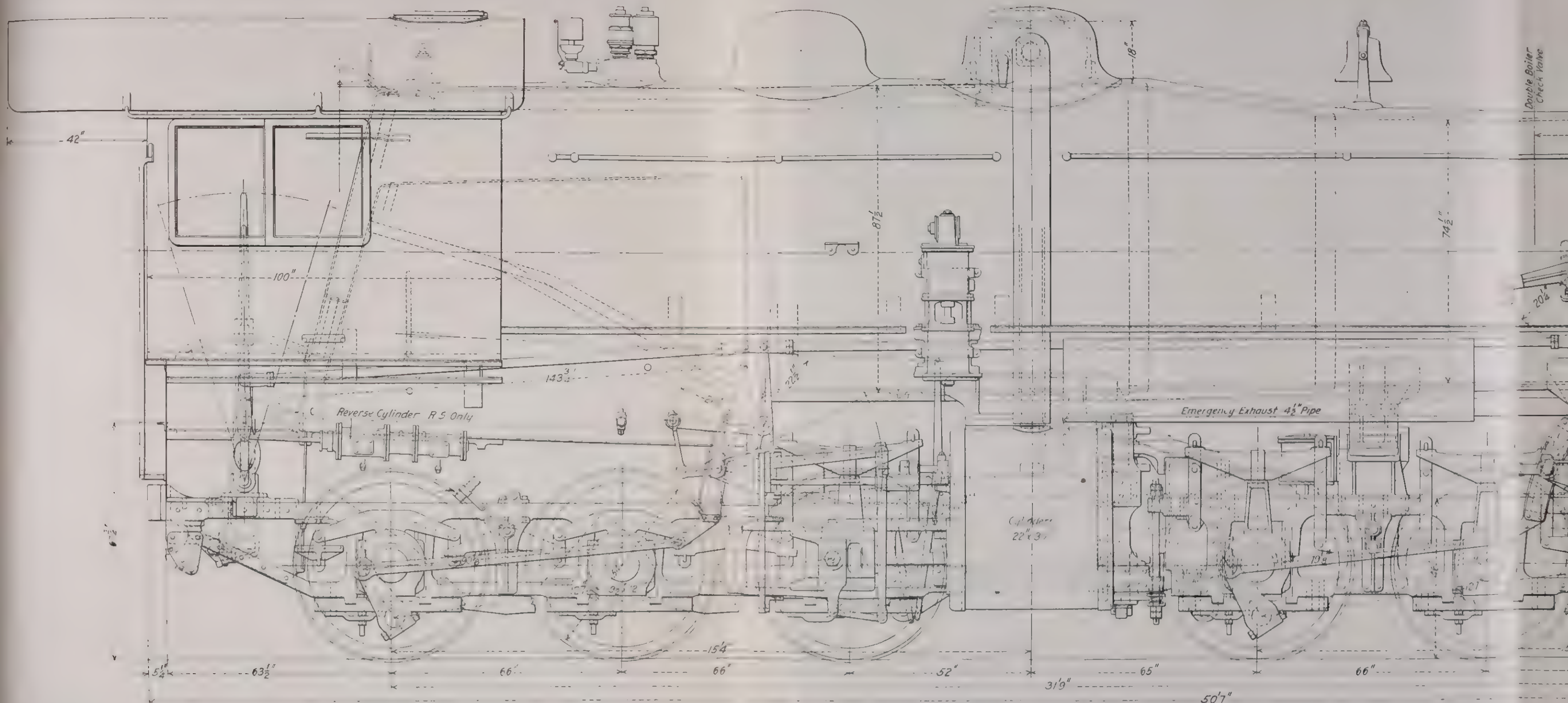
In the preparation of surfaces to be painted great care should be exercised. It is quite true that the price, service and character of workmanship do not permit of any very elaborate provisions for the preparation of the surfaces of steel cars, but it is within the range of possibility to exert more care than is being used. For example, it is common practice to allow the shapes and sheets to be exposed to the weather before use in a way that will allow rusting to start. Then when they are painted the work is done over the rust spots without cleaning, and deterioration straightway commences. It would not add appreciably to the cost of a car to keep the metal under shelter and protected from the weather until it is used.

The same principle holds in the matter of painting on dry surfaces only. "It is of paramount importance that no water should be imprisoned beneath the paint. To seal up moisture by a coating of anything is to confine a corrosive agent on the surface which the paint is supposed to protect. It is, therefore, desirable that the painting should be done under shelter and in as dry an atmosphere as possible, and especially that there should be no moisture on the plates when the work is being done.

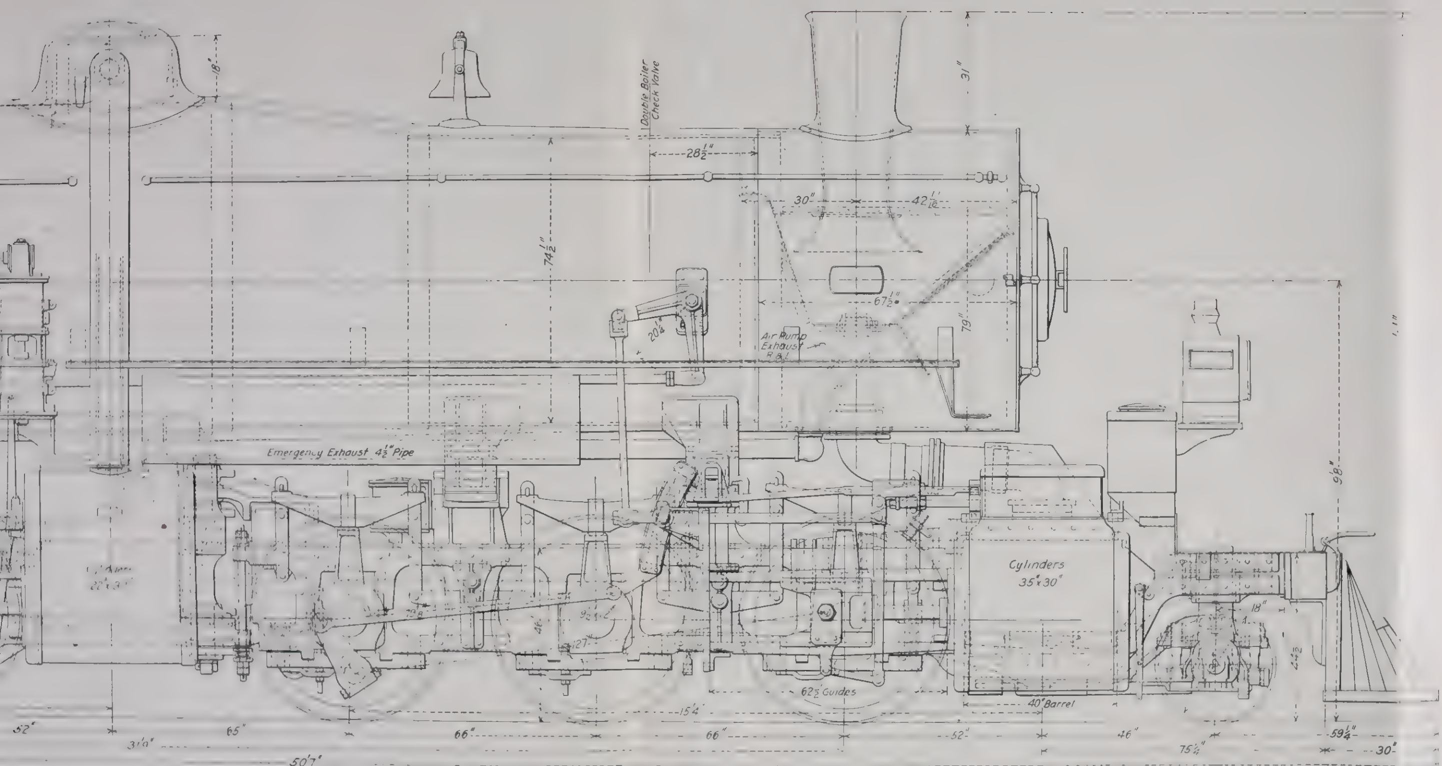
It is also essential to good painting that the metal should be first cleaned. Of course, as a method of cleaning, sand-blasting stands at the head. Although sand-blasting of the whole surface of the car would add materially to the life of the paint, it is impracticable, and possibly unnecessary. But it is quite probable that it would be an economy to use it for the removal of the rust spots on the metal. Scraping before a coat of paint is applied should be considered necessary for the preservation of the metal, or blistering of the paint and pitting of the iron may result.*

Blistering also "sometimes occurs from carelessness and overhaste in painting, which are fatal to durability; from want of preparation of the surface to be coated, which cannot be too clean or dry in order that all dirt or moisture may be removed and air expelled, and also from the paint not being equally spread." In paints generally it principally arises from the second coat being applied before the first has had time to dry and harden; the use of dryers that injure it and over oiling; by moisture having accumulated at some crack or joint, re-

*I am quoting freely from Toch's "The Chemistry of Paint," and from an older work on the protection of metallic structures.



MALLET ARTICULATED COMPOUND LOCOMOTIVE FOR THE VIRGINIAN RAILWAY. BUILT BY THE AMERICAN LOCOMOTIVE COMPANY AT RICHMON



OR THE VIRGINIAN RAILWAY. BUILT BY THE AMERICAN LOCOMOTIVE COMPANY AT RICHMOND, VIRGINIA.

sulting in a thin layer of rust between the paint and the surface of the metal, the evaporation of the moisture confined under the coat, by heat, by air being confined upon the surface consequent upon the too rapid and careless spreading of the paint, by inequalities and unevenness of the surface painted, and also from the decomposition of the paint.*

When cars are to be repainted the same care regarding cleanliness should be observed, with the additional precaution that attention should be directed to ascertain that the old coat is still adhering firmly and protecting the metal, and that "the new paint will not deleteriously affect that already on the metal or have its valuable properties and drying qualities injured. The best method to adopt is to remove the old paint, together with any scales of the iron, as the pure iron, not the outer scale, cannot properly be protected unless this is done."

This is really of more importance than most men realize, and was brought out very vividly in some paint tests that have recently been completed. In these, after the painted surfaces had been subjected to a rather severe treatment for several months, the surface appeared to be perfectly intact, suited not only to receive a fresh coat of paint, but capable of protecting from rust the metal to which it had been applied. Almost any inspector would have said that it was all right. An examination under the microscope, however, revealed the fact that the surface was not as smooth as it appeared, but had become pimply, as though covered with gooseflesh. Under a moderate degree of magnification these pimples appear to be minute blisters, but quite intact. But an increase of the power of the lense developed the fact that these swellings had burst and that many of them were punctured by small holes about one-thousandth of an inch in diameter. It could also be seen that water had entered these holes and that rust had already been started beneath. So that, had a fresh coat of paint been applied to these surfaces, it would have started on a course of rapid deterioration, because of the rust already existing beneath it. Therefore it appears evident that surface inspection, unaided by a powerful glass, cannot be depended upon to determine whether a surface is in proper condition for repainting or not.

In laying paint care must be exercised that there is an intimate contact between the paint and the metal, and an endeavor should be made to expel all of the air in spreading it. The failure to do this is probably one of the contributing causes to the failure of sprayed surfaces.

It has been suggested that painting while the sheets are hot would be of great advantage in preserving the metal, and this would undoubtedly be the case, but it is probably impracticable of application in steel car work.

It is, perhaps, needless to raise a cry against the use of cheap paint, but it may be well to keep the matter alive by calling attention to it. "Paint that is twice the first cost of any specious stuff sold at prices below those for which even the raw materials of a really anti-corrosive and efficient paint can be obtained is much cheaper in the end, for cheap paint may soon lose any protective qualities it may at first possess, and frequent repainting is necessary."

It has been suggested one of the chief points contributing to the deterioration of paint on steel cars is that of demanding a quick drying article. Neither the railway companies nor the builders seem to be willing to allow a sufficient time for drying before the application of the successive coats. It is demanded that the second coat should be applied within six or eight hours of the first. Paints can, of course, be made to meet these specifications, but any reputable manufacturer of paints does it under protest, and does it because it must be done in order to meet the requirements and competition. If specifications were to be drawn allowing at least 24 hours for the drying of each successive coat, steel car painting would be much more efficient than it is now.

To sum up this matter, it may be suggested that the metal should be made clean before painting; that the paint be well brushed on; that a slow-drying article be used; that the coat should remain elastic; that it should form a hard, smooth, even, glossy surface, impervious to air and moisture; that three coats be used, and, above all, that the integrity of the coat be maintained over the whole of the painted surface, that there may be no cracks or flaws through which air or moisture can enter and gain access to the metal, thus setting up a corrosion that will be sure to cause a deterioration and destruction of the paint. It is of the utmost importance to the proper preservation of the paint that rust shall not be carried over its outer surface by the trickling of water.

COMPARISON OF LOCOMOTIVE BUILDING IN THE UNITED STATES, GERMANY AND FRANCE.*

BY MARCEL BLOCH,
Motive Power Inspector of the Paris-Orleans Railway.

II.

POWER HOUSES.

Power houses are very similar in all three countries, with the exception that automatic stokers are used almost exclusively in America and Germany while in France their number is limited; it is also noticeable that in the latter country the power house is not developed on the same scale as the shops themselves. Most French shops appear to be always short of compressed air for air-hammers, etc.; their compressors rarely yield more than 350 to 500 cubic feet per minute, while in America a production of 1,400 to 1,700 cubic feet is common.

PATTERN SHOP.

The differences in all three countries are trifling; the shops can deliver a pattern for a single cylinder in about three weeks, and for a double cylinder in about one month.

FOUNDRY.

In addition to their size and the large number of cupolas as compared with the actual production, American foundries are exceptionally well equipped with molding machines, crane facilities and powerful machinery generally, while the force is trained to work systematically and as rapidly as possible. The foundry at Schenectady, for instance, 650 ft. long and 175 ft. wide, is divided into three sections, or floors; the main floor has two 10-ton and two 25-ton high-speed overhead cranes. At the lower end of the foundry there are 30 Tabor molding machines, with eight 5-ton cranes; numerous pneumatic hoists help the molders to set their cores. The output of this shop is seven cylinders per day, corresponding to 50 to 60 tons. Two days are generally necessary to finish an American cylinder, one day for molding, one night for drying, one day for re-molding and pouring. Four days are required for a double-compound locomotive cylinder. Floor iron is always cast in green sand by means of white metal patterns and Tabor molding machines.

The output of German foundries is necessarily lower; the Borsig foundry casts about two cylinders per day, with a total output of about 40 tons of cast iron. Molding machines are less extensively used than in America and are generally hydraulic, which makes them necessarily much slower than the American machines. The latest and most up-to-date German foundry, at Hannover, does not possess a single molding machine; it requires about seven days to cast a cylinder in Germany.

French foundries are generally much older and their equipment out of date as compared with those of Germany and America. Molders and foundrymen are more experienced and careful; the castings produced have a much finer appearance; but the time required is a great deal longer, with the possible exception of one foundry, recently installed in the Nord district, which can easily deliver one cylinder in a week. In

*Translated from the *Revue Generale des Chemins de Fer.*

another large French foundry, now somewhat out of date, the following time is required for the casting of a double compound locomotive cylinder:

Molding	6 days
Drying	2 nights and one day
Remolding	5 days
Total	12 "

that is, practically two weeks. This foundry cannot therefore deliver more than four cylinders per week; about 20 tons of iron are poured per day and no night work is done.

The following table can now be established for making a double cylinder:

Schenectady	4 days
Germany	7 "
France	12 "

BLACKSMITH SHOP.

Blacksmith and hammer shop practice is radically different in Germany, the United States and France. In the two former countries, and particularly in the United States, parts are very roughly forged, and much more machine work is therefore necessary to bring them down to finished dimensions.

In France the common practice is to give the rough forging a shape and size approximating as nearly as possible the finished part. All Americans who have visited French shops have noticed with what perfection the French smith succeeds in forging parts. Yet it is incontestable that with the modern machine shop facilities and powerful machine tools, the utility of leaving as little excess metal as possible on forgings disappears almost completely, and the careful French smiths' work becomes to a certain degree useless.

In Germany some of the most modern shops now use the oxhydric burner for the more complicated forgings, such as eccentric straps, rod straps, draft-gear hooks, etc., which are cut out at high speed (about 2¾ in. per minute, for 2-in. thickness). This practice saves making special dies.

French shops are beginning to use the same methods; the Denian shops, for instance, have recently welded mudrings with an acetylene burner.

BOILER SHOP.

French shops are incontestably superior to German and American as far as careful boiler work is concerned. The short life generally required of locomotives in the United States renders carefully finished work less necessary; however, even when French inspection is imposed, the work is gotten out much more rapidly in the United States than in France. This is due in the first place to the powerful machinery with which American shops are equipped, and also to their standard shop practice. Taking as an example the American Locomotive Company's boiler shop in Schenectady, which is wonderfully well fitted, and measures 650 ft. long by 175 wide, the following table will show the order in which boilers are gotten out:

South <————————> North

Bending Drilling Punching Shearing Laying out Material (A)

<———— <————

————>

Riveting Assembling Erecting Complete boilers

————>

Machine tools Flanging presses Crown stays and staybolts Tubes

This order is always followed strictly; the plates are received from the mills through the door at (A) and follow the direction of the arrow, being successively laid out, sheared, punched, drilled (in series of four or five), then bent, welded and arrive thus to the southern side of the shop, and start up again along the middle aisle where they are first adjusted and riveted, then assembled and finally the complete boiler is put together. During this time, the fireboxes have been prepared in the eastern part of the shop; plates are flanged, and drilled, mudrings milled and drilled, crown stays and staybolts threaded. The assembling of the boiler is done by the help of two 35-ton overhead cranes. Thus boilers advance from south to north as their construction is proceeded with. In this manner handling of boilers, etc., is reduced to a minimum; stays and staybolts are set by compressed air, which is distributed generously throughout the shop. On account of this logical and rigorously followed order and thanks to a large force (I have seen 18 men working at the same time on one of the Paris-Orleans fireboxes), astonishing results are obtained in the matter of quick execution. The most wonderful feat ever accomplished was the construction of a complete boiler in three days and three nights, from the laying out of the first plate to the last detail on the boiler. This is certainly remarkable, notwithstanding the fact that it is quite an exceptional performance, and that the finished boiler was probably not of highest perfection.

For establishing a comparison between the three countries, the construction of thirty boilers for the Paris-Orleans Railway may be cited as an example. The Schenectady Works began by making dies for all firebox, firebox shell and side-frame plates. These plates were then flanged, or bent, on a press without the least difficulty. In France the number of dies used was much smaller, and the firebox plates were flanged with small flanging presses. The same process was followed in Germany, but the boiler makers in this country being much less skilful than in France, caused a great deal of time to be lost. The fireboxes were placed in their shells only after many failures. Although it must be considered that 30 locomotives were ordered in America while only 10 were placed in France and Germany, and that therefore the American builders found it more to their advantage to make dies for all flanged plates, yet it is unquestionable that the method followed by the latter saved them much time and gave more accurate results.

Little difference exists between the German and French methods of boiler construction, and the only advantage in time which the former possess results from the fact that they work both night and day, and that their work is less careful. This is proved by noting that a German boiler shop which delivers ordinarily 30 complete boilers per month, only succeeded in getting out five French boilers in the same time, on account of more careful work being required by the inspectors.

MACHINE SHOP.

In this shop, more than in any other, is noticeable the radical differences between American and European practice.

An American manufacturer who has paid $10,000 for a machine wishes to make it pay for itself in the shortest possible time by obtaining the largest possible amount of work from it and by keeping down repairs. On account of the constant improvements introduced in machine design, he will find it to his advantage to scrap this machine in a relatively short period of time, and purchase in its stead some new design, invented or improved during that time, which will be more powerful and yielding a better output.

In Europe, on the other hand, machine tools are still considered as delicate pieces of mechanism, requiring scrupulous care, whose life should be lengthened as much as possible by careful handling and frequent repairs. They are generally run by much lower-power motors than used in America, and are not used except on carefully prepared forgings, in which the excess metal to be removed is reduced to a minimum. This naturally carries with it a great difference in the time required for machining different parts.

Here are some time studies taken in the three countries: milling side-rods; horizontal milling-wheel:

	U. S. A.	Germany.	France.
Number of rods worked	2	1	1
Diameter of milling wheel	8 in.	5.12 in.	6 in.
Height of cut	4 in. x 2 in.	4.7 "	4 "
Depth of cut	½ in.	1.37 "	0.15"
Cutting speed of tool	60 ft.	46 ft.	37 ft.
Feed	2 in.	1.12 in.	1.38 in.
Weight of chips per hour	175 lbs.	123.5 lbs.	14 lbs.
Time required (rods 7.3 ft. long)	49 min.	88 min.	71 min.
Power	Elec. motor 50 h.p.	Belt	Elec. motor 12 hp.

This shows the time saved by the American machine. Two rods are milled on one side in 49 minutes, while one rod is milled on one side in 88 and 71 minutes, respectively, in Germany and France. The forging is placed on the machine

in a much more finished condition in France, therefore the time gained in America in the blacksmith shop should be added to the time gained in machining. The French shop is, however, ahead of the German, but the time saved by the former is compensated fully by the quicker forging work in Germany, which saving is considerably greater than the 17 minutes gained by the French.

Grooving side-rods on horizontal milling machine:

	U. S.	Germany.
Number of rods	2	1
Type of machine	Bement	Droop & Rain
Size of wheels	11 in.	5.1 in.
Height of cut	3½ in. x 2 in.	2.67 "
Depth of cut	1 in.	0.98 "
Cutting speed	70 ft.	37.5 ft.
Feed	2 in.	1.53 in.
Weight of chips per hour	242.5 lbs.	68 lbs.

Planing four guides:

	Schenectady.
Cut	0.4 in.
Feed per minute	¾ "
Cutting speed	35½ ft.
Weight of chips per hour	265 lbs.
Time required	5 hours

For boring wheels, the Niles wheel lathes are extensively used in America and give interesting results. The *American Engineer* gives the following results (September, 1908,) obtained by such a lathe, worked by a 25-h.p. electric motor, when boring 55-in. tires with two tools:

	Schenectady.
Speed	21 ft. 6 in.
Feed	½ in.
Depth of cut	⅝ "
Weight of chips per hour	160 lbs.

With one machine, a hoist and one helper, a man has been able to bore 41 tires in a 9-hour day. He could have bored 54 with two hoists and two helpers, in the Chicago shops of the Chicago & North Western Railway. In Europe, with the air lathes generally used, the slowness of fixing, etc., and the lower cutting speed, only 6 tires can be gotten out in a 9-hour day.

These examples show the considerable advantage gained by Americans in using more powerful machines and harder tool steel. But these are not the only factors to be considered. American engineers have also succeeded in reducing the time required for mounting parts on mâchines to a minimum; as soon as the drawings are finished the drawing room designs and studies the quickest way in which these operations can be done. The foundry and machine shop make special jigs and supports whose shape and size are such that after fixing them on a machine the workman has only to securely fasten all bolts holding the part to be machined. These jigs are numbered, and the same number appears on the drawing of the part, and the workman is thus advised what particular jig should be used for that part. The most remarkable application of this method is the manner in which the Schenectady Works of the American Locomotive Company bored the double low-pressure cylinder in the recent Paris-Orleans order executed by them. As soon as the sides of the cylinder saddle had been planed, the cylinder was placed on the boring-mill by means of a large cast-iron support, made in such a way that the center-line of the cylinders coincided exactly with the center of the movement of the tools. For milling the valves, planing, etc., three more similar jigs were made, thus avoiding all laying out and greatly reducing the possibility of errors. The same applied to driving boxes; these were planed in lots of eighteen, bolted to a cast-iron jig, which held them rigidly in the required position. The high-pressure eccentric cranks were also turned in this manner and the time for laying out was thereby saved.

European engineers are beginning to realize the large advantages derived from these methods, and several shops, such as th Eastern Railway of France Epernay shops and the Cail Locomotive Works at Denain (France) are introducing them. But European builders are rarely willing to invest so much money in up-to-date machine tool equipment, dies, jigs, etc., unless a large number of locomotives ordered in one lot justify this expenditure.

ERECTING SHOP.

Much more allowance being granted builders in the United States in fitting, etc., the latter are able to erect their locomotives in a very short time, as there is little adjusting to be done. For French locomotives, which are put together much more carefully and precisely, these facilities do not exist. Nevertheless, some remarkable results have been obtained in quick work, due principally to the specialization of the different gangs and the personal initiative which their foremen are allowed to use. The 300 men working in the Schenectady erecting shop are divided in 20 specialized gangs, while in Europe these gangs do not number more than 10 or 12. In America the different gangs work simultaneously on the engines which are on the floor; each gang foreman is permitted, on his responsibility, to begin operations on any engine he deems sufficiently assembled for the purpose. While the first Paris-Orleans locomotive required 38 days for assembling, the last but one only demanded 13 days, the workmen being thoroughly trained to the work in hand.

In Germany the assembling is not conducted on the same basis, as the frame is finished throughout, cylinders adjusted, etc., in a special shop, and is not placed over the pit until these operations are complete; the engine is therefore in an advanced stage of erection before it reaches the floor, and the time for assembling proper is therefore greatly shortened. But notwithstanding this, it takes from three weeks to one month before a French type of compound locomotive is ready for test. The Paris, Lyons & Mediterranean suburban locomotives now building at Hannover require as long as six weeks for erection.

Although in France it has taken up to 80 days to assemble an engine, there are some erecting floors very well organized, in which the labor is as much specialized as possible. Assembling is done very quickly, considering how complicated French locomotives generally are, and it often happens that an engine is only 15 days on the floor.

YARD FACILITIES.

The American practice of working as rapidly as possible has naturally brought with it a large increase of yard and general shop facilities, such as powerful cranes, yard engines, etc. European shops are now generally equipped with a fairly good amount of yard tracks, locomotives and cranes; but the latter, particularly, work much more slowly than American machines of the same power. For an example, all the cranes at the Schenectady works having 20 tons capacity or less move at a speed varying between 300 and 500 ft. per minute, which is rarely reached by French or German cranes, even of very small capacity.

LABOR.

The character of working men in the three countries is also entirely different. The American, desirous of having all comforts around him, wishes to earn the largest amount possible in the shortest time. All labor is organized on this basis; the labor unions uphold it very strongly, and, keeping away from politics altogether, and only acting for the financial good of their members, second the working man very effectively. Time labor, always to be preferred in work for which great exactness is required, is replaced by piece work whenever possible. In this system the workmen receive in addition to their regular compensation a certain bonus based upon the gain on standard time for the part he is working upon. This bonus is generally calculated so as to divide equally between the workman and his employer the amount gained on standard time. This system, although greatly in vogue in the United States, has many disadvantages, such as the continual discussions which arise, the intervention of the unions, etc., which render its application rather difficult, and in the locomotive business, in which standard time is easily determined, preference is shown for piece work, or "contractors." The latter are generally

either foremen or other men in the confidence of the company to whom the works pay fixed prices for the various parts. The contractor attends himself to enrolling the required number of men and pays them as he deems best, either by piece work or per day. This system is very much in favor at the Baldwin Locomotive Works of Philadelphia, and is also used by the American Locomotive Company at Schenectady. It is rather difficult to obtain much information about the contracts between employers and contractors, as the details of such are kept secret as much as possible. This system has the disadvantage, no doubt, of producing an inferior grade of workmanship, and would require very careful inspection and supervision. The latter is generally rather scarce in American shops, where everything is subordinate to the rapidity of execution. But the rapidity of contract labor is certainly very great.

The workmen, as stated, specialize as much as possible in one kind of work, or even on a single machine. But it must be said that in America the increase in the efficiency of a workman does not to the same extent as in Europe cause an attempt on the employers' part to diminish the bonus allowed to the workman. In the United States, where labor is high, it is particularly desirable to increase every man's efficiency as much as possible and derive all the possible benefit from this increased output. This tendency has been noted by most Europeans visiting America, particularly the English Mosely Commission (1903). Mr. Barnes states* that in the Westinghouse Pittsburgh shops a man earning 26 cents per hour can easily increase his pay to 40 cents; from actual observation, it appears that bonus work generally corresponds to a 33 per cent. increase in salaries, while in many cases observed recently this increase has been as high as 50 per cent.

In Germany the ordinary workman has a very different character from the American. The Berlinese frequently change their occupation and are generally of wandering disposition. The large number of different industries in Berlin make them much harder to please than their qualifications justify. The number of parts rejected on account of carelessness of workmen is very high in the Borsig Locomotive Works, at Tegel, near Berlin, and shows conclusively that the average German mechanic, although reputed, is greatly inferior to the French and American. He is generally well paid, but the tendency is to decrease the standard price paid for parts as the output increases, and this is certainly no incentive for him to work rapidly.

The French workman, much more skilful, is placed in the same conditions. French companies generally limit to a certain sum the amount of bonus their men can earn, and this limitation has caused, in the North of France particularly, a tendency in the labor unions to compel their members not to work above a certain amount, in order that the companies may find no pretext to lower their rate schedules, or obtain from their men more than a certain amount of "bonus" work, usually between 30 and 40 per cent. These conditions are responsible for the low output and tardy development of French shops. Indeed, some companies have entirely suppressed piece work on this account.

There is another practice in American shops which greatly helps rapid production; with the possible exception of some automatic machines the American shop man only runs one machine. American engineers claim that they save considerable time thereby. It is not to be questioned that the French shop practice of having one man run two machines, or two men three machines causes considerable loss of time. While it is true that these losses are not noticeable at once, and that it does not often happen that both machines are idle at the same time, there is no doubt that the men do not obtain the maximum results the machines are capable of producing. It is impossible to follow and observe the tool progress. It often happens that a man finishes the work on two machines together, and the result is that one of them remains idle while he fixes a new part on the other. While there are some advantages in this practice, and at least one-quarter is saved on the pay-roll, when the men are paid by the day, the American system makes a larger and quicker output possible, and is therefore more economical in the long run.

*See J. Barnes' report on Mechanical Shops.

RESULTS.

The natural results of American shop practice, where the machines are worked to their utmost capacity and frequently renewed, and where labor is organized so as to place speed above everything else, are, of course, in the locomotive industry, a much more rapid execution than can possibly be obtained in Europe.

On two different occasions the Paris-Orleans Railway ordered in America locomotives of French design throughout; twenty 10-wheelers from the Baldwin Locomotive Works in 1906 and thirty Pacific type from the American Locomotive Company in 1908. The former were ordered in December, 1906, and delivered in June, 1907, while the latter were ordered in February, 1908, and delivered in August, same year. In both cases six months sufficed to build locomotives of entirely new type, with which the shop men were totally unacquainted.

In Germany a number of consolidated locomotives were ordered from the Borsig Works. Orders for raw material for these engines were placed in July, 1907, yet the first engines were not delivered until April, 1908, five per month being shipped thereafter, and the last locomotive was not completed until October, 1908. It therefore took 14 months to build these engines, which was a much longer time than had been stipulated in the contract.

The results obtained in France when normal business conditions prevail are comparable to those obtained in Germany; but when the works are crowded it is impossible to obtain any, but much longer deliveries. For instance, an order placed in France in January, 1907, was not delivered until December, 1908—viz., 24 months after signing of contract. Another order for 20 locomotives, placed in March, 1906, was not shipped until January, 1908, for the first locomotive and June, same year, for the last, a total delay of 27 months for the execution of this order.

COST AND PRICE.

Analyzing the cost of locomotives is generally very difficult. It is rarely possible to obtain the elements on which a price is based, and manufacturers naturally do their best to keep this essential part of their business as secret as possible. For an outside party to establish a cost is generally guesswork for the greater part, and only approximate results are obtained, chiefly by comparison and a careful study of the methods used in different countries.

The chief factors of a cost list are labor, material and general expense factor.

The selling price is obtained by adding the profit, or margin, to the total estimated cost.

LABOR.

The writer has shown in this paper the radically different conditions between American and European labor. As a result the rate of comparison in the two continents differs greatly.

The following table shows the average pay of American, German and French labor:

	United States.	Germany.	France.
Boiler maker	\$2.80 to \$3.10	\$1.50 to \$1.75	\$1.20 to \$1.50
Machinist	2.20 " 2.80	1.25 " 1.40	1.00 " 1.30
Assembler	2.50 " 2.80	1.20 " 1.40	1.00 " 1.40
Helper	1.50 about	.80	.60 " .80

To these salaries must be added a bonus, often exceeding 50 per cent., in America, but between 30 and 40 per cent. in Europe. The average ratio between European and American salaries is between one-third and one-half. The average German salary is slightly greater than the French. In the large cities a 25 per cent. difference is at times observed, which may be accounted for by the difference betwen the mark and the franc.

MATERIAL AND GENERAL EXPENSE FACTOR.

In France there is no metal market, hence no material price list, as in Germany and America, and therefore any estimating based on the figures contained in these market reports would be impossible. It is true that these market prices are often ignored totally, private contracts being made between manufacturers and builders on bases often different from the quoted market price. It is extremely difficult, unless the builders are willing to divulge the information themselves—which they are very reluctant to do—to give any reliable details on the average cost of materials.

The writer has, however, been able to reach some satisfactory results by comparing costs of locomotives built by the railway companies in their own shops, both in America and in France, which are given below.

These tables are based on two simple expansion 2-8-0 consolidation type locomotives, weighing 87 and 93 tons, respectively, built in America and on two French freight locomotives —namely, one consolidation and one 4-8-0 type, both being four-cylinder compounds:

Cost of a consolidation single expansion locomotive of American design built in the United States in 1907.

Weight in working order: 87 tons.
Weight empty: 82 tons.

	Labor.	Material.	Total.
Boiler shop	$1,047	$2,102	$3,149
Tank shop	584	1,811	2,395
Brake	205	644	850
Wheels and axles	150	1,550	1,705
Patterns, tools, etc.	3,488	5,403	8,891
General expenses	2,533	417	948
	$6,007	$11,827	$17,848
Overhead charges			1,534
Cost per locomotive and tender			$19,382

Cost of locomotive alone, $16,987.
Cost per lb., $0.094.

Cost of a consolidation single expansion locomotive of American design built in the United States in 1908.

Weight in working order: 93 tons.
Weight empty: 88 tons.

	Labor.	Material.	Total.
Boiler shop	$1,046	$2,292	$3,337
Tank shop	639	1,340	1,977
Brake	189	615	804
Wheels and axles	166	1,593	1,739
Patterns, tools, etc.	3,500	6,427	10,127
General expenses	800	400	1,200
	$6,340	$12,667	$19,184
Overhead charges			2,200
Cost per locomotive and tender			$21,384

Cost of engine alone, $19,407.
Cost per lb., $0.107.

Cost of a four-cylinder compound consolidation type French freight locomotive of French design.

Material	$10,693
Patent royalty	10
General expenses	1,069
Drawing room	59
Labor	3,508
Overhead charges on labor (100 per cent. of labor)	3,508
	$19,847

Cost per lb., $0.126.

Cost of a four-cylinder compound 4-8-0 type locomotive of French design, built in France.

Material	$12,142
Factor	655
Labor	3,175
Overhead charges on labor (70 per ct. approx.)	2,064
	$18,036
Deduct value of scrap	807
Net cost	$17,229

Cost per lb., $0.109.

The following tabulated statement gives a résumé of the above tables, separating labor from material, and adding to each item the general expenses, proportionately, for American locomotives:

American Locomotives.

	Wt. empty, 82 tons. Loaded wt., 87 tons.		88 tons. 93 tons.		Average.	
	Total.	Per lb.	Total.	Per lb.	Total.	Per lb.
Labor and factor	$5,425	....	$5,881	....	....	....
Part of gen. expenses	513	....	747	....	....	....
Total for labor	$5,938	$0.033	$6,628	$0.034	$6,280	$0.0335
Material and factor	$10,121	....	$11,327	....	....	....
Part of gen. expenses	1,021	....	1,453	....	....	....
Total for material	$11,142	$0.062	$12,780	$0.066	$11,961	$0.064
Grand total	$17,078	$0.095	$19,408	$0.100	$18,243	$0.0975

French Locomotives.

	Consolidation.		4-8-0 type.		Average.	
Labor and overhead charges	$7,017	$0.047	$5,240	$0.0335	$6,028	$0.04
Mater'l and overhead charges	11,772	0.078	12,797	0.086	12,285	0.082
Grand total	$18,789	$0.125	$18,037	$0.1195	$18,313	$0.122

With the exception of the arbitrary percentage taken as overhead charges, which is only estimated, the above statement is interesting and gives very clear comparisons between the costs of production in the different countries.

Thus, notwithstanding the considerably higher prices paid for labor in America, the net price per pound falls much below the average cost in France. This is due partly to the fact that many parts used in the American locomotives are delivered finished and ready for application, and that the labor proper on these parts is charged to material. The greater simplicity of design and lesser amount of finish must also be considered in American locomotives, as the engines considered are of the simple expansion type. But notwithstanding these factors, the difference in cost is worthy of consideration and is without doubt due to special American shop practice and general methods of construction. Concerning material, besides the extra cost accruing in America on certain parts delivered finished and ready for application, there is a difference of 0.245 dollars per pound between the two costs, representing an excess in the French prices of about 30 per cent.

We will now consider the American price per pound, as applied to a compound locomotive, delivered in France, by adding the factors appearing in the following table:

Cost per lb. in America for a single expansion locomotive	$0.0975
Overhead charges on capital (not considered in a railway company, but which must be added in the case of a manufacturer)	0.011
Extra for copper firebox and staybolts (say $1,200 to $1,400 per engine)	0.007
Extra for compounding feature	0.008
Duty when entering France	0.018
Stripping, boxing, packing, insurance, reassembling at destination (about $2,000 per locomotive)	0.011
Total, per lb.	$0.1525

To this cost must be added the expenses incidental to more rigorous inspection by French railways, better finish being required, radical changes in current shop practice rendered necessary in the construction of an entirely new and different type of locomotive, also the legitimate profit to which builders are entitled; it will, therefore, be seen that in ordinary times American builders cannot successfully compete with French prices. American locomotives can only be sold in France during periods of great activity, when French builders are unable, owing to full order books, to offer satisfactory deliveries, or else during times of depression in America, when builders are willing to sacrifice all or a part of their usual profit in order to keep their shops going.

German labor is generally higher than in France, and less good. Material is expensive in France, particularly on account of the high duties imposed, the minimum rates of which are as high as 64 cents to $1 per 100 lbs. on steeel plates, 73 cents for rough tires and axles, and 54 cents on shapes.

In a recent report made out by the Tariff Commission, Marc Reville writes that the duty imposed on imported material necessary for the construction of a compound locomotive weighing 63 tons, amounts to a total of $1,703, corresponding to 1.23 cents average per pound of finished engine.

The duty on imported locomotives, 1.4 cents per pound, amply protects French builders; it is a significant fact that in the revision of the tariff, now under discussion, the large French metal industry has asked for no additional protection. It may, therefore, be assumed that builders consider themselves sufficiently, even amply, covered by the actual schedule of rates.

There are no data proving that this duty of 1.4 cents per lb. on locomotives imported from Germany is greater than the actual cost of production in the two countries; we have seen

in this paper that as far as labor is concerned, the German builders have a distinct disadvantage; it may, therefore, be correctly assumed that with the tariff now applied in addition to the freight charges which German builders are obliged to pay, there is no apparent reason for the German locomotives being any cheaper than the French.

It may be drawn from the data given in this article that in normal times, and for locomotives of French design, delivered in France, little or no advantage is possessed, as far as price is concerned, by American or German companies over French builders. But builders in the United States are far ahead in time of delivery.

ALL-ELECTRIC INTERLOCKING AT ALLENTOWN.

About one mile east of Allentown, Pa., the westbound passenger trains of the Central Railroad of New Jersey are diverted to the Allentown Belt Railway in order that they

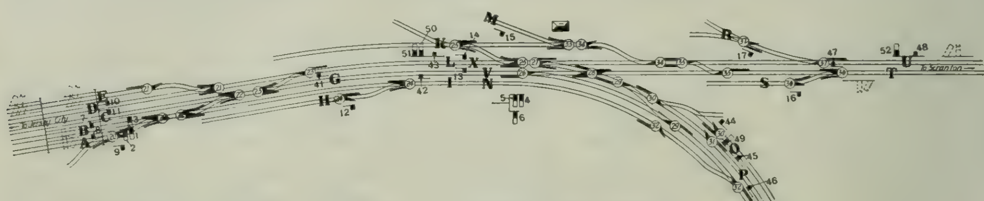


Fig. 1—All-Electric Interlocking at Allentown, Pa., Central of New Jersey.

may reach the station near the center of the city, while the freight trains continue on the main line and go around the city on other tracks. The extensive improvements in the track arrangement made it desirable that an electric interlocking plant be installed at this place and a contract was made with the Federal Signal Company of Albany, N. Y.

The tower, built by the railway, is well located on the outside of the curve, giving the best possible view. While the plant covers considerable space, the important switches are nearly in front of the tower. The building itself is of brown brick, attractive in appearance, and while it has only two floors, the operating floor is higher than usual in order that as much of the plant as possible may be seen. The lower floor is used as a storeroom, and contains a cupboard for some of the relays. The stairway is on the outside. The power house, also built by the railway, is a short distance to the west of the tower, and besides the generators, contains the battery room.

The power plant consists of two 9 h.p. Fairbanks-Morse gasoline engines, each direct connected to 5½ k.w. shunt-wound generators. These generators are used to charge the main storage battery, consisting of 57 cells of 240 A. H. capacity of the National type. There are also two sets of the same type, of six cells each, for operating indicators and electric locks. Gravity cells are used on track circuits. The switchboard in the power house has Weston voltmeter and ammeter and the switches are so arranged as to give all necessary combinations for properly charging and discharging the batteries. The usual switchboard is provided in the tower.

As will be seen by reference to the track plan, there are 30 switches and derails, one set of movable front frogs, 7 home signals and 14 dwarf signals. A signal bridge erected by the railroad company at the east end, carries the westbound home signals with two low-speed suspended signals and three dwarf signals. The distant signals are part of the automatic system previously installed through this location by the railway. Except for the signal bridge above mentioned and one bracket mast carrying two dolls, every signal is adjacent to the track it governs. There are four tracks up to a short distance east of the tower, from which point there are one eastbound and two westbound tracks to where the freight tracks diverge to the north, in front of the tower.

The wires are run in trunking supported on stakes, in accordance with the railway company's specifications. Junction boxes with slate terminal blocks are provided at each point where wires lead from the main run to the various
main storage battery, consisting of 57 cells of 240 a. h. ca-

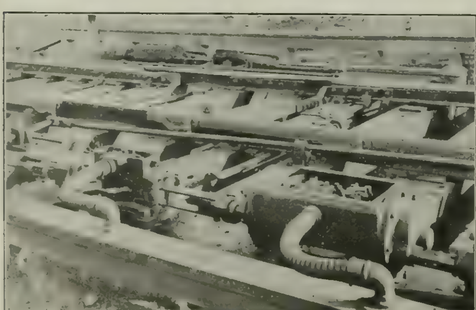


Fig. 2—Switch Movement, with Cover Off.

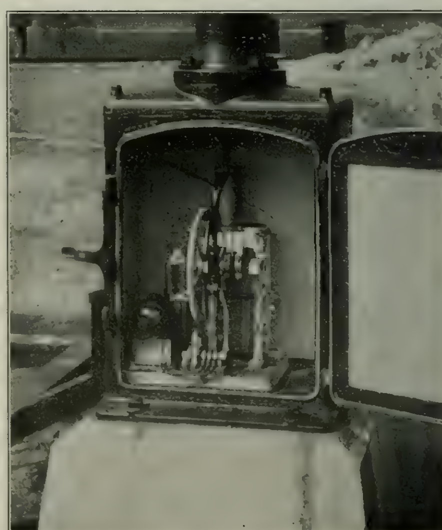


Fig. 3—Signal Motor.

tower. All wires are suitably tagged in each box. The wire conforms to the railway company's specifications, which are essentially the same as those of the Railway Signal Association and secure an exceedingly good grade of wire.

Both detector track circuits and detector bars are provided, the letters on the plan indicating the various track sections.

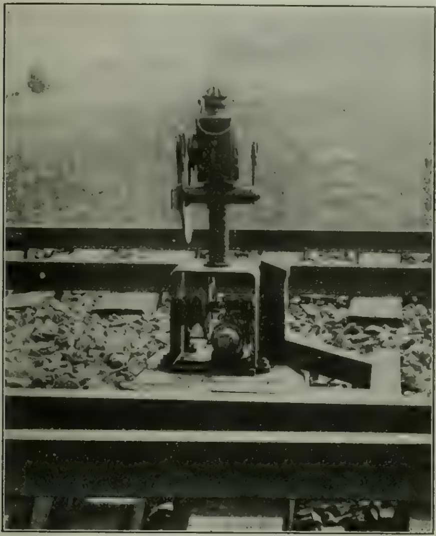


Fig. 4—Dwarf Signal.

The circuits are so designed that each home signal goes to stop after the passage of a train, remaining in that position until the signal governing the reverse movement is passed.

Approach locking is provided so that a distant signal accepted in the proceed position will lock its home signal lever at proceed, releasing the latter when the home is at stop, distant at caution, and train beyond the signal in front which governs the reverse movement. Indicators, each with a different toned bell, are provided for approaching trains, and electric locks hold the levers when trains are on the track circuits. The electric locks may be freed by hand releases when necessary.

The machine is of the Federal design with 47 working levers and 5 spare levers, there being no spare spaces. A hard wood cabinet encloses the whole machine, which allows all the wire terminals to be locked up, although the fuses are exposed.

Fig. 1 shows a plan of the track. Fig. 2 shows a switch movement. The cover is off showing the motor, gear box and other parts. The connection from trunking to the mechanism is made by means of a new insulating covering known as "flexiduct." Fig. 3 shows a signal mechanism for a one-arm signal; Fig. 4 is a dwarf signal; Fig. 5 shows a part of a terminal box; Fig. 6 is the interior of the power house; Fig. 7 is the machine. Flexiduct consists of two strips wound spirally and interlocked in such a way as to form a structure like a hose which can be bent quite freely, as shown in Fig. 2.

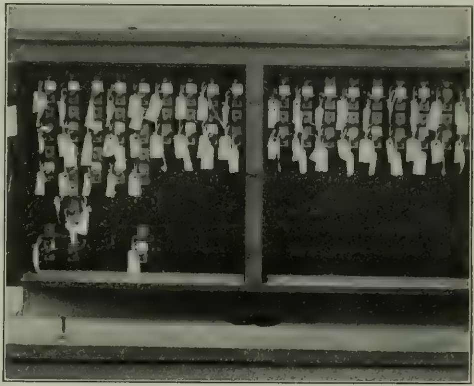


Fig. 5—Terminal Box.

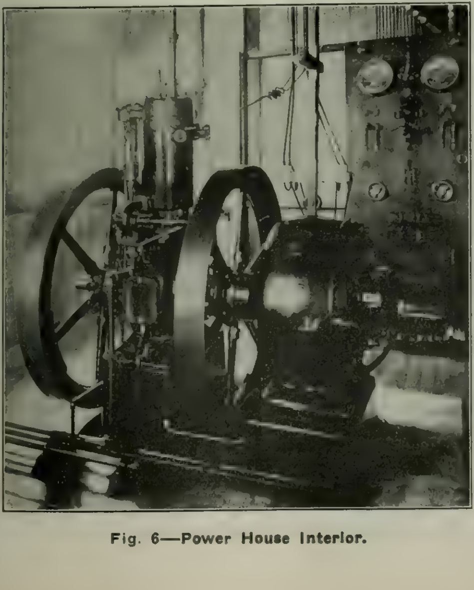


Fig. 6—Power House Interior.

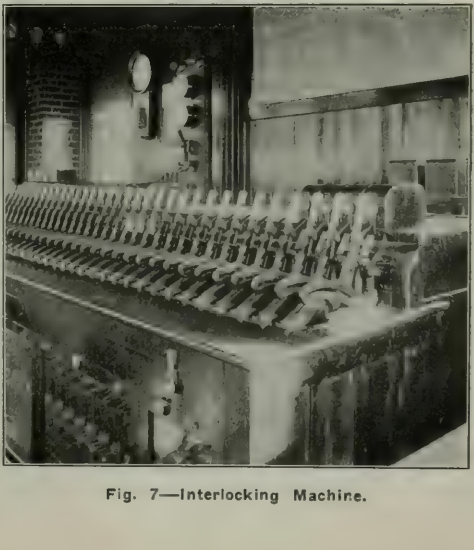


Fig. 7—Interlocking Machine.

It is waterproof but is not made to withstand pressure. It has given good service for uses of this kind and is more convenient than trunking, and it also presents a better appearance.

THE LATEST PRINTING TELEGRAPH.

J. C. Barclay, Assistant General Manager of the Western Union Telegraph Company, has recently developed a comparatively simple printing telegraph apparatus, which is adapted to handle the short distance traffic over circuits at present operated by means of the Morse system, and he is about to put it in use on the Western Union lines between New York and Newark, a distance of 9 miles. Messages can be sent at the rate of about 40 words a minute, and no punching of paper is required; that is to say, the sending operator, pressing on keys like those of a typewriter, thereby instantly actuates the apparatus at the receiving station, letter by letter, which apparatus automatically prints the message on a regular blank, 5 in. x 8 in., and turns it out ready for delivery.

Mr. Barclay's elaborate high speed automatic telegraph apparatus was described in the *Railroad Gazette* of June 9, 1905, page 640—a most fascinating story. The new machine is less complicated and less costly than that, and takes up far less space on a table; but on the other hand, its speed is not so great. In both systems the function of the line wire is simplified to the last degree.

Q 1 NY XC BN

NEWYORK,JUNE 12-1909.

B.B.ADAMS,

RAILROAD AGE GAZETTE,

NEWYORK.

THIS IS A SAMPLE OF THE WORK DONE ON MY NEW PRINTING TELEGRAPH APPARATUS.

J.C.BARCLAY.

The older apparatus is now in constant use between New York and Buffalo, New York and Boston, New York and Philadelphia, New York and Washington, New York and Pittsburgh, New York and Chicago, New York and St. Louis, New York and Cleveland, New York and Cincinnati, New York and Kansas City, New York and Detroit and New York and Atlanta.

The average number of messages transmitted over each of these circuits is two hundred an hour. The work of the operators taxes the nerves far less than sending at high speed by Morse, as any Morse operator can readily imagine; and the same is true of the new apparatus. Since the publication of our description of the earlier invention the sending apparatus of that system has been perfected, and now two operators, working typewriter keyboards at the sending stations, regularly perforate the messages to be sent over a single wire; though the system is flexible and in a large office the perforators can do work for any of the circuits indiscriminately.

In the new system the sending apparatus consists of a keyboard transmitter having a mechanical polechanging device from which the signaling impulses are transmitted directly into the main line. These impulses—alternately positive and negative—are utilized to control the movement of an escapement, through the operations of which a typewheel at the receiving end of the line is rotated into the position required for printing any letter or character. The actual printing of such characters is effected at the moment when, by depressing a key at the transmitting station, the polechanger changes the character of the line impulses from an alternating to a steady current, the time duration of which is just sufficient to operate the printing magnet.

The local receiving apparatus includes a series of electromagnets for operating the typeshift, feed paper, and carriage return mechanisms, which are brought into action through the instrumentality of a rotating arm or "trailer." This trailer, which is connected with a source of current, normally sweeps over a number of metallic segments respectively connected to one or other of said magnets, without in any way affecting the mechanism, until, by the depression of an appropriate key, the trailer is momentarily arrested on the desired segment, through which a local current then flows into the corresponding electromagnet.

In the main line there is but one receiving instrument—an ordinary polarized relay; the rest of the apparatus being entirely local.

This invention restores to the telegraph company and the public all the benefits of the time-honored House printing telegraph, with the added advantage of greater simplicity and of a receiving instrument that prepares messages in a form convenient to read, instead of a form—tape—which is very inconvenient. One of the greatest drawbacks in the old printers was the necessity of synchronizing the revolving mechanical apparatus at the receiving station with that at the sending station; this is entirely done away with. The question of the human element is now subject to very different conditions. The art of fingering the keys is now known in every business office, whereas a half century ago, when the House apparatus was in its glory, operators had to be specially trained. To-day any business office which sends many telegrams can connect itself to a telegraph office and, with the Barclay apparatus, have its typewriting clerks send them direct. The receiving of messages is entirely a mechanical proposition, apparently no more difficult to manage than is a typewriting machine.

The introduction of telephones on the despatchers' wires of the railways is not the only force which is weakening the Morse operator's supremacy, evidently; the telegraph companies, so far as their "heavy" circuits are concerned, seem to be accomplishing the same freedom.

The Funilense Railway, which runs 31 miles, from Campinas, Brazil, to Arthur Nogueire, is to be extended 22 miles to the river Mogyguassu, between the Mogy-Mirim and Arras. A nucleus colony is to be founded at the terminal point.

RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY,
Professor of Economics, Harvard University.

CHAPTER V.

THE THEORY OF RATE MAKING.

Two general theories governing the rates chargeable by railways are entertained, known respectively as cost-of-service and value-of-service. According to the first the proper rate for transportation should be based upon the cost for carriage of the persons or goods, with an allowance for a reasonable profit over and above the expenses of operation involved. This line of argument is commonly advanced by representatives of shippers and the public, who reason by analogy from other lines of business. In several European countries when railways were first built, and afterward, especially in Germany in 1867, attempts were made to apply this principle widely in the construction of tariffs. Practical railway men, on the other hand, usually adhere to the second principle of value-of-service. This argument maintains that, while theoretically cost-of-service should determine minimum rates, owing to the nature of commercial competition, as a matter of fact rates must be based upon the principle of charging what the traffic will bear. This is accomplished by proportioning the rate to the commercial value of the service. Practically the rate is found by charging as much as the traffic will stand without evidence of discouragement. Thus if the price per bushel of wheat in New York is twenty-five cents higher than in Chicago, it would obviously be absurd to charge a rate which would absorb all of that increment of place value due to transportation. Enough margin must be left to the shipper who buys wheat in Chicago and sells it in New York, to permit a reasonable profit on the transaction, after payment of the freight rate.

These two principles of cost-of-service and value-of-service are directly opposed in one regard; inasmuch as the cost-of-service theory harks directly back to railway expenditure; while the value-of-service principle contemplates primarily the effect upon the railway's income account. Any charge is justified according to the latter view, which is not detrimental to the shipper, as indicated by a positive reduction in the volume of business offered. No charge, on the other hand, may be deemed reasonable according to the cost-of-service principle which affords more than a fair profit upon the business regardless of its effect upon the shipper. As a matter of fact neither of these views is entirely sound by itself. Both have large elements of truth in them. Each qualifies the other. In the first place, it is to be noted that between them they fix the upper and lower limits of all possible charges. Less than the cost of service cannot be charged; else would a confiscatory rate result. This is the plea set up by the railways in the now celebrated Texas Cattle Raisers' Association case against the cancellation by the Interstate Commerce Commission of an extra charge of $1 per car for switching charges at Chicago. At the other extreme, more than the traffic will bear cannot be charged without a disproportionate decline in volume of tonnage. This would be bad business policy, as it would at once entail loss of revenue. The railway would not submit to the former, it would not conceivably resort to the latter alternative.

Attempts have been made by various authors to account for the phenomena of rate making on other grounds. The German author, Sax, has sought to trace an analogy between the imposition of taxes and railway charges, alleging that both should be proportioned to what the shipper "can afford to pay," from an ethical rather than an economic point of view. Acworth interprets the phraze "charging what the traffic will bear" to mean something analogous to this. His allegation is that rate schedules are built up upon the principle of "equality of sacrifice," otherwise characterized as "tempering the wind to the shorn lamb." High class traffic contributes liberally of its abundance of value, while third class passengers and low grade tonnage are let off lightly on the ground of their poverty. Taussig in his memorable contribution to the subject* has, however, shown how untenable this theory of "equality of sacrifice" is. Not ethical but purely economic considerations are applicable in such circumstances except, of course, in so far as common carriers, enjoying privileges by grant of the state, may be considered as imposing taxes for the performance of a quasi-public duty? This latter test of a reasonable rate has underlaid a long line of Supreme Court decisions since the Granger case.† Nevertheless, as so frequently happens, legal and economic bases of judgment seem to be lacking in harmony.

There can be no question, that for an indispensable public service like transportation, conducted under monopolistic conditions, the ideal system of charges would be to ascertain the cost of each service rendered and to allow a reasonable margin of profit over and above this amount. To the application of this principle alone, however, there are several insuperable objections both theoretical and practical. Such cost is practically indeterminate, being joint for all services in large part, as we have seen: it is highly variable, being perhaps never twice the same as circumstances change from time to time; cost is unknown until volume is ascertained, and volume is ever fluctuating; the cost of service obviously could never be ascertained until after the service had been rendered, while, of course, the schedule of rates must be known in advance, in order that the shipper may calculate his probable profits; and finally the principle of increasing returns, flowing from the dependence of cost upon volume of traffic, imposes such an incentive for development of new business, which in turn depends for its volume upon the rate charged, that cost-of-service is subordinated at once to other considerations in practice.

Of these objections to rate making upon the principle of cost-of-service alone, it would indeed appear as if the first should be conclusive. If the cost is simply indeterminable, why bother about any further refutation of the principle at all? But the persistency of the idea, that somehow railway operations are analogous to the business of an ordinary merchant; and that cost and profits are ascertainable; renders it necessary to pile proof upon proof of the limitations upon its applicability to real conditions in service.

Not only is the mere cost of service indeterminable; if it could be ascertained, it would not establish the chargeable rate in many instances. The freight service of a railway comprises the carriage of all kinds of goods simultaneously from the most valuable high-priced commodities, such as silks and satins, down to lumber, coal, cement, and even sand.‡ To compel each of these classes of goods to bear its proportionate share of the cost of carriage, would at once preclude the possibility of transporting low-priced goods at all. One dollar a hundred pounds may not be too much to add to the price of boots and shoes for transportation from Boston to Chicago. It would still form only a small part of the total cost of producing and marketing them. But to add anything like that sum to the cost of one hundred pounds of salt or cement would put an end to the business at once. Only about so much can in practice be added to the price of any given commodity for freight without widely limiting the area of its available market. Thus raw cotton seems to be able to bear an addition of about fifty cents per hundred pounds for freight to its total cost. Experience demonstrates that anything more than this one-half cent per pound charged on cotton, entails more loss than gain. In the case of fancy groceries or fine furniture there may be no considerable demand in any event above a certain ascertainable level of prices. For boots and shoes or cut building stone it may be that competition from some other center of production nearby precludes any great addition to the

*Reprinted in Ripley, Railway Problems, p. 143.
†*Cf.* Int. Com. Reports, 1903, p. 436.
‡The Hepburn Committee testimony, in 1879, p. 2893, is eloquent upon this aspect of the question.

price for freight. The business simply will not bear more than a certain proportion of charge. Not only would the rigid application of the cost-of-service principle hinder all transportation of low-grade traffic; it would also prevent any development of long distance business. It is indubitable that sole reliance upon cost-of-service as a basis for rate making is theoretically unsound, and impossible of practical application.*

Cost-of-service, while unsound as a sole reliance, nevertheless affords an important check upon the value-of-service principle. Without it there is always grave danger that traffic managers, seeking to enlarge their revenues, may push rates unreasonably high. At first sight, it would appear as if this could not occur, inasmuch as an inordinately high rate would immediately reduce the volume of business offered. It is constantly alleged by railway men that this must of necessity occur. And it would indeed follow, were it not that the incidence of the rate is rarely upon the actual shipper. He merely pays it, and at once shifts it to the consumer. For low-grade or staple goods like cement or kerosene, where transportation charges form a large part of the total cost of production, it is conceivable that higher freight rates might so far increase the price as to check consumption. Five cents a hundredweight higher freight means $1.25 per 1,000 ft. added to the price of soft lumber, $2 to hard lumber; three cents per bushel added to the price of wheat, and $1 to the ton of pig iron or coal. Such substantial additions might readily reduce the demand. Yet even this would not be true of necessities of life like anthracite coal or sugar, on which latter the freight rate amounts to about one-half cent per pound. Is five cents a barrel added to the price of flour likely to decrease the consumption of that staple commodity? Yet the enhancement of railway revenues would indeed be enormous from such an increase of freight rates. For these necessities of life an increased freight rate might become an actual charge upon the people, without reducing their consumption, like a tax upon salt. Only upon goods the use of which might be freely lessened, would higher freight rates be reflected in a corresponding decline in the volume of business. Moreover, with all high grade traffic, the value-of-service principle fails utterly by itself alone to prescribe the upper level of a reasonable charge. Competent testimony is ample upon this point. Thus from the commissioner of the Trunk Line Association; † "The tonnage of the higher class articles is an extremely difficult matter for transportation companies to increase or decrease. * * * In that class of articles the carrier can do but little to increase the transportation." And the reason in part lies in the almost immediate diffusion of the burden in the processes of distribution. That no complaints are made—a defence often brought forward for higher rates—proves by itself the uncertain incidence of the burden imposed.

That the principle of charging what the traffic will bear affords no protection to the consumer against exhorbitant rates on many commodities follows also from the relative insignificance of transportation charges as compared with the value of the goods. This, in fact, is naively conceded by railway managers themselves; when, as in the case of the widespread freight rate advances of 1908-9, publicity agents flooded the country with calculations as to the infinitesimal fraction which would be added to the price of commodites by a ten per cent. rise in rates.‡ The rate from Grand Rapids to Chicago on an ordinary dining room set of furniture, being $1.60, a ten per cent. increase would add only 16 cents to the cost. A harvester transported one hundred miles would be enhanced seventeen and a half cents in price; a kitchen stove carried from Detroit to the Mississippi would only cost twenty-five cents more; and the price of a Michigan refrigerator sold in New York, would be only seven and one-half cents higher; were freight rates to be increased by ten per cent in each instance. On wearing apparel the proportions were represented as even more striking. An ordinary suit of clothes transported three hundred miles, under similarly enhanced rates, would, it was alleged, cost only one-third of a cent more. For all their apparel, made in New England, consisting of everything from hats to shoes, each wearer in the middle west would be affected by a ten per cent. rise of rates by less than one cent apiece. True enough all this; and a striking testimonial to the effectiveness of the railway service of the country! But at the same time, if a ten per cent. increase of rates is inappreciable to the consumer, why not increase them by twenty per cent.* And what becomes of the argument that charging rates according to what the traffic will bear, is an ample safeguard against extortion? Many of these small changes in price are diffused in the friction of retail trade;† some of them are unfortunately magnified to the consumer, especially under conditions of monopoly. When freight rates on beef go up ten cents per hundredweight, the consumers' price is more likely than not to rise by ten times that amount. But even assuming the final cost to follow the range of transportation charges closely, is it not evident that, so small relatively are many freight charges by comparison with other costs of production, that consumption is not proportionately affected by their movement one way or the other. And yet the entire argument that the value-of-service principle is a self-governing engine against unreasonable rates, is based upon this assumption. Surely the increased income to the carriers when rates are raised must come from someone. Because it is not felt is no reason for denying its existence as a tax. But the very fact that it is not felt undermines the argument that a safeguard against extortion obtains. The theorem that value-of-service in itself affords a reliable basis for rate making, presupposes that freight rates and prices move in unison; a supposition which a moment's consideration shows to be untenable in fact.‡ Such cases must be finally settled by some reference, indefinite though it be, to the cost of conducting that particular service; or rather, as Lorenz puts it, to the *extra* cost incident to that service. This extra cost may oftentimes be segregated, where the total cost could not be ascertained.§ That the problem is, however, a most difficult one is evidenced by the periodic controversies over railway mail pay.¶

Of course in order that any change of rates should be reflected in prices, all carriers must of necessity agree upon the matter. The price is made by the least expensive source of supply. So that any carrier refusing to raise rates, might aid in the continuance of an already established price. Under conditions of transportation prevalent in the United States twenty years ago, the likelihood of an increased freight rate becoming a tax upon the community, was lessened by the probability that either by means of secret rebates, or by special and perhaps open commodity rates, some roads might choose to protect their clients against enhancement of prices. Markets were local—not reached by great systems operating from remote sources of supply. The policy of the northern transcontinental lines in making lumber rates from Oregon to the middle west, might be quite independent of any policy in force on the southern hard pine carrying roads. But under present day conditions, the entire area of the United States is one

*Vide. First annual report, Interstate Commerce Commission.

†C., N. O. & T. P. case, testimony, Vol. II, p. 332-3.

‡*Cf.* The Freight Rate Primer bearing no authors or publishers name, but largely compiled from addresses by President W. C. Brown of the New York Central & Hudson River. Similar arguments and computations occur in the testimony before the Elkins Committee of 1905, pp. 1162 and 2276.

*Now who will say that it is unreasonable to charge 7½ cts. to carry a suit of clothes from Chicago to New York . . . Railways could charge three or four times the cost of transportation for a pair of drawers and the rates would still be reasonable. . . . But all the first-class rates are of that nature."—Albert Fink, testimony, C., N. O. & T. P. case, p. 290.

†*Cf.* Hines Elkins Committee, 1905, p. 1162.

‡*Cf.* Re Proposed Adv. Frt. Rates, I. C. Report, April 1, 1903.

§An interesting illustration of such determination of separable or extra cost was the computation by which the movement expenses of a train load of 50 cars of grain, 80,000 lbs. to the car, from Buffalo to New York were fixed at $520.—I. C. Reports, 1903, p. 397. Or again in the estimation of the costs of operation in the express service from New Orleans to Kansas City in the banana trade.—I. C. Com. No. 1235, 1908. The able Wisconsin Railroad Commission has carefully studied a number of such cases, notable in its Two-Cent Fare decision of 1906.

¶*Cf.* Tunell, Railway Mail Service, Chicago, 1901.

great market. Hence, with rebates eliminated, and with practical monopoly established through actual consolidation, control or harmony of policy, the carriers have the consumers much more completely at their mercy. Only two safeguards for the public interest remain. One is government regulation, or at all events supervision, of charges. The other is "enlightened self-interest"—which in transportation matters means a full appreciation of the possibilities and limitations in the application of the value-of-service principle to the determination of rates.

Considerations of cost-of-service afford protection, not only against unreasonably high rates, but also against unduly low charges. The evil in such cases is, not only that the carriers operate at a loss, but that inequality and discrimination are inevitable concomitants of too low rates. No railway conceivably, of course, will charge unremunerative rates for a long time. But it sometimes happens that managements may be led to the adoption of policies of temporary expediency, not compatible with the long-time welfare of stockholders. During the presidency of Charles Francis Adams on the Northern Pacific in 1890 an unaccountable and unnatural diversion of traffic from this road to the Atchison, Topeka & Santa Fe suddenly occurred. A large volume of freight from the East to Oregon was diverted to the round-about route via Southern California. On investigation it appeared that the English banking house of Baring Brothers, having become involved in unfortunate Argentine speculation, and being obliged to force a market for its investments in Atchison securities, demanded an immediate showing of large gross earnings regardless of the net profits. Orders to get traffic at any price went forth. A market was made for Atchison stock; although it was powerless to prevent the firm's final bankruptcy. In such a case the only safeguard against unreasonably depressed rates by the Atchison road, which of course immediately compelled corresponding reductions by the natural routes to the Northwest, should have been consideration of the actual cost of moving traffic by so long and round-about a route. And yet this consideration was entirely ignored. Another illustration of the same danger occurred in April, 1903. A gang of western speculators unobtrusively acquired control of the Louisville & Nashville road, by taking advantage of the issue by that company of a large amount of new stock. This they did by the use of borrowed money. They had no intention, even had they been sufficiently well financed to do so, of permanently controlling the road as an investment. They bought the stock merely in order to resell it at a higher figure. They threatened the railway world with a general disturbance of rate conditions throughout the South. Their plan was to cut rates and steal traffic from other roads in order to make a large show of gross earnings; and to unload their stock holdings on the market thus made, before the public learned the truth. This was prevented only by repurchase of their stock at very high prices. In such a case, what guidance would the principle of charging what the traffic would bear, afford? Cost-of-service must be invoked in order to determine the reasonableness of the low rates in force.

In any industry where rates are made under conditions of monopoly rather than of free competition, it is imperative that cost-of-service be constantly held in view. Under conditions of free competition it is bound to obtrude itself automatically; but under monopoly it must oftentimes be forcibly invoked. The shipper whose manufacturing plant has once been located in a certain place is no longer free to accept or reject a certain rate. He can afford neither to move nor to abandon his works. In order to continue in business he must meet the prices made by competitors. This price may be made elsewhere under more favored circumstances. To a manufacturer an increase of freight rates, instead of curtailing output, may lead to attempts to lessen the costs of production per unit by an enlarged output sold at cut prices. Under such conditions an enhanced freight rate is a positive deduction from profits without any gain to the consumer. It is impossible to trace any safeguard against extortion in the operations of a value-of-service law under such circumstances. An instance in point is afforded by a complaint of the Detroit Chemical works in 1908.* This company imports iron pyrites through Baltimore from Spain; that being the source of the bulk of the material used here in the manufacture of sulphuric acid. The Detroit Company sells its product throughout the West in competition with companies at St. Louis, Chicago and Buffalo. The companies at Chicago and St. Louis enjoy low import rates by way of the Gulf ports. The Buffalo concern used to be favored by a low rate said to be due to canal competition on shipments from New York. Since 1903, however, the rate on pyrites from Baltimore to Detroit has been steadily increasing from $1.56 to $2.72 per long ton. Even this latter rate by itself does not seem absolutely excessive, yielding a revenue of less than four mills per ton-mile. But here again, it is not the absolute but the relative rate upon which the continued welfare of the industrial concern depends. The question must be decided not on the basis of cost, but from the point of view of the value of the service to the user. The carriers after this petition was filed voluntarily reduced the rate 51 cents per ton in January, 1908. The relative rate as compared with that to other competitive points was thus more equitably adjusted. The Interstate Commerce Commission on a review of the evidence held that this increase to $2.72 was unreasonable and unjust so long as it was in effect and awarded reparation to the amount of 51 cents per ton on all shipments made during its continuance.

It is indisputable that the great dynamic force in railway operation inheres in the value-of-service idea. The traffic manager who is always considering how much it will cost to handle business, will seldom adventure into new territory. The United States, as a rapidly growing country, is consequently the field in which charging what the traffic will bear has been most ardently upheld as the only practicable basis for rate making. A few detailed illustrations will serve to show the results of its application in practice. Not infrequently does it happen that rates are different over the same line for shipments between two given points in opposite directions. Where this is due to a preponderance of traffic in one direction, and a consequent movement of "empties" which invite a back loading at very low rates, the difference of charges according to direction may actually be due to differences in the cost of carriage.† An empty train, which must be returned from New York to Chicago for another loading of grain, or to Georgia or Oregon for shipments of lumber, if loaded with merchandise can be moved with no allowance for dead weight of cars or locomotives; inasmuch as the train must move in any event, whether loaded or empty. But even where this defense of difference in the cost of service fails, the practice may be entirely proper from every point of view. By increasing the total tonnage a special rate may ultimately contribute to lower charges all along the line. Raisin culture began in California in 1876. Prior to that time the Spanish product had supplied the American market. The first thing to do was to find a market for the California raisins in the East. They would not bear the freight rate which had previously been charged for Spanish raisins moving over the transcontinental lines westward. A very low rate was all that the new traffic would bear. During the year 1876 therefore 70,000 lbs. of California raisins were carried east at 1¾ cents per 100 lbs., while simultaneously 1,000,000 lbs. of Spanish raisins were carried west over the same lines at a rate of three cents. No such difference in the cost of service in opposite directions existed, although a preponderance of empties moving eastward undoubtedly cheapened the service from California. The aim of the commodity rate was to upbuild a new industry. How far this succeeded appears from the fact that in 1891.

*Interstate Commerce Reports, No. 1064.
†*Cf.* Rates on Kansas salt, Ripley, Railway Problems, p. 196.

no Spanish raisins were carried west at all; while the eastbound shipments amounted to 37,600,000 lbs. The preceding illustration leads us then to this further conclusion. The cost-of-service principle might most conceivably be applied to a railway in a purely static state. But, dynamically considered, as involving the growth and development of business, it fails utterly by itself to meet the necessities of the case.

At times it is inevitable that cost-of-service and value-of-service considerations come flatly into opposition. Usually, as in the California raisin case or in the grant of low rates on Oregon lumber east bound about 1893, they reinforce one another; that is to say, the lower rate given to build up business obtains on a service given at lower cost. But it sometimes happens that shipments of the same commodities over a line in opposite directions may occur and that the lower rate applies to the (presumably) more costly service. In 1906 a manufacturer in Menasha, Wis., complained to the Interstate Commerce Commission* that his rates on woodenware to the Pacific slope were 10 cents per 100 lbs. higher than were rates on the same goods between the same points eastbound, *notwithstanding* the fact that the empty car mileage westbound was then three times as great as in the contrary direction. The movement of empties westbound would certainly seem to justify as low if not lower rates on the basis of comparative cost of operation, supposing that there was coincidence in time. Only one satisfactory explanation for this apparent anomaly suggests itself; *viz.*, that this low eastbound rate was given to build up a new industry in the West. In other words, the cost of service, a dependable guide for a road in a static condition, failed of effect upon a line possessed of great dynamic possibilities. Occasionally opposition of principles like this may occur in questions of classification. It may temporarily be worth while, in order to build up a new industry, to accord a lower rating to a commodity actually more valuable or more expensive to handle than others. Here again the dynamic force in the value-of-service principle outweighs all other considerations of relative cost of service.

The value-of-service principle in general fails, not only in the determination of absolutely reasonable rates, but it is inadequate also to the solution of perhaps the more difficult problem of relative rates. This question of relativity is twofold; first as between different places, and secondly as between different commodities. These are, in other words, the problems respectively of distance tariffs and of classification. The manner in which distance tariffs evolve, has already been discussed, and it is evident that the cost-of-service principle is of fundamental importance, even though it be tempered by considerations of commercial expediency, that is to say, by the necessity of at all times under stress of competition, charging only what the traffic will bear. But while the value-of-service principle—charging according to demand in other words—applies at the competitive points, the other principle of relative cost should be the fundamental one in fixing upon the scale of local non-competitive rates.

The second phase of the problem of relativity arises in connection with classification. How shall goods be graded in respect of their freight charges for identical services in carriage. Besides illustrating the interplay of the two fundamental principles, this topic serves also to clear up another possible confusion of terms. Proportioning transportation charges to the value of the service must always be clearly distinguished from basing them upon the mere value of the goods. Nothing is more certain than that no direct causal relation between freight rates and the intrinsic value of commodities is traceable. On wire the freight rate between two given points may be about one-fourth of the commercial value; on sheet iron one-third; on lumber somewhat more, and on hay two-fifths; while on cattle and hogs the freight rate may range as low as one-tenth to one-eighth of their commercial value. On coal, on the other hand, the freight rate often more than equals the price of the coal at the mine, and on very low grade commodities like bricks, the transportation charges may equal two or even three times the entire worth of the goods. For each locality or even direction, these percentages will change. Between New York and Boston, the rates on live cattle (eastbound) and shoes (westbound) are not widely different, namely, 9 cents and 25 cents per 100 lbs. respectively. On the other hand, between Montana and Chicago, the cattle rate (72 cents) is only about one-quarter of the rate on shoes between the same points westbound. Positive reasons for these varying relationships are discernible in local trade conditions. While in general cheap goods are rated lower; if for any reason—bulkiness or risk—they cost relatively more to transport, they may very properly be advanced in grade. Normally, raw products move at lower rates than finished products—for instance, wheat and flour or cattle and beef. This is in accord with charging what the traffic will bear in relation to value. But in the making of export rates, it may be to the interest of the carrier to reverse this order, actually according to the finished product, the lower rate thereby encouraging the development of manufactures at home rather than abroad. Classification committees and regulative commissions are thus compelled to waver between the two opposing considerations of cost and value. One cannot avoid the conclusion, however, that, contrary to the usual rule, in this field of classification undue weight is often accorded by railway managers to that small element of total cost of service arising from risks of damage in transit—insurance cost, in other words—to the neglect of the financially more important consideration of what the traffic will bear. This emphasis upon the cost side of the account by classification committees, oddly enough is peculiarly characteristic of ratings in the higher class commodities. Among low grade goods, like grain, lumber or coal, the risk of damage is small, so that insurance cost becomes almost negligible. The insistent consideration among these low grade commodities is much more apt to be that of relative demand; arising from the necessity of close and constant adjustment to the behests of trade. Special or commodity rates, based directly upon what the traffic will bear, rather than upon the element of cost, are likely to prevail in these cases. But the very large revenue which could be obtained from increasing the rates upon the higher grade of goods seems not to be fully appreciated.

A valuable instance of the play of opposing considerations of cost and value of service in the classification of freight rates is afforded by a complaint in 1908 of the pulp paper makers in Wisconsin before the State Railroad Commission. It appeared that for similar service over the same roads, the rates per carload on saw logs for lumber were only about one-half those charged for carriage of logs to be ground into paper pulp. Judged on the basis of commercial value, hemlock and spruce bolts, too short and often otherwise unfit for lumber, were worth much less than saw logs; and yet they paid double the freight rates. This was not because the pulp wood was less desirable as traffic. In many ways it was more so. The haul was twice as long as for saw logs. The paper mills brought relatively more supplementary tonnage in the form of coal, food stuffs and supplies for workmen and their families. Fully as much of the finished product to be reshipped to consumers resulted. While smaller in volume, the pulp wood business was far more permanent. It was growing rapidly while the lumber business was declining. Moreover, the actual cost of service in hauling pulp wood was fully as low as for lumber logs. Carloads were much heavier, and were more regular in movement. In practice they involved no milling-in-transit obligation, that is to say, no obligation to re-ship the finished paper out over the same road; while all the saw log rates carried this obligation—a matter of some moment to the railways. And finally the value of the service to shippers of pulp wood was less than to mere lumbermen; in other words, the paper makers were operating under closer margins of

*Interstate Commerce Commission, No. 797.

profit; their plants were more costly, and depreciated more rapidly. The defense of the carriers in this case was not that the rates on pulp wood were too high in themselves, but that the rate on saw logs was perhaps unduly low—the latter having been crowded down to a minimum figure by competition in the early days of the business by the lumber raftsmen who floated the saw logs downstream from the forest to the saw mills. But of equal importance probably in perpetuating the higher rates on pulp logs, was the assumption that while the value of the bolts themselves was perhaps even less than that of saw logs, the value of the resultant product, paper, was much greater than that of lumber. But the Wisconsin Railroad Commission, in entire harmony with the principle repeatedly laid down by the Federal commission, held that the carriers must be guided by real distinctions of cost from a transportation standpoint and not by gradations of value. If the goods were bulky, awkward, or risky to handle, perhaps requiring special appliances or equipment, relatively high classification was permissible. But if they were substantially similar for purposes of carriage, no gradation in rates based upon differences in the ultimate uses to which the commodity might be put would be upheld. Such was the reasoning of the Interstate Commerce Commission in a decision,* holding that fire, building and paving brick must be accorded equal rates, regardless of their differing values. That the element of value is, however, not negligible is brought out in a later Federal case,† wherein it was recommended that cheap china, to be given away as premiums in the tea trade, be rated nearer ordinary crockery or earthenware, even though shipped in the same manner as high grade chinaware. Under the official classification chinaware is rated first class if in boxes, and second class in casks. Earthenware or crockery is carried at 20 per cent. less than third class, in small packages (L. C. L.). On the basis of mere cost of service, it would seem as if boxes of chinaware should have a lower rating than casks. Boxes stow better than casks, with less risk of breakage. But the commercial practice being to ship the finer grades of chinaware in boxes, such shipments are graded higher, because the traffic will usually bear a higher rate. Thus considerations of cost of service yield to those of value. The Interstate Commerce Commission, however, noting the exceptional circumstances under which the tea company distributed its cheap chinaware, recommended a revision of the classification to meet the needs of the case; in other words ordering a greater emphasis upon the elements of the value of the service, even at the expense of relative cost of operation.

Our final conclusion then must be this. That both principles are of equal importance; and that both must be continually invoked as a check upon each other. The tendency to the elevation of cost-of-service to a position of priority—rather characteristic of regulative bodies and of legislators—is no less erroneous than the marked disposition of railway managers to insist upon the universal applicability of the principle of charging what the traffic will bear. Neither will stand the test of reasonableness alone. Whether the one or the other should take precedence can only be determined by a careful study of the circumstance and conditions in each case; and in practice, the instances where either principle becomes of binding effect to the entire exclusion of the other, are extremely rare.

*Annual reports, 1907, p. 47.
†Union Pacific Tea Co., Int. Com. Report, No. 1569, decided Nov. 14, 1908.

SOUTH MANCHURIAN RAILWAY.

At the close of 1908 a radical reorganization of the South Manchurian Railway was effected, the changes being mainly in the line of simplifying the organization by abolishing unnecessary departments, dismissing superfluous employees, and in general placing the administration of the company more on a business basis. The new company has adopted the policy of training Chinese to fill as many positions as possible of the inferior grades in the railway service, with the expectation that, eventually, almost all the station and train hands will be Chinese. Two reasons have been given for the adoption of this policy. The first is the saving in wages, as the Japanese in Manchuria must be paid at least twice as much as the Chinese who do the same work. The second reason is that since the principal patrons of the line are Chinese it is thought, other things being equal, that Chinese railway employees would be able to deal with them more satisfactorily than could Japanese. It will take a long time to make the change, since experienced Chinese railway employees cannot be secured immediately. The Chinese employees who, on April 1, 1907, constituted 40 per cent. of the force, are now 45 per cent. of the total number of ordinary employees. A number of new positions have been created by the appointment of seven division superintendents for the main line, each supervising the work of maintenance of way, care of rolling stock, administration of settlements and control of receipts and expenditures in his division. Mr. Kunisawa, the new Vice-President, was the only one among the original eight directors of the company who had actual experience with railways. He is an engineer by profession, and received his technical education at the Imperial University in Tokyo, from which he graduated in 1887. It should prove of great advantage to the company to have in the important position of Vice-President a man with such long experience in practical railway affairs.—*United States Consular Report.*

DISADVANTAGES OF ELECTRIC HEADLIGHTS.*

The Lake Shore experimented with two electric headlights 15 years ago and discarded them. The Baltimore & Ohio also tried and after investing many thousands of dollars discarded them. The New York Central and the Pennsylvania decided against them. The Indiana law stated that an emergency existed, requiring prompt action; but really no emergency exists, and the present form of headlight is effective for all necessary or desirable purposes. No accidents have occurred because of not having a stronger light. It must be that special interests have been fostering agitation. In Minnesota this year a bill was introduced in the legislature, but a demonstration showed such good reasons for not using electric headlights that the enginemen who were supporting the bill had it withdrawn.

European railways do not use headlights.

The United States government steamboat inspection service has a rule forbidding pilots of steam vessels to flash the rays of a searchlight into the pilot house of a passing vessel. Prominent New York yacht clubs have a similar rule.

The police department of New York city has a rule requiring automobiles carrying strong lights to have them properly shaded when on the public highway so as not to blind or dazzle other users of the highway.

Government accident bulletin No. 28 cites a case of a butting collision (accident No. 3, page 6) where both trains were equipped with electric headlights and one or both of the enginemen misjudged the distance between the trains.

On a railway in Indiana using a large number of electric headlights the enginemen have asked that they be notified when trains with these headlights are displaying green signals because of the uncertainty of seeing the green lights in the glare of the electric headlight. On the same road last March an engineman passed an extinguished signal, his electric headlight making the green lens signal appear like a green light. On the same road another engineman ran past a home signal which was extinguished because the glare of the electric headlight of an opposing train made it impossible to see any signal at that station.

High power headlights daze animals, causing them to stand

*From a statement by H. F. Houghton, General Superintendent of the Cleveland, Cincinnati, Chicago & St. Louis, presented to the State Railroad Commission at Indianapolis, Indiana, May 27, 1909. This meeting was reported in our issue of June 4, page 1179.

motionless on the track until struck, thus endangering trains. Wayfarers at highway crossings make bad mistakes in estimating the distance to approaching trains. In one case persons were struck at a crossing because they assumed that the headlight was far away when really it was near. On double track roads an engineman meeting an electric headlight has his ability to see signals entirely suspended for the time being and until some seconds after he has passed the opposing train.

An intense light is sometimes so strongly reflected from the surface of a lens as to make a red light appear white. On a crooked road an engineman with an electric headlight has his mind withdrawn too much from the track, as he naturally follows the shaft of light, which, of course, on curves is not in line with the track. Even on straight track the increased illumination is not of real value, as in a great majority of cases the location of objects is not well defined. In fog the rays are reflected back from the particles of water, blinding the engineman so that he can see practically nothing.

MALLET ARTICULATED COMPOUND LOCOMOTIVE FOR THE VIRGINIAN RAILWAY.

[WITH AN INSET.]

In the issues of the *Railroad Gazette* for March 15 and August 23, 1907, a general description of the engineering features of the Virginian (then the Tidewater-Deepwater) Railway, was published in which the high standard of construction, the low grade obtained across the state of Virginia, and other features were set forth. While a portion of the road has been in operation for some time it is only within the past few months that all of the bridges have been completed and the rails connected through from Norfolk to Princeton, which is the assembling point of the line.

In the location of the road the ruling grade against the eastbound traffic was placed at .2 per cent. compensated, with the exception of the climb over the Alleghenies, where it rises to .6 per cent. There are also places north of Princeton where grades in excess of the regular .2 per cent. are encountered. For the purpose of handling the traffic over these places the Mallet articulated compound locomotive will be used and four of these engines are now in course of construction at the Richmond Works of the American Locomotive Co. These engines will be completed this month and will be used as pushers on the Clark's Gap grade north of Princeton, which is 14 miles long and laid on a 2.07 per cent. They will also be used for a similar service on the climb over the Alleghenies at Whitehorn, where, as already stated, the grade is .6 per cent.

The engines are built to the specifications prepared by R. P. C. Sanderson, the superintendent of motive power of the road, and show a number of modifications from the Mallet locomotives previously built by the American Locomotive Co. The most marked feature is the use of a leading two-wheeled truck. In the locomotives built by the company for the Baltimore & Ohio and the Erie no truck was used; while in those built by the Baldwins for the Great Northern and other roads such a truck is used at each end of the engine. In this case there is a leading truck for the forward frame but no trailing truck at the rear, an arrangement that is novel, at least among these big Mallets that have been developed in America. The engine is therefore of the 2—6—6—0 type.

The truck has a radial swinging bolster which is suspended by three-point hangers and the load is transmitted to the journal boxes by means of coil springs seated on top of the box and supporting the truck frame.

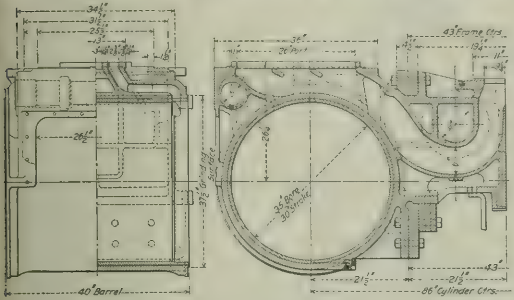
In working order it is estimated that the engine will have a total weight of 330,000 lbs., of which 312,000 lbs. will be on the driving wheels, so that it will be somewhat lighter than either the Baltimore & Ohio or the Erie engines. The calculated tractive effort, working compound, is 70,800 lbs. This can be increased about 20 per cent. by working the engine simple, the engine being fitted with the Mellin intercepting valve, which allows live steam to be admitted to the low-pressure cylinders, while the exhaust from the high-pressure cylinder is diverted through a separate pipe to the exhaust pipe in the smokebox. This pipe is shown lying along the left side and beneath the boiler and leads from an elbow coming from the high-pressure steam chest to the smokebox. The pipe leads from the emergency exhaust valve that is located in a separate chamber attached to the side of the left cylinder casting and communicating with the intercepting valve. It is 4½ in. in diameter.

Exhaust steam from the right high-pressure cylinder passes back through the casting into an outside U-shaped pipe connecting to a passage in the left cylinder casting, which leads up to the intercepting valve chamber into which steam from the left cylinder also exhausts. From the intercepting valve it passes to the receiver pipe, leading to the low-pressure cylinders. At the front the emergency exhaust turns from the side of the engine to the center and enters the smokebox from the bottom on the center line. At this point there is an elbow riveted to the bottom of the sheet and fitted with a joint on the inside to make a connection with the casting of the exhaust pipe. This pipe is of the usual form, so far as the main exhaust is concerned as it comes from the low-pressure cylinder. The emergency exhaust, however, comes in from the rear and enters an annular space circling the main pipe near the top, and with an annular opening about the main exhaust, so that when working with single expansion the exhausts from the high and low pressure cylinders in no way interfere with each other. The construction of this exhaust pipe is clearly shown in the engraving. The receiver pipe has a ball joint connection with the high-pressure cylinders and a slip joint at the front end where it connects to a Y-pipe, the branches of which connect to the cored passages in the low-pressure cylinders. This arrangement was fully illustrated in the description of the Erie Mallet engine published in the *Railroad Gazette* October 4, 1907. The high-pressure cylinders have piston valves with internal admission, while the low-pressure valves are provided with Allen-ported slide valves, having external admission. Both valves have a maximum travel of 6 in. and are set for $\frac{3}{16}$-in. lead. The high pressure valves are designed with 1¼-in. steam lap and $\frac{3}{16}$-in. exhaust clearance, while the low-pressure valves have the same exhaust clearance, but $\frac{1}{8}$ in. less steam lap. The valves in each case are actuated by the Walschaerts valve gear, and the two sets of gears are so arranged that the high-pressure link block is raised while the low-pressure one is lowered, when being thrown into forward gear, and the two consequently counterbalance each other. As the high-pressure valve has inside admission and the low-pressure outside admission, the eccentric crank leads the pin in each case. Reversing is effected by means of a hydropneumatic reversing device, the same as that used on the Mallet articulated compound built by this company for the Baltimore & Ohio. The construction of the frames, which are of cast steel, and the arrangement of the articulated connection between the front and rear engines are also practically the same as in the Baltimore & Ohio engine.

The low-pressure cylinders are 35 in. in diameter, with a stroke of 30 in., and are cast in pairs with half saddles. They are fitted with flat slide valves and are bolted between the upper and lower bars of the frames in what was the standard American practice.

Owing to the application of the leading truck and the consequent moving forward of the boiler, it was necessary to use a different arrangement of flexible connections between the low-pressure cylinders and the exhaust nozzle from that employed by the builders in other engines of this type without a truck. The original arrangement of exhaust pipe was

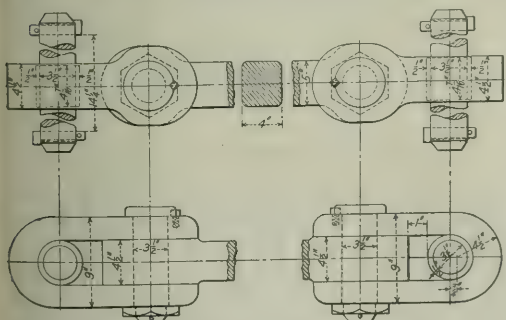
fully illustrated in connection with the description of the Erie locomotive already referred to. In that construction there is an eblow bolted to the cylinder casting and the bottom of the smokebox, and the ball joints for the pipe are held in place by flanges and cases. In this instance the two exhaust passages from the cylinders come together in the center of the cylinder saddle, and fitted to the single opening in the top of the saddle is a cast-iron flange which forms a stuffing box for the ball joint connection to a cast-iron elbow. The back end of this elbow screws into the front



Low-Pressure Cylinder.

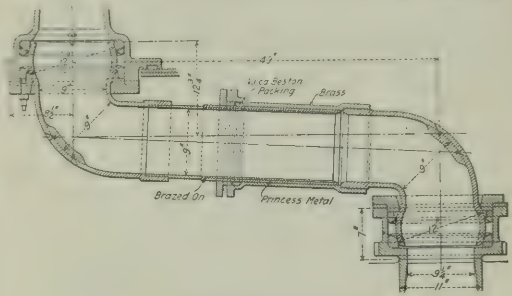
section of the connecting pipe leading to the exhaust pipe in the smokebox. The two sections of this pipe have a slip joint connection between them, and the rear section is provided with an elbow which has a ball joint connection with the exhaust pipe in the smokebox. This combination of ball joints and slip joint thus permits the connecting pipe to adjust itself to any lateral or vertical movement of the low-pressure cylinders relative to the smokebox. This new arrangement is clearly shown in the illustration. In this, vulcabeston is used for packing the slip joint, and also for a filling between the rings of the ball joint. The pipe itself is a standard dimension wrought iron pipe galvanized, but it is protected by a wearing sleeve of princess metal brazed on. The shell in which this pipe is held is of brass screwed with a fine thread to the elbow leading from the cylinder.

The boiler is of the radial stayed extended wagon top



Drawbar Between Engine and Tender.

type, and is 76 in. in diameter outside at the first ring. It contains 390 2¼-in. tubes 21 ft. long, and has a total heating surface of 5,065.9 sq. ft., 4,842 sq. ft. of which is contributed by the tubes, 200 sq. ft. by the firebox, and the remainder by the arch tubes. The firebox is 114 in. long and 72 in. wide, with sloping back head and throat sheet, and provides a grate area of 57 sq. ft. Large water spaces are provided around the firebox, these being 5 in. wide at the mud ring on the back and sides and 6 in. on the front. The firebox sides and crown sheet are in one piece, as are also the outside side sheets and roof. The dome, which is of cast steel, is located on the third course on the vertical center line of the high-pressure cylinders. It is similar in design to that used on other Mallet articulated compounds built by this company, having an annular cavity extending around the front half of its circumference, which leads from the throttle pipe connection to the steam pipes on either side of the boiler, leading to the high-pressure cylinders. The throttle, which also acts as a steam separator, is similar in design to that applied to the engine of this type built for the Erie Railroad.



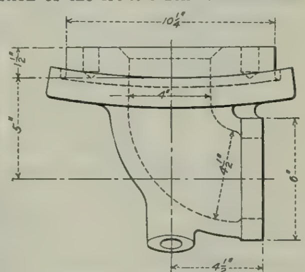
Exhaust Pipe Joints.

As will be noticed from the illustrations, the throttle valve is operated through a system of levers by a crank arm on a horizontal shaft, passing out through a stuffing box in the side of the dome and fitted with a lever arm on the outer end, which is connected by a rod, extending along the outside of the boiler, to the throttle lever on top of the boiler back-head.

The arrangement of steam pipes to the high-pressure cylinders and the design of the cylinders follows the builders' usual practice for this type of engine. The high-pressure cylinders, which are 22 in. in diameter by 30 in. in stroke, are cast in pairs with saddles and are separated at a point to the right of the center in order to provide room for the connection to the receiver pipe, which extends along the center line of the engine.

As before stated, the Mellin system of compounding is used, the intercepting valve being located as usual in the left high-pressure cylinder casting.

Because of the application of the front truck it was necessary, in this design, to use two self-adjusting sliding bearings to support the boiler on the front frames, both of which carry load under normal conditions. Each of these bearings is provided, as usual, with safety straps to prevent the frames from dropping away from the boiler in case of derailment, and the front bearing is provided with the builder's usual design of spring-centering device.



Exhaust Pipe Connection.

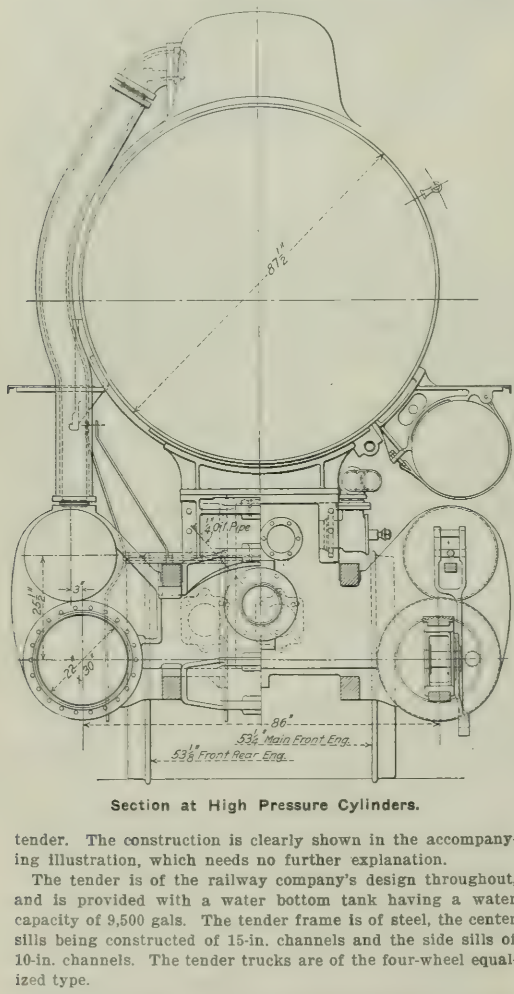
The front and rear systems are equalized together by vertical bolts, connecting the upper rail of the front frame with the lower rail of the rear frame. But in this design the load on the bolt is supported by a coil spring, through which the lower end of the bolt passes and which bears up against the bottom of the rear frame rail, the spring cap having a ball joint with the frame.

A flexible support at this point was necessary in order that each of the three boiler supports, namely, the two sliding

bearings and the equalizing bolt, might bear its proportion of the load in any variation in alinement of the three.

In order to obviate the necessity of flexible connections in the sand pipes leading to the driving wheels of the front engine, sand is supplied to these wheels from a sandbox supported on the front deck plate. The headlight is carried on a bracket bolted to the front of this sandbox.

Another interesting detail of the design is the arrangement of the draw gear between the engine and tender, in which the drawbar pin is horizontal and is inserted through the side walls of the foot plate instead of being vertical and put in through the top of the foot plate, as is the usual practice. This arrangement facilitates the extraction of the drawbar pin when it is necessary to disconnect the engine from the



Section at High Pressure Cylinders.

tender. The construction is clearly shown in the accompanying illustration, which needs no further explanation.

The tender is of the railway company's design throughout, and is provided with a water bottom tank having a water capacity of 9,500 gals. The tender frame is of steel, the center sills being constructed of 15-in. channels and the side sills of 10-in. channels. The tender trucks are of the four-wheel equalized type.

The following are some of the principal dimensions of these engines:

Cylinder, diameter, H.P.	22 in.
Cylinder, diameter, L.P.	35 "
Piston stroke	30 "
Wheel base, rigid	11 ft.
" " driving	37 ft. 9 in.
" " total	39 " 11 "
" " engine and tender	73 " 2 [illegible]"
Weight on drivers	312,000 lbs.
" on truck	18,000 "
Weight, total	330,000 lbs.
" engine and tender	392,300 "
Heating surface, tubes	4,842 sq. ft.
" " firebox	200 "
" " arch tubes	23.9 "
" " total	5,065.9 "
Grate area	57 "
Journals, driving	9½ in. x 12 in.
" truck	5½ " x 12 "
" tender	5½ " x 10 "
Boiler, diameter	76 "
Steam pressure	200 lbs.
Firebox, length	114 in.
" width	72 "
" thickness, crown, sides & back	⅜-in.
" thickness, tube sheets	$\frac{9}{16}$-in.
Water space, front	6 in.
Water spaces, sides and back	5 "
Tubes, material	Charcoal iron
" number	390
" diameter	2¼ in.
" length	21 ft.
" thickness	No. 11; B. W. G.
Air-brake reservoirs, number	2
Air-brake reservoirs, size	25½ in. x 118 in.
Exhaust	5½ in. and 6 "
Stack, diameter	16 "
Valves, travel	6 "
" lap, H. P.	1¼ "
" lap, L.P.	1 $\frac{1}{16}$ "
" exhaust lap	$\frac{3}{16}$-in.
" lead	$\frac{3}{16}$-in.
Wheels, diameter driving	54 in.
" " truck	30 "
" " tender	33 "
Tank capacity, water	9,500 gals.
Tank capacity, coal	14 tons
Tractive effort	70,800 lbs.

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = 94.54^*$$

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.41$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 4.66$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 754.29$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 89.40$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 3.94^*$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 61.58$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 65.14$$

Displacement 2 h. p. cylinders, cu. ft. = 13.2

$$\frac{\text{Total heating surface}}{\text{Displacement 2 h.p. cylinders}} = 383.78$$

$$\frac{\text{Grate area}}{\text{Displacement 2 h.p. cylinders}} = 4.31$$

*Per cent.

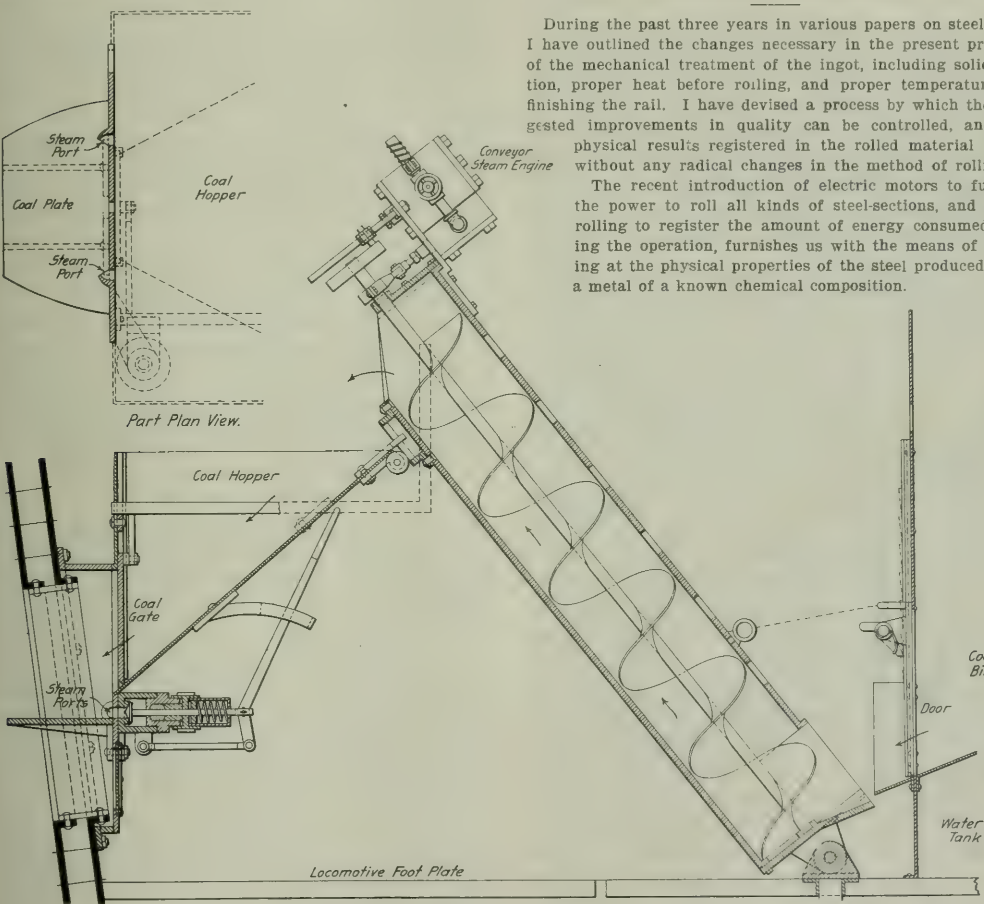
NATAL GOVERNMENT RAILWAYS.

The railways of Natal are owned by the government and have been built under government contract. The mileage operated is 988 miles, completed at a cost of $67,649,148. The track is 3 ft. 6 in., the standard in all South African railways. The gross revenue in 1908 from all sources was $8,907,183, a decrease of $23,650 from 1907. The gross working expenses were $6,034,653, or 2.19 per cent. less than the preceding year, leaving a net revenue of $2,883,610. Deducting $2,825,830 for interest on the capital invested and contributions to sinking fund, there is a surplus to the state of $57,779. The reduced working expenses were shown notwithstanding an increase of 15 miles opened during the year. The train-miles during the year were 4,844,858, and the receipts from all sources were $1.84 and working expenditures $1.33 per mile. Beautiful flower garden spots add to the appearance of the stations. The offering of prizes for the best kept station gardens has stimulated the station masters to put forth special effort, so that these gardens throughout Natal are most beautiful and furnish examples of excellent landscape gardening.

MARSHALL LOCOMOTIVE STOKER.

An automatic stoker for locomotives recently designed by J. J. Marshall, of Shelburne, Ont., Canada, is here illustrated. This stoker has not yet been used on locomotives, but it is interesting on account of the simple manner in which the coal is fed from the tender to the stoker. The method by which the coal is projected into the furnace is quite similar to that of the Hayden stoker so far as the use of steam jets is concerned, but there the jets are operated automatically while in the Marshall stoker they are operated by hand levers and require constant attention by the fireman. The drawing shows the fuel plate arranged with three steam jets; the right hand one blowing to the left; the left hand one blowing to the right, and the one at the center blowing the coal directly toward the center of the firebox. The admission of the coal to the plate is governed by a rotary cut-off valve.

The coal from the tender is conveyed to the stoker by means of an inclined spiral conveyor which is pivoted to the floor of the tender by a four-way hinge, and stands at an angle of about 45 deg. The upper end rests on the hopper, which is placed against the back end of the boiler, and is free to adjust itself to the oscillation of the engine and tender. At the upper end of the conveyor there is a small steam engine for driving it. The whole apparatus has been so designed that it can be removed when it is necessary to resort to hand firing. The stoker is attached to the boiler head by locking bolts, which can be released and the stoker replaced by the ordinary fire door. The conveyor also is so arranged that it can be easily taken down and put out of the way when necessary. The drawings illustrate the first designs of this stoker, which will probably be modified as it is further developed in practice.



Marshall Locomotive Stoker—Elevation and Part Plan.

REGISTERING THE PHYSICAL QUALITIES OF STEEL RAILS DURING ROLLING.*

During the past three years in various papers on steel rails I have outlined the changes necessary in the present practice of the mechanical treatment of the ingot, including solidification, proper heat before rolling, and proper temperature for finishing the rail. I have devised a process by which the suggested improvements in quality can be controlled, and the physical results registered in the rolled material itself, without any radical changes in the method of rolling.

The recent introduction of electric motors to furnish the power to roll all kinds of steel-sections, and while rolling to register the amount of energy consumed during the operation, furnishes us with the means of arriving at the physical properties of the steel produced from a metal of a known chemical composition.

In the manipulation of steel, heat and work are closely related. Heat displaces work. Efficient work is the measure of quality in the finished steel, so it follows that the more work incorporated in the steeel product at proper temperatures the better will be the physical qualities. Consequently, as the heat increases the steel softens, and this condition displaces work in a relative degree, since the compression of the metal under high heat requires much less energy as compared with the corresponding compression at the proper heat required for the best physical results. The record, in kilowatts, of the power required to roll a given sized ingot

*From a paper by James E. York, before the American Institute of Mining Engineers, at New Haven, February, 1909.

into a rail can be made to control the heat of the ingot, and the temperature at which to finish the rail, since any change of temperature is recorded by the motor—more power in proportion to the reduction being demanded when the heat is low and less when it is high. This process will furnish a simple and reliable pyrometer for controlling the temperature of the steel during the rolling, and its application to the manufacture of steel rails and other sections promises many advantages.

UNIFORM GRADING AND INSPECTION OF LUMBER.*

Of all the material used in the construction of buildings, bridges, tracks, cars, etc., lumber is probably the most difficult to purchase. This difficulty arises largely from the fact that lumber is the product of trees, and one of the most distinguishing characteristics of trees is that they are different. Two oak trees growing on the same acre of ground, in the same soil, and of the same age, will produce lumber, in one case of a very high, and in the other of a very low grade. In other words, trees are as different one from the other as human beings. The recognition of this variation is one of the most fundamental factors in the consideration of the grading and inspection of lumber.

The factors used in the classification of lumber are, generally speaking, size and the absence or presence of defects. The various lumber associations of the country have adopted standard grades for the kinds of lumber which they manufacture, by which they mean that boards will go in one or the other grade according as they come up to certain standards of sizes or quality, as determined by the absence or presence of certain defects, and it is to insure uniformity in the interpretation of these various grades of lumber that we recommend the question be taken up by this association.

In the purchase of a specific grade of lumber from the same territory and under the same conditions, all railways should receive the same quality of timber, but we all know from experience this is not a fact, for mill men soon learn that inspections on certain railways and at different points on the same railway are more lenient than others and gradually begin to cut the grade and put in a few pieces of inferior grade, and if culled, hope to have the material accepted at a slight reduction in price. If this condition prevails on some roads, it makes it easier for them to get their lumber, but at the expense of quality.

With many of us lumber is ordered and purchased without sufficient recognition of changing conditions, such as location of source of supply, improvement in methods of manufacture, etc., and I do not doubt many roads are following a practice which has been in vogue many years and are ordering lumber to grades which are practically obsolete, owing to exhaustion of forests in that territory. Many times lumber is ordered in certain lengths, either from precedent or for some minor convenience, when, if the party making requisition knew that these lengths were considerably more expensive and that mill lengths would answer just as well, he would probably be satisfied with the latter.

Lumber purchased on a railway is generally for a specific purpose and of a grade which should be determined beforehand if practicable, and no deviation from this grade should be allowed.

Lumber represents to most western lines from 15 to 20 per cent. of the total annual purchases, and the cost of inspection at mill as compared with destination inspection represents a saving of $1 to $2 per 1,000 ft. in favor of the destination inspection. We have worked under both systems and we are strongly in favor of inspection at destination, where the inspectors have plenty of time to make the inspection and are not likely to be hampered by mill representatives, and furthermore, when shippers learn that all lumber not strictly up to grade will be rejected at destination, and freight charges, cost of handling and storage charged against their invoice, they will be more careful in selecting the material to apply on our orders. It may be difficult to formulate a general rule that will be applicable to all railways on account of their geographical location compared with the geographical location of the natural timber source of supply for the interested companies. In other words, the railway on the Pacific coast could hardly hope to have grading rules uniform with a railway on the Atlantic coast or Gulf states on account of the entirely different kinds of woods used for most purposes, but this can be overcome to a large extent if the Master Car Builders' and Maintenance of Way associations will consider favorably the adoption of the rules of the various lumber associations, which cover practically all the lumber manufactured in the United States.

To most mills railway material is known as "bill stuff," and has no standing in the grading rules for the reason that it is cut to order to the consumer's specifications. Thus the various manufacturers of lumber have joined together and adopted uniform specifications for their own protection, and we think that the railways that consume approximately 50 per cent. of the output should take similar action and accept the association grades to avoid paying a premium on their own specifications from which they derive no direct benefit.

It must not be overlooked by railway companies that prices quoted them, when intelligently made, are usually based on the general practice of the railway company, as understood by the trade, in the matter of inspection, and if we can only bring about uniformity in the matter of inspection of lumber, as has been done with other materials interchanged between railways, we think a great saving can be accomplished.

*From a paper presented at the Chicago convention of the Railway Storekeepers' Association by J. M. McCarthy, Purchasing Agent of the Chicago, Rock Island & Pacific Ry.

STRIKE IN BRAZIL.

A consular report says that the successful strike of the employees of the Great Western of Brazil has modified the railway outlook for the states of Pernambuco, Alagoas, Parahyba and Rio Grande do Norte. The original demands of the Brazilian employees of the railway were: (1) Increase of 50 per cent. for the employees whose salaries do not exceed $83 per month and of 20 per cent. for others. (2) Two days' rest, at least, per month for engineers, firemen and conductors, without diminution of salary and without obligation to present themselves at the shops, stations or offices. (3) Responsibility of the company toward its employees for accidents in work. (4) Sick employees to be kept in their positions without diminution of salary during illness. (5) Abolition of obligatory removals. (6) Employees and their families to receive, during the year, two more free passes. (7) Daily pay for employees when on duty away from the shops or from their places. The strikers suddenly returned to work on the announcement that the governor of the state was to act as arbitrator. Later it was learned that the basis of agreement was a concession on the part of the railway of an increase of 30 per cent. to employees receiving a monthly salary of $30.75 or less; 20 per cent. to those receiving between $30.75 and $76.88 and 10 per cent. to certain classes of employees receiving a daily wage. The railway is thus pledged to an additional outlay of about $75,000 in wages. Up to the time of the strike the railway had under immediate contemplation the construction of a large central station in Pernambuco, to take the place of the three stations now in use, whose lines have already been linked up; the prolongation of its various lines, especially of the branch which terminates at Vicosa, in the state of Alagoas, and the building of extensive shops and roundhouses. The money to cover these expenditures was to have been raised by loan in Europe, but it is doubtful if an issue will be attempted for some time to come.

General News Section.

The Wisconsin legislature has passed a law permitting railways to give bona fide immigration agents free or reduced rates of transportation. The law provides that a bona fide immigration agent is one who devotes at least one-half of his time to immigration work.

The New York, New Haven & Hartford announces that from July 1 the officers whose pay was reduced in April, 1908, will be restored to their former status. Ten per cent. was taken off from those receiving $2,000 a year and over, and 5 per cent. from those receiving between $1,200 and $2,000. The present change will increase the payroll by $132,000 a year.

At the second conference called by the Indiana Railroad Commission (June 11) to consider the electric headlight question, 24 locomotive engineers declared that the ordinary oil headlight was efficient and greatly to be preferred. Not a single engineman spoke in favor of the electric light. The commission will make some personal tests soon and hold a third conference June 29.

The Indiana State Railroad Commission announces that it will not prosecute under the full crew law in cases where a train is compelled to pick up cars en route which the terminal officers have no way of knowing that it must pick up; where a flagman is suddenly incapacitated and no one with the statutory qualifications can be procured to take his place; and in other unforeseen circumstances.

Governor Marshall, of Indiana, has written a sharp letter to the Railroad Commission denying the Commission's right to construe the Full Crew law, because it is a penal statute. The Governor further charges the Commission with being "too reasonable" with the railways in giving them license to violate the law. The Commission ruled that in certain emergency cases there should be no prosecution.

Since June 15 the transcontinental expresses of the Canadian Pacific traverse the new loop at Field, B. C. The tunnels, three in number, one 170 ft. long, one 2,912 ft. and the other 3,185 ft. reduce the grade from 4.5 to 2.2 per cent. In order to obtain the lesser grade it was necessary to lengthen the line about 3 miles. The ascent is now made in two 10-degree spiral curves. The cost of the work was $1,500,000. It was done by McDonald & Gzowski, contractors.

The so-called Chapple railway taxation bill, passed by both houses of the Wisconsin legislature, has been vetoed by the Governor on the ground that it will lead to the destruction of the present excellent ad valorem taxation law of Wisconsin. The Chapple bill provided that all elevators, merchandise docks and ore docks owned by railways in Wisconsin should be exempt from the ad valorem taxation law and should be taxed by the city or village where they were located.

The Indiana State Railroad Commission has adopted a resolution approving the blocking of frogs. The commission recommends that all steam roads put in suitable blocks. Crude methods are now in use, and the commission recommends the installation of adequate iron and steel fillers in at least 50 per cent. of all yearly renewals of frogs, guards, wing rails and switches. All future installations should have bevel ends, or suitable forging, or sloping blocks of wood, so as to provide the maximum safety.

The Pennsylvania Company has notified the Indiana Railroad Commission that it will not comply fully with the order to exchange freight with the Chicago, Cincinnati & Louisville at Richmond. The company holds that the question involves a grave invasion of its rights and refuses to exchange with the C. C. & L. any freight except that originating at or for delivery to some point on that company's line not reached by any other line. The Commission will test the law.

A 2,000-mile park is planned by E. H. Harriman for his Pacific railways and the start will be made with the Union Pacific at Omaha. The scheme is to embellish the route so that passenger trains will travel in a continuous parkway from the Missouri to the Pacific. Across the broad expanse of Nebraska the work this year will consist of sowing the right of way with alfalfa, a plant which becomes green early and remains green until late in the fall. This thickens and forms a green sward. A double row of bull pines, alternating with elms will be planted every two rods on the edge of the right-of-way.

"The Railroad Holding Company" bill, an outline of which was given in these columns last week, has been passed by both nouses of the Massachusetts Legislature, and since it was drafted by Governor Draper and passed without radical amendment, it would seem probable that it will be made a law. It provides for a company to be financed by some railway—it is understood the New York, New Haven & Hartford—which new company shall buy a controlling interest in the stock of the Boston & Maine. A large block of B. & M. stock is now held by John L. Billard, who acquired it from the New York, New Haven & Hartford when public opinion forced the New Haven company to dispose of its Boston & Maine holdings.

At the first annual convention of the Engineers of Pennsylvania, held at Harrisburg last week, the Pennsylvania Railroad Company exhibited a topographical map of its improvements in and around New York City. This map is 30 ft. long and many of the principal buildings in the central part of New York City can be recognized.

The cross section of this map shows the tunnel lines from Long Island City to Bergen Hill in New Jersey, and brings out the breadth of the tunnel approaches to the station proper. The main building in New York City now nearing completion, is shown in plater of Paris. In addition to the cross section view of the tunnel work there are separate reproductions of the tunnel showing a train as it will appear drawn by an electric locomotive.

The Legislature of New York has established a commission to inquire into the question of employers' liability and the causes and effects of unemployment. Seven of the members are taken from the legislature and the others, appointed by Governor Hughes, are Henry R. Seager, president of the American Association for Labor Legislation and professor of political economy in Columbia University; Otto M. Eidlitz, builder, New York; John Mitchell, American Federation of Labor, New York; George W. Smith, Lackawanna Iron & Steel Company, general superintendent of the Seneca Transportation Company, president of the Central Railway Company, Buffalo; Philip Titus, passenger conductor, chairman of general committee of adjustment, New York, Ontario & Western Railroad; Miss Crystal Eastman, author and investigator, New York. The members are to serve without compensation, but their expenses are to be paid from a $10,000 appropriation made by the Legislature.

Mississippi Deepening Too Costly.

The special report of a Board of Army Engineers sent to Congress June 10, holds that "it is not desirable to construct a navigable channel 14 feet in depth from St. Louis to the mouth of the Mississippi River or from Chicago to the mouth of the Mississippi River. The present demands of commerce between St. Louis and the mouth of the Mississippi River are adequately served by the existing projects having for their object to obtain and maintain an 8-ft. channel from St. Louis to the mouth of the Ohio, and a channel of not less than 9 feet in depth below the mouth of the Ohio. An 8-ft. channel from Chicago to St. Louis, corresponding to the present 8-ft. project from St. Louis to Cairo, would be desirable, provided its cost is reasonable."

The estimated cost of the 14-ft. plan of improvement is $128,600,000, with $6,500,000 annually for maintenance after the completion of the work.

The Chief of Engineers, who transmits the report, believes

that it will not be practicable to obtain a minimum depth of 14 ft. of water between St. Louis and Cairo by means of locks and movable dams. The structures might be built, but their efficiency is problematical, and the changes of favorable operating are very remote. Nor is the Chief of Engineers prepared to recommend that it is practicable from an engineering standpoint to secure and maintain a 14-ft. depth at low water in the section from St. Louis to the mouth of the Ohio River by any method of open river improvement.

A New Drop Testing Machine at the University of Illinois.

The department of Railway Engineering of the University of Illinois has recently set up a drop testing machine which is identical in design with the standard machine of the Master Car Builders' Association.

The apparatus will be used in making impact tests of car couplers, wheels, axles, etc. The anvil weighs 20,000 lbs. and the hammer 1,640 lbs.; and the extreme drop is 50 ft. The addition of this machine to the existing equipment of the College of Engineering of this institution, renders it possible to make there tension, compression, bending and impact tests of all materials of construction, on specimens of the full size. The Pennsylvania (Mr. Gibbs) furnished the drawings and lent the patterns for the machine, and the Cleveland, Cincinnati, Chicago & St. Louis (Mr. Garstang) gave its services in connection with the work of construction and assembling the machine, which was done at the Urbana shops of that company.

Replacing Timber Viaducts With Steel on the Chicago, Milwaukee & Puget Sound.

The Chicago, Milwaukee & Puget Sound has given an order for six large steel viaducts, aggregating about 4,000 tons, to replace timber structures on its main line in Washington and Idaho. Two were given to the American Bridge Co. for the crossings of Mine and Hull creeks, Washington; two to the Toledo-Massillon Bridge Co., for Hansen and Change creeks, Washington, and two to the McClintic-Marshall Construction Co. for Turkey and Glade creeks, Idaho. Bids have been asked on several other structures of the same kind, and the contracts probably will have been awarded by the time this item appears.

This replacement of timber viaducts with steel is in line with the policy the road has adopted of getting rid of all such timber structures on its main line without delay. It was felt that, although these timber structures are new and of unusually substantial construction, the fire risk, with the delay to traffic that the destruction of one such bridge would entail, was too great to allow of their retention. A large number are being filled in with earth. All of the steel viaducts will have ballasted floors.

In crossing the "Continental Divide" in the Rocky Mountains, three steel and 18 timber viaducts were built. The latter are being filled in. Seven are already done and the work on the remainder is in progress. By the end of the year there will be no timber bridges on this part of the line.

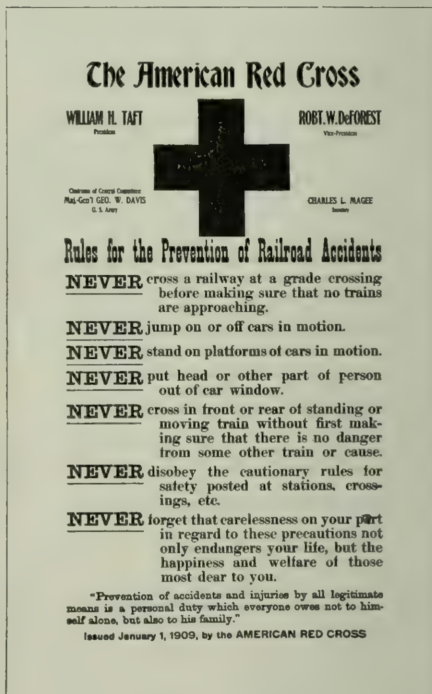
For the same reason that the timber bridges are being replaced, a number of the tunnels which have timber linings when built are now being lined with concrete.

New Haven Electrification.

Reports printed in the newspapers after a meeting of directors of the New York, New Haven & Hartford in New York City last Wednesday indicated that the company had fully decided on the electrification of its main line from Stamford, Conn., to New Haven; but there is no official confirmation of anything except some experimental work. The road which is now electrified extends from Woodlawn, N. Y., the junction with the New York Central, eastward about 21 miles to Glenbrook, just east of Stamford. The electric structures are to be extended at once about one mile beyond Glenbrook, with a view to experimenting with freight trains (at present only passenger trains are hauled by electric engines); and two experimental electric freight locomotives have been ordered from the Westinghouse Electric & Manufacturing Company. Work has already been begun on the foundations for the overhead construction at Glenbrook. The newspaper statement that cast of Stamford the electric apparatus would be prepared for freight trains first, and then later for passenger trains, would seem to be misleading, for the line is four-track, and neither passenger trains nor freight trains are confined always to the same track. Moreover, the use of electric motors in passenger service may be said to have passed out of the experimental stage on this road.

Prevention of Accidents.

The American National Red Cross has prepared a poster, designed to be put up in and around railway stations, on which are displayed in large type numerous warnings to careless persons not to get run over or injured by the cars. Letters, offering to furnish these posters free, were sent to



about 150 of the leading railways of the country; and, in response to the answers received from the railways, 43,000 posters have been sent out. The illustration shows a facsimile of the poster, reduced three-fourths in height and width. In the actual poster the cross and the "NEVER" appear in red.

New Courses at the Rensselaer Polytechnic Institute.

The Rensselaer Polytechnic Institute at Troy, N. Y., announces that it has inaugurated courses in mechanical enginering and electrical engineering—leading to degrees in those branches—of the same high character and the same thoroughness that have made its courses in civil engineering famous for three-quarters of a century. The gift of $1,000,000 by Mrs. Russell Sage has insured the establishment of laboratories in mechanical and electrical engineering unsurpassed by any other school of engineering.

The history of the Troy Polytechnic is an interesting one. It was the first school of science and the first school of engi-

neering to be established in any English-speaking country. It was founded by Stephen Van Rensselaer in 1824 as a school of practical science, and lectures on engineering subjects were given as early as 1828. Members of the alumni still living are at work in 46 states and territories and in 19 foreign countries. The work done on railways by the graduates of the Troy Polytechnic is of great credit to that institution. A partial list contains the names of 119 Presidents, 281 Vice-Presidents, Managers and Superintendents and 160 Chief Engineers of railways, steel and iron works, bridge companies, water works and electrical companies. These men have helped to build and operate more than 160,000 miles of railways in North America alone, and they have been connected as designers and constructors with all the important bridge companies and nearly all of the great bridges of this country.

The new Russell Sage laboratory is now finished and the machinery has been installed. The west wing will contain the department of mechanical engineering; the east wing, the department of electrical engineering, and the central portion will be used by both departments. This portion contains a large lecture room capable of seating over 400 people; a reference library; a museum, and a large drawing room. The subbasement floor contains the steam engine, laboratory, hydraulic, gas engine and refrigerating laboratories. It will thus be seen that our oldest engineering institute is in a flourishing condition, and is providing buildings and equipments for large additions to its student body.

Queensboro Bridge Opened.

With Governor Hughes, Secretary Dickinson, of the War Department; President McGowan, of the Board of Aldermen, representing the Mayor; Borough Presidents Ahearn, Gresser and Coler, and a score of other dignitaries present, together with some 50,000 citizens, the Queensboro Bridge between the boroughs of Manhattan and Queens, New York City, was thrown open to traffic on Saturday, June 12. There were addresses, a great parade of about 30,000 men, a display of fireworks at night, and a performance by amateurs of a comic opera, the proceeds from which will be given to the hospitals of Queens. This bridge extends across the East River and the south end of Blackwells Island. Illustrated accounts of it appeared in the *Railroad Gazette*, Aug. 28, 1903, and May 8, 1908; and in the *Railroad Age Gazette*, Nov. 20, 1908.

The Timber Problem.

For each railway there are certain lines of general policy which can be profitably adopted:

"1. The use of chemically treated ties wherever possible.

"2. The use of so-called inferior woods, as, for example, black gum and loblolly pine, for ties, which will reduce the drain on white oak, and which is entirely practicable if the ties are treated.

"3. The purchase and management of land bearing mature timber which can be used immediately and of second-growth which will meet the needs of the future. Such lands if properly managed will insure a perpetual supply of ties and lumber at the cost of production.

"4. The planting of trees upon non-agricultural land owned by the company, which does not now contain sufficient young growth to produce a timber crop.

"5. Co-operation with other roads in the adoption of standard specifications for ties and timber and for the treatment of them. Co-operation with timberland owners and the states in fire prevention, and in bringing about conditions which will make the practice of forestry profitable.—*G. Pinchot.*

Society of Railway Club Secretaries.

The Society of Railway Club Secretaries is to hold its annual dinner at the Windsor Hotel, Atlantic City, on June 19. John J. Baulch, formerly President of the St. Louis Railway Club and Superintendent of Transportation of the Manufacturers' Railway Club of St. Louis, is to present a paper, and following the dinner there is to be a musical and a vaudeville entertainment for the invited friends of the secretaries and some high class talent has been engaged for the event.

American Street and Interurban Railway Association.

Although the selection of the date for holding the 1909 convention was given careful consideration by the Committee, a very decided preference has been manifested toward a change of date and with the approval of the various committees, President Shaw has decided to change the date of the convention at Denver to October 4, 5, 6, 7 and 8.

National Irrigation Congress.

The seventeenth National Irrigation Congress will meet in Spokane, Wash., August 9-14. The Secretary of the Board of Control is Arthur Hooker, of Spokane.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.

American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, O.: June 22-25; Albany, N. Y.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.

American Railway Industrial Association.—R. E. Wilson, Ry. Exchange, Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago.

American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago, June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago, June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Society of Railway Financial Officers.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

Some or all of the lines in Missouri which have adopted a rate of 2½ cents a mile for tickets are to charge 3 cents a mile in cases where the passenger boards the train without a ticket.

Statistics compiled by the western immigrant bureau show that during the first four months of the present year there was an increase of 246 per cent. in the number of steerage passengers brought to the port of New York.

Reports from Montreal say that Atlantic steamships are now leaving that port in water ballast, being unable to get grain because of the reduced rates which have been made on export grain by the railways from Buffalo to New York.

The Missouri Pacific and the Iron Mountain made effective a 3-cent passenger rate on all their lines in Missouri on June 8, except between Kansas City and St. Louis. This marks the complete discontinuance of the 2-cent fare in Missouri. The Wabash announced on June 9 that on June 11 it would apply a rate of 2½ cents on all its lines in the state, including that between St. Louis and Kansas City.

The negotiations between the different railways leading to the West concerning rates from Boston, Baltimore, Philadelphia and New York on imported freight, which furnish a perennial source of copy for the news columns of the New York papers, seem to be no nearer settlement than six months ago. New tariffs are filed now and then by one road or another, and a few weeks ago it was said that an agreement had been reached by which, about the middle of August, revised tariffs would be adopted from each of the several ports which would be unobjectionable to all of the others; but this satisfactory condition lasted only a few days, when it was announced that the whole question would be reopened this week.

A press despatch from Boston says that New England merchants have sent to the National Association of Railway Commissioners a protest against the proposed uniform car demurrage rules. They suggest that free time be made 72 hours instead of 48 hours. It is urged that New England merchants are receivers instead of shippers, and that the retail dealers should have a chance to unload cars." As the New England merchants are now allowed 96 hours' free time, the astonishing thing in this item is their moderation in asking for only 72 hours. There must be a mistake. Or, perhaps they understand that rules adopted at Washington are not very likely to nullify the benevolent 96-hour law of Connecticut (which rules in Massachusetts by what an electrician might call induced currents) and are simply expressing their willingness to have 72 hours allowed in the rest of the country.

The Spokane Rate Mix-Up.

A traffic officer of one of the Transcontinental roads, speaking of the Spokane rate case, explained the situation to the *Wall Street Journal* as follows:

"We put in effect immediately the class rate reductions, and that will cost the roads more than $1,000,000 annually, but with respect to the commodity rates we are more at sea than ever. New difficulties have arisen on every side. To understand them it must be recalled that the commission ordered reductions in rates on only 32 of the 600 commodities from St. Paul and Chicago to Spokane, and that it lays down no rate making principle, but merely declared the rates complained of to be excessive. The commission intimated that if the railways could arrange some general reductions its order would be withdrawn. The order was withdrawn so far as the Harriman roads were concerned.

"The northern lines in conference with their competitors undertook to rearrange all commodity rates, but last week's conference at Washington showed the proposed schedules were unsatisfactory to everybody. Now the matter goes over to a general conference next October. A great mass of traffic was held back for the reductions that are now suspended.

"It was a serious tactical mistake for the railways to recognize water competition in the Spokane adjustment, as they did, by basing Spokane rates on 75 per cent. of the seaboard-Seattle rates, plus locals back to Spokane. This gave Spokane an advantage not implied in the commission's order, and aroused opposition in Seattle. Still, Spokane was dissatisfied, because it feared the effect of adding the New York-Chicago rates to the reduced rates west, instead of scaling the rates from the seaboard, as had been done previously, in many cases. Spokane stood on both sides of the fence. It wanted rates which the commission would endorse as reasonable in themselves, regardless of water competition, and it also demanded concessions of its own to offset water competition. The situation there is more confusing than anywhere else in the country.

"Rates always have been scaled westward, and the commission in the Missouri river and Denver rate cases, has contended that through rates must be less than the sums of locals. But Seattle cannot go west. How far east can it go? In the Denver rate case, which is before the courts, the commission reduced the first class rate from Chicago to Denver from $2.05 to $1.80. The new first class rate from Chicago to Spokane is $2.50, and grading it back to Utah would make the rate from Chicago to Utah $2.70, whereas by grading the Chicago-Denver rate west to Utah would make a Chicago-Utah rate of something between $2.70 and $1.80.

"We are building rates on two theories, and somewhere the rates forward and backward must overlap. This will be straightened out in time, but it is folly to hope for any adjustment satisfactory to the various distributing centers.

"One difficulty is the employment by commercial bodies of ex-railway soliciting agents as traffic experts. They never were trained to see around rate problems and now are paid good salaries to see one side only.

"Another difficulty is the conjested condition of the Interstate Commerce Commission, which is swamped with complaints. The ten best experts in the world could not begin to keep up with that work. The commissioners are aware of the tendency towards misrepresentation on the outside and the danger of snap judgment, so they avoid hard and fast rules. They have to leave more and more to subordinates. The railways continue to hope for some declaration of principles to guide them, and hope deferred too long, you know, 'maketh the heart sick.'"

INTERSTATE COMMERCE COMMISSION.

Joint Rates on Lignite Coal.

Northern Coal & Coke Co. v. Colorado & Southern et al. Opinion by Commissioner Lane.

Defendants ordered to establish through routes and joint rates on lignite coal from Louisville, Colo., via Denver, to points reached by the Chicago, Rock Island & Pacific in Kansas, Nebraska, Missouri, Iowa and Oklahoma.

Class Rates on Cotton.

Pepperell Manufacturing Co. v. Texas Southern et al. Opinion by Commissioner Clark.

Class rate of $1.37 per 100 lbs. on cotton from Marshall, Tex., to East St. Louis, Ill., as a part of through rate to Biddeford, Me., found to be unreasonable to the extent that it exceeded 60 cents per 100 lbs. Reparation awarded.

Tariffs Must be Specific.

Newton Gum Co. v. Chicago, Burlington & Quincy et al. Franklin Display Fixture Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Lane.

Tariffs are to be construed according to their language. The intention of the framers and the practice of the carriers do not control and therefore commodity rates of Transcontinental Freight Bureau tariffs are not to be construed as governed by Western Classification in absence of tariff provisions to that effect.

On complaint alleging improper assessment of charges on shipments of show cases from Quincy, Ill., to San Francisco, Cal., it is held that show cases are entitled to the commodity rate on furniture under transcontinental tariff in effect at the time of shipment. Reparation awarded.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1909.
(See also issues of June 4 and 11.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$86,821	$30,347	$126,184	$22,461	$28,124	$3,680	$41,825	$5,726	$101,816	$24,368	.....	$4,450	$19,918	$13,962
Alabama Great Southern	309	191,228	61,210	283,740	30,968	42,355	8,037	86,763	7,525	175,648	108,092	$387*	10,954	96,751	63,696
Ann Arbor	301	79,166	33,012	120,134	15,684	14,543	3,249	48,730	3,334	85,540	34,594	2,752	15,621	21,725	‡4,239
Baltimore & Ohio	3,992	4,379,140	1,023,752	5,761,925	778,465	913,541	139,171	1,974,325	123,308	3,928,810	1,833,115	42,441*	176,898	1,613,776	685,923
Bangor & Aroostook	515	192,099	47,756	252,180	35,327	26,049	2,582	71,946	9,729	145,633	106,547	.....	1,500	105,047	‡81,526
Buffalo & Susquehanna	373	143,720	16,535	166,571	29,963	44,288	2,494	68,949	6,671	152,365	14,206	72*	4,000	10,134	17,662
Central Vermont	411	205,543	62,774	292,797	16,842	25,405	7,446	136,931	7,418	194,042	98,755	392	12,500	86,647	22,867
Chicago & Erie	269	267,077	62,629	356,488	24,878	81,214	13,457	170,294	9,248	299,091	57,397	405	11,083	46,719	‡24,125
Chicago, Cincinnati & Louisville	284	81,134	20,362	107,178	31,063	21,638	8,342	49,066	5,592	115,701	8,523*	.....	4,080	12,603†	4,693
Chicago, Indianapolis & Louisville	616	313,585	110,774	464,422	61,780	79,316	13,016	145,851	13,415	313,378	151,044	.....	22,000	129,044	56,411
Chicago, Lake Shore & Eastern	670	348,748	....	386,674	30,723	86,842	1,383	110,415	5,770	235,133	151,541	.....	2,818	148,723	28,564
Chicago, Milwaukee & St. Paul	7,516	3,210,970	941,466	4,533,295	525,180	549,170	111,979	1,760,584	87,136	3,034,049	1,499,246	239	206,640	1,292,845	346,573
Cincinnati, Hamilton & Dayton	1,036	424,259	116,438	606,842	104,893	124,163	21,660	267,247	20,991	538,954	67,888	.....	25,833	42,055	50,799
Cincinnati, New Orleans & Texas Pac.	337	544,065	102,282	682,238	77,927	128,952	18,045	187,293	16,591	428,808	253,430	119	20,000	233,549	67,881
Detroit, Toledo & Ironton	438	94,176	10,510	115,225	19,827	16,278	2,497	60,713	3,942	103,257	11,968	.....	6,979	4,989	10,296
Duluth, South Shore & Atlantic	593	123,797	69,760	209,422	27,720	24,414	7,147	75,772	5,734	140,787	68,635	298	16,000	52,933	12,790
Eastern Ry. of New Mexico	227	57,612	43,193	105,724	11,520	14,419	1,045	33,074	2,142	62,200	43,524	.....	3,481	40,043	12,772
Grand Trunk Western	336	323,603	126,112	477,610	46,132	54,274	21,892	173,316	11,105	306,719	170,891	920*	32,000	137,971	29,873
Gulf & Ship Island	307	117,853	25,609	153,326	35,715	23,443	1,012	50,533	6,600	117,303	36,023	.....	6,854	29,169	12,203
Hocking Valley	347	308,496	59,164	391,276	52,145	52,450	6,937	131,305	12,672	255,509	135,767	1,075	18,913	117,929	131,451
Kanawha & Michigan	177	134,650	22,795	161,620	33,766	46,801	2,545	51,631	2,839	137,582	24,038	82	6,469	17,651	7,133
Minneapolis, St. Paul & S. S. Marie	2,395	631,812	239,536	914,718	104,151	115,628	18,485	295,308	20,603	554,178	360,540	16,688	66,465	310,763	92,911
Nashville, Chattanooga & St. Louis	1,230	636,042	187,312	892,430	153,826	119,047	33,556	326,793	23,643	656,866	235,564	47	20,668	214,943	36,101
New Orleans & North Eastern	196	182,806	42,141	243,200	27,646	41,279	8,224	81,679	10,025	168,853	74,347	.....	9,000	65,347	34,813
New York, Susquehanna & Western	151	161,414	48,032	233,439	19,718	25,924	1,472	78,047	6,043	131,204	102,235	5,489	15,089	92,635	33,013
Norfolk & Southern	582	160,493	47,061	220,913	26,195	22,088	3,692	64,929	12,452	129,356	91,557	884*	5,200	85,473	60,217
Oregon R. R. & Nav. Co.	1,327	638,990	275,956	977,852	115,938	85,488	30,353	278,768	28,480	539,027	438,825	868*	56,209	381,748	‡98,706
Pecos & Northern Texas	152	100,769	26,239	131,689	18,768	13,208	1,072	53,815	2,949	89,812	41,877	.....	876	41,001	3,350
Santa Fe, Prescott & Phoenix	257	76,246	29,401	112,597	17,148	6,509	2,519	25,207	3,536	54,919	57,678	.....	.....	57,678	25,458
Seaboard Air Line	2,603	969,833	308,348	1,429,159	218,415	204,978	52,637	470,144	47,818	993,992	435,167	816	54,053	381,930	120,660
Southern Kansas of Texas	125	118,390	24,774	146,727	12,635	20,438	1,013	53,751	2,916	90,753	55,974	.....	1,083	54,891	10,705
Southern Pacific—Pacific System	5,598	4,192,079	2,294,760	6,917,658	820,240	955,848	119,086	1,786,639	200,302	3,882,115	3,035,543	1,174	218,862	2,817,855	433,915
Southern Pacific—Atl. S. S.	...	429,221	38,214	470,671	....	....	......	....	......	431,275a	39,396	5,109	.....	44,505	62,696
Union Pacific	3,310	2,466,659	743,386	3,642,856	552,402	395,325	105,270	899,655	97,179	2,049,831	1,593,025	4,022*	111,783	1,477,220	‡37,971
Vicksburg, Shreveport & Pacific	171	63,973	32,805	105,319	22,751	19,702	2,783	34,828	4,615	84,677	20,642	.....	6,000	14,642	14,087
Wabash	2,515	1,434,820	491,130	2,103,422	352,157	345,573	76,518	831,397	64,962	1,670,607	432,815	2,990*	68,216	361,609	30,971

TEN MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Operating revenues: Passenger.	Operating revenues: Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Operating expenses: Maintenance: Of equipment.	Operating expenses: Traffic.	Operating expenses: Transportation.	Operating expenses: General.	Operating expenses: Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$848,174	$364,818	$1,308,590	$214,889	$274,678	$33,682	$431,986	$50,449	$1,005,684	$302,906	.....	$42,070	$260,836	$14,429
Alabama Great Southern	309	1,889,982	787,813	2,972,507	371,836	548,611	76,052	979,881	84,470	2,060,850	911,657	$6,269*	114,528	790,860	373,884
Ann Arbor	301	964,253	380,512	1,438,312	196,760	191,945	30,560	571,696	40,003	1,030,964	407,348	21,079	117,940	310,487	9,089
Baltimore & Ohio	3,992	44,683,290	10,737,908	58,900,372	7,190,599	8,958,073	1,324,736	20,508,959	1,228,562	39,210,929	19,689,443	450,691*	1,710,104	17,528,648	2,568,345
Bangor & Aroostook	515	1,870,691	469,004	2,453,972	422,768	276,869	28,782	733,717	104,464	1,566,600	887,372	....	15,000	872,372	257,973
Buffalo & Susquehanna	373	1,677,930	169,578	1,908,460	324,881	453,614	23,915	742,825	68,690	1,613,925	294,535	781*	40,000	253,754	100,672
Central Vermont	411	1,877,229	805,626	2,908,509	368,172	443,523	74,313	1,372,936	71,373	2,330,317	578,192	7,547	100,675	485,064	1,334
Chicago & Erie	269	2,624,629	644,125	3,562,264	324,673	825,046	117,080	1,705,233	79,622	3,051,654	510,610	3,150	112,414	401,347	215,856
Chicago, Cincinnati & Louisville	284	846,936	231,019	1,132,915	251,855	246,263	79,404	508,708	58,791	1,145,021	12,106*	.....	34,045	46,151†	43,611
Chicago, Indianapolis & Louisville	616	2,879,060	1,104,672	4,388,363	652,581	710,156	125,246	1,475,321	135,722	3,099,026	1,289,337	.....	216,000	1,073,337	84,595
Chicago, Lake Shore & Eastern	670	3,086,786	....	3,402,213	280,094	768,167	11,812	1,053,950	60,842	2,174,865	1,227,348	.....	29,818	1,197,530	60,309
Chicago, Milwaukee & St. Paul	7,516	35,783,311	10,617,041	50,346,594	5,726,818	6,133,064	1,092,611	18,209,316	892,189	32,053,998	18,292,596	156,711	2,015,414	16,433,893	823,798
Cincinnati, Hamilton & Dayton	1,036	4,557,712	1,362,318	6,602,905	815,198	1,259,181	214,322	2,851,513	208,647	5,348,861	1,254,044	.....	253,189	1,000,855	424,442
Cincinnati, New Orleans & Texas Pac.	337	4,968,375	1,179,249	6,484,996	669,707	1,258,062	168,637	1,976,338	173,354	4,246,098	2,238,898	11,452*	197,756	2,029,690	757,243
Detroit, Toledo & Ironton	438	1,081,628	129,538	1,298,409	235,648	259,150	24,502	596,141	43,342	1,158,783	139,626	97	69,788	69,935	130,561
Duluth, South Shore & Atlantic	593	1,316,707	744,590	2,203,007	333,547	267,434	84,766	847,239	64,597	1,597,583	605,424	6,795	165,783	446,436	‡53,563
Eastern Ry. of New Mexico	227	427,324	340,964	813,958	131,505	93,512	9,593	220,095	23,032	477,737	336,221	.....	31,096	305,125	14,699
Grand Trunk Western	336	2,986,537	1,388,239	4,658,259	378,518	638,362	204,119	1,807,725	114,150	3,142,874	1,515,385	10,334*	320,000	1,185,051	397,324
Gulf & Ship Island	307	1,191,921	293,373	1,582,279	336,609	237,613	13,225	519,340	71,795	1,178,582	403,697	.....	47,512	356,185	10,887
Hocking Valley	347	4,144,650	698,324	5,013,118	524,620	1,139,824	74,553	1,534,553	120,742	3,394,292	1,618,826	40,974	196,131	1,463,669	259,772
Kanawha & Michigan	177	1,489,807	263,222	1,795,884	346,840	471,896	23,793	557,669	27,822	1,428,020	367,864	60*	66,141	301,663	215,377
Minneapolis, St. Paul & S. S. Marie	2,395	7,237,592	2,450,833	10,172,530	1,006,395	1,141,180	190,576	3,161,611	225,352	5,725,114	4,447,416	232,232	728,915	3,950,733	862,749
Nashville, Chattanooga & St. Louis	1,230	6,593,055	2,077,001	9,312,883	1,414,116	1,652,328	342,619	3,321,004	232,175	6,962,242	2,350,641	6,607*	202,004	2,142,030	160,655
New Orleans & North Eastern	196	1,916,595	464,801	2,555,820	252,931	457,120	75,552	863,848	103,605	1,753,056	802,764	.....	78,000	724,764	156,327
New York, Susquehanna & Western	151	1,399,514	490,922	2,132,074	206,346	218,225	14,616	766,894	41,173	1,247,254	884,820	3,933*	119,839	761,048	180,784
Norfolk & Southern	582	1,333,825	516,294	1,987,633	257,345	209,796	41,186	635,402	142,718	1,286,447	701,186	2,551*	60,000	638,635	340,181
Oregon R. R. & Nav. Co.	1,327	7,222,582	2,785,700	10,637,694	1,083,469	742,171	232,213	2,922,964	289,305	5,270,122	5,367,572	23,608*	529,561	4,814,403	‡575,489
Pecos & Northern Texas	152	664,755	236,560	943,711	153,539	96,451	8,871	301,652	29,008	589,521	354,190	.....	6,506	347,684	274,165
Santa Fe, Prescott & Phoenix	257	769,782	272,114	1,110,348	180,913	85,576	30,072	258,933	51,090	606,584	503,764	.....	.....	503,764	‡1,596
Seaboard Air Line	2,603	9,491,803	2,950,947	13,762,709	1,957,358	1,981,628	487,487	4,691,672	470,531	9,588,676	4,174,033	10,296*	515,659	3,648,077	941,043
Southern Kansas of Texas	125	618,425	229,112	880,931	152,124	134,849	9,871	316,822	27,659	641,325	239,606	.....	11,039	228,567	533,996
Southern Pacific—Pacific System	5,598	40,961,829	21,899,535	67,296,329	8,232,646	8,645,858	1,118,202	17,996,813	1,973,891	37,967,410	29,328,919	61,414*	2,332,845	26,934,660	3,746,382
Southern Pacific—Atl. S. S.	...	4,701,023	388,725	5,136,856	....	....	......	....	....	4,463,788a	673,068	55,267	.....	728,335	181,874
Union Pacific	3,310	27,563,992	8,041,916	38,936,108	3,750,687	4,076,641	859,816	9,254,483	1,004,093	18,945,719	19,990,389	20,903*	1,097,853	18,871,633	4,337,424
Vicksburg, Shreveport & Pacific	171	681,251	389,595	1,158,750	206,438	229,493	33,128	366,590	42,807	878,456	280,294	.....	60,453	219,841	62,958
Wabash	2,515	14,362,250	5,324,667	21,463,525	2,468,827	3,311,003	687,797	8,320,729	684,317	15,472,673	5,990,852	17,909*	680,647	5,292,296	‡69,107

a Not classified. *Deficit. †Loss. ‡Decrease.

COURT NEWS.

Judge Burdett, in the Circuit Court at Charleston, W. Va., has granted the prayer of the Coal & Coke Railroad and enjointed the attorney general and the prosecuting attorney of Kanawha County from enforcing the 2-cent fare law as to that road. The Coal & Coke runs through the north-central part of the State, from Charleston, for a distance of 130 miles.

The supreme court of the state of Washington has sustained a lower court in refusing to issue a writ to compel the Northern Pacific to run all of its through trains on its main line into and out of the city of Tacoma. The railway averred that it was necessary, in order to expedite its business to run its through trains to Seattle via Auburn, and to run "sub-trains" from Auburn into Tacoma. The courts held that this arrangement was justified.

The supreme court of Missouri on June 8 issued a writ of prohibition forbidding Judge George Williams of the circuit court of St. Louis to proceed with the trial of the suit brought by District Attorney Jones of that city to restrain certain railways of Missouri from advancing their passenger fares to 3 cents a mile. The suit brought by the Attorney General of Missouri in the supreme court to oust 15 railways from the state on the ground that they are in a combination in violation of the state anti-trust law, is still pending.

The decision of the circuit court at Little Rock in the case of Watson against the St. Louis, Iron Mountain & Southern, sustaining the federal employers' liability act, was reported in these columns June 11, page 1,227. Following is the syllabus prepared by the court:

1. *Powers of Congress Under Commerce Clause.*—Under the commerce clause of the Constitution, Congress has the power to regulate the relation of master and servant of carriers by rail engaged in interstate transporation, if limited to employees while engaged in interstate service.

2. *Obiter Dicta.*—General expressions in an opinion which are not essential to a disposition of the cause on points not presented nor argued to the court are *obiter*, and are not permitted to control the judgment of the courts in subsequent cases. But when a question is directly involved in the issues raised, was determined by the trial court, is assigned as error in the assignment of errors on appeal, argued by counsel for all parties, and distinctly decided by the appellate court a decision of such questions is not *obiter dictum*, although the cause is disposed of on other grounds, and this applies specially when the question involves the power of Congress to enact the legislation.

3. *Fifth Amendment.*—The fifth amendment to the United States Constitution applies only to privileges and immunities which arise out of the natural and essential character of the National Government or are specifically granted or secured to all citizens or persons by the Constitution of the United States. Those fundamental rights which are inherent in and belong to all who live in a free government are privileges and immunities of state citizenship only, and not within the protection of the fifth amendment.

4. *Same.*—A statute, although it indirectly works harm and loss to individuals, is not a taking of property without due process of law within the meaning of that amendment.

5. *Classification of Carriers.*—A statute abolishing the fellow-servant rule, and limited in its application to carriers by rail, is neither an arbitrary nor unreasonable classification.

6. *Employers' Liability Act of* 1908.—The employers' liability act of Congress of April 22, 1908, is a valid exercise of the powers granted to Congress by the commerce clause of the Constitution, as it is confined to common carriers by rail engaged in interstate commerce and employees while thus actually engaged. The fact that the act is not limited to injuries caused by the negligence of a fellow-servant who is at the time engaged in interstate employment does not make the act or that part of it abolishing the fellow-servant rule unconstitutional.

Leave having been granted by Judge Trieber (who decided the case), Wade H. Ellis, Assistant to the Attorney General of the United States, filed a brief on the constitutionality of the act.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. A. Gandre has been appointed the Acting Treasurer of the Trinity & Brazos Valley, succeeding O. H. Nance, resigned to accept service with another company.

B. F. James, Assistant Secretary and Assistant Treasurer of the Colorado & Southern, has been elected the Secretary and Treasurer, succeeding E. T. Nichols, resigned. L. E. Catzenbach succeeds Mr. James.

Richard A. Jackson, President of the Rock Island Company and First Vice-President and General Solicitor of the Chicago, Rock Island & Pacific, whose election as the Vice-President of the Chicago & Eastern Illinois and the Evansville & Terre Haute and as General Counsel of the St. Louis & San Francisco, has been announced in these columns, succeeded Robt. Mather as President of the Rock Island and now succeeds him also as General Counsel of the Chicago, Rock Island and Pacific, and as Vice-President of the other roads mentioned. Mr. Jackson was born on September 5, 1858, at Richmond, Indiana. He was educated at Earlham college 1872-76 and at the University of Virginia, 1876-79. He began railway work in 1900 as General Attorney of the Cincinnati, Richmond & Muncie, now a part of the Chicago, Cincinnati & Louisville. From August, 1902, to 1904, he was General Attorney of the Chicago, Rock Island & Pacific at Chicago. From 1904 to 1908 he was First Vice-President and General Solicitor of this road. In April, 1909, he was elected President of the Rock Island Company, which office he retains. He will have offices in both Chicago and New York.

Richard A. Jackson.

Operating Officers.

L. A. Forth has been appointed the Car Accountant of the Manistee & Grand Rapids, with office at Manistee, Mich.

W. T. Shaff, Trainmaster of the Cleveland division of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed an Assistant Superintendent of the Lake Shore & Michigan Southern.

E. T. Lamb, Superintendent and General Agent of the Southern Railway, and General Agent of the Chesapeake Steamship Co., has been appointed the General Manager for the Receivers of the Norfolk & Southern.

L. S. Miller, General Manager of the Central New England, having resigned to accept service with another company, O. M. Laing, Superintendent, will have jurisdiction over matters pertaining to the operating department.

J. E. Hutchinson, General Superintendent, First district, of the St. Louis & San Francisco, has been appointed the General Manager, succeeding W. C. Nixon, resigned. H. F. Clark, Superintendent at Sapulpa, Okla., succeeds Mr. Hutchinson.

The offices of the Superintendents of the St. Louis division and the Louisville division of the Southern Railway have been abolished, and C. C. Coffee, Superintendent of the St. Louis division, has been appointed the Superintendent of the St. Louis-Louisville Lines, with office at Louisville, Ky., and C. G. Walker, Superintendent of the Louisville division, has been

appointed the Trainmaster of the St. Louis-Louisville Lines, west of Huntingburg, with office at Princeton, Ind. J. F. Sheridan, Trainmaster of the St. Louis division, has been appointed the Trainmaster of the St. Louis-Louisville Lines, lines east of Huntingburg, with office at Louisville, Ky.

Arthur N. Dutton, Superintendent of Transportation of the Brooklyn Rapid Transit, has resigned and his duties are to be assumed by W. S. Menden, assistant manager. Mr. Dutton is to become the vice-president and general manager of the Peerless Motor Car Co., New York.

Albert Ewing, Chief Clerk to the General Superintendent of the Atchison, Topeka & Santa Fe, Western Lines, has been appointed the Trainmaster of the First, Second, Third, Silver City, Hanover, Santa Rita and Lake Valley districts of the Rio Grande division, with office at San Marcial, N. Mex.

W. L. Derr, whose appointment as inspector in the division of Transportation of the New York Public Service Commission, Second District, has previously been announced, began railway work—after having taken a special course in the Polytechnic College of the State of Pennsylvania—as assistant engineer on the Philadelphia, Wilmington & Baltimore, in 1876, where he was engaged in the construction of the Susquehanna River bridge. He later worked in the engineering department on the Pittsburgh, Cincinnati & St. Louis (Pennsylvania Lines West of Pittsburgh). From there he went to the New York & New England, where he was appointed road master and assistant superintendent. In 1886 he went to the Erie as road master, but was soon made assistant superintendent. He was promoted to superintendent and served as superintendent of various divisions for about 16 years; and in 1903 was made acting chief engineer. Since leaving the Erie he has been superintendent of the Hartford Division of the New York, New Haven & Hartford, superintendent of the lines in Illinois of the Chicago & Alton, and general superintendent of the New York City (Surface Street) Railway. The Public Service Commission is fortunate to get an inspector of Mr. Derr's character, experience and ability.

W. L. Derr.

Traffic Officers.

Lander Sevier, Traffic Manager of the Seaboard Air Line, has resigned.

Charles Stewart has been appointed Boston agent of the Cunard Steamship Line, succeeding Charles P. Sumner, promoted.

R. C. W. Lett has been appointed a Traveling Passenger and Colonization Agent of the Grand Trunk Pacific, with office at Winnipeg.

D. C. McCready has been appointed General Agent, Freight and Passenger department, of the El Paso & Southwestern, with office at Pittsburgh, Pa.

J. E. Allen, Assistant General Freight Agent of the St. Louis Southwestern, has been transferred from Texas to St. Louis and his former position has been abolished.

V. Kistler has been appointed a Division Freight and Passenger Agent of the Great Northern, with office at Grand Forks, B. C., succeeding P. H. Burnham, transferred.

J. T. Mudd, Soliciting Agent of the Southern Railway at Chicago, has been appointed a Traveling Freight Agent, with office at Chicago, succeeding W. M. Orr, transferred. E. F. McKee succeeds Mr. Mudd.

W. W. Dickinson, General Agent of the New York Central fast freight lines at Spokane, Wash., has been appointed General Agent at San Francisco, succeeding John Gill, resigned, to engage in private business.

C. C. Crawford, Commercial Agent of the Chicago Great Western at Cleveland, Ohio, has resigned to engage in other business. He is succeeded by C. H. Bieber, Contracting Freight Agent at Pittsburgh, Pa.

D. L. Melville, Traveling Freight Agent of the Baltimore & Ohio at San Francisco, has been appointed a Traveling Freight and Passenger Agent, with office at Seattle, Wash. Charles W. Doerflinger succeeds Mr. Melville.

William Trufant, Traveling Freight Agent of the International & Great Northern at St. Louis, Mo., has been transferred to New York. James Stewart, Contracting Freight Agent of the Eastern Illinois, succeeds Mr. Trufant.

J. G. Cook has been appointed Traveling Freight Agent of the Erie at Kansas City, Mo. L. F. McFarland has been appointed Travelling Passenger Agent at Kansas City and Wm. L. Briggs has been appointed Soliciting Freight Agent.

F. H. Smith, Soliciting Freight Agent of the Seaboard Air Line at Norfolk, Va., has been appointed Contracting Freight Agent, with office at Norfolk, succeeding F. W. Elliott, resigned to accept service with another company. J. E. White succeeds Mr. Smith.

J. L. Amos has been appointed a General Agent of the freight and passenger departments of the Missouri Pacific, the St. Louis, Iron Mountain & Southern and leased, operated and independent lines, with office at Pueblo, Colo., succeeding C. E. Wagar, promoted.

Milton Smith, Jr., has been appointed an Assistant General Passenger Agent of the Louisville & Nashville, with office at Louisville, Ky. For some time there has been but one Assistant General Passenger Agent. Mr. Smith's appointment brings this number up to two.

H. E. Graber, General Agent of the Kansas City Southern at St. Louis, Mo., has been appointed a General Agent, with office at Chicago, succeeding O. G. Parsley, resigned to accept service elsewhere. T. E. Hayward, Traveling Freight Agent at St. Louis, succeeds Mr. Graber. W. S. Blair has been appointed a Soliciting Freight Agent, with office at St. Louis.

John G. Love, whose appointment as an Assistant General Freight Agent of the Chicago, Milwaukee & St. Paul, with office at Chicago, has already been mentioned in these columns, was born on June 21, 1861, at Quebec, Canada. He was educated in the public schools of Grand Rapids, Wis., and began railway work in September, 1876, with the Wisconsin Valley Railroad, now part of the C., M. & St. P. He was a clerk and telegraph operator for four years. He was subsequently for about eleven years in station service on the Chicago, Milwaukee & St. Paul; Traveling Freight and Passenger Agent at Milwaukee for three and one-half years; Commercial Agent at St. Louis for about five and one-half years; Division Freight and Passenger Agent at Sioux City for eight years, and Division Freight and Passenger Agent at Des Moines, Iowa, for four months.

Engineering and Rolling Stock Officers.

R. Preston has been appointed the Master Mechanic of the Central division of the Canadian Pacific, with office at Winnipeg.

E. H. McHenry, Vice-President of the New York, New Haven & Hartford, has had his authority extended over the Central New England, taking charge of the Construction and Engineering departments, with office at New Haven.

The offices of the Roadmasters of the St. Louis division and the Louisville division have been abolished and C. J. Murphy, Roadmaster of the St. Louis division, has been appointed the Roadmaster of the St. Louis-Louisville Lines, with office at Youngstown Yard, Louisville, Ky.

A new roadmaster's district has been established on the Montana division of the Oregon Short Line consisting of the

St. Anthony Railroad and the Yellowstone Park Railroad and known as the Yellowstone Roadmaster's District. J. D. McCauley has been appointed the Roadmaster of this district, with office at Idaho Falls, Idaho.

W. S. Dawley, Chief Engineer of the Missouri & North Arkansas, has signed a contract for three years as Chief Engineer of the Yunnan-Szechuan & Teng Yueh Railway of China. Mr. Dawley, who is an early graduate of the University of Minnesota, has been connected with the building and maintaining of several railways in the Central West, his best known work being with the Chicago & Eastern Illinois, with which he was connected nearly 20 years, being Chief Engineer for 12 years. He is now closing up his work as Chief Engineer of the Allegheny Improvement Company, of St. Louis, in which capacity he has had charge of the building of 210 miles of the Missouri & North Arkansas, largely in the Arkansas mountains. Mr. Dawley is a member of the American Society of Civil Engineers, and the Western Society of Engineers, and is Treasurer of the American Railway Engineering and Maintenance of Way Association.

Purchasing Officers.

J. W. McCune, storekeeper of the Union Pacific at Omaha, Neb., has retired, having reached the age limit. He had been with the Union Pacific since the close of the Civil War and had been storekeeper at Omaha for six years.

H. S. Hunt, Division Storekeeper of the Delaware & Hudson at Green Island, N. Y., has been appointed chief clerk to the Purchasing Agent, with office at Albany, N. Y. Oscar J. LaPaugh succeeds Mr. Hunt, with office at Green Island.

OBITUARY.

Joseph Nimmo, Jr., LL.D., a well known statistician and economist, died at his home in New York from a stroke of paralysis on June 15. For 10 years he was chief of the Government Division of Internal Commerce and of the Bureau of Statistics.

Charles W. Douglas, whose death at Wayne, N. J., at the age of 77 has recently been announced, seems to be fairly entitled to the distinction of having been the first despatcher in America. He was a telegraph operator on the Erie in 1851, when Charles Minot was superintendent, and Minot on learning that Douglas could read by sound, which was then looked upon almost as magic, insisted that Douglas should take charge of all the trains on the division, a position which the young man accepted with reluctance because a heavy traffic was being done on a single track. As despatcher, Douglas worked from 6 a. m. to 6 p. m., Sundays included. A carefully prepared account in the *Port Jervis Evening Gazette*, from which we take these facts, says that Douglas, born in 1832, was in the spring of 1849 a student at Alfred University; but he caught the general craze to become a telegraph operator, and he gave up his studies at school. His first telegraph office was in the newspaper office at Dundee, where he worked. Soon he went to the Erie and was made operator at Addison. Here one day he took a train order by sound, and the conductor, seeing that he did not use the proper paper register, refused to act on the order. Douglas worked at a number of different stations and soon was appointed station agent, from which position he was promoted to be train despatcher, as before stated. In 1862, on account of impaired health, Douglas was made passenger conductor, but in 1863 he resumed his former place. In 1865 the Superintendent of the Delaware division resigned and Douglas took his place; but in 1869, after dismissing an employee for intoxication and refusing to reinstate him at the request of the President, Jay Gould, he resigned, as did the General Superintendent, Hugh Riddle. After leaving the Erie, Douglas had a checkered career. He was General Superintendent of the South Side, of the Long Island, Superintendent of the New York & Oswego Midland, a contractor on the construction of the Pine Island branch of the Erie, and a railroad builder in Texas; then Superintendent of the New York & Greenwood Lake, Manager of the New York & Sea Beach, route agent of the Erie Express, conductor on the West Shore, proprietor of a printing office in Syracuse, and finally in August, 1900, station agent of the Erie at Wayne.

Railroad Construction.

New Incorporations, Surveys, Etc.

ALTUS, ROSWELL & EL PASO.—An officer writes that this line is being built from Altus, Okla., west to Roswell, N. Mex., about 325 miles. Grading has been finished on 130 miles and bridges built over Butler Creek, and the Salt Fork of Red river. Track laying is to be started July 15. At Memphis, Tex., 200 acres of land have been acquired for shops, yards, etc. Within 30 days contracts will be let for 70,000 cu. yds. of grading, mostly earth work. The grade from Altus to the west line of Greene county, 40 miles, is ready for track laying, except where seven small bridges and 1,200 ft. of tiled drains are to be put in. (Mar. 19, p. 651.)

APALACHICOLA NORTHERN.—An officer writes that a contract has been given to the Morey-Faulhaber Construction Co., of St. Louis, to build a 20-mile extension from the southern terminus at Apalachicola, Fla., west to St. Josephs bay, where the company has good harbor facilities and will build wharves and docks.

ATCHISON, TOPEKA & SANTA FE.—According to press reports contract has been given to the C. H. Sharp Contracting Co., Kansas City, Mo., to build the extension from Clovis, N. Mex., near the eastern end of the Belen cut-off southeast to Coleman, Tex., on the Gulf, Colorado & Santa Fe, about 300 miles. (May 14, p. 1051.)

BEAR CREEK & WESTERN.—See Northern Pacific.

CANADIAN NORTHERN ONTARIO.—The line from Hawkesbury, Ont., to South Nation River is to be opened for traffic at once.

CANADIAN PACIFIC.—The company is proceeding with the rebuilding of the several bridges on different parts of its line, among which are eight in the Pacific, Lake Superior, Ontario and Atlantic divisions, three additional in the Sirdar section, and one in the Eastern division and one in the Central division.

CENTRAL RAILWAY OF OREGON.—Press reports indicate that this company will build about 80 miles this year, to complete a line from Union Junction, Ore., on the Oregon Railroad & Navigation Co., north to Walla Walla, Wash. The company operates 18 miles of road from Union Junction to Cove.

CHICAGO, MILWAUKEE & PUGET SOUND.—An officer writes that a general contract has been given to McIntosh Brothers, Milwaukee, Wis., to build branch lines as follows:

From the main line immediately west of the Missouri river in South Dakota, southerly, crossing the Moreau river and following Virgin Creek to the divide between the Moreau and Cheyenne rivers, thence westerly through the Cheyenne River Indian Reservation and Meade county, about 150 miles.

From the above line about six miles from the junction with the main line, westerly along the plateau between the Moreau and Grand rivers, through the Cheyenne River Indian Reservation and Butte county, to Slim Buttes, about 150 miles.

From the main line at McLaughlin, S. D., about 25 miles west of the Missouri river, north to a crossing of the Cannon Ball river in North Dakota, thence westerly and northwesterly along the north fork of the Cannon Ball river to the western boundary of Hettinger county, about 130 miles.

Press reports indicate that a branch is to be built from Bonner, Mont., north, about a mile and a half to the Big Glackfoot Company mill. The improvements include a bridge over Hell Gate river 750 ft. long immediately south of the Northern Pacific station.

CHICAGO RAILWAYS COMPANY.—According to press reports, 32.23 miles of single track has been laid this year out of the 112 miles which the company proposes to lay before the coming winter. There are at present 4,800 men at work on the improvements, being carried out by the company.

CHICAGO, ROCK ISLAND & PACIFIC.—Press reports say that work is now under way on the cut-off from Amarillo, Tex., west to Tucumcari, N. Mex., 110 miles, by the Ray Construction Co., St. Louis. Work was suspended last summer after the first 21 miles from Amarillo west to Eldorado had been finished. About 50 miles of the line is now finished and it is expected

that the entire line will be completed by November. (Mar. 19, p. 653.)

CONNELL NORTHERN.—See Northern Pacific.

DAKOTA SOUTHERN.—An officer writes that preliminary surveys and some of the right-of-way has been secured. The projected route is from Williston, N. Dak., on the Great Northern, southeast to Dickinson, on the Northern Pacific, also from Minot, on the Great Northern and Minneapolis, St. Paul & Sault Ste. Marie, southwest to Dickinson, thence south, crossing the Chicago, Milwaukee & Puget Sound at Reeder, N. Dak., to Rapid City, S. Dak., which is reached by the Chicago, Milwaukee & Puget Sound, the Chicago & Northwestern and the Rapid City, Black Hills & Western. Contracts are to be let in July for grading and work started about July 10. It is expected to finish 510 miles within a year. Arrangements are now being made to sell $12,500,000 of 20-year gold bonds, to complete construction and equip the line. The work will not be difficult, as the line follows rolling prairie for most of the way, and will include four steel bridges. Chas. F. Merry, Mgr., Dickinson, N. Dak. (Oct. 30, p. 1274.)

GENEVA & AUBURN (ELECTRIC).—See Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction.

GENEVA, WATERLOO, SENECA FALLS & CAYUGA LAKE TRACTION. —The Public Service Commission has granted permission to this company to build an extension from Seneca Falls, N. Y., east across Cayuga lake to Auburn, and the State Land Board recently granted perpetual easements to lands under the waters to permit the erection of a bridge about a mile long over the lake. The company is also permitted to change its name to the Geneva & Auburn Railway Company.

GRAND TRUNK PACIFIC.—An officer writes that construction work on the branch from Melville, Sask., northwest to Prince Albert, also on the other branch lines north and south from Melville will be started as soon as surveys are completed, and as much of the lines finished as possible this year. (June 4, p. 1187.)

GULF & NORTHWESTERN.—An officer writes that contracts are to be let in about 60 days for building the first section of this line. The projected route is from Goodland, Kan., on the Chicago Rock Island & Pacific, south via Sharon Springs and Tribune, to Syracuse, thence southwest to Liberal, continuing southeast through Oklahoma, via Woodward and Oklahoma City, to Dennison, Tex. The work will be light on the first section; maximum grades will be one per cent. and maximum curves 4 deg. J. B. Dyatt, Pres. and R. B. Ketchum, Ch. Engr., Goodland. (Apr. 30, p. 960.)

LACHINE, JACQUES CARTIER & MAISSONEUVE.—A bill is before the Canadian Parliament to incorporate this company, which proposes to build from a point in the parish of Lachine, Que., north to the city of Montreal, or to Maissoneuve, with power to extend to the northern end of the island of Montreal, and from Lachine to Dorval. The incorporators include William Mitchell, of Drummondville, A. Bergevin, G. R. Lightall, A. Wainwright and E. A. Bernard, all of Montreal.

LAKE CREEK & COEUR D'ALENE.—An officer writes that construction work will be started at once on a line from Lockwood, Wash., on the main line of the Oregon Railroad & Navigation Co., 21.8 miles, southeast of Spokane, east to a point on Lake Coeur d'Alene, near Farmington Landing, 12.36 miles. From this point the company will operate boats to Harrison, Idaho, which is also on the Oregon Railroad & Navigation Co. Contracts let in May to Twohy Brothers, Spokane, Wash. The work will be moderately heavy; maximum curves will be 10 deg. and maximum grade eastbound 1.7 per cent., westbound 1.5 per cent. It is expected that the line will be ready for operation by October and on completion will probably be leased to and operated by the Oregon Railroad & Navigation Co. J. P. O'Brien, Pres.; George W. Boschke, Ch. Engr., Portland, Ore.

MIDLAND CONTINENTAL.—Work is expected to be started soon on the first 40 miles of this line projected from Pembina, N. Dak., southwest, via Walsh, Grand Forks, Nelson, Griggs, Stutsman and La Mour counties to Edgeley, N. Dak., about 212 miles in all. J. T. Adams, Columbus Savings & Trust Company building, Columbus, Ohio, has been given the general contract. F. K. Bull, Pres., Racine, Wis., and G. P. Beach, Jamestown, N. Dak., Eng. in charge of construction.

MISSOURI INLAND & SOUTHERN (Electric.).—An officer writes that contracts are to be let by September 1 for building from Rolla, in Phelps county, Mo., south via Elk Prairie, Lecoma, Anutt, Lenox and Maples, to Licking, in Texas county, about 40 miles. There will be very little grading work, as the line will follow a natural roadbed for almost the entire way. E. E. Young, Pres., Licking, Mo., H. G. Palmer, Ch. Engr., Box 305, Aurora, Ill. (June 4, p. 1187.)

MISSOURI RIVER RAILWAY.—See Northern Pacific.

NEW BRUNSWICK SOUTHERN.—This company is to build a bridge at Little New River, N. B., and also one at Canal Brook.

NEW YORK, NEW HAVEN & HARTFORD.—Agents of the New York, Westchester & Boston, applying for a change in their franchise in Mount Vernon, say that work on the line is to be resumed at once, the directors having authorized the letting of contracts between the New York terminus (One Hundred and Seventy-seventh street) and New Rochelle. The line extends from One Hundred and Seventy-seventh street, New York City, northward to a point in the southern part of Mount Vernon, and from here the plan was to build eastward through New Rochelle to Portchester, and northward to White Plains; but it is now proposed to change the junction point; the line to Portchester will diverge from the White Plains line, near Lincoln avenue, Mount Vernon, which is a mile or two north of the point of junction originally selected. Between the New York terminus and the Mount Vernon junction considerable grading and bridge work has already been done. (March 12, page 524.)

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

NORTHERN PACIFIC.—Press reports from Montana say that this company has incorporated the following companies:

Missouri River Railway of North Dakota with a capital of $300,000, to build from a point in the western part of North Dakota near Fort Buford, southwest along the Yellowstone river to Glendive, Mont., about 75 miles.

Bear Creek & Western, with $10,000 capital and headquarters at Helena, Mont., to build from the terminus of the Northern Pacific at Bridger, Mont., in Carbon county, southerly and westerly through Bear Creek to Cooke City, Park county. The incorporators include J. G. Brown, W. Wallace, Jr., and H. K. Jones.

According to press reports, this company has incorporated in Washington the Connell Northern with $50,000 capital and headquarters at Tacoma. The plans call for a line from Connell, in Franklin county, at the junction of the Northern Pacific and the Oregon Railroad & Navigation Co., north to Adrian, on the Great Northern and the Northern Pacific, with a branch east to Ritzville and Tokio. The incorporators include H. C. Nutt, F. S. Jarvis and J. L. Taggard, all of Tacoma.

NORTHWESTERN PACIFIC.—Press reports say that work was started recently on a cut-off from Camp Vacation, Cal., on the Guerneville branch, west to Duncans Mills, five miles. Material is already on the ground for a bridge over the Russian river.

OREGON RAILROAD & NAVIGATION CO.—See Lake Creek and Coeur d' Alene.

ST. LOUIS & SOUTH WESTERN.—An officer writes that work is now under way widening the banks and ballasting the roadbed on the Fort Worth division.

TEXAS ROADS.—L. C. Hill, prominent in Harlingen, Texas, is said to have secured the backing of the Mississippi Valley Trust Company in an undertaking to build a new line of railway from San Antonio, Tex., south to Harlingen, about 250 miles. It is understood that Mr. Hill has notified the holders of the $100,000 bonus at San Antonio that he will apply for its use in building this road. (See M., K. & T., June 4, page 1187.)

VANCOUVER TRACTION.—An officer writes that the company is building with its own forces from Vancouver, Wash., east 12 miles. The work will include three small bridges. The company has just finished a power plant in connection with a saw mill in Vancouver. W. J. Patterson, Pres., and E. Hall, Ch. Engr., Baker City, Ore. (June 4, p. 1187.)

Railroad Financial News.

Albany & Susquehanna.—See Delaware & Hudson.

Atchison, Topeka & Santa Fe.—It is officially stated that up to the close of business June 9, $8,527,000 of the $49,711,000 4 per cent. and $462,000 of the $26,056,000 5 per cent. convertible bonds outstanding had been converted into common stock. The right to subscribe for new convertible bonds to the extent of 12 per cent. of stock holdings attaches to stock of record at the close of business June 16. (June 11, p. 1230.)

Atlanta, Birmingham & Atlantic.—The receivers have applied for permission to issue $3,500,000 receiver's certificates, the proceeds to be used to complete the road and terminals as originally planned.

Chicago Great Western.—The reorganization plan which has been approved by the various security holders' protective committees is as follows:

J. P. Morgan & Co., New York, are to act as reorganization managers. A new company is to be formed and is to authorize: (1) First mortgage 4 per cent. bonds of September 1, 1909-1959, aggregating $28,000,000, exclusive of bonds to be issued later under the same mortgage for dealing with or acquiring the first mortgage bonds of the Mason City & Fort Dodge and the Wisconsin, Minnesota & Pacific. [The property of both of these companies is leased to the C. G. W. and the entire capital stock is owned by the C. G. W.]; (2) Four per cent. preferred stock, aggregating $50,000,000 of which $41,021,402 is to be issued at once under the plan. The stock is non-cumulative until June 30, 1914, and after that is 4 per cent. cumulative and is preferred both as to principal and interest, but in the event of the liquidation of the company's affairs, is not entitled to more than its face value and interest; (3) Common stock aggregating $46,000,000, of which $45,245,613 is to be issued at once for purposes of the plan.

The new securities are to be distributed as follows:

		Stock.	
	Bonds.	Preferred.	Common.
Sold to syndicate, for $24,892,274.	$18,500,000	$10,135,604	$31,641,333
Given to debenture stockholders..	....	30,884,798	....
Given to preferred A stockholders	....	....	13,604,280
	$18,500,000	$41,020,402	$45,245,613

The new company will deal directly with the debenture stockholders and the preferred A stockholders, and will give the debenture stockholders, as noted above, $30,884,798 new preferred stock in exchange for their stock, which amounts to $28,077,089. This is on a basis of 110 per cent. of their holdings. The company will give to preferred A stockholders, as noted above, $13,604,280 new common stock in exchange for their $11,336,900 old preferred A. This is on a basis of 120 per cent. of their holdings. The syndicate will deal with the preferred B and the common stockholders and will sell them new preferred and common stock as follows:

For the outstanding $23,051,942 preferred B stock, and for $15 in cash per share of the outstanding preferred B (the cash payment is $3,457,791) $3,457,791 new preferred stock and $13,831,165 new common stock. This is as if the new preferred stock was sold to the old preferred B stockholders at par and they received new common stock to the extent of 60 per cent. of their old preferred B holdings;

For the outstanding $44,525,420 common stock and for a payment of $15 per share in cash (the cash payment amounts to $6,678,813), $6,678,813 new preferred stock and $17,810,168 new common stock. This is as if the old common stockholders paid in cash at par for the new preferred stock and received new common stock to the extent of 40 per cent. of their holdings of the old common.

It will be seen that the syndicate sells all of the securities received by it, except the $18,500,000 first mortgage bonds, for which it pays, after subtracting cash payments made by old preferred B and common stockholders, $14,755,670. In other words, it is paying approximately 79.76 for the new first mortgage bonds. The company is receiving $24,892,274 cash, of which $15,000,000 approximately will be used to pay accrued interest and the expenses of the receivership and reorganization, and $9,892,274 will be used to pay for cost of rehabilitation of the property, additional terminals and additional equipment.

It will be seen that the company also has at its disposal $10,000,000 first mortgage bonds, which it may sell from time to time for additions and betterments to the property. The fixed charges after the full $28,000,000 bonds have been issued will amount to about $1,980 per mile on the 818 miles operated by the Chicago Great Western.

The new stock is to be held in a voting trust for five years and voting trust certificates will be given to purchasers in place of the actual stock certificates. The voting trustees are J. P. Morgan, George F. Baker and Robert Fleming.

The securities of the old Chicago Great Western sold on June 10, after the announcement of the plan, as follows: Common, 4½; preferred A, 28¾; preferred, B, 6½; debentures, 62. On this basis the new preferred stock of the company would sell in the neighborhood of 56⅝, and the common at a little less than 24.

Chicago, Milwaukee & St. Paul.—The company has sold, subject to the approval of the Wisconsin Railroad Commission, $25,000,000 25-year 4 per cent. debenture bonds, to Kuhn, Loeb & Co. and the National City Bank, of New York. A director of the company is quoted as saying that the proceeds of the bond sale are to be used to add to the company's working capital and to pay for the building of branch lines on the Pacific Coast extension.

Colorado & Southern.—No action was taken by the directors at their meeting June 10 as to the declaration of a dividend on the common stock. In November, 1908, an initial 2 per cent. was declared. President Harris is quoted as saying that the common is a 2 per cent. stock.

Delaware & Hudson.—The United States Circuit Court of Appeals has affirmed the judgment granted by the lower court for $1,107,923 in favor of the Albany & Susquehanna. This apparently compels the D. & H. not only to pay the amount of judgment, but to increase its rental payments by $120,750 per year. The minority stockholders of the Albany & Susquehanna brought suit about two years ago to recover certain sums which they claimed were diverted by the directors, who are also directors of the Delaware & Hudson, whereas they should have been paid as dividends. The Circuit Court of New York awarded judgment for $1,106,672, from which judgment the D. & H. appealed, and in the Circuit Court of Appeals the question of the right of the minority stockholders to bring suit at all was raised and this question was sent to the Supreme Court of the United States and was answered in the affirmative. The Circuit Court having passed on the case on its merits and the Supreme Court being adjourned, it is thought that the case is now finally decided.

Elgin, Joliet & Eastern.—The property of the Chicago, Lake Shore & Eastern has been leased to the Elgin, Joliet & Eastern and will be operated by the latter company as part of its system. It was erroneously stated in these columns, June 4, that the Chicago, Lake Shore & Eastern had leased the property of the Elgin, Joliet & Eastern.

Fonda, Johnstown & Gloversville.—An initial quarterly dividend of 1½ per cent. has been declared payable June 15, on the $500,000 6 per cent. non-cumulative preferred stock.

Georgia, Florida & Alabama.—J. P. Williams, President, has bought out the minority stockholders and has also bought most of the outstanding bonds, it is understood. The road runs from Cuthbert, Ga., to Marabelle, Fla., 156 miles.

Grand Trunk Pacific.—A despatch dated Winnipeg, Man., says that the Grand Trunk Pacific is to take over at once that portion of the Transcontinental line running from Winnipeg Junction, a point north of Port Arthur, where the branch line at Port Arthur connects with the Transcontinental to Winnipeg. This is part of what is known as the National Transcontinental, which is being built by the government from Winnipeg east to Moncton. Under the terms of the charter of the Grand Trunk Pacific, it is to

take over the Transcontinental as it is completed by the government and is to pay the government rental on the basis of the cost of construction. It is said that this cost is very much greater than was originally estimated by the Grand Trunk interests.

MEXICAN NORTHERN.—The $708,000 outstanding first mortgage 6 per cent. bonds maturing December 1, 1910, have been extended to December 1, 1930, at the same rate of interest through an agreement with the bondholders.

NORTHERN PACIFIC.—Arrangements have been completed between the Union Pacific and the Northern Pacific, by which the Clearwater Short Line, running from Arrow, Idaho, to Stites, 63 miles, built by the Northern Pacific, is to be operated jointly by that company and the Oregon Railroad & Navigation. This agreement is similar to that in force between the Great Northern and Northern Pacific and Union Pacific, regarding the Portland-Tacoma line of the Northern Pacific.

SAVANNAH, AUGUSTA & NORTHERN.—Boden Phinizy has been appointed receiver by the United States Court. The bill asking for receivership was filed by the trustee of the authorized issue of $11,000,000 bonds, of which about $400,000 bonds are outstanding. The company has about 25 miles of line in operation and proposes to build about 400 miles more.

SEABOARD AIR LINE.—It is expected that this company, which is now in the hands of a receiver, will be reorganized without foreclosure. The following gives the main features of the reorganization plan:

The present first mortgage securing $75,000,000 4 per cent. bonds, of which $12,775,000 are outstanding, remains undisturbed.

No assessment on common preferred shares.

The sale of $18,000,000 5 per cent. income bonds, of a total issue of $25,000,000 at 70, the proceeds of which, amounting to $12,000,000, will be used to pay off the receiver's certificates and floating debt.

Payment of defaulted interest on first mortgage bonds will be made out of the funds now in the hands of the receiver.

Creation of a supplemental mortgage to secure an issue of $125,000,000 4 per cent. unified and refunding bonds.

The retirement of collateral trust three-year and 10-year 5 per cent. bonds at or before maturity.

Merging of Atlanta & Birmingham and Florida & West Coast and other subsidiary lines, except the Macon, Dublin & Savannah, with the Seaboard Air Line.

Reduction of annual fixed charges from $4,242,300 to $2,905,000, a saving of 28 per cent.

Exchange of general mortgage 5 per cent. bonds of 1907 for income bonds, dollar for dollar.

Return of Seaboard Air Line Railway and subsidiary companies, now in hands of receivers, to stockholders by Jan. 1, 1910.

TENNESSEE CENTRAL.—S. M. Felton, president of the Mexican Central, has been elected also chairman of the Board of Directors of the Tennessee Central, succeeding H. Clay Pierce, resigned.

UNION PACIFIC.—See Northern Pacific.

WICHITA FALLS & NORTHWESTERN.—Lewis Bros. & Co., Boston, Mass., are offering the unsold portion of $1,000,000 first mortgage 5 per cent. bonds of January 1, 1909-1939, at 95. The Wichita Falls & Northwestern, running from Wichita Falls, Tex., northwesterly to Frederick, Okla., 51 miles, is a continuation of the Wichita Falls Railway, operated by the Missouri, Kansas & Texas.

A press despatch dated Pekin says that the Chinese government has agreed not to ratify the foreign loan of $27,500,000 made by British, German and French bankers for the building of the Hankow-Sze Chuen Railways. It is thought that this refusal, together with the representations made by the American Ambassadors in London, Paris and Berlin, may result in an arrangement being made in Europe for American participation in the loan.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Gulf & Northwestern, Goodland, Kan., expects to be in the market for locomotives about September.

The North Western of Brazil has ordered three, meter gage ten-wheel locomotives from the American Locomotive Company.

The Kansas City Belt is reported to have ordered 2 six-wheel switching locomotives from the Baldwin Locomotive Works. This item is not confirmed.

The Harriman Lines as reported in the *Railroad Age Gazette* of June 4, have ordered 105 locomotives from the Baldwin Locomotive Works. These will be divided as follows: 21 Consolidation Mallet, 12 Mogul Mallet, 21 10-wheel, 21 Pacific, 15 Switch and 15 Mogul. These will be divided between the lines of the Harriman system as follows: Union Pacific 34, Oregon Short Line 7, Oregon R.R. & Navigation Co. 17, Southern Pacific 15, Galveston, Harrisburg & San Antonio 12 and lines in Arizona and Mexico 20.

General Dimensions.

	Pacific.	10-wheel.	Mogul.	Switch.
Weight on drivers.	141,000 lbs.	159,000 lbs.	147,000 lbs.	140,000 lbs.
Weight, total	222,000 "	203,000 "	174,000 "	140,000 "
Cylinders	22 x 28 in.	22 x 28 in.	21 x 28 in.	19 x 26 in.
Diameter of drivers.	77 in.	69 in.	63 in.	51 in.
Boiler type	Str'ght top.	Wagon top.	Str'ght top.	Str'ght top.
Boiler workg press.	200 lbs.	200 lbs.	200 lbs.	175 lbs.
Heating surf., tubes.	2,874 sq. ft.	2,867 sq. ft.	1,956 sq. ft.	1,417 sq. ft.
" " firebx	174 "	181 "	146 "	140 "
" " total.	3,048 "	3,048 "	2,102 "	1,557 "
Grate area	49.5 "	49.5 "	49.5 "	30.2 "
Tubes, number	245	365	297	237
" outside diam.	2¼ in.	2 in.	......	2 in.
" length	20 ft.	15 ft.	......	11½ ft.
Firebox, length	108 in.	108 in	108 in.	108 in.
Firebox, width	66 "	66 "	66 "	40¼ in.
Water capacity	7,000 gals.	9,000 gals.	7,000 gals.	4,000 gals.
Coal capacity	14 tons.	10 tons.	14 tons.	6 tons.

Special Equipment.

Bell ringers	Gollmar
Brakes	New York
Brake-shoes	American Brake-Shoe & Fdry Co.
Couplers	Climax
Headlights	Handlan-Buck-Pyle-National
Injectors	Monitor
Lubricators	Nathan
Safety valves	Consolidated
Sanding device	Leach
Springs	Railway Steel-Spring Co.
Steam gages	Ashcroft
Tender brake-beams	Damascus
Whistles	Star Brass Mfg. Co.

Delivery to begin August 5, 1909.

CAR BUILDING.

The Chicago & Alton is in the market for chair and baggage cars.

The Chicago & Northwestern has ordered 96 passenger cars from Pullman Co.

Patten Manufacturing Co., Chattanooga, Tenn., is said to be asking prices on dump cars.

The Gulf & Northwestern, Goodland, Kan., expects to be in the market for rolling stock about September.

The Vancouver Traction, Baker City, Ore., expects to be in the market for rolling stock some time in July.

The Milwaukee Electric Railway & Light is said to be preparing plans and specifications for 100 double-truck city cars.

The Ann Arbor is understood to be in the market for a number of fifty-ton coal cars. This item has not been confirmed.

The Pacific Electric Railway, Los Angeles, Cal., has ordered 20 interurban and 30 city cars from the St. Louis Car Co., St. Louis.

The Interborough Rapid Transit, New York, has ordered 110 subway coaches from the American Car & Foundry Co., and 40 from the Standard Steel Co.

The Buffalo & Lake Erie Traction is now receiving bids, it

is said, on 15 trolley cars, on which it expects to spend about $100,000. This item is not confirmed.

The Philadelphia Rapid Transit, as announced in the *Railroad Age Gazette*, June 4, has ordered 10 all-steel coaches for the elevated from the Pressed Steel Car Co., to be built at the McKees Rocks, Pa., shops. They have a capacity of 44 passengers and a body weight of 30,000 lbs. They will be 40 ft. 6¼ in. long, 7 ft. 7½ in. wide and 8 ft. 6 in. high inside, and 49 ft. 7¼ in. long, 8 ft. 9 in. wide and 13 ft. high over all. The special equipment includes the following:

Axles	Hammered steel
Brakes	Westinghouse Traction Brake Co.; electric auto.
Brake Shoes	American Brake-Shoe & Fdry Co.
Couplers	Van Dorn
Curtain fixtures	Curtain Supply Co.
Curtain material	Curtain Supply Co.
Heating system	Consolidated Car Heating Co.
Journal boxes	T. H. Symington Co.
Lighting system	General Electric Co.
Trucks	Curtis Motor Truck Co.'s "Special"
Ventilators	Automatic Ventilator Co.
Wheels	Solid steel

The Pennsylvania Lines West, as reported in the *Railroad Age Gazette* of June 4, have let contracts for 47 passenger train cars as follows: Pressed Steel Car Co. 18 all-steel mail cars. These will weigh 129,000 lbs. and will measure 70-ft. 9¼-in. long, 9-ft. 1⅛-in. wide, and 9-ft. 4½-in. high, inside; and 74-ft. 9¾-in. long, 9-ft. 11½-in. wide, and 14-ft. ½-in. high: American Car Foundry Co., 17 all steel mail cars. These will have a capacity of 35,000 lbs. and will weigh 93,000 lbs., measuring 60-ft. 3-in. long, 9-ft. ⅞-in. wide, 9-ft. 3¾-in. high, inside; and 64-ft. 3¾-in. long over buffers, 10-ft. 1-in. wide, and 14-ft. ½-in. high, measuring from the rail, over all: Standard Steel Car Co. six all-steel passenger coaches. These will have a capacity of 88 passengers and will weigh 115,000 lbs., measuring 69-ft. 7⅝-in. long, 9-ft. 1⅛-in. wide, 9-ft. 4½-in. high, inside; and 80-ft. 3¾-in. long, 10-ft. 1-in. wide, and 14-ft. ½-in. high, over all: Standard Steel Car Co. six all-steel passenger-baggage cars. These will have a capacity of 35,000 lbs. for the baggage end and will weigh 123,000 lbs., measuring 70-ft. 3¾-in. long, 9-ft. 1⅛-in. wide, 9-ft. 4½-in. high, inside; and 77-ft. 8¾-in. long, 10-ft. 1-in. wide, 14-ft. ½-in. high, over all. The special equipment of all the cars include the following:

Axles	(Mail, Pressed Steel C. Co., and passenger-baggage) 5-in. x 9-in.; (mail, Am. C. & F. Co., and coach) 5½-in. x 9-in.
Bolsters, truck	Steel plate
Brakes	Westinghouse
Brake-beams	(Mail, Pressed Stl. C. Co., and passenger-baggage) 7-in. channels
Brake-shoes	Cast iron
Brasses	Penn. R.R.
Couplers	Polar, Penn. R.R. type
Curtain fixtures	(Coach and passenger-baggage) Curtain Supply Co.
Curtain material	(Coach and passenger-baggage) Mercerized cotton, Pantasote back
Doors	Steel
Door fastenings (or checks)	Penn. R.R.
Draft gear	Westinghouse friction
Dust guards	Penn. R.R.
Heating system	(mail) wrought iron pipe; (coach) cast iron radiators; (passenger-baggage) wrought iron pipe, cast-iron radiators
Journal boxes	(Mail, Pressed Stl. C. Co., and passenger-baggage) 5-in. x 9-in.; Penn. R.R. (mail, Am. C. & F. Co., and coach) 5½-in. x 9-in. Penn. R.R.
Lighting system	Electric
Paint	Penn. R.R.
Platforms	Penn. R.R.
Roofs	Penn. R.R.
Seat covering	(Coach and passenger-baggage) plush
Side bearings	Flat
Springs	Penn. R.R.
Trucks	(Mail, Pressed Stl. C. Co., and passenger-baggage) 6-wheel, steel; (mail, Am. C. & F., and coach) 4-wheel, steel
Ventilators	(Mail) drop sash; (coach and passenger-baggage) Globe
Vestibules	Penn. R.R.
Vestibules diaphragms	Ajax
Vestibule trap doors	(Coach and passenger-baggage) O. M. Edwards fixtures
Wheels	Rolled steel
Window fixtures	(Mail, Pressed Stl. C. Co., coach and passenger-baggage) O. M. Edwards

IRON AND STEEL.

The Detroit & Mackinac is in the market for 2,000 tons of standard section rails.

The Chicago & Northwestern has ordered 10,000 tons of rails from the Carnegie Steel Co.

The Sheboygan Light, Power & Railway Co. is reported in the market for 500 tons of 60-lb. rails.

The Missouri, Kansas & Texas has ordered 2,000 tons of structural steel from the King Bridge Co.

The Twin City General Electric Co., Ironwood, Mich., is reported in the market for 600 tons of 60-lb. rails.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 10,000 tons of rails from the Carngeie Steel Co.

The New York, New Haven & Hartford is said to have ordered 500 tons of structural steel for a bridge at Westerly, R. I.

The Missouri Pacific has ordered 19,000 tons of rails from the Illinois Steel Co. and 16,000 tons from the Carnegie Steel Co.

The Northern Pacific has ordered 5,000 tons of rails from the Carnegie Steel Co., and 15,000 tons from the Illinois Steel Co.

The Chicago, Indianapolis & Louisville has ordered 500 tons of structural steel from the Stroebel Steel Construction Co., Chicago, Ill.

The North Coast, building the Columbia river to Granger, Wash., is said to have ordered rails sufficient for laying 75 miles of track.

The Sewall Valley is said to have ordered 2,000 tons of rails from the Carnegie Steel Company, for the line it is building from Meadow Creek, W. Va., about 21 miles.

The Philadelphia & Reading have received bids for 1,500 tons of structural steel for a girder bridge at Philadelphia. Louis F. Shoemaker was the lowest bidder. Bids were asked recently for 300 tons of structural steel for a girder bridge on the Norristown branch, and bids were asked up to June 15 for 5,500 tons of structural steel for track elevation work.

The Chicago, Milwaukee & St. Paul has given a contract to the American Bridge Co., for a viaduct at Hanson Creek, Wash., which will require about 1,360 tons of steel. Orders for 750 tons of structural steel have been given to the Toledo-Massillon Bridge Co. for steel work to be erected in Milwaukee, Wis., and orders for 1,000 tons of structural steel have been given to the Wisconsin Steel & Iron Works.

General Conditions in Steel.—There has been a steady and very marked improvement in the outlook in the steel industry. This improvement, although not sharp, has been very consistent. The United States Steel Corporation has been booking orders at about the same rate as recently, and it is understood that a number of railways and other companies are in the market for steel. The feeling seems to be that while there has not been a great number of definite orders for either steel or equipment placed within the last few days, there have been large appropriations made by different companies for buying both steel and equipment, and that it is only a question of a short time until these orders are definitely placed. Western roads have been rather more liberal with their orders than have the Eastern roads. The question of the tariff has apparently ceased to be an important factor in the holding up of steel orders, and prices seem to be governed by competition and tend to become rather firm. The shipments of the United States Steel Corporation are running at the rate of close to 9,000,000 tons a year. The actual production of finished and semi-finished steel "for sale" in 1907 was less than 10,500,000 tons. It is estimated that orders are being received at the rate of between 30,000 and 40,000 tons a day, which is a remarkably good showing when the fact is taken into consideration that the railways have been buying little steel. The Steel Corporation has made no changes in prices over the last week.

RAILROAD STRUCTURES.

Altus, Okla.—See Altus, Roswell & El Paso under Railroad Construction.

Bonner, Mont.—See Chicago, Milwaukee & Puget Sound under Railroad Construction.

Brownsville, Tex.—An officer of one of the roads concerned

writes that work is now under way on the six-span steel bridge on concrete piers over the Rio Grande river. The bridge is being built jointly by the St. Louis, Brownsville & Mexico and the National Railways of Mexico, and is to have a maximum grade of three per cent. and a maximum curvature of four degrees. Contracts for the substructure let to the Foundation Company of New York, and for the steel superstructure to the Wisconsin Bridge & Iron Company of North Milwaukee, Wis. E. Fischer, Ch. Engr., Brownsville. (Mar. 12, p. 528.)

CHICAGO.—A step toward the erection of a new station for the Chicago & Western Indiana, which now has its terminal at Polk street, was taken at the annual meeting of the board of directors, when a committee, with President William J. Henley at its head, was appointed, with instructions to go over the entire situation and make a full report with recommendations. The directors seem to favor an entirely new terminal. The company has secured all the land it needs for a new terminal, having strips on both sides of the depot and extending to and below Twelfth street. It is said that the Chicago & Eastern Illinois is willing to return to the terminals of the Chicago & Western Indiana should they be rebuilt.

COLD SPRINGS, OKLA.—The St. Louis & San Francisco will build a new station shortly.

DUNCANS MILLS, CAL.—See Northwestern Pacific under Railroad Construction.

DURANT, OKLA.—The Missouri, Oklahoma & Gulf is said to be making plans for new freight and passenger stations.

ELDRED, PA.—Contract has been given by the Pittsburgh, Shawmut & Northern to the Fort Pitt Bridge Company of Pittsburgh, Pa., for putting up two steel viaducts over the Alleghany river, near Eldred. The work will require about 400 tons of structural steel.

INDIANAPOLIS, IND.—The paint department of the Indianapolis Traction & Terminal Co.'s plant was burned June 9, in which fifteen cars were destroyed. The loss is estimated at $50,000.

KANSAS CITY, MO.—The Chicago, Burlington & Quincy will build a double-track bridge over the Missouri river.

MANSFIELD, LA.—According to press reports, the Texas & Pacific has started work on a new passenger station, to replace the structure recently destroyed by fire.

RICE LAKE, WIS.—An officer of the Chicago, St. Paul, Minneapolis & Omaha writes that contract has been given to William Baumeister, 1205 Ross street, St. Paul, Minn., for a steel-concrete brick and timber passenger station, 30 ft. x 129 ft., including baggage and express offices, at Rice Lake, to cost $14,000. (Apr. 9, p. 823.)

SAN FRANCISCO, CAL.—The Southern Pacific will build a new freight house.

TERRE HAUTE, IND.—An officer of the Vandalia writes that the plans are made to put up a 25-stall roundhouse.

VANCOUVER, WASH.—See Vancouver Traction under Railroad Construction.

WILLESTON, N. DAK.—See Dakota Southern under Railroad Construction.

SIGNALING.

The Rock Island now has under construction automatic block signals between Culver and Eldon on the Missouri division; Iowa City and Valley Junction on the Iowa division, and West Liberty and Twin Junction on the Cedar Rapids division. All this is single track with the exception of a short distance between Altoona and Valley Junction, through Des Moines.

The Federal Signal Co. has taken a contract to install for the Elgin, Joliet & Eastern an all-eelctric interlocking plant at Griffith, Indiana. This plant will take the place of an old mechanical interlocking plant. It is at the crossing of the Elgin, Joliet & Eastern, the Chicago & Erie, the Michigan Central, and the Grand Trunk. There will be 35 levers for 35 signals, 14 levers for 7 derails and 7 switches, and 12 levers for 12 derails; 53 working levers in a 64-lever frame.

The General Railway Signal Co. has taken the contract to install for the Chicago & North Western three mechanical interlocking plants as follows:

At Nachusa, Ill., 25 working levers and 3 spare spaces.

At Union Grove, Ill., 24 working levers and 4 spare spaces.

At South Fulton, Ill., 14 working levers and 2 spare spaces.

The first two plants will protect switches on the North Western only. The last named will protect a crossing of the North Western and the Chicago, Milwaukee & St. Paul. All three will have electric locking in addition to detector bars, and all distant signals will be power-operated.

New Automatic Signals on the Erie.

The Erie Railroad is to equip with automatic block signals the whole of the main line of its Susquehanna division from Susquehanna, N. Y., to Hornell, about 147 miles, all double track. The signals will be Union electric-motor semaphores, working in the upper right-hand quadrant; three-position, normal clear. The distant indications will be controlled by the reversal of the polarity of the track circuit. The block sections will be about one mile long.

FOREIGN RAILWAY NOTES.

Press despatches say that an American syndicate has proposed to build a line from Santa Rosa, Uruguay, on the Uruguay river, in the northern corner of the Republic, to Puerto Corinilla on the east coast, about 500 miles. The cost is estimated at about $15,000,000.

Work on the Blumenau Railway, in the state of Santa Catharina, Brazil, is well advanced, and trains are now running as far as Warnow. It is expected that the first section of the line to Hensa will be inaugurated in July next. The section will run to Passo Fundo in the state of Rio Grande do Sul, and it is hoped that the line will eventually greatly increase the importance of the port of Itajahy.

A new line connecting Batavia-Samarang-Soerabaya, which is to be begun in Java by the Dutch government within a few months, will make the distance between Batavia and Soerabaya about 503 miles; it will take 15 hours by train, while at the present time it requires 34 hours, one night being spent at Maos, and making the actual time on train 22 hours. The connection will be about 168 miles long, and will take three and one-half years to complete. This line will run through a low and level country, and a higher rate of speed can be made. It is also expected that it will open up a productive country.

The first sod of the Accra-Akwapim railway in the Gold Coast, West Africa, was cut on January 7, 1909. The road is being built to develop, especially, the cocoa industry. This industry is worked by the natives themselves, by whom it was started. Notwithstanding the lack of adequate transportation the value of cocoa exported has risen in the last ten years from under $50,000 to over $2,500,000. The Ashantis have also taken to cocoa growing within recent years, and numerous farms near the town of Kumasi are now in the producing stage and it is hoped that the line will eventually be extended to Kumasi.

During 1908 there were 648 miles of new railway built for the Chilian government at a total cost of $10,254,284, of which mileage 166 miles were built under contract and the remainder by Government forces. Of this, 174 miles were added to the main line, or "longitudinal," as is known locally, since it follows the foothills lengthwise of the country, and the remainder was branch lines leading to the coast or up into the Cordilleras. The prospects for 1909 seem even brighter for railway construction in Chili than those of 1908. Indications are, therefore, that there will be a demand for quite an amount of railway material and supplies during the year. The Chilian government will continue to do a large amount of construction work.—*Consular Report.*

Supply Trade News.

The Direccion General de Ferrocarriles, Buenos Ayres, Argentine, is in the market for 35 tank cars, 190 flat bottom trucks and 30 covered trucks.

F. J. Jumper, Assistant Mechanical Engineer of the Union Pacific at Omaha, Neb., has resigned that office to accept the position of Mechanical Engineer of the McKeen Motor Car Co., at Omaha.

The Junta de Obras del Puerto de Almeira, Spain, is said to be in the market for six electric cranes, together with all accessories, for the Almeira docks, and also for 108 iron boxes required for the electric cranes.

The Atlas Locomotive Ashpan Co., Ft. Wayne, Ind., has been incorporated with a capital stock of $200,000. The incorporators are: J. A. Swartz, T. P. Whelan, N. C. Myers, H. O. Cowing, Sr., and L. E. Merriman.

The Mitchell Switch Rod Mfg. Co., Salt Lake City, Utah, has been incorporated with a capital stock of $250,000. The incorporators are: Harry M. Mitchell, Frederick J. Mitchell, Orson B. Eldredge, Willard Mitchell and Alfred D. Pierson.

The Pressed Steel Car Co., Pittsburgh, Pa., will on August 2 anticipate the payment of $500,000 of its first mortgage notes, due February 1, 1910. These notes are part of the $5,000,000 authorized issue dated 1901, and maturing in annual instalments of $500,000.

Arthur P. Van Schaick, President of the W. K. Kenly Co., Chicago, has been elected a director and Second Vice-President of the Ernst Wiener Co., New York, with headquarters in Chicago. Walter J. Briggs has resigned as director, Secretary and Treasurer and is no longer connected with the company.

Arthur Masters, formerly Assistant Superintendent of the Crescent Shipyard, and for the last few years consulting engineer for the Panama Railroad Co., and Isthmian Canal Commission, has been appointed salesman in the railway department of the U. S. Metal & Manufacturing Co., New York, taking the place of Charles R. Day, resigned.

I. R. L. Wiles, who has become second vice-president of the Wolfe Brush Company, Pittsburgh, Pa., in charge of railway sales, was for several years the supply agent for the Missouri Pacific in St. Louis, and before that was with the Wabash and the Burlington, having spent his entire business life in railway work, starting at the age of twenty.

Among the orders recently received by the Crocker-Wheeler Company, Ampere, N. J., are several for large direct-current generators. One of these, a 1,500-kilowatt, 550-volt, direct-current machine, is to be used in the machine shop of Armour & Co., Chicago. One of the 800 kilowatts, at 575 volts goes to Landers, Frary & Clark, New Britain; Warner Brothers, Bridgeport.

"The Q M S Co." is now the corporate name of the well-known Quincey-Manchester-Sargent Co., of Plainfield, N. J., maker of metal saws, traveling cranes and other railway specialties. This change of name, which has been under consideration for some time, has been made to simplify the details of correspondence. Much time has been consumed in making the old name intelligible over the telephone.

The Isthmian Canal Commission is asking bids up to June 30 on car, engine and valve oils, to be supplied during the fiscal year ending June 30, 1910. (Circular No. 518). Bids are being asked up to July 19 on machinery for a central pumping station and three pumping units for hydraulic excavating and sluicing, including pumps and motors, engines, boilers, monitors, pipes and fittings. (Circular No. 516.)

A railway company in Latin America is to change its present gage of 5 ft. 6 in. to standard gage, and the American Consul in that country writes that its present rolling stock will be discarded and new equipment, including locomotives, freight cars, passenger coaches, etc., will be needed. The change is to take place in the course of six or eight months and a complete list of the requirements of the company may be obtained from the Bureau of Manufacturers. (No 3490.)

The Iron & Steel Products Co. has been incorporated under the laws of New Jersey, with a capital of $2,500,000, and has acquired the capital stock of the Canton Iron & Steel Co. of Baltimore, the West End Iron Co. of Lebanon, Pa., the Lebanon Chain Works, and the Bristol Iron & Steel Co. of Bristol, Pa. E. R. Chapman is president, John C. Brown, Vice-President and General Manager and W. D. Dunlap, Secretary and Treasurer. The company will devote itself principally to the manufacture of bar iron and chains.

Herbert S. Crocker, M. Am. Loc. C.E., and Milo S. Ketchum, M. Am. Loc. C.E., have formed a partnership under the firm name of Crocker & Ketchum, consulting engineers, with offices at 811 Seventeenth street, Denver, Colo. The firm offers its services in connection with the following: Steel and reinforced concrete bridges, steel and reinforced concrete building construction, mill and mine buildings and structures, irrigation structures, grain elevators, bins, retaining walls, dams, foundations, examinations, valuations and reports. The firm is the representative of the American Bureau of Inspection & Tests, Chicago.

The construction of a plant for building steel passenger cars has been begun at St. Charles, Mo., by the American Car & Foundry Co., New York. The new plant, which will cost between $500,000 and $1,000,000, will have a capacity of forty coaches a month. In a few days the company will complete the new foundry in South St. Louis at a cost of nearly $1,000,000, to employ 600 men, and it recently finished a plant in South St. Louis for the building of steel freight cars, at a cost of about $1,500,000. In its shops and foundries in St. Louis, St. Charles and Madison, the American Car & Foundry Co. employs when operated at capacity more than 10,000 men.

The plan and agreement of reorganization of Milliken Brothers, Inc., New York, has been approved by the stockholders and creditors of the company and is understood to be in general as follows: The company's property is to be taken out of the hands of the receivers and the fabricating plant only is to be operated. This, it is believed, will enable the company to pay fixed charges and taxes and earn a surplus which can be applied to paying its debts. The control of the company for five years is to be vested in a voting trust. The amount of preferred and common stock and first mortgage bonds remains unchanged. There is to be $2,000,000 bonds issued and pledged for about $400,000, notes to be sold to raise money needed as working capital. The voting trustees are to have the right to exercise every power and privilege of stockholders to the same extent as if they were absolute owners of the stock.

Figures for May compiled by the *Wall Street Journal* show that the business of the Western Electric Co. is running at the rate of between $46,000,000 and $48,000,000 per year. This would make the gross returns for the first half of the company's fiscal year ended with May, show business of close to $23,000,000 or an average of nearly $4,000,000 a month. April sales were 50 per cent. larger than in April, 1908, and the sales in May were 70 per cent. greater than the corresponding month in the preceding year. Each month in the current calendar year has shown gains over the preceding month, and each month's returns have been greater than the same months in 1908, so that with a continuance of the present rate of monthly increase will enable the company to show gross returns for the year of $50,000,000 or better. The report that the General Electric Co. had completed arrangements to take over the heavy machinery manufacturing branch of the Western Electric at Hawthorne was declared by an officer of the company to be without foundation. During the last month the Western Electric, on the basis of business in sight, has taken advantage of the low price of copper to purchase more of the metal than it has bought for a long time. The company's consumption, however, is still below the ratio to be expected from the ratio of operations. Its stocks of metal on hand are still only nominal.

James B. Forsyth, President and General Manager of the Boston Belting Co., Boston, Mass., died at his home in Boston, June 11, at the age of 59. Mr. Forsyth was born in Brookline, Mass., of English and Scotch descent. His father was connected with the Boston Belting Company for more

than 25 years, and the son was thus intimately acquainted with the business from boyhood. In consequence of poor health, his attendance at the public schools was many times interrupted, so that his education was largely obtained under private instruction, and he had ample time to interest himself in the machinery at the shops. As soon as he was old enough he took a position as clerk; and he successively filled important positions in the works until, in 1884, he was elected general manager and a director. He continued in active charge of the entire business until shortly before his death, and he had been president for several years. Mr. Forsyth had marked inventive genius, and he had taken out about 50 patents, nearly all of which were in connection with rubber making. Among these is one for the process of lining with rubber a seamless woven tubular fabric, now in use all over the world; the process of covering rollers with rubber, as used in paper mills and print works, and many improved processes of manufacturing rubber. The machines thus designed are widely employed by rubber makers. Mr. Forsyth was a strong character, as was illustrated in his successful management of this extensive business; and his democratic manner, high personal character and admirable qualities of mind and heart won him innumerable friends. He was unmarried and had lived at the Hotel Touraine many years. He is survived by two brothers, John H. and Thomas A., both connected with the Boston Belting Company.

TRADE PUBLICATIONS.

Gasolene Locomotives.—The Ernst Wiener Co., New York, has just issued Bulletin No. 150 on gasolene locomotives. The pamphlet contains a number of half-tone illustrations, with detail specifications of the motor and truck.

Thomson Recording Wattmeters.—The General Electric Co., New York, has issued Bulletin No. 4662, covering Thomson recording wattmeters for switchboard service. This bulletin illustrates and describes the various types of wattmeters and their parts, and in addition gives dimensions and connection drawings.

Belts.—The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a 24-page pamphlet entitled "The Proper Care of Belts." The pamphlet is divided into three sections, dealing respectively with running conditions of belts, their treatment with various preparations, and some general points about belting and its use.

Aluminum Lightning Arresters.—The General Electric Co., New York, has recently issued Bulletin No. 4661, which contains a description and numerous illustrations of aluminum lightning arresters for alternating-current circuits. Dimensions and diagrams of connections for circuits of from 4,600 to 110,000 volts are also shown.

Midnight on the Alkali Southwestern.—This is a little 3-minute story issued by the Ralston Steel Car Co., Columbus, Ohio, illustrating life among trainmen in the Southwest. The pictures of the passenger engineman, the freight engineman, the call boy and the waitress in the station restaurant constitute the feature of the story.

Lubricators.—The Detroit Lubricator Co., Detroit, Mich., has included in its 1909 catalogue of sight-feed lubricators the following: Plain lubricators, brass and glass oilers, brass and glass oil pumps, multiple oilers, oiling devices, grease cups, boiler-oil injectors, low-water indicators, throttle valves, globe valves, steam and hot-water valves, radiator valves, etc.

Motor Cars and Velocipedes.—The Buda Foundry & Manufacturing Co., Chicago, has just issued Catalogue No. 13A, on motor velocipedes and inspection, section gang, bridge gang and power cars. The catalogue contains a large number of half-tone illustrations of these cars, with complete descriptions in each case. Sectional and elevation views of Buda pressed steel wheels are also shown.

Sirocco Blowers.—The American Blower Co., Detroit, Mich., has issued Catalogue No. 251, covering the subject of "Sirocco" Blowers. The catalogue includes an interesting comparison of the Sirocco turbine wheel, with former types of steel blade fan-wheels. Typical apparatus applications for ventilation of buildings, marine applications, mine fans, mechanical draft, etc., are shown. A new capacity table of Sirocco fans, manufactured at the Troy plant, is given, along with a partial list of American users. Several types of ABC apparatus are also illustrated and described.

Lubrication.—The Dearborn Drug & Chemical Works, Chicago, have issued a booklet, called "Lubrication versus Friction," describing various lubricants and the tests that are used to determine the value of lubricants. The various devices used in these tests are described and illustrated and the necessary physical properties and composition of lubricants for use under all conditions are given. The pamphlet includes an interesting table showing comparative differences in the physical properties and market prices of some of the well known crude petroleums in the United States.

Cars and Trucks.—The Wason Manufacturing Co., Springfield, Mass., has just issued a rather complete catalogue of railway cars and trucks. All the descriptive matter in this catalogue is printed in four languages, English, German, Spanish and French. There are a large number of half-page illustrations showing exterior and interior views of passenger and freight train cars. Complete details of the Strang gas-electric car "Irene," which was illustrated and described in the *Railroad Gazette* of May 29, 1908, are included. A considerable portion of the catalogue is devoted to freight-car equipment, including steel underframes, trucks, etc.

Curtis Steam Turbines.—The General Electric Co., New York, has recently issued Bulletin No. 4669, illustrating and describing the various types of Curtis steam turbines for low pressure and mixed pressure. In addition to the illustrations of the turbines, this bulletin contains curves showing tests of an engine in combination with a low pressure Curtis' turbine, and a chart showing the power output and costs, which indicate the increased capacity and economy secured by installing low pressure turbine sets. The service for which these low pressure turbines were designed was to render available in the form of mechanical or electrical power the energy of steam at low pressure, which is either used with poor economy by condensing steam engines, or is altogether wasted when non-condensing engines are used.

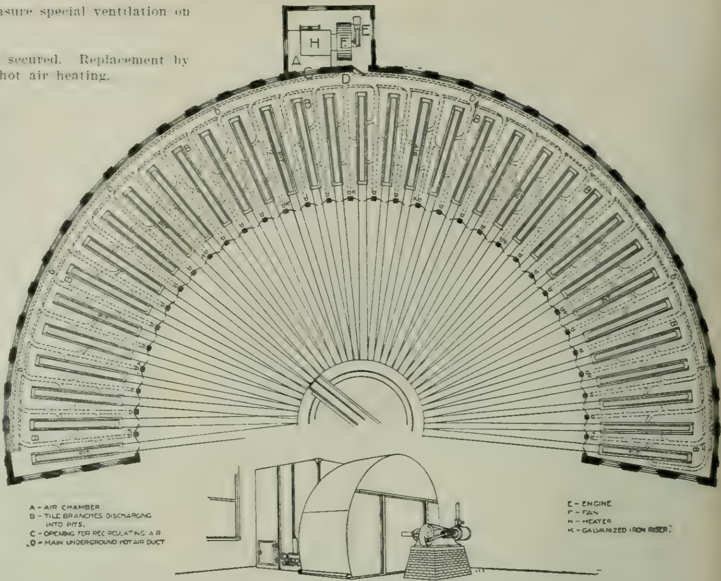
Ventilation and Heating of Engine Roundhouses as Adopted by the New York Central Lines.

There having evidently been some doubt in the minds of some railway officers as to the best system of smoke removal, ventilation and heating of roundhouses, the committee on buildings, at the recent convention of the American Railway Engineers and Maintenance of Way Association, held at Chicago, were called upon to investigate thoroughly the various systems, and we quote in part from their report (page 629, March 19 issue of the *Railroad Age Gazette*):

Fig. 1—New York Central Roundhouse at Avis, Pa.

Heating.

The primary consideration being to thaw out engines, the heat should be concentrated to the pits. Where steam coils are used, care must be taken to prevent water from splashing on the pipes, which forms a fog in the houses and also tends to cause a crack in the pipes, causing



Details of Steel Plate Blower.

leaks also special care must be taken to insure special ventilation on account of the lack of positive air change.

Ventilation.

A continuous upward movement must be secured. Replacement by fresh air is most securely accomplished by hot air heating.

Conclusions.

First.—Heat should be concentrated to pits.

Second.—The general temperature should be kept between 50 and 60 degrees.

Third.—The best method of heating engine houses is by hot air, driven by fans, through permanent ducts, under the floor where practicable. The supply should be taken from the exterior of the building, no recirculation should be allowed. Air should be delivered to the pits, under the engine portion of the locomotive. Air should be heated as far as possible by exhaust steam, supplemented by live steam.

The system referred to as the "Hot Air System," in the committee's report, is sometimes called the "Blower System," "Fan System" or "Hot Blast System."

The New York Central lines have used the above described system with good success for some time, and only within the last year have installed such at their Depew, Rensselaer, Oswego and Avis shops. In all of these were installed fans, engines and heaters manufactured by the American Blower Co., Detroit, Mich.

Fig. 1 shows a new 10 stall roundhouse, photographed from the top of a 170-ft. stack, at the Avis, Pa., shops of the New York Central lines.

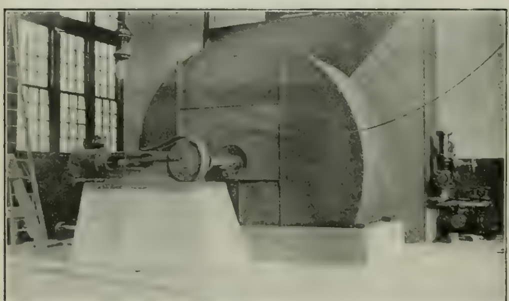


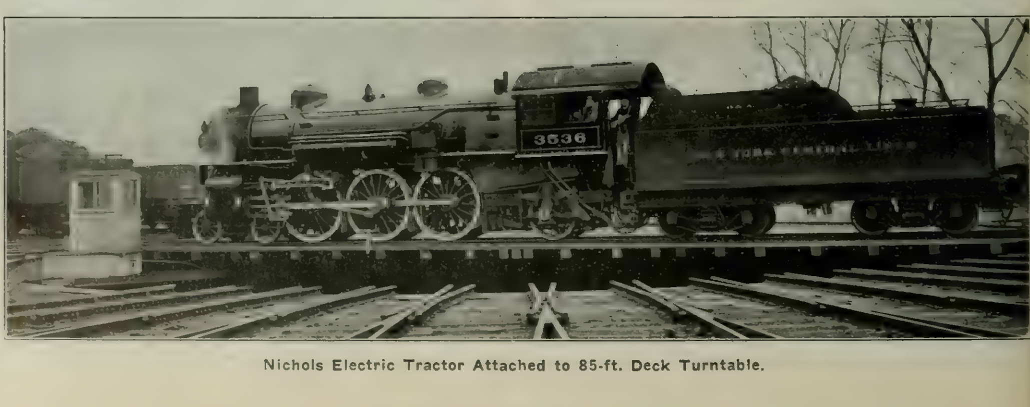
Fig. 2.—American Blower Company Steel Plate Blower.

Fig. 2 shows 160-in. ¾-housed steel plate blower with direct-connected 10 x 12 open-frame, side-crank engine, drawing fresh air from out of doors through 10 sections of sectional base heater containing something over 15,000 lin. ft. of 1-in. pipe. This apparatus was guaranteed by the American Blower Co., to deliver 55,750 cu. ft. of air per minute, heated to the proper temperature when driven at 265 r. p. m.

The American Blower Co. are exhibiting their fans, engines, sectional base heaters, steam traps, electric generating sets, cupola and forge blowers, and the new "Sirocco" (trade mark) fans at the June convention of the Master Mechanics and Master Car Builders' Associations.

Electric Turntable Tractor.

The electric tractor is rapidly becoming recognized as an essential part of the equipment of every important engine house where electric current can be obtained. Only with such a device can a busy engine house be kept up to its fullest capacity. So much dependence necessarily has to be placed on a device of this sort that it is of extreme importance that it be simple, well designed, strongly built and as nearly "fool-proof" as possible. The motor and machinery should be housed from the weather, and an operator's cab provided, preferably mounted on the tractor over the machinery. So located, it places the operator near the ends of the rails to be matched up, and simplifies the brake and sand-box connections. All wires should be run in an iron conduit, and switches, cutouts, etc., enclosed in steel boxes. A very important part of the equipment, often overlooked, is the center collector for bringing current from the fixed to the moving part of the turntable. This should be below the deck of the table, and if properly designed and inspected periodically should give no trouble. The severe service to which a tractor is necessarily subjected at the best, and the neglect and abuse which it frequently has to stand, make it desirable to use the most reliable apparatus that can be obtained. The accompanying illustration shows a Nichols electric tractor attached to an 85-ft. deck turntable. Geo. P. Nichols & Bro., Old Colony building, Chicago, are the makers.



Nichols Electric Tractor Attached to 85-ft. Deck Turntable.

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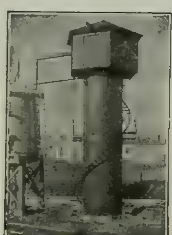

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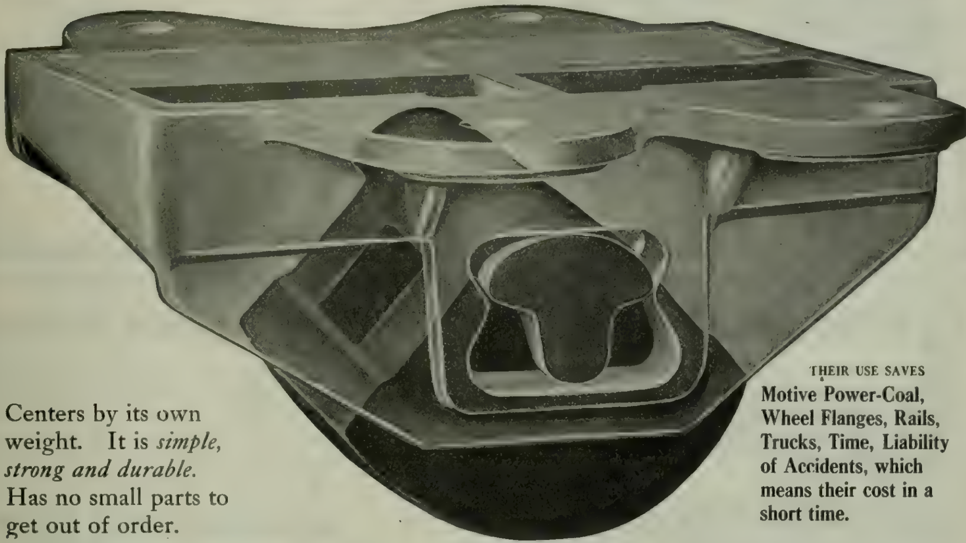

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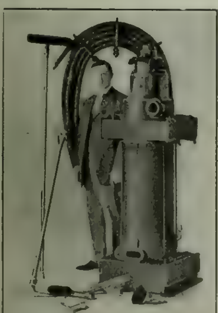

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CONTENTS

THE REACTION AGAINST RAILWAY BAITING.

A year ago at just about this time state legislatures without number, but especially at the West and South, were closing sessions or had just closed them, which had been a kind of saturnalia of railway baiting. The railways had been attacked at almost every point open to statute or believed to be so. Capitalization, rates, demurrage, rights and wrongs of passengers and employees, and a medley of other subjects all dropped into the law-making hoppers, usually to be ground out into some form of law. And the general assault came too, strikingly enough, at a period when railway earnings were dropping fast under the impact of the business depression, and when the railway situation called for leniency rather than severity To state attack federal attack was added. Indeed impartial history will probably find that the epoch of railway baiting of 1908 and a little earlier had its primal spur at the federal capital and the example of National authority was reflected downward on that of the constituent states.

The change during the past six months has been impressive. Where before was action is now reaction or, at least, cessation. In a number of western states, albeit on a small scale, there has been distinct recession; in almost none renewal or continuance of the old anti-railway asperity. Even in Massachusetts where the anti-monopoly cry, focussed against the Boston & Maine merger, reached a pitch of frenzy there has been subsidence into sobriety, with the governor of the state himself taking an active hand in a measure of compromise. Deep and broad aftermaths of last year's legislation of course remain; the state railroad commissions and the courts, federal and state, as in the Missouri rate case, have been loaded and overloaded with interpretations and legal applications of the new statutes. The end is not yet and cases not a few must probably go up to the federal supreme court. But the temperamental reaction or stagnation in railway baiting remains an impressive and interesting as well as cheering study.

The temperamental change at Washington and the substitution of admonition for the "big stick" must obviously not be overlooked in the theory of reactionary causations. Indeed it stands in the foreground of causes, yet is apt to be underated by those not aware how far the federal tentacles reach, how every federal attorney takes his cue from the national department of justice and how his influence and acts swerve local feeling. But, passing by all federal aspects of the change, it strikes quite as deeply into a fundamental law of popular feeling. Quick action and reaction are the traits of a self-governing people—the flush, the full, the ebb of temper, the flash that almost never grows to the continuous flame. The anti-railway wave is now subsiding just as the granger movement starting in 1873, starting too in a post-panic period, went down, though after a larger and broader, if less violent, sweep than the movement of 1908. Movements, uprisings of this kind in our civic life reach other questions than those of the railways. They may be good or bad, may be reformative or arrant demagogism, may range from ultra selfishness up to the betterment of Philadelphia politics. But they subside ere long into what the modern writers are fond of calling "individualism"—of which one form in the railway case is the good crops and prices in the west, where the farmer has begun to go to market in his automobile.

Another element in the reaction favorable to the steam railways must also be counted in. Sharp as was the attack of 1908 upon them it had to distribute its forces. The somewhat analogous granger uprising of 1873 was concentrated on the steam lines. There were no industrial trusts, no street railway combinations to divide it. The anti-trust movement and the Sherman act have involved railway questions too in their broad reach, and to that extent have been prejudicial to railway interests. But let us imagine for a moment, if we can, what would have been the result during the last two years had all the anti-trust ardor and the civic emotions roused by the street railway scandals of New York City—and there are others—been centered on the steam railways alone. There is a sense, and a large sense, in which these extraneous interests under attack have served the steam railways as lightning rods.

The look into the future has, of course, its dubious spots. As a sequel of the year of railway baiting an enormous mass of statutes, taking the country through, has been laid upon the railway corporations. Some of it will stand in the courts; much of it will fall, and especially that part of it which bears upon confiscatory rates. Some of it, notably taxation statutes, is serious; some of it petty. It may be a considerable length of time before the grains of justice are winnowed from the chaff of prejudice, selfishness, "politics" and demagogism. But whatever the consequences of past anti-railway legislation recurrent prosperity will go far to overcome them and the present reaction against such law making stands as a telling and encouraging fact.

PECULATIONS OF CONDUCTORS.

According to the newspapers two prominent western roads which have never before employed "train auditors" are now putting them on, "with a view to preventing the alleged peculations of the conductors." We do not suppose that any officer of the roads named has actually used that ugly word, at least not in the presence of the reporters, and officially; but there is some gain in having such a frank explanation, even unofficially, and at second hand, and we modestly attribute a part of the credit for this improvement to our article of two weeks ago! At any rate our setting forth of the absurdity of the declaration, so often made, officially and unofficially, that the conductors are relieved of a part of their work because they have not time to attend to the whole of it properly, was only a recognition of a situation which is universally acknowledged. The reason that we commend frankness is that so many railway officers all over the country speak frankly on this subject in private. On an important matter of this kind we can see no advantage in keeping up such a wide difference between what is said and what is thought. Many railway managers of long experience use a shorter and uglier word, and do not say "alleged"; and there is no use in denying a well-known situation—even where there is not enough satisfactory proof of detail facts.

And a railway manager can be entirely frank in this matter without casting reflections on honest conductors; any more than a bank reflects on the character of its honest employees by keeping a close watch for dishonest ones. The problem before the railway manager who does not want to have two conductors on a train is comparatively simple; not so simple as in the case of bank cashiers and station agents, yet simple enough to make inaction inexcusable. We do not say that the complete cure of the evil is in all cases simple; but it is a simple question to decide what to do. When a single company estimates that it has made a half-million dollars in a year by putting collectors on its trains it behooves every manager at least to know all that he can about the actual situation on his own road.

And this suggests one of the first principles in the matter; the principle that the superintendent is bound to maintain a high standard of efficiency even at high cost. One prominent superintendent said recently that in certain situations he had spent, to remedy the non-collection of fares, more money than the recovered fares themselves amounted to. The need of training the public to be honest with the carrier is not to be ignored. It is a duty to see that the passengers pay, aside from the question whether the conductor does or does not turn the money over to his employer. The road that does its utmost at this point may know a good deal more about the accuracy of its conductors' work than is now known on most roads. "Accuracy" is another word to bear in mind. The need of proving the accuracy of a conductor's cash fare collections justifies the most careful checking of his work, assuming that he is honest. On one important road a number of years ago a great change was effected in the work of the conductors as a whole simply by reining them up in non-fiduciary matters. Spotters were employed, in the ordinary way—though they were unusually reliable and efficient men—and the confidential reports thus secured and with which the superintendent subsequently confronted the conductors were so detailed, accurate and convincing that each conductor acknowledged their substantial fairness as statements of fact. There is no doubt that some stealing was stopped. In short, strict inspection, maintained for the purpose of correcting all kinds of negligence and misconduct, will have its effect on the cash collecting.

Another important element in the businesslike collection of tickets and fares on trains is to have the work supervised by men who have been brought up in that kind of work. One of the elements of reasonableness in the employment of "train auditors" is that men can be employed for the work who have had experience and training in an auditor's office or in some kind of accounting work. Some of the eastern roads, of which the Pennsylvania was the pioneer, have recognized this principle in the employment of "ticket receivers"—men stationed at division termini to receive the collections of conductors immediately on the termination of each run. To the conductor brought up in freight-train service the accurate keeping of accounts of any kind is often an irksome task, and frequent admonition, instruction and even radical correction may always be a necessity, if his work is to be classed as satisfactory. Checking a conductor's accounts within two or three hours after the end of the trip is far different from making an investigation a week afterwards. Officers of the Pennsylvania put a high value on their ticket-receiver system. It might be said that office men should be made conductors; but men with freight train experience are always going to be valuable as passenger conductors, if they can be otherwise well qualified, and it is worth while to do everything practicable to utilize them.

In saying that the superintendent's duty in this matter is a simple one we are not blind to the possibility that he may be obliged to declare war. Charles Paine, who was a model superintendent, had but one formula in dealing with untrustworthy conductors on the Lake Shore & Michigan Southern. Having concluded that a conductor did not make satisfactory returns for a given train, he told him just that and nothing more; and then discharged him. But the discharge was final. There is no use in blinking the fact that nowadays that kind of action requires grit. The superintendent must know his inspectors; he must know his conductors' records thoroughly, and must have treated them so fairly that they can have no ground for appealing to the president of the road and there stabbing him (the superintendent); must have strict regulations and be prepared to discharge men for dischargeable causes uninfluenced by anything not connected with the problem in hand. Many conductors of years' standing might be discharged for habitual discourtesy, with great potential advantage to the public and the company, and with mighty little injustice to the conductor.

As we suggested in our former article, the conductors' brotherhood ought to take a lively interest in denouncing dishonesty and in establishing a high standard of honor in the railway service. It seems as though there ought to be somewhere, on some road, the three elements necessary for a "demonstration" which would give this subject the illumination that it needs: (1) A courageous superintendent, backed up by (2) an equally vigorous general manager; (3) a conductors' committee willing to co-operate in an attempt to establish businesslike conditions in fare-collecting. But, as we have just suggested, there is no use in starting such a campaign except with the determination and the resources to transform the whole business of dealing with passengers on trains into the most perfect system that brains and money can produce.

It is a great pity that the "pay as you enter" plan cannot be adopted on railways generally. No financial business, outside of a corrupt political organization, was ever managed in such unbusinesslike ways as prevail on American passenger trains. One of the best experiments ever made was that of the Alton road a few years ago when for a time every passenger was made to buy a ticket, even if the train had to be held while he went to get it. One minor division of the Big Four was treated to the same reform. It would be well worth while to investigate the history of those trials and see if their abandonment was surely justified. The street railways in New York and other cities have made thousands of dollars by the "pay as you enter" system; and although the stealings of conductors have been great, if we may accept the unanimous testimony of those who have most carefully studied the situation, the losses by passengers' evasion

of the conductor and neglect to pay when not asked, have been even greater. At least that is the testimony of one prominent street railway officer. As to one glaring self-inflicted fraud—allowing another road to cheat you by careless or doctored reports of car service—the railways have purged themselves by adopting the per diem system of paying for borrowed cars; it is time that this other voluntary self-bleeding process be attacked.

THE NEW DUTCH PASSENGER TARIFF.

There are two railways in Holland which heretofore have had each a distinct passenger tariff. The Holland Railway company charges a regular rate per mile, with reductions for return tickets; the Netherland State Railway Co. has a zone tariff, in which the rates per mile are reduced for every successive 50 kilometers (31 miles). In the following statements the rates are given in Dutch *cents*, one of which is just about 0.4 of one of our cents.

Now the Holland Railway rates are, per kilometer, 5, 3¾ and 2½ such cents for single fare for the three classes respectively, and 6, 4½ and 3 cents for round-trip tickets. This in our currency is 3.22, 2.42 and 1.61 cents for single fares and 3.86, 2.90 and 1.93 cents for return tickets, these latter costing only one-sixth more than the single tickets. The Netherland company charges the same as the Holland company for single fares for the first 50 kilometers, 8, 6 and 4 Dutch cents for return tickets within that distance; but for greater distance the fares grow lower, as follows, in Dutch cents:

	Single ride.			Go and return		
Class	1st.	2d.	3d.	1st.	2d.	3d.
Up to 50 km.....	5	3¾	2½	8	6	4
51 " 100 "	4	3.2	2	6	4½	3
101 " 150 "	3½	2.8	1.75	5	3.75	2.5
151 " 200 "	3¼	2.6	1⅝	4½	3⅜	2.25
200 and over	3	2.4	1½	4	3	2

This makes the fares for 200 kilometers or more very low, though you cannot ride very much further without running out of Holland, which is not as big as Maryland. The fares are at the rate of 1.93 American cents per mile, first-class, 1.54 second and 0.97 third-class, and 2.58, 1.93 and 1.29 cents respectively for round-trip tickets. The two companies have now agreed upon a common tariff, the basis of which is 3.25 Dutch cents per kilometer for the first-class, 2.45 for the second, and 1.625 for the third, which is slightly more than one-half the round-trip rates on the Holland company's lines and round-trip tickets are abolished. There is, however, provision made for the few distances of more than 200 kilometers, and there are some other modifications. This is a very great reduction on the single-trip tickets, which, however, are but a small part of the whole. There are some trips that will cost more than by the old rates, but generally there is a reduction, and the tariff as a whole appears to be lower than any other in Europe, which is the more notable because the canals of Holland carry most of the freight and the railways consequently depend more on the passenger traffic.

The new tariff had been submitted to the government authorities at the latest report and had not yet gone into effect.

NEW PUBLICATIONS.

Der Preussische Landeseisenbahnrat in den ersten fünfundzwanzig Jahren seiner Tatigkeit (1883-1908). Berlin: Carl Heymanns Verlag. 1908.

This memorial tells how the government in Prussia has kept and keeps in touch with the changing demands and requirements of the public in reference to the service rendered by the railways, which, as is known, are owned and operated almost entirely by the state.

When the bill authorizing the state to acquire railways was being considered (1879-80), the concurrence of the house of delegates was made dependent on the furnishing of satisfactory guarantees that the state would operate them in a manner to serve the economic interests of the country. To satisfy this demand a law was agreed to establishing "railway councils," i.e., commissions composed of members representing the commercial, industrial and agricultural interests of the country. This law went into effect Jan. 1, 1883, and by it were created district railway councils and a central railway council (*Landeseisenbahnrat*).

The territory of the Prussian railways is divided for administrative purposes into districts. For each of these districts (in some cases for several) a railway council was established composed of representatives and of alternates chosen for a term of three years by the chambers of commerce, the associations of merchants, those of agriculture and those of other activities in the district. It must meet at least twice a year, may appoint a permanent committee, and is to be heard on all matters concerned with railway transportation in its district.

The central railway council was originally composed of a presiding officer with an alternate, appointed by the king, and of forty members chosen for a term of three years, ten of which were appointed by various ministers and thirty chosen by the district councils in a manner prescribed by law. On account of the increase of railway districts, the number of members elected by the districts has increased. For each member there is an alternate in case of temporary incapacity. To expedite work a permanent committee must be appointed to report matter requiring attention. There must be submitted for the opinion of the council all passenger and freight rates, rulings as to the application of rates, questions concerning exceptional and differential rates, and proposals for changes in operating and railway policing in so far as they are not of a technical character. It may be called on to give its opinion on questions of importance and may make suggestions to the minister of public works or ask him for information. It is made the duty of the minister of public works to report regularly to the Landtag the result of deliberations of the central railway council and submit the passenger and freight rates in force.

It will be noted that the object of this system of advisory councils is to determine by amicable discussion between the railway authorities and the representatives of the public, the traffic regulations and rates that will best meet the needs of the country.

The example of Prussia has been followed by the other German states and similar bodies now exist in most of the countries of continental Europe. The success of these councils and the importance that traffic on the internal waterways has assumed, has led the Prussian government to establish advisory councils for waterways on lines similar to those for railways.

The memorial, after a short history of the development of the railway council, gives a summary of the work it has accomplished. The text of the law creating the railway council and subsequent modifications is also given. E. F. E.

Foundry Practice. By James M. Tate and Melvin O. Stone. New York: John Wiley & Sons. 234 pages; 5 in. x 7 in.; 112 illustrations; cloth. Price, $2.

This book was written in order to supplement the shop practice at the University of Minnesota with class room work that would deal directly with the details of the manual instruction, and it is in the close attention given to these details that the book excels. Ordinarily the text-book on foundry or any other shop practice takes it for granted, unconsciously perhaps, that the reader is more or less, usually more, familiar with the processes to be described, with the result that many minor, but none the less important, details are overlooked or barely mentioned. The authors of this book have started out with the position of the ideal instructor that the student is absolutely ignorant and somewhat stupid, and that, therefore, every step must be made abnormally clear and simple. Certainly this has been done in the opening chap-

ter where every minute movement to be taken in the making of a mold is described, clearly, concisely and simply; and these instructions are supplemented by illustrations to make the meaning unmistakable. It starts in with placing the turnover board on the sand and the proper placing of the pattern on the board, and so on until the cope is lifted, the pattern drawn and the mold closed.

Then in dealing with the more intricate problems of the work, it gives the reason for things, and in this teaching of the whys and wherefores it will serve to impress the value of little things upon the student or apprentice in a way that a mere rule of direction can never do. It tells why venting is necessary and why it should be done in certain ways. It explains the effect of uneven ramming, and why that effect is produced. It explains the reason for the variation in core-making and why different sands have different values. And so it is of value to the beginner and the apprentice. It is not a book for the skilled foundryman, because it does not enter into the wide field of scientific foundry practice, though there are undoubtedly many foremen who could read it with profit to themselves and their employees; but it is essentially a book of instruction, and, as such, is well worthy the attention of every student and apprentice. For, though, to the latter, when he has advanced a little, it may seem to deal with simple things; it will do him good to read of these simple things and impress it on his mind.

In its scope it touches upon green and dry sand molding, the molder's tools, cores and core-making, cupola practice, chilled, malleable and steel castings, brass founding and cast-iron alloys, and closes with an excellent glossary of the technical terms of the foundry.

Patents as a Factor in Manufacturing. By Edwin J. Prindle. New York: *The Engineering Magazine.* 134 pages; 5 in. x 7 in.; cloth. Price, $2

The opening statement of the preface of this book is a negative one. It says that "the purpose of this volume is not in any sense to make the inventor or the manufacturer his own patent lawyer." Instead of this it is intended to show him exactly what his status is before the law in regard to inventions that may originate with him or with his employees. There is a short resume, possibly somewhat gilded, as to the general value of patents, and instances are cited of those that have been pre-eminently successful as money getters. This is unimportant, but in the second chapter the author gets down to the work before him, setting forth the real nature of a patent and how it must be prepared in order to secure the desired results or at least the results that are warranted under the law. He then goes on to show the general scope and nature of the claims and what is dependent on them, and what the courts will read into and out of them. This naturally leads to the discussion of infringements and what protection the courts afford to the patentee, as well as what he must prove in order to obtain damages. From this it is a direct step to the consideration of the relations of employer to employee and what must be done on the part of the employer to secure even a shop right under a patent in the absence of a definite contract to assign. The extension of the word employee is also shown, including not only individuals but also corporations and companies who do work for an inventor. At the same time the book shows the danger of having patents issued to anyone who is not the actual inventor, as is frequently done in the case of large companies where there is a desire to concentrate all of the inventive ability that appears to the public in the president or other officer.

The final chapter takes up the matter of rival claimants and sets forth what must be done in order to establish the claim to invention.

It will be seen that the disclaimer of the preface is well taken and that the book will serve to show the manufacturer and inventor just what the respective standings are before the law and what they can expect from the patent office and the courts. There is not one word regarding patent office practice or as to the formalities that are to be observed in the securing of a patent. But just that sort of information is given that everyone interested in patents ought to possess.

Surveyor's Handbook. By T. U. Taylor. Chicago: Myron C. Clark Publishing Co. 310 pages; 4½ in. x 6½ in.; flexible cover.

This book is intended ostensibly for the use of surveyors in the field, and, as such, it is doubtful if it will meet all of the requirements. It presupposes considerable ignorance on the part of the surveyor as to the methods that are to be used in his work. For example, it is hardly credible that any man would start out on a piece of work who would need instruction as to Gunter's chain or tapes or range poles or plumbs. Yet a description of all of these are given in the opening pages. Again, he will hardly need instruction in the ordinary rudiment of geometry or as to the method of carrying his tripod and compass. If he does need all of this he should return to school and learn his profession over again.

Yet, while the book will be of little value to the trained man, it may meet his untrained assistants who are ambitious to learn. The scope of the book includes chain, compass and transit work, leveling, plotting, government surveying, and concludes with the trigonometric formulas for the solution of triangles and the usual tables of logarithms and of sines and tangents.

Shop Tests on Electric Car Equipment. Eugene C. Parham and John C. Shedd. New York: McGraw Publishing Co. 121 pages; 5 in. x 7½ in.; 55 illustrations; cloth. Price, $1.

This book is announced as the first of two that will deal in a practical manner with the testing of electric car equipment, using such instruments and facilities as are usually to be found in the ordinary car barns. Explanations of the methods to be pursued are given very briefly and without any attempt to explain the reason why, so that the manipulator of the tests will have to depend blindly on the results obtained, or be posted beforehand regarding the phenomena that he is investigating, for there is little or nothing in the way of electrical instruction in the book.

The opening chapters deal with the general subject of current measurements with the ammeter and details of the various methods to be pursued in measuring currents. This includes the use of the wattmeter for the same purpose. Voltage measurement with resistances of circuits and insulation is then taken up, using the methods of the voltmeter, the lamp circuit, the bell circuit and the magneto. The last third of the book is occupied with miscellaneous tests, and closes with a long series of questions intended to give the reader or student an opportunity to rehearse and fix the information that has been acquired from the preceding pages. At the end there is a good index, by which a ready reference to any particular test can be obtained.

Letters to the Editor.

ENGLISH RAILWAYS.

Yeadon, Pa., May 25, 1909.

To the Editor of the Railroad Age Gazette:

In reading Mr. Turlay's article on English railways, in your issue of May 21, I was glad to notice your footnote in regard to the arms of seats in first-class carriages, and would say that my own experience, although of a number of years ago, fully confirms it. During two different visits to Europe I did all my traveling in first-class carriages, and cannot now recall a single instance in which I found the seat arms fastened rigidly. I recall riding from Mallow Junction to Dublin on the night express and raising these arms to enable me to use the seat as a bed, and in the book published by the London & North-Western Railway, in 1876, to which I referred in my article of several months ago on "Short Fireboxes in Locomotives," a woodcut shows a compartment of a standard first-class

passenger carriage of the company arranged for sleeping purposes at night, and in this cut the arms are raised, and cushions are also drawn from one seat across to the other at one door; the whole arrangement enabling three persons to lie at full length.

At the time of my visits, the L. & N-W. was probably the only line using its own sleepers, or "Saloon" carriages, as they were styled. The Midland; Great Northern; North British, and London, Brighton & South Coast railways all used Pullman cars of the standard American types, the last named line, I believe, running only parlor cars. Even the "Saloon" carriage of the L. & N.-W., as shown in the volume referred to, was much like the Pullman in its interior arrangements. I certainly agree with Mr. Turlay in commending the greater privacy of the present English sleeping carriages, and trust it may not be long until our Pullman cars which are in almost every other way built on lines of good taste and refinement, will also be so constructed as to afford every occupant of each car that degree of privacy which is so great an essential of every well-ordered life and is especially desirable for women, young girls or children who may be traveling unaccompanied. C. H. CARUTHERS.

HANDLING L. C. L. FREIGHT.

Harrisburg Freight Station, Pa., May 21, 1909.

To the Editor of the Railroad Age Gazette:

The telfer system of loading and unloading vessels has been generally and freely canvassed among freight men for a number of years until it has become quite familiar as the most nearly adaptable to the purposes of the railway freight business of any of the overhead electric crane systems of handling merchandise.

Some time ago there was organized in New York the Anglo-American Moving Van Company, placing into international service the van or large container for the accommodation of an entire and complete shipment of household goods or other merchandise, and these vans are now coming into quite general use, serving the purpose admirably and containing the entire furnishings of a set of apartments for international (or other) shipment.

The third consideration that presented itself was the fact that the German government has caused or induced to be built along its improved and deepened waterways landing stages at each town of even but small importance, fully equipped with railway tracks and easy approaches by team, and equipped with overhead cranes of American manufacture; and has induced the building of lines of boats on these streams for the carrying trade, the entire decks of which are composed of removable hatches, so that, when unloading, the entire top of the vessel is removed and the crane has easy access to the entire contents of the boat for the purpose of unloading such freight as may be destined to the point of handling, or all the freight loaded and contained in the boat.

It seems to me that a combination of these principles would be a great benefit to railways in handling L. C. L. freight; and that it would pay each road to create a special department to have the oversight of the L. C. L. traffic moving over its lines. The appointment of a superintendent of transfers with the adoption of the overhead electric crane in combination with the van system of loading from receiving point to destination in one container, the container or van to be loaded on a flat car along with others to transfer point and there transferred by telfer or overhead traveling crane, and combined for classified territory upon other flat cars, would tend to place the express freight and all L. C. L. business upon a strictly modern basis, overcome much cause for complaint and delay, save money in the handling and re-handling, do away with much detail and worry and place responsibility for shortage and overage with the L. C. L. forwarding agent direct.

As it stands to-day the business is being handled and plans for new work are all being based upon the same idea as it was handled 50 or more years ago, upon a system of loading and transferring which involves the re-handling of each and every package loaded more or less indiscriminately into cars which were built and are primarily intended for bulk freight in carloads.

The use of the men at transfer points and large forwarding platforms could be so much better and more adequately devised that it seems strange that no combination has ever yet been effected for the express purpose of making the L. C. L. service of the specialized importance that has been assumed, for instance, by the refrigerator service, the coke service or the coal service, to say nothing of the express service. This, it strikes me, the system herein outlined will accomplish.

SANCHO.

DRAWING THE LINE BETWEEN THE MANAGER AND THE COMMISSION.

New York, June 2, 1909.

To the Editor of the Railroad Age Gazette:

There has been so much criticism of commissions charged with the regulation of railways that the Railway Business Association has taken especial pleasure in noticing a recent opinion and decree of the New York Public Service Commission for the Second district which seems to reveal an attitude characterized by breadth of mind, painstaking care in ascertaining the practical factors and wisdom in applying fair principles.

The petition was a complaint of the residents of the village of Marathon against the Delaware, Lackawanna & Western, relative to passenger train service. The petitioners requested that the company be required to stop a certain one of its fast trains at Marathon. Commissioner Olmsted says in this opinion:

"The railway is entitled in the first instance to schedule its trains as seems to it most advantageous both as to time and stops to be made. The commission should not interfere with this arrangement unless the change asked for will serve the convenience of a considerable number of people and will not inconvenience a greater number; also that it will not seriously interfere with the running of trains and with the general operating plans of the railway considered as an entire system. * * * The principal petitioner has chosen to locate its business in a small village of 1,100 inhabitants. It undoubtedly had its reason for doing so: in small taxes, lessened cost of living of employees and the cheapness of manufacturing, etc. Having chosen to locate at that place it must take the disadvantages as well as the advantages of such a location.

"While it is true that the railway company might be able to make the stop at Marathon and yet keep its schedule time from Syracuse to Binghamton it is still a matter to be considered that in railroading a train which is scheduled to stop at a number of points is not as popular as one that runs through without stops."

Recognizing the reasonableness of maintaining express trains in competition with other railways, in this case the New York Central on through traffic to New York City, and quoting a Lackawanna official as saying that the policy of the road was to reduce the stops instead of increasing them on certain trains, the commissioner concludes: "We think that the railway has a right to pursue this policy, but not to the extent of seriously inconveniencing a large number of people, and that has not been shown to be the case in this instance."

So clear a demarcation of the line between matters which are properly the subject of regulation and matters which it is in the public interest to leave to the discretion of the operating managers should be gratifying to all concerned and tend to inspire confidence in the body enunciating it.

GEO. A. POST,
President, Railway Business Association.

Contributed Papers.

MANUAL BLOCK-SIGNALING IN ENGLAND.*

Signal Apparatus.—There are few automatic block singals in Europe. While there are small installations on double or four track lines, practically all of the English roads use the manual block system. This simple system of block signaling has been developed to the highest extent in England, and a comparison of the train accidents occuring under the manual block system in England and in the United States can not but compel the belief that the system has reached a higher degree of perfection in England than in this country.

All of the principal English lines are double track, and on those which carry heavy traffic the blocks are so short that in a good share of the territory the distant signal for one cabin is mounted on the same post as the home signal of the cabin in the rear. The distant signals are practically all mechanically operated semaphores connected to the lever by a single connection, the wire usually consisting of a light galvanized stranded cable. For the home signals both pipe and wire connections are used.

The cabins as a rule are of brick, solidly constructed, and maintained with scrupulous neatness. The night indications of both home and distant signals are alike—that is, the proceed indication is a green light and the night caution indication of the distant and the night stop indication of the home consist each of a single red light. On some four-track lines a ring or other distinguishing mark is added to the blades of signals on the outer tracks to distinguish them from the signals which apply to the inner tracks.

Communication Apparatus.—Communication from cabin to cabin is had by means of an electric-bell system used in connection with the needle telegraph and to some extent with telephones. The use of the needle telegraph, or its equivalent in the shape of a visual indicator operated in connection with the bell circuits, undoubtedly contributes greatly to the successful operation of the system as compared with a system operated entirely by the Morse telegraph, the reason being that with a visible indication, such as that given by the indicator or the needle telegraph, a record is constantly before the eye of the signalman showing the last operation of the communication system. With the use of the Morse telegraph the audible signal of the sounder must, of course, be written down by the signalman on his train sheet or block report to obtain a record of the operation of any portion of the system. Substantially the same forms of block records are kept on the English railways as in this country.

Rules.—The rules governing the manual block working are, in general, much like those of American railways, perhaps the most notable exception in detail working being the blocking back at stations or junctions. At a junction no train on one line is permitted to pass the block station in the rear of the one located at the junction while a conflicting movement is being made on the other line. In the same manner at certain stations one unoccupied block must intervene between the station block and any approaching train whenever a train is standing in the station. These are often suspended, however.

Signalmen.—As a rule, the English block signalman is probably no more intelligent than the American block signalman, but he is probably much better trained and under a stricter personal supervision. Passenger stations are so frequent on English roads that most block stations are under the jurisdiction of some stationmaster, and by far the greater percentage of signalmen are recruited from the ranks of the station porters. A smaller number are promoted from the track forces which furnish most of the fog signalmen, these men forming an important part of the personnel in English railway operation during the winter months. (A more detailed description of the fog-signaling methods is given in Part III, section F.) Suffice it to say here that the more intelligent trackmen (or plate layers, as they are called) are employed in times of fog and snow at the block stations, and thus have an opportunity to acquire a knowledge of the block system. When a man has served as a plate layer or station porter for a sufficient length of time to become familiar with the general working of the road in his vicinity, and a vacancy occurs in the grade of a signalman, he may be selected as a candidate for the post. If so, he is trained under a signalman at the designated cabin for a month, and at the end of that period is orally examined on his knowledge of the rules by the inspector, who, if the examination is satisfactory, fills out a competency certificate. The applicant is generally examined further by the assistant district superintendent who, if the examination is satisfactory, approves the certificate, and the man then appears before the district superintendent, who looks him over and may question him further, and if he is satisfied he signs the applicant's certificate. Should the applicant fail to pass the examination at the appointed time, he may be given another chance or be sent back to his former position at the discretion of the district superintendent. The method of selection and examination here described is that in use on the London & North Western. It is in substance the same on other lines.

If a man is transferred from one cabin to another, his period of training varies from about a week at the new cabin, if it is of practically the same class as his former post, to a fortnight if the new cabin is a more complicated one. Each man is examined not only as to his knowledge of his apparatus and the block-signal rules but in the local working conditions, and it should be noted that the British signalman not only has to perform the functions of signalmen but in addition practically acts as train despatcher for the blocks controlled from his cabin, for the very good reason that there is no such official as the train despatcher nor anyone corresponding to him on British railways.

The traffic conditions on most roads in England vary very little from year to year, as compared with conditions on American roads where new industries are constantly springing up and new lines of traffic of varying volume are being constantly developed. Most of the English lines run through territory already developed and the traffic demands of which are so well known that it is relatively easy to predict within reasonably close limits, from past experience, the nature and volume of the traffic on any division at any given time. On this account a much greater proportion of British freight trains, and in fact all trains can be, or at least are, run on schedule than is the case in this country. In fact very few trains except work trains are run without a schedule, the extra or special train movements for any month, or even for a single week, being scheduled in monthly or weekly supplements to the working time-tables.

The block signalman is required to be familiar with all these special train movements, and as all schedules are, especially in bad weather, subject to derangement, he must be familiar with a very large number of special rules governing the precedence of delayed trains, there being no despatcher to give him orders on such matters. In fact on some roads there is provided a book of "train margins," in which is set forth in detail the precedence of the various trains when tney or other trains are late at junctions or other important points. As an example of this method of handling train movement under the block-signal rules, it may be noted that the special trains carrying passengers from the ports of arrival of American steamers to London are scheduled to use a given time between given points. The leaving time of such special trains from the steamship docks is, of course, variable and the actual leaving time is telegraphed to the principal stations on the line when the train leaves the port. On the basis of this actual leaving time and the published speed schedule the signalmen at junction points throughout the line must make their own arrange-

*From the fourth annual report of the Block Signal and Train Control Board, Interstate Commerce Commission, January 27, 1909.

ments for handling the branch and main line trains with as little delay as possible to either.

Probably the training in the conduct of such movements as those described above assists very materially in connection with the careful and voluminous instructions given to these men and the constant personal supervision to which they are subjected in making them the thoroughly competent and reliable signalmen that they are.

The system of inspection to which they are subject begins with that of the station master, who on some roads is required to make a daily inspection of the cabins under his jurisdiction and certify thereto upon the block report. District inspectors are also employed, who are supposed to visit each cabin about once a week, inspect the records and the work of the men, noting their visit on the block reports. Assistant district superintendents make frequent inspection, and on one road, at least, an inspector from headquarters visits each cabin once a year, and in addition to conducting an inspection examines the signalmen orally on the rules and special instructions. On most roads a premium or bonus is paid to signalmen for correct working of the block system, amounting to from £2 to £6 per year. Practically all roads have pension systems for their employees, largely supported, however, by the employees themselves.

As an example of the number of men engaged in signal operation, it may be noted that the Great Western employs 3,200 signalmen on 2,600 miles of territory.

The closing of a block station for a part of the day or night is common, the wires being switched through. In closing a block station the signals are cleared and usually the lights are extinguished, though if the office is to be again opened before daylight they are left burning. An office, say, Station B, may be cut out, the wires being connected through from A to C, if in time of sudden fog B has difficulty in securing fogmen for his signals.

The general impression obtained from an observation of the working of the English manual block system is one of admiration for the men, methods, system of training, and conditions that make possible the high degree of safety and celerity with which a great volume of fast and dense traffic is handled by its use.

CONTROLLED MANUAL.

While the English roads evidently have, as a whole, the best of signalmen, a number of companies have nevertheless introduced electric-control apparatus by which the men at the opposite ends of a block must co-operate in giving a clear signal. Whether from a knowledge of errors which have occurred but which have caused no collisions and have not been made public, or from the desire to provide all possible safeguards, regardless of the smallness of the percentage of errors occurring when these refinements of safety are not employed, or from an inclination to satisfy a real or fancied demand on the part of the public, these roads have taken action which indicates that their past records, good as they have been, are not entirely satisfactory. Among the roads which have done this are the London & South Western, the Great Northern and the Northeastern.

The Southeastern & Chatham Railway and the London, Brighton & South Coast Railway have had a controlled manual block system in use for a long time. Almost all single-track lines in Great Britain are worked by the staff system, this being a fully developed electric system giving a high degree of protection through electric control exercised over the manual operation of the block signals. The Caledonian Railway on its Callander and Oban line has for several years used a high-speed electric staff and tablet system, which is still satisfactorily operated, though most of the trains stop at all stations, the tablets being exchanged by hand. On some of the lines, however, where faster trains are run, the device for catching and delivering the tablets at speed is in successful use.

RULES TO BE UNDERSTOOD BY ALL ALIKE.

At the convention of the Train Despatchers' Association at Columbus, F. C. Dow (C., B. & Q., Sheridan, Wyoming) read a short but useful essay on the necessity of securing uniform understanding of train rules. He said, in part:

Often new instructions are issued to prevent the recurrence of an accident where insistence upon conformity to the original rule, disregard of which caused disaster, and a clearer understanding of its purpose and better interpretation of its language, would be all sufficient to produce intelligent obedience. Nothing can be more of a relief to a superintendent than knowledge that his employees will all act alike and with perfect understanding of what ought to be done in any contingency that may arise.

One road will have a set of rules that are the latest standard; another, an unrevised standard, and still others that never were standard; and yet they are all operated safely because all of the employees on each road understand and work as one, as far as the operation of the rules is concerned. Perhaps we might go so far as to say that a staff of men uniformly and thoroughly educated in certain methods, could maintain safety without any printed rules; even superintendents of divisions of one system may differ as to the meaning of a rule, or the application of it. This is dangerous. There are cases where the superintendent would not go on record, and evaded giving a decision, in certain cases, but would get around it by issuing special instructions through other channels, that quieted the matter for the time being, but left the thing still open and ready for another argument when the same conditions again arose.

We should unite in an endeavor to make our part above criticism in the respect that the dispatchers in an office all work alike, and not have one construing a rule one way and another another way. Differences of opinion as to construction of rules should be promptly submitted to the proper officer, if no ruling already exists, and a ruling obtained, which, when obtained, should be strictly conformed to.

THE LOGARITHMIC SCALE IN GRAPHIC CHARTS.

BY W. J. CUNNINGHAM,

Statistician, Boston & Albany Railroad.

The increasing use of the graphic chart in railway statistics is a gratifying indication of the passing of an attitude of indifference, if not to say aversion, to that method of presenting figures comparatively. While many still refuse to concede any special merit in charts, asserting rather that the time and expense are not justified except in technical work, their number is growing less. The so-called "practical" officer (as distinguished from his technical associate) is learning to appreciate the superiority of diagrams over tabular work, when different factors are to be compared with each other, with preceding periods, or both.

No other form of indicating the trend of receipts, expenses or work done (as expressed in train, engine, car or ton miles, cars handled, tons handled, etc.) equals the graphic method. By its use the high spots in expenses stand out like danger signals, and gradual but continued losses in efficiency are much more apparent at a glance than a careful study of the figures, by themselves, will disclose. It is trite to say that statistics in their usual form are dry, even repellant, to the busy officer. He prefers to deal with affairs of the hour or the morrow rather than study post mortem tabulations. But when the same information is put before him graphically it becomes attractive, and is replete with suggestions, both corrective and productive. Professor W. M. Cole, in his recent book on "Accounts, Their Construction and Interpretation," likens the accountant or statistician to the historian. The historian of deeds is relatively of lower rank than the doer,

but, Professor Cole adds, "as the historian often sees more deeply into politics than the busy politician or statesman, so the accountant often sees more deeply into business transactions than the manager himself. A statesman who disregards history makes himself ridiculous; a business man who cares nothing for accounts often makes himself not only ridiculous but a pauper."

It is plain, therefore, that the statistician, specializing as he does on the analysis and interpretation of statistics and accounts, does not perform his proper function unless he places the results of his analysis and research before the manager in a form which may readily be comprehended by him with the minimum outlay of time or study. To that end the graphic method is invaluable. Figures alone do not convey such instantaneous and lasting impressions; the graphic method makes it possible to take in at a glance a long series of related facts, and the general character of the changes therein, both as between themselves and between different periods of time.

Under certain conditions, however, the ordinary form of graphic chart is slightly misleading. It will be conceded that its true function is to portray comparative fluctuations. This result is practically secured when the factors or quantities compared are nearly of the same value or volume, but analysis will show that this is not accomplished when the amounts compared differ greatly in value or volume. The fluctuations shown are absolute rather than relative. The extent or degree of the fluctuation, as indicated by the ordinary chart, depends

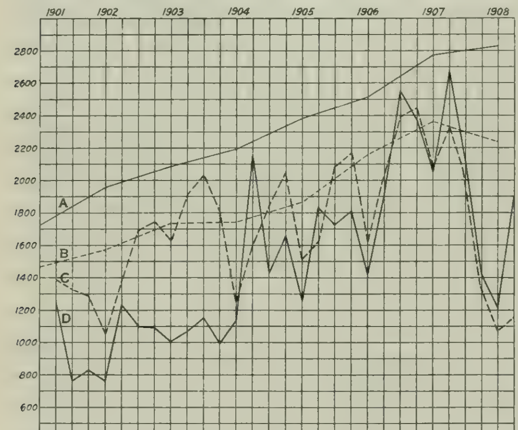

Chart 1—Natural Scale.

Passengers and employees killed and injured in train accidents. (From quarterly reports of the Interstate Commerce Commission.)
A = Passenger miles (2,000 on scale = 20 billion passenger miles).
B = Ton-miles (2,000 on scale = 20 billion ton-miles.)
C = Employees injured.
D = Passengers injured.
E = Employees killed.
F = Passengers killed.

in a measure on the proximity of the curve to the top or bottom of the chart.

As an illustration: if the scale has a range of 1 to 100, a curve beginning at 90 and affected by an increase of 10 per cent. would move upward nine units on the scale to 99, while a curve beginning at 10 and affected by the same percentage of increase (10 per cent.) would move upward but one unit on the scale to 11. The extent of the change in the curve near the top of the scale is nine times greater than in the curve near the bottom of the scale, yet in each case the relative change was the same—10 per cent. The chart registers the actual change in value, rather than the ratio or percentage of change. The wider the range of the scale the greater the variation between actual and relative changes.

The same criticism applies to charts which employ two or more scales for various curves. If the different scales are in proper proportion, the result is the same as with one scale, but when two or more scales are used which are not proportional an indication may be given with respect to comparative fluctuations which is absolutely false.

The percentage scale is used to some extent in graphic charts and corrects the deficiency in the ordinary chart by showing the changes in percentages of increase or decrease. But in correcting one deficiency, another is introduced. The per-

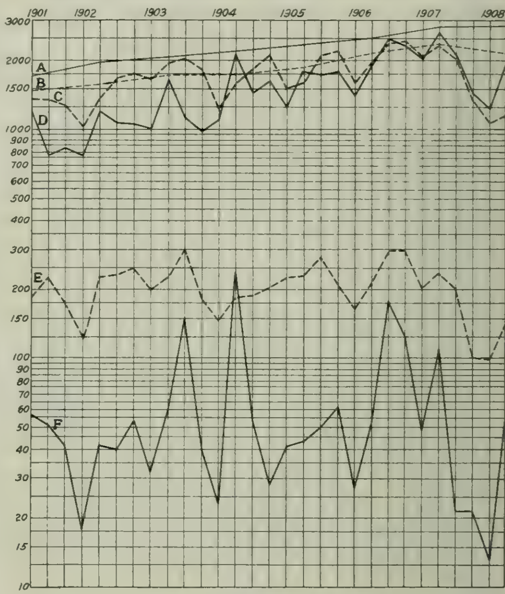

Chart 2—Logarithmic Scale.

Passengers and employees killed and injured in train accidents, all railroads in United States. (From quarterly reports of the Interstate Commerce Commission.)
A = Passengers carried 1 mile (2,000 on scale = 20 billion passenger-miles).
B = Ton-miles (2,000 on scale = 20 billion ton-miles.)
C = Employees injured.
D = Passengers injured.
E = Employees killed.
F = Passengers killed.

centage scale gives no clue to the magnitude of the quantity represented by any curve. The true proportion of relative changes is shown, but the actual value is not indicated. The use of the percentage scale also involves considerable labor in computing percentages of change.

As a substitute for the ordinary (or natural) scale and the scale of percentages, as well as compound scales, the logarithmic scale, or scale of ratios, practically meets the requirements. It permits the exhibition of both actual and relative values, and actual and relative fluctuations. While some knowledge of logarithms will make plain certain features which otherwise are hard to understand, no special knowledge of higher mathematics is essential to the use of the scale. The principles involved are the same as those embodied in the slide rule, and any treatise on the slide rule will make them sufficiently clear. An accountant who can plot a chart to the ordinary scale should have no difficulty in using the logarithmic. The scale may be copied from either side of the slide rule or worked out easily to fit any space by dividing it into tenths and hundredths and using the logarithmic tables to plot the lines corresponding with the notation in the scale column.

To illustrate the features to which reference has been made, two charts are presented, each showing graphically the same figures. The data are taken from the quarterly accident bulletins of the Interstate Commerce Commission and the annual reports of the same body. The subject of train accidents is of sufficient importance in itself to make either chart of interest, showing as each does the close relation between accidents and volume of traffic. The "passenger miles" and "ton miles" for fiscal year ending June 30, 1908, are estimated from the preliminary report of the commission showing passenger and freight revenue.

Chart 1 uses the ordinary or natural scale; chart 2 has the logarithmic scale. The advantages of the latter are apparent by comparison. On the natural scale fatal injuries reflect little change, while non-fatal injuries fluctuate within wide bounds. Fatal injuries, being so much smaller in number, appear very near the bottom of the chart, and it takes a very marked increase or decrease to register an appreciable change in the curve. On the other hand, non-fatal injuries, being very much greater in number, are near the top of the scale, and a very slight percentage of increase makes the line shoot upward.

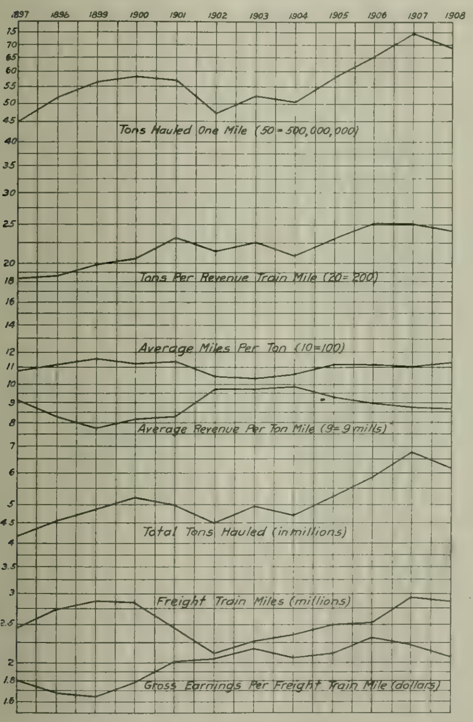

Chart 3—Logarithmic Scale

Freight statistics of the Boston & Albany; year ending June 30.

Chart 2 shows the two lower lines with their true ratio of change and indicate that relatively they fluctuated more than the upper lines. Compare, for instance, the third quarter of 1904. Fatal injuries to passengers increased from 23 to 228 (nearly 900 per cent.), while non-fatal injuries increased from 1,134 to 2,154 (90 per cent.). The percentage of increase in fatalities in that quarter was ten times greater than the percentage of increase in non-fatal injuries, yet the chart with the natural scale does not give that indication. Chart 2, with the logarithmic scale, shows the relative changes in true proportion.

As another instance, note the decrease in the last quarter of 1907. Passengers injured dropped from 2,663 to 2,125 (about 25 per cent.); passengers killed, from 261 to 21 (92 per cent.). The percentage of decrease in fatal injuries was nearly four times greater than in non-fatal injuries, yet an opposite indication is given by chart 1. The true ratio of change is shown on chart 2.

As a further example of the practical utility of the logarithmic scale, where a single chart with the ordinary scale could not have been used, chart 3 is presented, showing various freight statistics. With the natural scale the fluctuations in "tons hauled one mile," "average rate per ton mile" and "total tons hauled" would be out of proportion with the other curves lower on the scale. In fact, the curves on the lower half of the scale would be so close together as to make them indistinguishable.

No matter on what location on the chart, when the logarithmic scale is used the angle of upward or downward inclination is the same in all curves affected by the same percentage of change. A curve having an upward inclination equalling the distance from 100 to 200, 200 to 400, 300 to 600, or the distance between any number on the scale and double that number, has had an increase of 100 per cent. In other words, the quantity has been doubled. It will be noted that the distances on the scale from 200 to 400, 300 to 600, etc., are equal, the ratio in each case being 1:2, or 100 per cent. A curve having an upward inclination from 100 to 300, 200 to 600, 300 to 900, or the distance between any number on the scale and three times that number, has had an increase of 200 per cent. The ratio in the latter cases is 1:3, or 200 per cent.

The scale for decreases works somewhat differently. A curve having a downward inclination from 100 to 80, or any distance equal to it from any starting point, has had a decrease of 20 per cent. A downward inclination equal to the distance from 100 to 60 equals 40 per cent.; from 100 to 40, the percentage of decrease is 60 per cent.; 100 to 20, 80 per cent.; 100 to 10, 90 per cent. A decrease of 99 per cent. would be reflected by a curve with a downward inclination equalling the distance from 100 to 1; 99.9 per cent. by the distance from 100 to 0.1; 99.99 per cent. by the distance from 100 to 0.01, and so on, ad infinitum.

To summarize: With the ordinary scale, fluctuations in large factors are very noticeable, while relatively greater fluctuations in smaller factors are barely apparent. The logarithmic scale permits the graphic representation of changes in every quantity on the same basis, without respect to the magnitude of the quantity itself. At the same time, it shows the actual value by reference to the numbers in the scale column. By indicating both absolute and relative values and changes to one scale, it combines the advantages of both the natural and percentage scale, without the disadvantages of either.

TRAIN DESPATCHERS' ASSOCIATION.

The twenty-second convention of the Train Despatchers' Association of America was held at the Southern Hotel, Columbus, Ohio, June 15, F. D. Poland, Chief Despatcher of the Hocking Valley, General Chairman of the local committee of arrangements, presiding. M. S. Connor, General Superintendent of the Hocking Valley and the Toledo & Ohio Central, spoke briefly, recalling his connection with the association in the early days of its history, and on behalf of the railways centering in Columbus bade the members of the association welcome: and welcoming addresses were made by others. The forenoon was devoted to social intercourse. In the afternoon President Carl A. Mitchell read his annual address, and the report of the executive committee was submitted. The assets of the association have increased during the year $171. Attention was called to the cost of the official organ, and members were urged to greater activity in its support.

Letters of resignation from sixteen members were read and six were reported as having died during the year, leaving the membership of the association 964, which was a decrease from the previous year of 122. This falling off the Secretary-Treasurer attributed to the general depression in railway business which had borne with peculiar severity on train despatchers, and the members were urged to do all in their power both to increase the membership of the association and the circulation of its official organ.

The report of the train rules committee recommended changes in Rule 4 of the Standard Code, so as to make that rule read:

"Each new time-table from the moment it takes effect supersedes the old time-table, and its schedules take effect on any division (or sub-division) at the leaving time at their initial stations, on such division (or sub-division); except that when the schedule of the new time-table corresponds in number, class, day of leaving, direction and initial and terminal stations, with the schedule which was than in effect by the old time-table, it will take effect at once, subject to the provision of Rule 82; and a train due on the road, by the old time-table, will assume the schedule of the same number of the new time-table, and retain its train orders.

"Schedules on each division (or sub-division) date from their initial station on such division (or sub-division).

"But one schedule of the same number and day can be used on the same part of a division (or sub-division)."

The committee believe that this rule, since it explicity directs to be done what under the Standard Code rule has to be inferred, will be better understood by trainmen in general, than the Standard Code rule. The principle involved is precisely that of the Standard Code Rule 4.

The committee also recommended an addition to Form-A, reading:

"When a superior train is ordered to take the siding at a meeting point, such provision applies only to that meeting point under that order." Or as an alternative add to Example (1):

"This form may be modified by adding: 'No. —— take siding,'" followed by the explanation: "When a superior train is ordered to take the siding at a meeting point, such provision applies only to that meeting point under that order."

Modifications were recommended also in Form F, Form J and Form H.

The committee expressed itself more than ever impressed with the desirability of a "schedule fulfilled signal," to be displayed on the last section of a schedule consisting of sections, or on a solitary train fulfilling a schedule, and also with the desirability of an identification signal whereby the identity of every train might be made known to other trains passed or met. No special device was recommended, but what the committee had in mind was a combination classification and identification device to be carried on the front of every road engine, similar to the cupola indicator now generally used on freight train cabooses; and the present cupola indicator might be dispensed with. In view of the provisions of Rule 4 the committee believes that time-tables should show day of reading at head (or foot) of schedule column only at initial stations, and not at all at arrive stations.

The report was, after considerable discussion, approved by the convention, except the recommendation last mentioned. The discussion continued not only through the afternoon session of Tuesday, but occupied the entire business session of Wednesday.

A paper was read by F. C. Dow (C., B. & Q.), Sheridan, Wyo., on uniform understanding of train rules and order which evoked considerable discussion. A paper on The Train Despatchers' Status, by J. F. Mackie, secretary of the association, was also read and was warmly applauded. Twenty-seven members were elected during the various sessions of the convention.

On Tuesday evening a reception was held in the parlors of the Southern Hotel; on Wednesday evening there was a banquet, and on Thursday evening the members went to the Park Theatre. On Friday there was an excursion over the Pennsylvania lines in a special train to Sandusky, and thence by boat to Cedar Point.

The election of officers for the ensuing year resulted as follows: President, T. D. Dellmin (L. S. & M. S.), Youngstown, Ohio; Vice-President, F. C. Dow (C., B. & Q.), Sheridan, Wyo.; Editor J. F. Mackie (C., R. I. & P.), Chicago, Ill.

There was no election for Secretary-Treasurer, the incumbent of those offices holding over. The next annual meeting will be held at Spokane, Wash., June 21, 1910.

DISCIPLINE OF TRAINMEN.*

BY DANIEL WILLARD.

Nothing is more essential to the safe and efficient operation of a railway than good discipline. . . . To establish and maintain good discipline, it is necessary that the men affected should be properly instructed as to their duties and responsibilities. . . . Doubtless it is true that a large majority of the men in the train and engine service fully appreciate the necessity for good discipline, and prefer to work where discipline is known to be strict, providing also it is fair; and it is probably also true that a large majority of the men in such service are willing and anxious to obey the rules, and to do their work as required, and no doubt they feel much humiliated when accidents are caused by their personal fault. This feeling, which also stimulates pride in good work, is of itself sufficient, if properly developed, to keep the majority of the men in harmony with discipline requirements.

The practice of suspending a man from service for 15, 30, or even 60 days as in some instances, cannot possibly make him better, while on the contrary it deprives him of the opportunity to earn money with which perhaps to support his family, and not infrequently when a man has been so deprived of the opportunity to work, the punishment has borne most heavily upon those dependent upon him. It does not seem that a proper system of discipline should require such results.

When a man enters the employ of a railway company, that fact with certain other necessary information should be recorded in a book provided for that purpose. He should be fully instructed concerning his work, and it should be explained to him that his term of service will depend upon the manner in which he performs the duties assigned to him, and his advancement to better positions will be subject to the principle of seniority, *but only so far as his work justifies*, and in order that this question may at all times be clearly determined, it is essential that a complete record of his service be kept. . . .

It should be possible to keep such a fair, and at the same time accurate, record of the men in train and engine service that it can be made a sufficient basis for a system of discipline which will satisfy fully the requirements of existing conditions. Such a system, however, will call for greater care and personal attention on the part of all officers than has perhaps been given to this subject in the past, but it is believed that its importance justifies the additional effort.

To make the most of such a system it is necessary, or at least desirable, that the superintendent should know personally all, or as many as possible, of his train and engine men. He should make sure that they are all properly instructed concerning the duties which they are expected to perform, and he should be able, either personally or through his assistants, to keep a constant supervision over their work. . . . Where a failure was due to a lack of knowledge, and not to indifference, neglect or carelessness, it may not be necessary to place the matter upon the man's personal record, but it is

*On the Chicago, Burlington & Quincy discipline is now administered "by record" and without suspensions, as was announced in the *Railroad Age Gazette* of May 7. The paragraphs here given are from the preliminary circular sent out by Vice-President Willard.

necessary that the whole subject be fully explained to him. . . . Any act which approaches insubordination, but which of itself is not sufficiently serious to justify dismissal, should also be mentioned in the record. It is not necessary or desirable, however, that accidents or mistakes which may occur, but through no wilful neglect or carelessness on the part of the employee, should be placed upon the permanent record, unless of frequent occurrence; for certain matters of that kind will happen to all men, and the employees should be assisted so far as possible in keeping their records clear.

It frequently happens that employees in the train and engine departments have opportunity to do things outside of their specified line of duty, and by so doing prevent accidents which might result in loss of life or damage to property. When such acts are performed, they should be made a part of the employee's record.

A large number of experienced train and engine men are necessary for the efficient handling of the company's business; no credit attaches to the mere act of discharging a man from the service; great credit is due the officer who succeeds in building up a body of loyal and efficient men; it is an expensive matter to educate men to be conductors and engineers; and the cost of his education is lost when such a man is dismissed.

ACCIDENT BULLETIN NO. 30.

The Interstate Commerce Commission has issued accident bulletin No. 30, giving a summary, in the usual form, of the railroad accidents in the United States during the three months ending December 31, 1908. The number of persons killed in train accidents was 184 and of injured 2,924. Accidents of other kinds bring the total number of casualties up to 17,644 (798 killed and 16,846 injured). These reports deal only with (a) passengers and (b) employes on duty.*

TABLE No. 1.—*Casualties to Persons.*

	Passengers		Employees		Tot'l persons reported	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	19	932	97	875	116	1,807
Derailments	15	457	42	352	57	809
Miscellaneous train accidents	..	14	11	294	11	308
Total train accidents	34	1,403	150	1,521	184	2,924
Coupling or uncoupling	..	...	44	676	44	676
Other work abt trains or switches	..	...	19	3,948	19	3,948
In contact with bridges, etc	1	5	24	356	25	361
Falling from cars or engines or while getting on or off	44	770	148	2,881	192	3,651
Other causes	19	730	315	4,556	334	5,286
Total other than train ac'd'ts.	64	1,505	550	12,417	614	13,922
Total all classes	98	2,908	700	13,938	798	16,846

The number of passengers here recorded as killed in collisions and derailments, 34, is only two-thirds as large as in the last preceding quarter (when there were 8 notable collisions); and the present record, for the purposes of comparison, might fairly be reduced still further by deducting the 15 casualties charged to derailment No. 4, Table 2*a*, which, as will be seen, occurred under very unusual circumstances. Making this deduction the present record would be reduced from 34 passengers to 21 passengers, or exactly the same number as that shown in Bulletin No. 26, one year ago. In the present record the only accident which is notable, as regards fatalities to passengers, is collision No. 24; but there were two which together caused the deaths of 16 employees—collisions No. 10 and No. 26.†

Aside from item No. 1, as noted in the foregoing paragraph, the figures given in Table No. 1*a*, below, show generally considerable increases when compared with the last preceding quarter, but the decreases when compared with the corresponding quarter one year ago.

TABLE No. 1A. *Comparison of Principal Items with Last Bulletin and with One Year Back.*

	Bulletins No. 30.	No. 29.	No. 26.
1. Passengers killed in train accidents	34	53	21
2. Passengers killed, all causes	98	110	81
3. Employees killed in train accidents	150	138	199
4. Employees killed in coupling	44	39	77
5. Employees killed, all causes	700	624	1,011
6. Total passengers and employees killed	798	734	1,092

The total number of collisions and derailments in the quarter now under review was 2,684, as below:

TABLE No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons Killed.	Persons Injured.
Collisions, rear	303	$339,217	45	498
" butting	151	292,124	43	581
" train separating	122	47,336	1	68
" miscellaneous	797	351,172	27	660
Total	1,373	$1,029,849	116	1,807
Derailments due to:				
Defects of roadway, etc.	242	$138,145	1	273
Defects of equipment	629	437,640	5	131
Negligence	81	49,757	11	64
Unforeseen obstruction	68	78,003	24	127
Malicious obstruction	14	20,548	3	47
Miscellaneous causes	277	186,191	13	167
Total	1,311	$910,284	57	809
Total collisions and derailments	2,684	$1,940,133	173	2,616

Following is the usual list of Class A train accidents—all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

TABLE 2A.—*Causes of Thirty-four Prominent Train Accidents (Class A).*

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

Collisions.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
1	M.	P. & F.	0	0	$300	13	Collision at crossing at 2 a.m.; crossing not equipped with fixed signals. Passenger train, having stopped 200 ft. from crossing, was started forward and ran into side of freight train, engineman not seeing the freight cars.
2	M.	F. & F.	1	0	865	14	Collision occurred in yard: engineman of empty engine negligent. One passenger killed.
3	M.	F. & F.	1	0	1,700	40	Engine backing onto sidetrack bumped standing cars, which ran out on main track and collided with another train. Conductor and brakeman applied hand brakes, but were unable to prevent collision. One passenger killed.
4	R.	F. & P.	4	14	2,200	1	Passenger train standing at station run into at rear by following freight; passenger brakeman neglected flagging; freight was running at excessive speed. Four passengers killed.
5	R.	F. & F.	0	1	2,400	50	Two trains had been coupled together to get over a hill; were separated at the summit; leading train had among its cars a dead engine, and by this operator at next station was deceived. He thought that there were two trains, and thereupon authorized the station in the rear to send on another train.
6	R.	F. & F.	1	1	2,835	3	Standing train not protected by red signal; was run into by a train which was not properly controlled: one drover killed.
7	B.	F. & F.	0	3	3,152	10	Operator accepted order after train had left. (See note in text.)
8	B.	F. & F.	0	7	3,739	39	Operator, having two orders, one Form 19, one Form *31, delivered Form 19 only. Operator in service at this place one week; had had ten years' experience elsewhere.
9	B.	F. & P.	1	16	4,068	32	Freight train ran out of siding because not under control (See note in text.)

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*The term "passengers" includes passengers traveling on freight trains, postal clerks, and express messengers, employees on Pullman cars, newsboys, live-stock tenders, and men in charge of freight.

†The monthly accident records published in the *Railroad Age Gazette* show that:
Collision No. 10 occurred at Mid Canon, Mont., Dec. 28.
" " 24 " " Little Woods, La., Nov. 11.
" " 26 " " Borie, Wyo. ......Nov. 10.

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engines, cars & roadway.	Reference to record.	Cause.
10	B.	F. & F.	7	11	4,616	55	Conductor and engineman of freight held an order to run 1 hr. and 30 min. late; forgot order and ran 1 hr. and 15 min. late. Six carpenters and 1 brakeman killed.
11	B.	P. & P.	2	11	6,075	31	Misreading of despatcher's order. (See note in text.)
12	B.	P. & F.	0	25	7,314	7	Failure to observe wait order; conductor and engineman both apparently forgot that the order had been delivered to them.
13	B.	F. & F.	2	4	8,000	8	Failure to observe wait order and failure of inferior train to clear time of superior 5 min.
14	B.	F. & F.	2	5	8,300	38	Conductor accepted orders from operator and receipted for them, yet left them in office and moved his train regardless of their instructions.
15	B.	P. & F.	0	9	9,000	33	Conductor and engineman, having an order that the second section of a train would be 1 hr. late, carelessly assumed that both the first and second sections would be that much late.
16	M.	F. & F.	0	0	9,600	15	Train backing in on siding pushed boarding cars out on main line; these ran 2½ miles uncontrolled and collided with work train; wreck took fire and was burned up.
17	B.	F. & F.	1	4	10,000	53	Conductor and engineman misread or assumed name of station in telegraphic order; order was plainly written and the two names were utterly unlike.
18	R.	F. & F.	0	3	10,200	27	Failure to flag when backing out of siding.
19	B.	P. & F.	1	7	11,020	6	Conductor and engineman saw engine 605 standing on sidetrack and mistook it for engine 602, which they were to meet.
20	B.	F. & F.	4	3	12,148	37	Entire crew of northbound train forgot or ignored schedule of southbound.
21	B.	P. & F.	1	47	12,550	52	Freight encroached on time of passenger train. Engineman disregarded schedule of passenger train. It was Christmas day and his ignoring of the passenger train was due to his mistaken impression that the day was Sunday, on which that passenger train did not run.
22	B.	F. & F.	2	5	14,700	40*a*	Operator reported that an extra train had passed when in fact it had not arrived; despatcher acted on this misinformation.
23	B.	F. & F.	1	4	15,200	34	Engineman forgot order. (See note in text.)
24	R.	P. & P.	8	27	20,000	24	Engineman disregarded time interval. Eight passengers killed. (See note in text.)
25	R.	P. & F.	0	7	21,145	25	Freight train, delayed while entering sidetrack, encroached on time of following passenger train. Report indicates that this freight had left last preceding station when there was not sufficient time; so that the delay at the side track was not the only contributing cause of the collision.
26	R.	F. & F.	9	4	24,700	30	Runaway: mismanagement of air brakes on 79-ft. descending grade. Nine employees in work train killed.
Total......			48	218	$225,827		
							Derailments.
1	D.	F.	2	13	$250	20	Caboose occupied by track laborers overturned by wind.
2	D.	P.	1	6	2,300	66	Misplaced switch.
3	D.	F.	1	0	2,500	63	Broken flange. One passenger killed.
4	D.	P.	15	15	5,000	18	Track destroyed or weakened by fire. (See note in text.)
5	D.	P.	0	13	5,644	21	Rail maliciously removed.
6	D.	F.	2	0	6,000	22	Switch maliciously misplaced. Engineman and fireman killed.
7	D.	F.	0	0	6,990	68	Log on car projected and struck and demolished bridge; bridge and 9 cars fell to river.
8	D.	P.	0	25	11,984	19	Trestle bridge weakened by fire. Engineman saw smoke a half-mile away, but misjudged its location. Superintendent apparently does not blame engineman, but the track department is held blameworthy for not having burned weeds and grass to safeguard bridge against fire.
Total......			21	72	$40,678		
Grand total.			69	290	$266,505		

Derailment No. 4, causing the death of 15 persons, occurred near Metz, Mich., on the Detroit & Mackinac Railway, October 15, in the midst of extensive forest fires, and its immediate cause was the distortion of the track by the heat from a pile of burning sleepers, which lay near the track. The train, consisting of an engine and 6 freight cars, had been made up hastily to carry to a place of safety the inhabitants of a small village (Metz), this being the only chance of saving their lives. The atmosphere was filled with smoke so dense that the engineman could not see far ahead, and there was great danger; but it was impossible to go in the other direction, and it would have been fatal to remain at Metz. The refugees, numbering about 75, were in a steel gondola car. When the engine was derailed, about 1½ miles from Metz, in consequence of the weakness or displacement of the track, the cars, of course, could not be moved farther, and thus were left close to the burning sleepers and at the mercy of the flames; and 12 persons in the gondola car, unable to escape, were burned to death. One man, riding on the engine, escaped from the engine, but was burned to death on the ground a few feet away. Two trainmen were killed, and the list of injured persons includes 13 refugees and 2 trainmen. One of these latter, Conductor John Kinville, was severely burned in trying to save some of the persons in the gondola car. In the accident record these victims, except those who were employees of the railroad, are classed as passengers; but in view of the peculiar circumstances of the case this note is added to explain that the deaths and injuries do not come within the ordinary classification. It does not seem proper, however, to class the refugees as trespassers, and, therefore, the compiler has not felt at liberty to exclude the figures from the record.

Collision No. 24, killing 8 and injuring 27 passengers, was due to disregard of the 10-minute time-interval rule. Both trains were passenger trains, southbound, one due to leave S at 7 a. m. and the other at 7:30 a. m. The latter train came on to the main line from a branch at this point. The leading train was 30 minutes late leaving S. The second train was recorded by its conductor as leaving S at 7:30, which was exactly the time that the leading train left; but from testimony given before a coroner it appears that the actual time of departure was 7:35, making an interval of 5 minutes between the two trains. The rule requires that this time interval shall be 10 minutes. The junction being a registering station, the station agent or operator was not required to hold the second train to keep it 10 minutes behind the first, but this duty rested on the conductor and engineman, who were required always to examine the train register before leaving junctions.

The collision occurred at L, which is 17½ miles South of S. According to the men on the leading train, it occurred at 8 a. m., indicating that this train had run about 7 minutes faster than its schedule. According to the men on the other train, it occurred at 8:04 a. m. The leading train had made two stops of 30 seconds each for passengers; had stopped to open and close a switch at a station, and had reduced speed to about 10 miles an hour at one other point. It had started from L and was moving about 10 miles an hour when the collision occurred.

The second train was warned twice by drawbridge tenders of its proximity to the leading train, but the report says that the engineman inquired of the draw tender why he was stopped, and, on being informed, replied with derisive remarks, and he passed the drawbridge without having received the proceed signal. The report says that this reckless conduct on the part of the engineman of the second train was repeated at the second drawbridge, and that the train was running at a high speed when it struck the leading train. Its engine crushed 3 cars of the leading train and damaged a fourth, and did not stop until it had run 635 feet beyond the point where it first struck. There was a dense fog at the time,

making it impossible to see more than about 500 feet. The engineman says that he saw the preceding train about 500 feet before he reached it, but it is believed by the officers that he did not see it until his engine struck it. The evidence of two witnesses, one at L and one some distance back, is quoted to show that the engineman was not keeping a good lookout. He was facing backward, and apparently talking with another engineman who was riding in the cab. The brakes of both trains were set automatically as soon as the collision occurred, rupturing the air pipes; but in spite of this the distance run was 635 feet, as before stated. The schedule time of the second train from S to L, about 29 minutes, was 8 minutes less than that of the leading train.

Collision No. 7, occurring about 2 a. m., was due to misinformation given to the despatcher by the operator at A. A freight train with 2 engines arrived at A at 1:20 a. m., and the operator, assuming that the helping engine was the regular engine of the rain, made a mistake in reporting the numbers—the train being an extra freight, and trains being identified by the number of the engine—and continued to assert to the despatcher that the regular engine of the train—that is, the train itself—had not arrived. Accepting this information, the despatcher gave the right to the road to a train coming from the opposite direction. The operator in this case was 18 years old and had been in the service only 1 month. The despatcher was 21 years old. He had been a despatcher for about 6 months and an operator 4 years.

Collision No. 9 was between a southbound passenger train and a northbound local freight train. It occurred at 6:35 p. m., November 13. The freight train had entered the side track at the station to make way for the passenger train, but in consequence of the engine not being properly controlled the train ran through the side track and out upon the main line at the north end, and the collision occurred about 400 feet north of the north switch. The freight was to stop at that station long enough for the trainmen to eat supper, and the engineman had got off the engine a little distance short of the station, to go to a hotel. According to the testimony of this engineman the engine (moving) was left in charge of the fireman, but the fireman denies having received instruction to that effect, and he was on the front of the engine, covering the headlight, and therefore did not shut off steam or apply the brakes. The headlight being covered, the engineman of the passenger train did not see that the main track was obstructed until he was almost at the point of collision. The conductor of the freight train was also held at fault for allowing the train to move so far after it had entered the side track.

Collision No. 11 was due to a mistake of an engineman in reading a telegraphic order. This engineman, running southbound train No. 3, went past the appointed meeting station at full speed, having unaccountably taken the order to mean the next station south, the two names beginning with the same letter. The conductor had neglected to require the engineman to read the order aloud in his presence. The conductor had read the order to the baggageman, but the baggageman appears to have taken no pains to keep the meeting place in mind, as the train passed that station without his knowing it.

The collision occurred 2½ miles beyond the appointed meeting place. The northbound train, No. 4, was running faster than its schedule, the despatcher having ordered it to reach the meeting point, if possible, 5 minutes ahead of its schedule time. For giving this order the despatcher is blamed. All of the men at fault have been in the service several years, with good records, except the baggageman, who had been in the service only 1 year.

Collision No. 23 was caused by the engineman of the southbound train disregarding a meeting order and running 1½ miles beyond the station where he should have met the northbound train. The engineman and conductor had both read the order, and the conductor, the flagman and the firemen testify that they understood the meeting point to be as it was written in the order; but the engineman, although he received the order and read it with the others, got the impression, in some way, that it named another station farther on. The fact that the train was running beyond the meeting point was first discovered by the flagman. The testimony of the conductor concerning his endeavors to stop the train is confused; but at any rate he did not succeed in reducing the speed materially before the collision occurred. Both trains were running at about 30 miles an hour when they struck each other.

FEDERAL ELECTRIC INTERLOCKING AT INDIANAPOLIS.

The Federal Signal Company has installed for the Cleveland, Cincinnati, Chicago & St. Louis at Indianapolis two all-electric interlocking plants. One called the West Side Belt plant, is at a crossing of the Big Four and the Indianapolis Belt. The other, the West End of Moorefield plant, is at a junction of the Big Four and the Peoria & Eastern, and also includes a crossing of the Big Four and the Indianapolis, Crawfordsville & Western, an electric interurban road.

At the West Side Belt plant power is supplied by a 6 h.p. vertical Fairbanks-Morse gasoline engine, direct connected to a Fairbanks-Morse 3.5-k.w. generator, situated in the basement of the tower. On the first floor is the storage battery and on the second the interlocking machine. The machine has 43 working levers in a 56 lever frame. It controls 35 signals, 23 switches and derails and 3 sets of crossing bars.

At the West End of Moorefield plant power is supplied by a motor generator set, taking current from the electric railway. The motor generator set and storage battery are on the first floor and the interlocking machine on the second floor of the tower. The machine has 21 working levers in a 24-lever frame. It controls 16 signals, 13 switches and derails and 2 sets of movable point frogs. The "Federal Switch Guard" is used on the electric road instead of detector bars, owing to the narrowness of the tread of the electric car wheels.

The Federal electric interlocking machine is a miniature mechanical Saxby & Farmer, to which have been added the necessary controllers and indicating devices to control electric switch and signal movements.

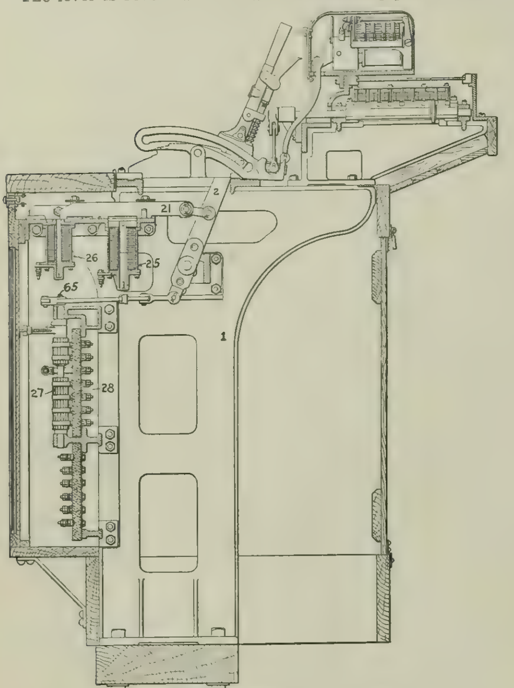
Attached to the front side of each lever is a slide, 21, fitting in a groove in the top plate of the machine. This slide has several pockets or notches on its lower side, the use of which will appear below. There is an indication coil consisting of a solenoid, 25, supported by the top plate, under the slide. A safety coil, 26, is mounted in front of the indication coil and has two windings. The controllers for the various functions consist of contacts mounted on a vertical roller 27 on a slate panel 28 situated in the lower front portion of the machine. The roller is turned by movement of the lever (2) by means of a crank (65). There are, in the case of a switch, four contact devices. One shifts current from one to the other of the control wires when the lever is moved, two others make a connection to common respectively as explained below, for one or the other of the control wires, viz.: the one which will be used in the next operation of the switch, and the fourth connects the indication coil to the indication wire which will be used in the next operation. In the case of a signal only half as many connections need to be made as there is no reverse indication or normal control circuit. A switch movement is controlled by four wires in addition to the main common, two of which are operating and two indication wires.

The switch movement consists of an ordinary mechanical switch and lock movement driven by an electric motor through a screw motion. A photographic view of it was shown in the *Railroad Age Gazette* of June 18, page 1308. It has suitable circuit controllers to cut out the motor at the end of the stroke and to close the indication circuit. At the same time that the motor is cut out at the end of the stroke, the control wire for the next operation is connected. The motor has two field windings, one for normal and one for reverse operation.

The signals, both high and dwarf, are moved by motors. The mechanism consists of a motor driving a train of gears. By means of a clutch these engage with the crank-arm operating the signal. The clutch armature carries a projection which catches one of several pins on a large gear.

The operation of the machine is as follows:

The lever is reversed as far as the indicating point, moving



Federal Electric Interlocking Machine.

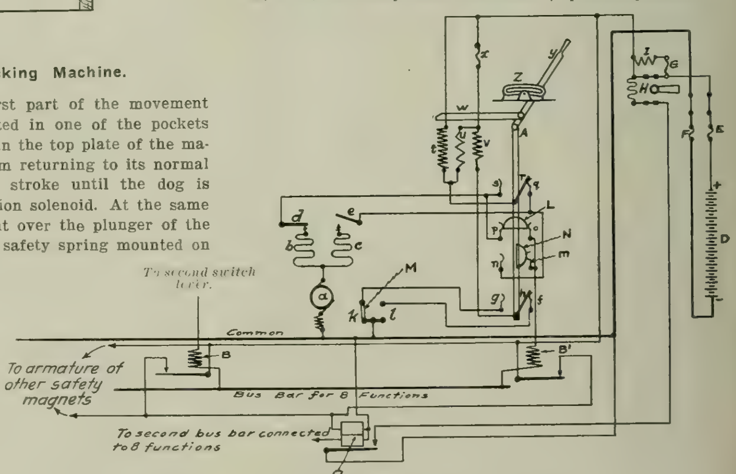
forward the lock slide. On the first part of the movement the indication dog, which is mounted in one of the pockets of the slide, is forced into a pocket in the top plate of the machine, thus preventing the lever from returning to its normal position, or completing its reverse stroke until the dog is raised by the plunger of the indication solenoid. At the same time a notch in the slide is brought over the plunger of the safety coil and the contacts on the safety spring mounted on the controller, the two second described above, will be opened. Further movement of the lever will cause a knife-switch to snap over by means of its toggle spring, completing the circuit from main battery. The current divides, one part going through a fuse and a low resistance winding of the safety coil and the other through a high-resistance winding without a fuse. This causes the plunger of the safety coil to rise into a notch in the slide and hold the lever immovable until current has ceased to flow when the switch has completed its stroke. Both paths unite again before reaching the lever contact. The circuit is then complete through the reverse-operating wire to the switch, and so through motor to common. The first movement of the function closes the normal operating circuit, which is now open at the machine contact. As the switch completes the stroke the motor is cut out and a magnetic brake stops the motor. At the last part of the stroke, and after the switch is locked the indication contact at the switch is thrown over by its toggle and connection made to common. This completes the indication circuit from common, through indication wire, and indication coil to battery. Current passing in this circuit raises the plunger of the indication coil which lifts the indication dog, permitting the lever to complete its stroke. During this last part of the movement the indication contacts at the machine are reversed, ready for the next normal indication.

Protection against crosses is afforded by connecting the control wire, which will be used in the next operation of the switch, through a contact on the lever of the machine to a "safety bus-bar" through the coils of a relay. There is one relay for each lever. Should a cross occur current would flow in two directions: one through the motor to common; one to the machine through the safety relay of the function in question, bus-bar and all other safety relays connected to the bar, to common through all the motors in parallel. This would energize the safety relay. When the relay picks up it puts a short-circuit on the battery, thus causing the automatic cut-out to operate.

The control, indication and safety circuits for signals are substantially the same as above described for switches, except that, as before noted, besides the common there are but two wires to a signal, viz.: reverse control and normal indication. It is not deemed necessary for a signal to indicate reversed and, as in other systems, signals are pulled to stop by the action of gravity.

The names of the parts shown in the diagram of circuits are:

a Motor armature.
b Reverse field.
c Normal field.
d Reverse contact operated by motor at end of stroke.
e Normal contact operated in same way.
f Reverse indication contact operated by lever at end of stroke after indication has been received.
g Normal indication contact operated in same way.
h Movable part of *f* and *g*.
k Normal indication contact at switch, closed at end of stroke.
l Reverse indication contact.
m, *n* Reverse safety contacts in machine, operated by lever.



Federal Electric Interlocking Machine-Circuits.

o, *p* Normal safety contacts as above.
q Normal operating contact operated by lever.
r Movable part of *q* and *s*.
s Reverse operating contact operated by lever.
t High resistance of safety coil.
u Low resistance of safety coil.
v Indication solenoid.
w Sliding bar attached to lever; has notches for plungers of safety and indication magnets.
x Fuse.

y Lever.
z Quadrant.
A Vertical rotating portion of lever, carrying contacts.
B, *B*[1] Safety relay.
C Secondary safety relay.
D Battery.
E Fuse, 45 amp.
F Fuse, 45 amp.
G Fuse, ¼ amp.
H Automatic cutout.
I Resistance of 750 ohms. When the cutout operates, sufficient current will pass through *I* to hold signals clear, provided they have already been cleared, but not enough to operate any function.
L Movable part of normal safety contacts.
N Movable part of reverse safety contacts.

FREIGHT CLAIM DEPARTMENTS.

BY W. L. SCHNEIDER.

One of the important objects of railway work is to so systematize the method of handling matters brought before the several departments for consideration as to derive the best results with the least clerical work and expense. Therefore, taking this as an argument unquestioned, and dealing with freight claim departments exclusively, experience and observation have impressed upon the writer most forcibly that this branch of railway service is not keeping pace with the times.

It is a fact generally recognized by those familiar with the conditions that railways spend too much money in handling and settling freight claims arising from loss and damage. The writer is fortunate in having had a general railway experience, and may claim a certain familiarity with this subject from a practical standpoint.

The reports of any of the trunk lines will show annual expenditures of from one-quarter to one-half million dollars in the adjustment of loss and damage claims. As this paper seeks to deal only with the question of goods going astray during transportation, we can safely estimate one-third of above figures as a conservative loss due to this cause. From the same authorities it will be found that the amount realized from the sale of freight unclaimed, etc., covered by the different causes given, will not exceed one-tenth of the loss estimate. A casual glance at the figures of any railway at the present time will show the conditions.

When one considers the amount of over and unclaimed freight that is annually brought to the various storage houses for sale—other disposition not being found—it is clearly evident that there is something radically wrong with the manner of handling freight of this nature.

The owners of such property invariably enter claims against the transportation lines for reimbursement, many of which are immediately paid as a matter of policy; and it is safe to say that no railway officer in charge of freight claim work is fully satisfied with the results obtained under present systems.

From the viewpoint of the business man this is a decided reflection upon claim departments, and indirectly upon the management of railways where such a situation obtains. Why is this condition allowed to continue. Extreme conservatism and prejudice toward changes and innovations are believed to be the cause of much of the trouble. Many claim officers are content to let well enough alone; hence no change for the better.

Summarizing briefly the present manner of handling over and unclaimed freight, tracers and claims, it is found that goods which have lain at freight stations for 60 days or more are forwarded periodically to the various storage houses, there to be sold under the hammer, and, consequently, at a considerable loss to the railway, which, in most cases, pays claims of this nature without murmur, acknowledging, by so doing, its inability to control the situation.

In handling tracers and claims line tracing is frequently resorted to in cases of importance when they do not yield to treatment after the forwarding, transfer and delivery points have been asked to show their records and are found wanting. By line tracing is meant that frequently all agents on one or more divisions are called upon to advise by this means whether or not they have any account of certain shipments in question; oftentimes of a very insignificant nature and value, but which, nevertheless, are invariably covered by claims for full valuation. In many cases the trace papers come back to the claim department without having attained their purpose, after having consumed valuable time in fruitless search. If the shipper, consignee or claimant, as the case may be, has been patient, the papers are again started on the road (or filed) with a forlorn hope that something may develop this time, and a month or two more is consumed. If trace papers have been filed the chances are the claimant will be promptly paid upon presentation of claim later. It is also a fact that claims are frequently paid without due investigation, it being deemed the wiser policy to pay the claims and thus retain the good-will of the claimants than to earnestly endeavor to locate the missing shipment.

It is often the case that trace and claim papers go astray in the course of investigation, making it necessary to ask an extension of time of the claimant until a new set can be gotten under way, at the end of which he will be ready to divert his shipments to other lines, and justly so.

Station agents have not the time at their command to give tracers, claims, etc., the attention they deserve, and the strong point of the agent is to get the papers off his hands and into those of the next agency, who has more time to look into such matters. This careless method of dealing with inquiries of this kind frequently results in the lost shipment being passed on the route of the tracer for it, and is allowed to remain in the freight house until the specified time for its removal to the storage room shall have passed.

Not the least disagreeable feature of delays and losses of freight is the fact that the claimant's books are kept open by reason of the non-settlement of these affairs, many considered petty; and railway soliciting agents can testify to the important part borne by these claims in the matter of securing traffic. Any reputable business man would much prefer to have his shipments delivered and received promptly and in good order than to secure reimbursement therefor of a railway by reason of loss. His relations with his customers are oftentimes greatly disturbed because of the non-delivery of goods, and the possible loss to him cannot be compensated for by the transporting line through the mere settlement for the goods.

It may and will be argued by some officers that small and insignificant claims would not justify extensive handling, and that it is the better policy to pay them after it has been reasonably established that the goods were shipped but did not reach destination. It need only be mentioned that most claims are comparatively small, but the total expenditures will show, in a measure, how it pays the railway companies to settle such matters upon the basis that they are too trivial to spend much time in their investigation.

From the foregoing comment it will be seen that by handling tracers and claims for lost shipments entirely by clerical work and mail the results are not what they should be. It will readily be admitted that personal attention and investigation of any matter is generally followed by much better and more satisfactory results than when the same case is taken care of entirely through the medium of the mails.

Some railways use their detectives or police in this work of locating astray goods on the theory that they ought to be fully as capable in tracing such shipments as in locating stolen goods. This is a plausible theory and works to a certain extent; but it is well-known that there is a deep-rooted antagonism between railway police and other employees of the service which prevents the close co-operation that should exist. It is to be regretted that such is the case, but every intelligent railway man acquainted with the situation will bear out the statement that such a feeling does obtain. How-

ever, even under the most favorable circumstances the police could handle but a few of the tracers and claims covering the more valuable consignments, and that leaves much to be desired. Furthermore, to take an officer from his police duty to enter the field of freight work is to lessen his efficiency in his proper sphere.

As has been said, personal attention will accomplish far more and with less expense than by the ordinary channel of correspondence, and the writer feels that a better method of bringing the shipments short or over in touch with the trace and claim papers is needed.

To this end it is suggested that traveling agents be appointed whose exclusive business it shall be, for a time at least, to cover every point of a railway and ascertain beyond doubt and question just what over and short shipments may be charged against the stations. A complete alphabetical record should be kept by them of all such shipments, which can very easily be done by means of a memo. book suitable for the purpose, showing description of goods, how long short or over, on what billing and such other information as the situation may suggest.

There appears to be no reason why such a method should not be of material assistance to station agents. They could acquaint the traveling agent with their shortages, etc., and he, making a proper record of same, might, with a reasonable degree of certainty, locate such shipments at another station. It is firmly believed that station agents would give their hearty co-operation and welcome such a plan of investigation, as it would give them the assistance of one whose duty it was to give such matters his undivided attention, and, besides, would remove, to a great extent, the present haphazard manner of tracing.

The difficulties attending the inauguration of this scheme are not underestimated in the least, and hard, conscientious work would be necessary to establish a basis; but the writer has no fear of the outcome if the plan is given a thorough and intelligent trial. This is the age of specialization, and too much stress cannot be laid on the matter of giving these agents no other duties in connection with this work. Traveling auditors, contracting freight agents, trainmasters and others cannot handle this question as a side-line and do justice to it.

I believe that the claim office forces and other large freight offices could be drawn upon for men to engage in this work without increasing the expense materially.

After the plan is put into operation it might be arranged that the time of continuous travel of these agents be limited to two weeks or one month, this, of course, depending largely upon the number of men performing this work and the territory to be covered. Existing conditions would govern the details of operation.

Their instructions should recall them to headquarters after the specified time of road work shall have been consumed. It is understood, of course, that the freight claim department will pay no claims of the nature under consideration until these agents shall have had an opportunity to compare them with the information gathered on the line.

After making such comparisons they might also get in touch with the active trace and claim files and give the office force such assistance as may rest in their power.

It may be argued that this innovation would impede the office work. The writer admits that some readjustment to the new conditions would be necessary in the routine of the department, but the introduction of this new element in the work, bringing it out of the rut in which it has so long been confined, would give this branch of the service an impetus such as it had not known in the past.

Let it not be understood that it is claimed this manner of handling would render tracing by mail unnecessary; that is absurd on its face. Tracing will always be necessary, but the scale on which it is now carried is unreasonably extensive, and in comparison therewith practically barren of results. The plan as given in the foregoing lines is crude and incomplete; but its intention is rather that of an outline of a policy which can, under proper handling, develop the ideas into tangible and substantial form, and the benefits to be derived will, it is believed, justify its trial.

TRAIN ACCIDENTS IN MAY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of May, 1909. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

TRAIN ACCIDENTS IN THE UNITED STATES IN MAY, 1909.

Collisions.

			Kind of		No. persons reported	
Date.	Road.	Place.	Accident.	Train.	Kil'd.	Inj'd.
3.	Bos. & Maine..	Portsmouth.	xc.	P. & Ft.	1	3
*3.	Gt. Northern ..	Delano, Minn.	rc.	P. & Ft.	0	20
15.	Gt. Northern...	Mead, Wash.	xc.	Pass.	0	12
25.	N. Y., P. & N..	Salisbury.	xc.	P. & Ft.	1	2
31.	At., T. & S. Fe..	Peabody.	xc.	P. & Ft.	1	2

Derailments.

			Cause	Kind	No. persons reported	
Date.	Road.	Place.	of derlmt.	of train.	Kil'd.	Inj'd.
*5.	Balt. & Ohio...	Romney.	acc. obst.	Pass.	0	6
9.	St. L. & San F..	Springfield.	washout.	Pass.	1	5
11.	Mo., K. & Tex..	Bonita, Tex.	unx.	Pass.	• 3	22
14.	Wabash	Randolph.	d. bridge	Pass.	0	12
15.	Chic. & Alton...	Odessa.	unx.	Pass.	0	30
17.	Chic. & N. W...	Mason City.	unx.	Ft.	1	2
20.	St. L. & S. F...	Vinita.	unx.	Pass.	1	7
23.	Gt. Northern...	Cascade, Mont.	washout.	Ft.	1	2
25.	Cent. of N. J....	Slate Dam.	unx.	Pass.	0	0
29.	Mob., J. & K. C.	Mobile.	washout.	Ft.	3	1
30.	Central Ga.....	Martindale.	unx.	Pass.	0	7

One of the most serious accidents in the foregoing list is that which occurred near Mobile, Ala., on the twenty-ninth—next to the last derailment. An engine of the Mobile & Ohio, with a caboose, was running over the Mobile, Jackson & Kansas City on account of a break in the roadbed of its own line, and it was wrecked by a flood on the M. J. & K. C. One of the men killed was a conductor of the M. J. & K. C. who was acting as pilot. The wreck was partly submerged in the flood, the engine being overturned.

In the derailment at Slate Dam on the twenty-fifth, five passenger coaches were ditched and a sixth was overturned. The train derailed near Mason City, Iowa, on the seventeenth consisted of an engine alone; and of the three men on it, one was killed and the other two were seriously injured. The engine was on its way to relieve a disabled freight train, and appears to have been derailed while running at good speed on a curve.

The collision at Mead, Wash., was caused by train robbers The robbers had detached the engine and mail car from a passenger train and had run them some distance ahead; and after finishing their robbery they started the engine and car back toward the train, unattended. The injuries to passengers were mostly caused by flying pieces of glass.

In the derailment near Bonita, Tex., on the eleventh, all of the coaches but one were ditched. The despatch gives no hint of the cause of the derailment except to say that the train was running at high speed and that the engine was the first to leave the track.

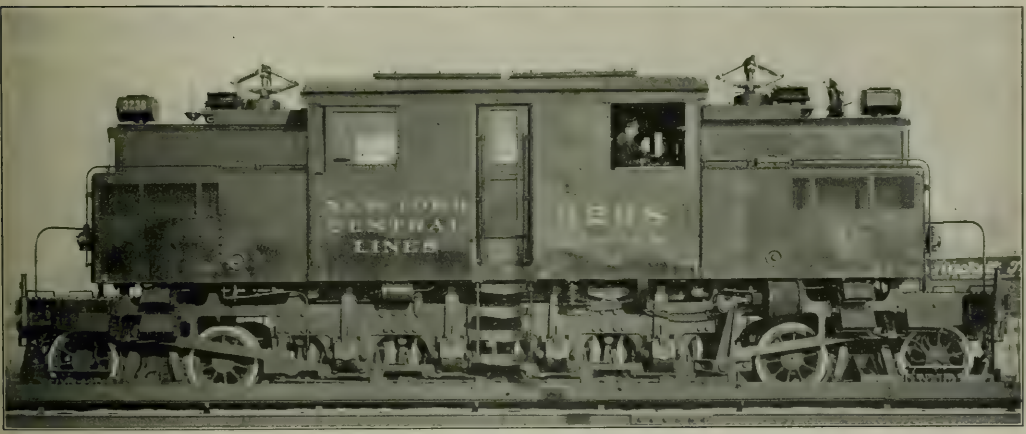
Of the eight electric car accidents reported in the newspapers in the month of May, one, a derailment at Memphis, Tenn., caused the death of one passenger.

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P., or Pass., passenger train——F., or Ft., freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

NEW YORK CENTRAL ELECTRIC LOCOMOTIVE.

The direct current electric locomotive built for the New York Central & Hudson River was illustrated and described, as it was originally put into service, in the *Railroad Gazette* of June 15, 1906. During the endurance tests and afterward on the road some peculiarities developed that led to a modification of the first design, and changes have been made which have materially increased the efficiency of the machine. For example, with the two-wheeled trucks at each end, there was a tendency to nose at high speeds, by which excessive stresses were undoubtedly put upon the track. The rigidity of the driving wheels in the frame also added to this same effect. This action rarely occurred at ordinary running speeds of from 50 to 55 miles per hour, but when this was increased to 65 miles or more, the nosing frequently developed. In order to overcome this tendency, the wheel base has been made flexible and four-wheeled trucks have been added at each end. There is also a change in the equalization of the running gear. In the locomotives, as first built, the two-wheeled truck at each end was equalized with the two adjacent pair of driving wheels, thus making two sets of equalizations for the engine. By cross connecting the diagonal truck equalizers at which the frame is carried, the support being at the center line of the engine.

Greater flexibility of the engine on curves was obtained as the result of some experiments made at Schenectady. In order to ascertain the lateral thrust of the wheels against the rail, the flanges of the axle box shoes were cut away so as to allow a play of ⅝-in. or more between them and the pedestals. They were then held in place by helical springs, the deflection of which indicated the thrust. It was found, however, that this arrangement gave such a very flexible and accommodating wheel base that the engine could readily run into a siding curve of 24 deg., while the wheels of an ordinary Atlantic locomotive would begin to lift from the rails before the truck wheels had reached the frog point. These springs have, therefore, been retained as a part of the regular equipment of the locomotive. In applying the springs, studs are screwed into the pedestal legs passing through the outside flanges of the shoes. A cap and nut at the outer end serves to so adjust the tension of the spring that the shoe is pressed firmly against the outside face of the frame. When, however, any excessive outward pressure is brought against the box, the spring yields and the necessary flexibility is given to the running gear. The springs are placed on each side and act in



New York Central Electric Locomotive.

one end, a three-point support for the locomotive was obtained.

With the use of a four-wheeled truck at each end, it was necessary to take some of the weight from the driving wheels and put it on the truck, although the total weight of the engine was increased by the addition of a heavy center plate for the truck. The use of the four-wheeled truck has also necessitated a change in the wheel-base as well as in the general arrangement. In the first engines, the driving wheel base was 13 ft., making a spacing of 4 ft. 4 in. between wheel centers. The total wheel base was 27 ft. With the four-wheeled truck, the driving wheel base has been maintained at 13 ft., but the distance between truck center pins has been increased to 30 ft. and. this with a truck wheel base of 6 ft., makes the total wheel-base of the engine 36 ft.

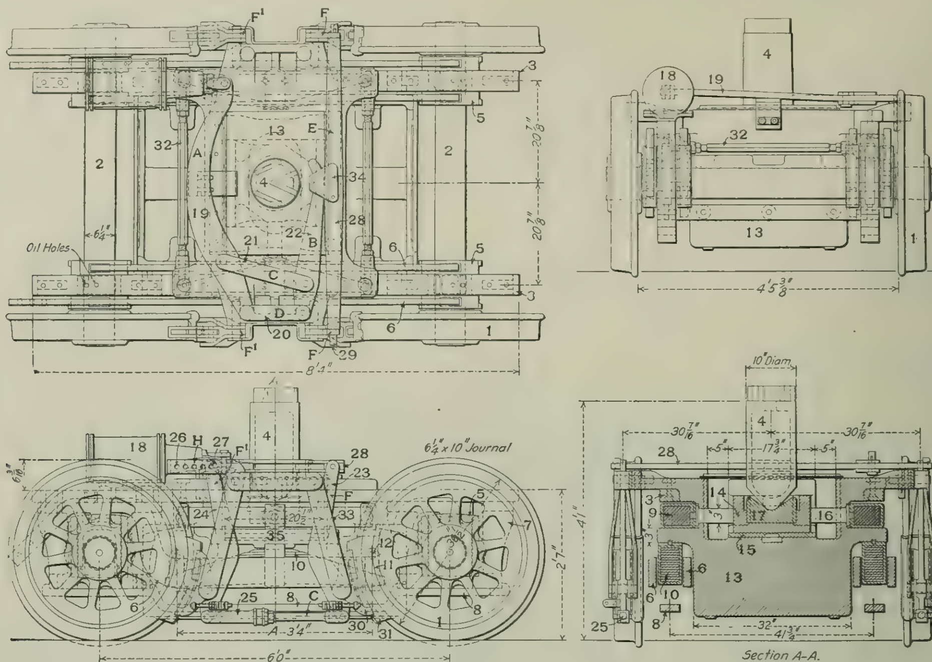
The system of equalization has also been changed. Instead of equalizing the truck with the two adjacent pairs of driving wheels as in the first engine, one truck is equalized with the end pair of drivers next it, and the equalization for the other truck extends through the remaining three pairs of drivers. This was done to retain the three-point suspension for the locomotive. At the end where but one pair of drivers is equalized with the truck, the two diagonal equalizers are themselves carried at their fulcrum points by cross equalizers, upon opposite directions, so that the movement can take place either to the right or left.

These changes have required considerable lengthening of the frame. The frames of the first locomotives had an overhang of 10 ft. outside the driving wheels at each end, making a total length of 33 ft. The revised frame has a total length over all of 40 ft. 3 in., or with an overhang of 13 ft. 6¾ in. to the face of the end plate. The dimensions of the old parts have been retained, with the exception of the lower rail of the extension, which is subjected to compression stresses, the depth having been increased from 2½ in. to 4½ in. The frame is made of cast steel, as were the old ones, and there are slight differences of shape on the two sides in order to meet detail requirements for attachments.

The truck is of the four-wheel design, similar to those previously built for heavy electric car work and locomotives. It is built up of a 2½-in. x 4-in. top rail, heavy pedestals bolted in place, with a stiff pedestal tie bar at the bottom of the legs. It has the usual inside bearings of locomotive trucks and in this it varies from the driving wheels, whose bearings are outside. One peculiarity of the truck is the exceedingly heavy cast transom. It is bolted to the side frames and has a deep center dropping down to within 4½ in. of the top of the rail. It is 32 in. wide and 53 in. long, and carries the center bearing

on its upper surface. The reason for this feature of the design is to place sufficient load on the truck to hold it to the rails and at the same time, to avoid taking any more weight from the drivers than is absolutely necessary.

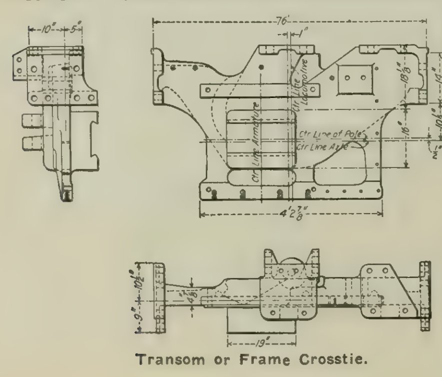
The load is applied through the equalizers to the top of a long center pin. The equalizer is a hollow steel casting having a pointed lower end resting upon the truck center plate. Between the bearing point and the truck center plate, the equalizer passes through a center pin guide bolted to the framing, and this serves to hold the truck in place. The truck center plate is held in position laterally by elliptic springs on each side. In order to check the tendency to nose, and avoid the resulting shocks, the whole is carried on a wearing washer of fiber that sets directly on the heavy cast transom.



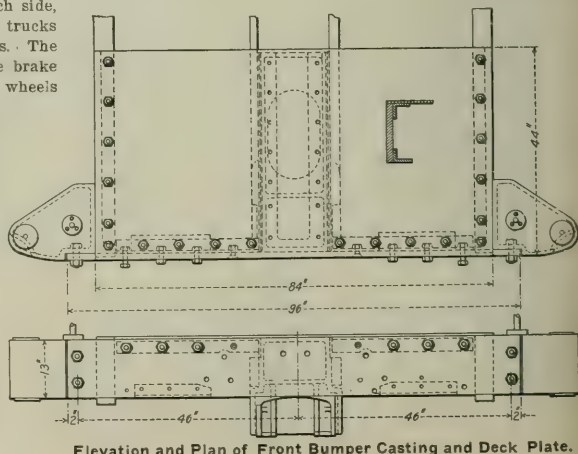
Elevations, Plan and Section of Truck.

The weight is carried by semi-elliptic springs on each side, hung between equalizers in the usual manner. The trucks have their own foundation brake rigging and cylinders. The latter are the 8-in. x 12-in. Westinghouse design. The brake rigging is of special design, since the space between the wheels is almost all taken up by the heavy center transom. The cylinder is located at the top and to one side of the truck. The cylinder lever runs across back of the center plate and above the frames. Following out these connections: the piston bears against the outer end of the lever A. This is connected to the lever B by the bars C and D, as D is fixed, the cylinder thrust is taken by C and communicated to the brake-beam E. This brake-beam has trunnions at each end that engage the upper ends of the live brake levers F, which are pinned to the brake-heads and are connected to the dead levers F¹ by the thrust rods G. The adjustment for the wear of the shoes is made in the usual manner by pins in the upper end of the dead lever and the dead lever guide H.

The driver brake rigging consists of the interfulcrumed



Transom or Frame Crosstie.

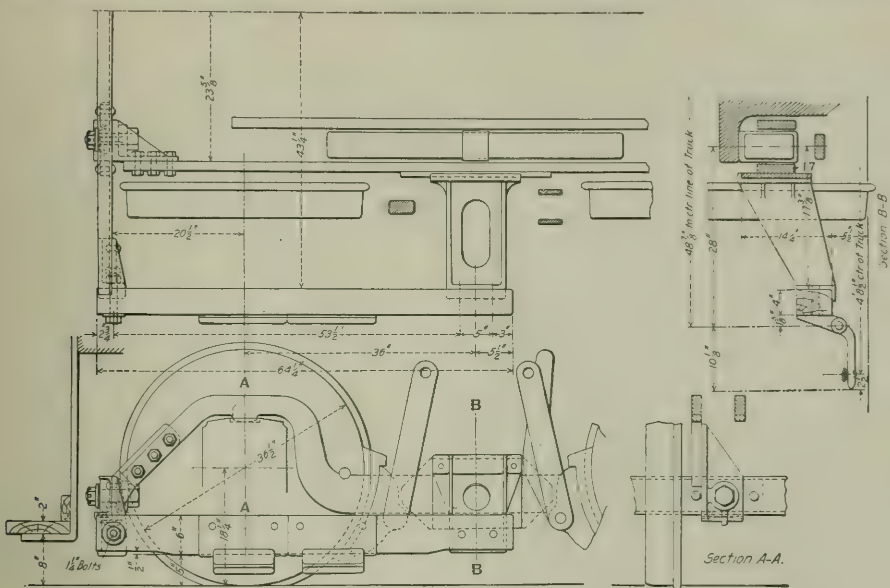

Elevation and Plan of Front Bumper Casting and Deck Plate.

equalized driver brake, made by the American Brake Co., St. Louis, Mo. There have also been a few minor modifications in the driving boxes, although they are essentially the same as when at first designed.

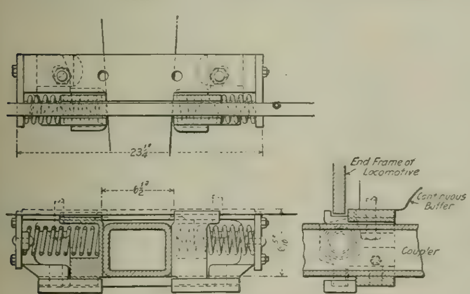
With the use of the four-wheeled truck, the method of supporting the contact shoe was changed and it is now carried on the truck instead of from a special frame fastened to the axle boxes. The outside equalizer on each side is extended out beyond the axle box and down on a slope to a point about flush with the tread of the wheel, where a cast bracket is bolted. To it is fastened a 6-in. I-beam, extending across from one side to the other, which serves to hold the timber which carries the shoe castings. The inner end of the timber is carried by a bracket bolted to the equalizer on the line of the center pin. The shoe is thus kept below the springs and at a constant height above the rail.

The frame transoms, or cross-ties, form, at the same time, the field magnet core. It is a steel casting and is bolted to the inside faces of the frames, with a lip over the top to take the shearing stress from the bolts. The core has a soft iron pole face held by the dovetail in the face of the core.

With the lengthening of the frames and the application of the four-wheeled truck, the construction of the end bumper has also been changed. In place of the cast steel design originally used, one of built-up type has been substituted. A steel plate ⅜-in. thick and 44 in. wide x 84 in. long is laid on top of the frames in front of the cab. The end plate is 1¼ in. thick and 13 in. wide, reaching across the end of the machine to a point 6 in. outside the side frames. Here it is bolted to a strong corner casting which is bolted to the frames. At the center, there are two bars, 6 in. x 2 in., set 15 in. apart, that extend back to the transom and which serve the same purpose as the center or draft sills of a car. The space between these is filled by a casting, which serves not only as a means of fastening the end plate to the center bars, but also as a point of attachment for the Gould friction type draft rigging. The end plate is connected to the cover sheet throughout its entire length by 3-in. angles bolted to the former and riveted to the latter with countersunk rivets.



Third-Rail Contact Shoe Support.



Draft Rigging Centering Device.

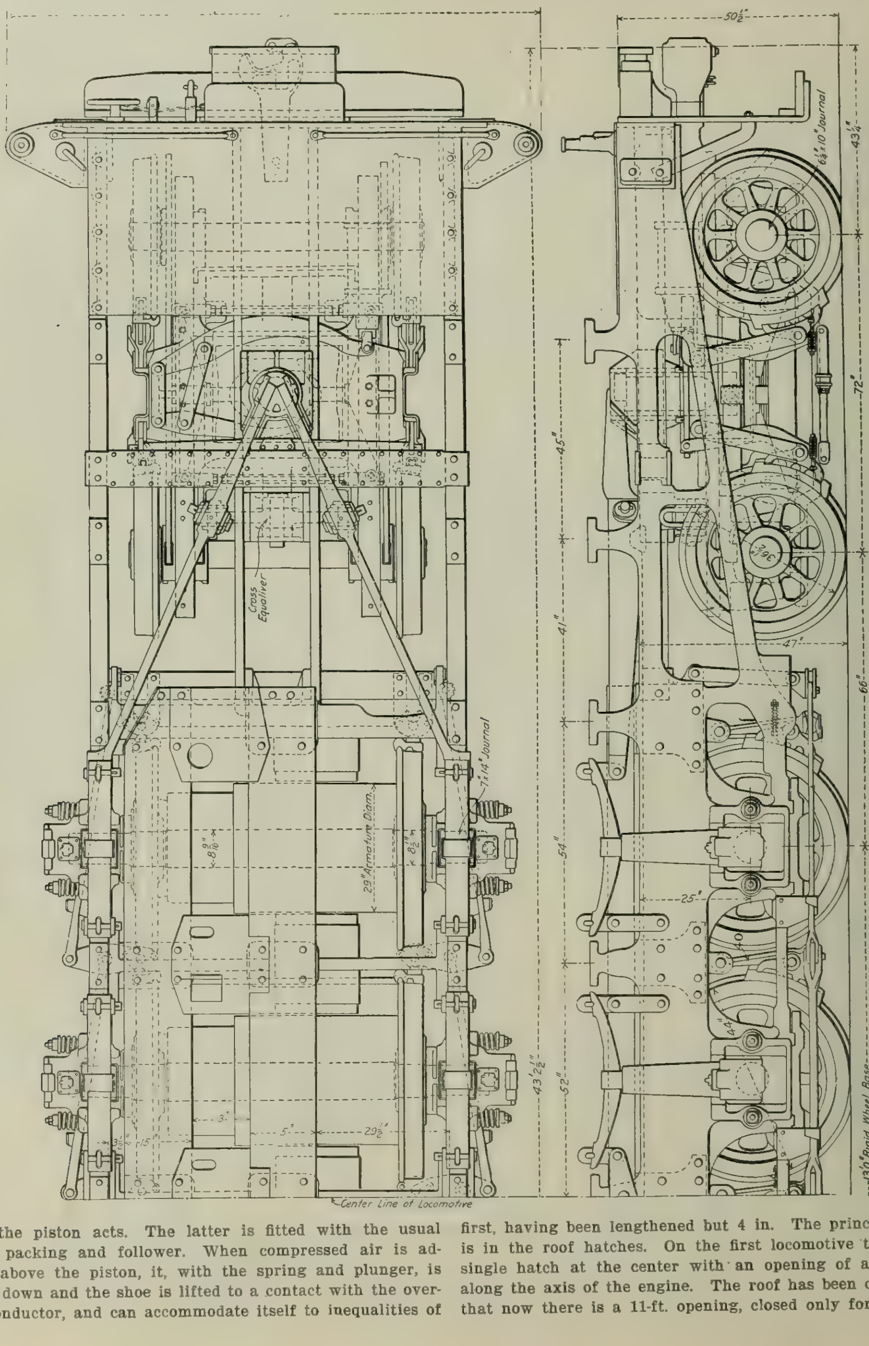
In the original locomotive, the centering device for the draft rigging consisted of a single long spring, set above the coupler shank and confined by the carry iron. A connection was made with the shank by a stirrup straddling it, also with upwardly projecting lugs having bearing on the spring caps, which could move inward only. One spring, acting under compression, served always to move the coupler toward the center. This arrangement has been changed for the one shown. In this, two springs are used, are set on the center line of the drawbar, bearing directly against a slide in contact with the shank. A strap bolted, across their ends, to the carry iron castings, holds the springs in place. This change was made necessary after abandoning the cast steel buffer beam and the substitution of the bars and filler now used.

The hand brake, located within the cab, has the coned, helical winding spool at the lower end of the brake staff, so that an increased pull is obtained with the same effort at the brake handle as the chain is wound up. In addition to this, the pull is doubled by passing the chain through a movable sheave on the brake connection and fastening the end to the floor timbers.

The pantagraph has also been modified. Air pressure is used for raising and lowering the shoe for the overhead contact. The arrangement is shown on the accompanying drawings. The shoe (2) is carried at the upper ends of the knee-joint levers, which have their lower ends pivoted on the cylinder

or base casting (1). These levers also extend in from the pivotal point and are connected at their extremities to a trunnion pin attached to the lower part of the plunger. The weight of the shoe and levers tends to raise this plunger and unless it were held down, the shoe would fall away from the overhead rail. It is held down by the spring above it, against surface and of height. On exhausting the compressed air, the shoe drops away from the contact rail. The electric connections between the shoe and the base or cylinder are maintained by the shunt (3). The range of lift of the shoe is from 1 ft. 9 in. to 2 ft. 7 in. above the base of the cylinder.

The cab remains of practically the same dimensions as at

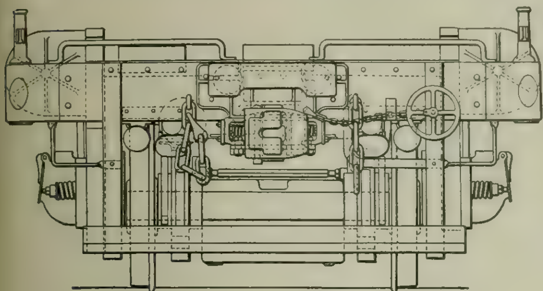


Half Elevation and Half Plan of Running Gear; New York Central Electric Locomotive.

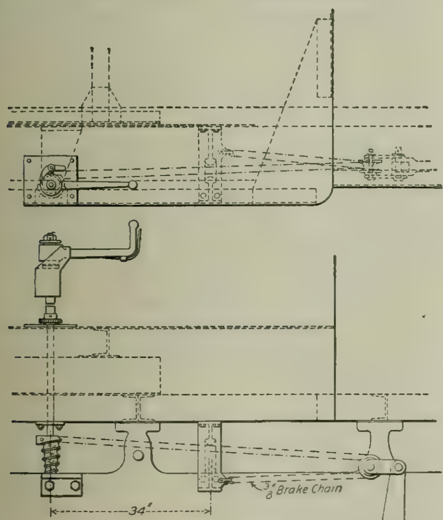
which the piston acts. The latter is fitted with the usual leather packing and follower. When compressed air is admitted above the piston, it, with the spring and plunger, is pushed down and the shoe is lifted to a contact with the overhead conductor, and can accommodate itself to inequalities of first, having been lengthened but 4 in. The principal change is in the roof hatches. On the first locomotive there was a single hatch at the center with an opening of about 40 in. along the axis of the engine. The roof has been cut away so that now there is a 11-ft. opening, closed only for a distance

of 7½ in. at the center by the carline angles. The hatches themselves are closed by covers built up of angles and a plate curved to the form of the roof.

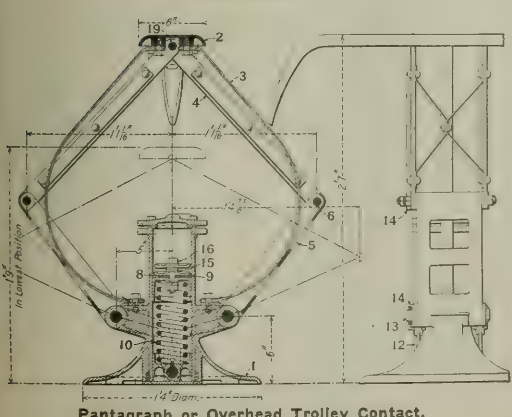
Of the minor details of the cab, the ends doors and lookout window have not been illustrated before. The door is of wood with a bottom panel of steel, ⅛-in. thick. The top panel is formed by a sliding sash with glass that can be raised and lowered and set at any desired height by ratchet locks on either side. The Yale lock is used and a latch that is lifted by a handle on both sides of the door. The lookout window is not only hinged as a whole, but has a swinging sash that can be turned, opened and set in any position independently of the window. The sash closes against the stop plate on the outside of the cab and is held firmly in place by the handle H, forming a nut that can be tightened on a swinging bolt, which fits in the open jaw of the clip B. The swing sash is turned and held by a slide that can be moved and locked at any desired point on a round guide, similar to the front doors of a cab on a steam locomotive.



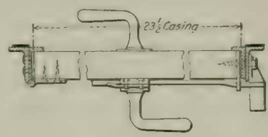
Front Elevation of Running Gear.

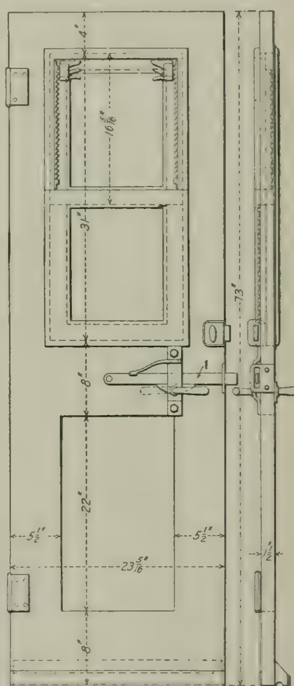


Hand Brake.



Pantagraph or Overhead Trolley Contact.





End Door.

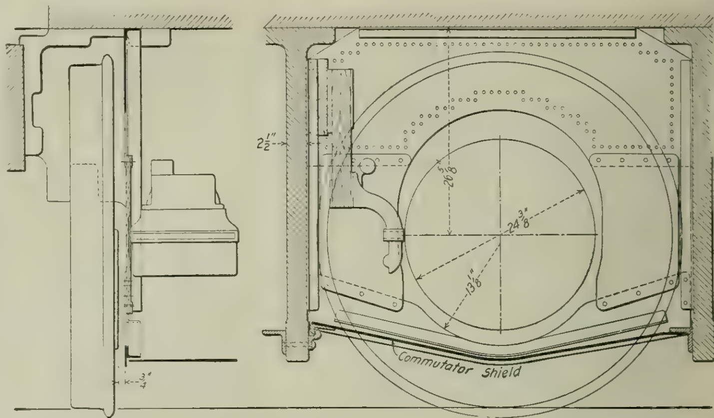
Other details, minor in themselves, but of vital importance to the safe operation of the locomotive, are the commutator shields and the magneto shield. The commutator shields are fastened to the bottom portion of the transom castings in a way to be readily removed for inspection and care of the motors which they protect, as shown in the accompanying illustration. A shield consists of a plate with a lip casting on one edge that hooks over a corresponding lug riveted to the transom. By loosening one edge, the other is readily removed. The magnet shield consists of a simple plate, bolted to the bottom of the transoms. It is 17 ft. 11½ in. long over all, and extends the whole length beneath the motors. This prevents the magnetic attraction of the motors from picking and drawing up into the moving parts, spikes, iron or steel tools that may be lying between the rails.

That there is a strong magnetic force in action whenever the motors are at work is, of course, evident, and the rapidity with which it acts is shown by the fact that a track wrench or spike lying on the ties between the rails will be picked up and held against the magneto shield until the current is shut off, even though the machine may be moving at as high a speed as 65 miles an hour. At this speed, the length of the shield will be traversed in .19 of a second, so that the articles have to be magnetized and lifted about 9 in. in that time. Finally the pilot has been removed and a foot-step put in its place.

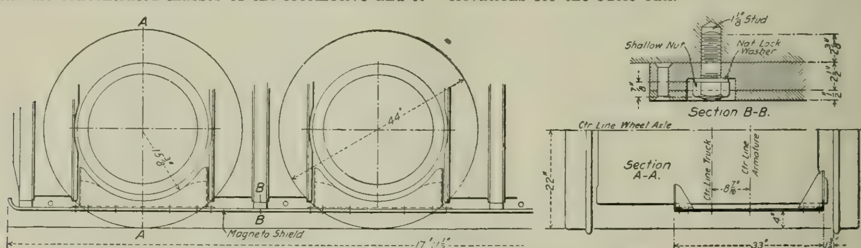
If a comparison be made between these and the first locomotives, it will be seen that the changes made are all those of apparently minor details and yet it was necessary to do this in order to obtain entirely satisfactory running conditions. The principal difficulty that was experienced at first was the moving at high speeds on tangents to which reference has already been made. The efforts of the engineers were first

directed toward this end. The substitution of the four-wheeled for the two-wheeled truck and the use of a center plate, offering some frictional resistance to turning, seems to have accomplished this, so that now the machines are said to run as steadily on a tangent at speeds of 65 and 70 miles an hour as they do at 45 miles, at which latter speed there never was any trouble even with the early locomotives. As to what the lateral action of these locomotives upon the track may be no information is available, nor is there any in existence. That the stresses so imposed are considered to be of some magnitude is evidenced by two things: first, the maximum speed in the electric zone is limited to 40 miles an hour, and second, the condition and construction of the track. Probably upon no other section of railway in the world is the surfacing and maintenance of the track kept so nearly perfect as it is upon that where these engines are operated; and, as for its strength it is as strong as human ingenuity can make it and probably the strongest in existence.

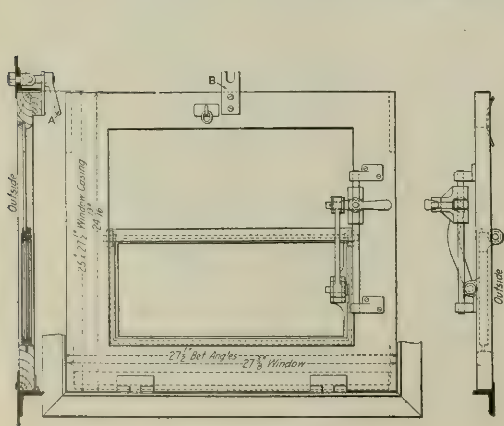
That these lateral stresses are rather severe seems evident from the construction of the machine. In the first place, the center of gravity is very low. Each pair of driving wheels, with its motor weighs about six tons and the center of gravity of this mass is but 22 in. above the rail. Then on the truck there is that heavy cast transom and center plate that must weigh at least 10,000 lbs., and whose center of gravity is not more than 14 in. or 15 in. above the top of the rail. These are the heaviest concentrated masses of the locomotive and it is evident that when nosing occurs or when the machine is being deflected on the passage of a curve the lateral stress on the rail must be high, especially whenever the speed exceeds that for which the outer rail is elevated. In addition to this, there must be some stress imposed by the gyroscopic action of the rotating parts, regarding which there are wide differences of opinion, but apparently no definite information. It is, therefore, proper that the officials should pursue the safe course that they are now following until it has been learned beyond all peradventure and independently of mathematical calculations as to just what physical action these engines may have upon the track when running at different speeds over curves of different radii and with a variety of super-elevations for the outer rail.



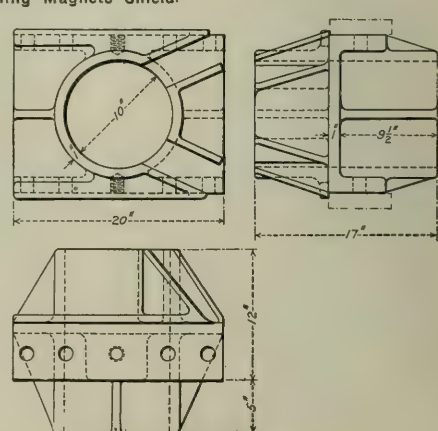
Location of Commutator Shields.



Location and Method of Fastening Magneto Shield.



Lookout Window.



Center Pin Guide.

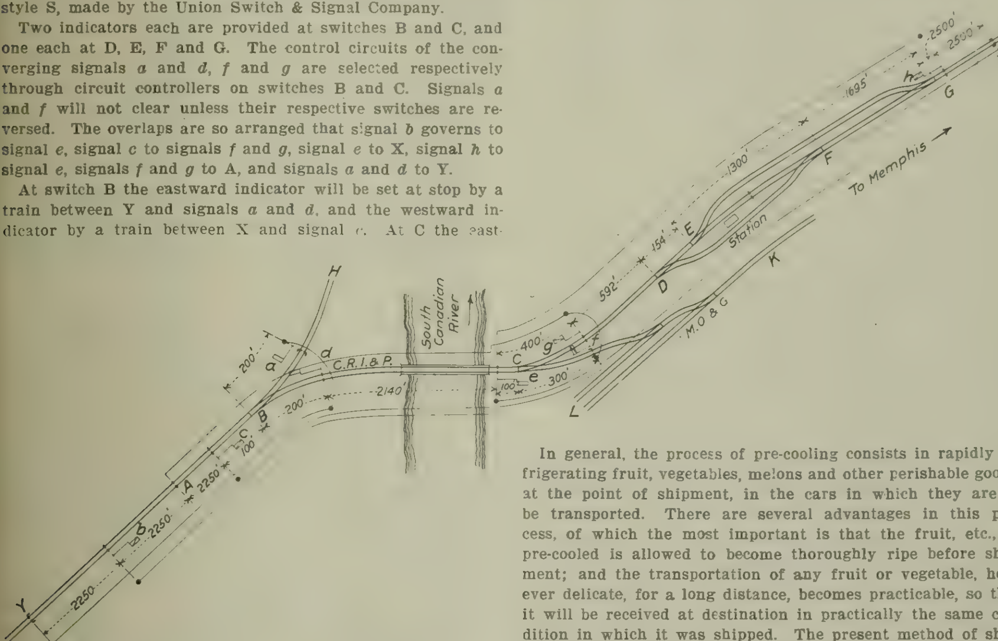
AUTOMATIC JUNCTION SIGNALS AT CALVIN, OKLAHOMA.

At Calvin, Okla., the Missouri, Oklahoma & Gulf, a north and south line, crosses the Chicago, Rock Island & Pacific, an east and west line; and both roads cross the South Canadian river at this point. To utilize a single bridge for both, the M. O. & G. is connected to the Rock Island as shown in the accompanying drawing, and its trains cross the river on the Rock Island bridge. Trains from the north (H) enter the Rock Island track at B, back over the bridge and through switch C to track K, and then proceed southward on track L.

The signaling for these junctions is at present wholly automatic, an arrangement which presumably will be maintained until the volume of traffic is larger than at present. Signals *a*, *d* and *e* give two indications and signals *b*, *c*, *f*, *g* and *h* give three indications, all in the upper quadrant, the last five repeating the indication of the signal in advance. They are all style S, made by the Union Switch & Signal Company.

Two indicators each are provided at switches B and C, and one each at D, E, F and G. The control circuits of the converging signals *a* and *d*, *f* and *g* are selected respectively through circuit controllers on switches B and C. Signals *a* and *f* will not clear unless their respective switches are reversed. The overlaps are so arranged that signal *b* governs to signal *e*, signal *c* to signals *f* and *g*, signal *e* to X, signal *h* to signal *e*, signals *f* and *g* to A, and signals *a* and *d* to Y.

At switch B the eastward indicator will be set at stop by a train between Y and signals *a* and *d*, and the westward indicator by a train between X and signal *e*. At C the east-



Automatic Block Signals at Calvin (Junction) Oklahoma.

ward indicator will be set at stop by a train between Y and signals *f* and *g*, and the westward indicator by a train between X and signal *e*. The indicators at switches D, E, F and G will be set at stop by a train between A and the switch in question.

Trains of the M. O. & G. must not enter upon the Rock Island track at either switch if either indicator at that switch indicates stop. If both are clear, the trainman opens the switch. Thereby, in the case of switch B, for example, he sets signals *b*, *c*, *d* and *g* at stop; and he clears signal *a*. This also sets signal *h* at caution. In the case of switch C, signals *c*, *e*, *g* and *h* are set at stop, and signal *f* is cleared; and signal *b* is set at caution. Thus in either case full protection for the movement is provided. Rock Island trains from both east and west are governed by the automatic signals.

All apparatus was installed by the Rock Island signal forces. The switch indicators are the Union Switch & Signal Company's upper quadrant semaphore type. Polarized line circuits are used for the control of all of the three-position signals. Track relays are of 4-ohms resistance; line relays of 500 ohms. The Hall Signal Company's type E-B relay is used for the track and neutral line circuits. The polarized line and slow-acting relays are of the "Universal" type, made by the Union Switch & Signal Company. The slots of the signals have a high and a low winding and are not slow acting. Slow releasing relays of 1,000 ohms resistance are provided to hold the circuits closed while the pole changers act.

PRE-COOLING PLANTS OF THE SOUTHERN PACIFIC IN CALIFORNIA.

The Southern Pacific is building in California two plants for pre-cooling fruit preparatory to shipment to eastern markets. The object and advantages of pre-cooling, as well as the experimental work that has been done in the development of processes, have already been described in these columns. However, these points will be gone over briefly again in order that the working of these plants will be understood.

In general, the process of pre-cooling consists in rapidly refrigerating fruit, vegetables, melons and other perishable goods, at the point of shipment, in the cars in which they are to be transported. There are several advantages in this process, of which the most important is that the fruit, etc., so pre-cooled is allowed to become thoroughly ripe before shipment; and the transportation of any fruit or vegetable, however delicate, for a long distance, becomes practicable, so that it will be received at destination in practically the same condition in which it was shipped. The present method of shipping fruit in ice-cooled cars is, of course, a vast improvement on no refrigeration at all; but it is open to the very great objection that the temperature of the car is so gradually reduced by icing that it takes two or three days before the entire contents of the car are cooled down to a point at which decay is arrested, for which reason it is necessary to ship perishable goods in a more or less unripe condition to allow for further ripening in transit. It is evident, therefore, that any process which can greatly expedite the initial refrigeration will permit of the shipment of fruits, melons, etc., in just so much more perfect condition as regards ripeness. This is what pre-cooling does; that is to say, by the use of this method a carload of fruit may be so quickly brought below the point at which decay is arrested that the contents may be fully ripe when shipped, and may be delivered to the consignee in practically the condition in which they are picked.

Besides the element of temperature, the emanations from the fruit itself are aids to decay, and it has been found of great advantage to be able not only to lower the temperature of the contents of the car, but to withdraw therefrom the heated air given off by the contents, which is charged with foul gases and emanations. What is known as the "intermittent" system

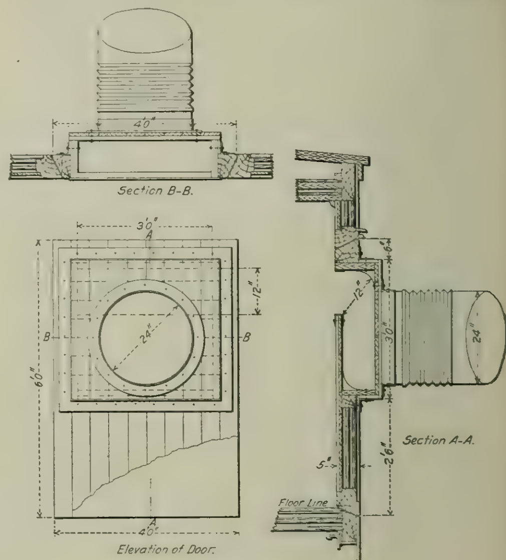
is used by the Southern Pacific, this process being devised to accomplish both refrigeration and purification. The apparatus for this purpose forces air through a false door or other aperture at or near the middle of a car and distributes this air, by means of suitable deflectors and baffles, through the boxes of fruit packed in the car. The cool air passes into the car in a continuous stream, and is withdrawn from the end hatches by means of temporary connections. At suitable intervals the inlet is closed for a brief time and an exhaust maintained in the outlet pipes, so that a partial vacuum is created in the car. During this part of the process the exhausted air is discharged into the atmosphere. Circulation of cold air through the car is resumed by opening the inlet and closing the exhaust to the outer air. The cold air, after circulating through the car, is passed by suitable fans over and through a coil of cooling pipes so as to condense any moisture or essential oils emanating from the fruit which may be left in the air after the vacuum part of the process. The amount of vacuum, the frequency of its application, and the length of time during which it is maintained should vary with the kind and condition of fruit, vegetable, etc. Thus, by this process not only are the contents of the car refrigerated, but they are also surrounded by sweet, clean air, sterilized by refrigeration. After pre-cooling, the cars are fully iced as usual, so as to maintain a low average temperature during shipment. This preserves the delicate flavor of fruits, berries and vegetables shipped for long distances, so that they arrive in a condition not heretofore possible under ordinary refrigerating methods; and there is evidence to show that the contents keep better when exposed for sale than fruit which has been shipped in the ordinary way.

The two pre-cooling plants are being built at Roseville and Colton, the former being near Sacramento and the latter east of Los Angeles. The Roseville plant will take care of all fruit shipments from the northern and central parts of the state, and the Colton plant will serve the great citrus fruit region to which it is adjacent. The Roseville plant will have only half the capacity of the other at the outset. Its capacity can be doubled readily by duplicating the initial installation.

Plans of the Colton plant are shown herewith. The ground plan shows an ice-making plant with a pre-cooling building at each end, a track on each side, and connections for 40 cars. The ice-making plant was already in existence, its capacity being more than sufficient to supply the road's icing needs for this part of the state. Since it produces the most of this ice during the winter months it has been partially idle heretofore during the summer months. Using it in connection with the pre-cooling plant will enable it to be kept busy the year through.

shown in the vertical section, a deflector is placed opposite the mouth of the pipe to throw the air current upward. The fruit is so packed as to leave an open space at the top of the car opposite the door, and in this space a special deflecting device is placed during cooling to direct the air currents among the boxes of fruit.

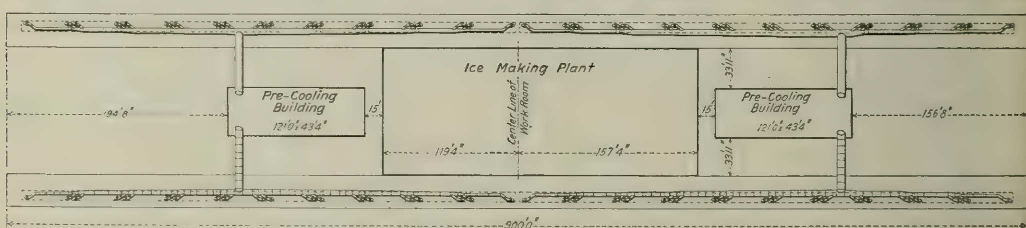
The temperature of the car is reduced to as low a point as possible without freezing the contents, this minimum depending on the particular fruit or vegetable in the car. Oranges, for example, will stand a temperature of 24 deg., while other fruits cannot safely be brought below 32 deg. A thermostati-



Details of False Doors.

cally regulated valve is placed in each inlet to close the same automatically at a predetermined temperature. This will not happen to all of the cars simultaneously, of course, and the attendants are thus enabled to remove the apparatus from the cars which have attained the desired temperature while the remainder are being brought to that point.

It requires from three to four hours to cool a car to the desired point. It will be observed from the plan view that the 40 cars are arranged in four equal lots. Handling these separate lots in rotation permits practically continuous operation of the plant.



Ground Plan of Pre-Cooling Plant at Colton; Southern Pacific.

The pre-cooling buildings, which are 121 ft. x 43 ft. 4 in., are built of reinforced concrete, and the mechanical equipment is the best. This includes the exhaust fans, which are motor-driven, the flexible piping, and the brine coils around which the air is passed, and which are therefore enclosed in an air-tight chamber.

In the description of the process, reference was made to a false door through which the cold air is forced into the car. A drawing of this door is included in the illustrations. As

The system used by the Southern Pacific is the Sprague-Edson. The pre-cooling plant work is in charge of C. M Secrist, General Manager of the Pacific Fruit Express Co., the refrigerator car line of the Southern Pacific. A. Faget is Consulting Engineer on the pre-cooling plants. We are indebted to J. D. Isaacs, Consulting Engineer of the Harriman lines, for the foregoing information.

General News Section.

The Kansas State Board of Health has issued an order requiring that on and after September 1 next common drinking cups shall not be used in railway trains or stations or in public and private schools and state educational institutions.

David C. Barrow, Chancellor of the University of Georgia, has been chosen the third arbitrator to consider the settlement of the strike of firemen on the Georgia Railroad. The other arbitrators are Congressman Hardwick and Hon. Hilary A. Herbert, former Secretary of the Navy.

Train No. 97 of the Canadian Pacific was stopped by four masked robbers on the night of June 21 near Kamloops, B. C., but no valuables were taken. It is supposed that the robbers had intended to stop train No. 5. The robbers escaped by crossing a lake in a boat. They were pursued by a large number of men.

The Boston & Maine, which for many months has been considering a plan to pay pensions to employees, has secured the passage by the Massachusetts legislature of a law authorizing such action by the company; but, as we are informed by an officer of the road, no decision has been reached as to what is to be done or when action will be taken.

As a bit of summer reading we copied last week, from another paper, the statement that Mr. Harriman was going to make a park, pleasing to the eye, from Omaha to Oakland, by beautifying the right of way, the whole distance, with broad strips of green sward and with trees. The basis for the item, so far as it has a basis, is that in Nebraska the Union Pacific allows farmers to cultivate unused ground on the right of way, and that these farmers plant a good deal of alfalfa.

The downtown tunnels of the Hudson & Manhattan, which run from the Hudson Terminal buildings in New York under the Hudson river to the Pennsylvania station in Jersey City, are to be opened for operation on July 19. An elaborate celebration will be held at the Jersey City terminal. The entire tunnel system, which runs to the Erie and Lackawanna stations, as well as to the Pennsylvania station, will be completed and ready for operation on July 19, but inability to obtain sufficient cars from the builders will delay the opening of the Erie and Lackawanna tubes until August 2.

The University of Michigan has issued a bulletin (Volume X, No. 20), announcing the beginning at the commencement of the next term of a four-year course in railway administration. The Department of Political Economy, of which Professor Henry C. Adams is the head, will furnish the larger part of the instruction; but the literary department, the law department and the engineering department will co-operate. Students must be admitted to the literary department as candidates for a degree, or else must come into the graduate school under the usual conditions. E. D. Jones is secretary of the committee on business administration, which has charge of the new course.

On the Bessemer & Lake Erie for a number of years the flags carried on the rear of trains as markers have been yellow, a practice which, unlike that prescribed by the standard code, is consistent with the use of yellow for caution in fixed signals; but this consistent practice is now abandoned, and the inconsistent practice of using green flags has been adopted—this for the purpose of making the signals consistent with those of the Erie Railroad, on which the inconsistent practice of the standard code is in vogue. The Erie runs trains over a part of the Bessemer & Lake Erie. Green is also substituted for yellow in the sides and fronts of the marker lamps, and the change in both flags and lamps takes effect also on the front ends of engines.

The White Star steamship "Cedric," which left New York for Liverpool Saturday, June 12, landed its London passengers and mail on Sunday, the 20th, at Holyhead, and they reached London at 5.48 p.m., about the time that the steamship arrived at Liverpool. The vessel arrived at Holyhead at 11.23, landed the passengers by noon, and these were taken to London by three special trains. The White Star line has not been able to secure the accommodations at Liverpool necessary to despatch its westbound steamers at a satisfactory hour, and the Holyhead experiment will be tried with other vessels.

The Cunard steamship "Mauretania," which left New York on Wednesday, June 16, reached Liverpool at 10:15 on the night of Monday, the twenty-first, so that passengers who took the special train for London that night reached the metropolis in five days, eight hours, from New York. The time of the "Mauretania" from Sandy Hook to Daunt's Rock was 4 days, 17 hours, 21 minutes, 50 minutes better than the best previous eastward record, which was made by the "Mauretania" a couple of weeks ago. The run was 2,933 knots, or an average of 25.88 knots an hour.

A Free Advertisement for the Argentine Central.

[A. B. Hyde, of Denver, in New York *Evening Post.*]

Gray's Peak, Colorado, is 14,300 ft. high, with a horizon wider than any other on our planet, and at a height reached by no other railway, not even by the one crossing the Andes in Peru. From Denver one goes 50 miles up the Clear Creek Canyon (by the Colorado & Southern), grand in mountain scenery; but at Georgetown sublimity begins. We formerly here took saddle; now we have the Pullman of the Argentine Central. This marvel of engineering through chasms, over ridges, in and out toward every point of the compass, gives the fullest acquaintance with "awful" mountain scenery. It now leaves you in the great Waldorf mining property, but it will soon be complete to the summit, three miles onward and upward. * * * Here the sun truly and visibly *comes up*. It visibly *goes down*, and the stars seem at your finger tips! Here will soon be a hostelry, an observatory with telescope. From Denver at 8 a.m. and back at evening one sees the world's choicest of mountain scenery and by night the heavens declare the Endless Glory.

Negro Firemen.

In commenting on a recent editorial on negro firemen in the *Railroad Age Gazette* the *Railroad Herald* of Atlanta, Ga., says in part:

"We think the *Age Gazette* was more bent on criticism than a correct editorial analysis of the situation, and we might begin with the grave disclosure which the *Age Gazette* also made in the same paragraph, viz.: that the negro's ineligibility as an engineman is due to social reasons wholly. The correct view is, we think, that railways in the South have not committed themselves to any social policy in this matter. The social mingling is a question which the railways have not entered into, but as we now see from this strike, the question is very decidedly raised by the firemen's brotherhood.

"It seems to us that the position of southern roads in regard to using negro firemen is purely commercial, with a strong admixture of common humanity. The negro comes to the railway cheaper than the white firemen. Then, among business men universally in the South there is no disposition to expel him from industrial life just because he is a negro. So, he is given the work he is capable of doing, but not given that which it is thought best not to trust to the senegambian brain.

As to the negro fireman being a detriment to the material from which enginemen are drawn, the negro can't have much weight in this respect as long as he shall not be drawn. There

are some white firemen who, too, for reasons deeper than the epidermis, are not apt to be enginemen. Why not say that their employment as firemen cheapens the engineer of the future?

In the North all white firemen must be used, and some even with the social ban or the race barrier not upon them will yet not become enginemen. Certainly it is reasonable to say that a railway might count upon having in its employ an average of non-promotable firemen.

Joint Interchange and Inspection at Union Stock Yards, Chicago.

The committee of car service officers, which (as stated by the *Railroad Age Gazette* in its issue of January 15, 1909, page 132) was appointed a few months ago to investigate and report on the advisability of establishing a bureau or bureaus for joint interchange and inspection of cars at Chicago, has prepared a report favoring the establishment of such a bureau for dealing with cars inspected and interchanged at the Union Stock Yards. The report of the committee, of which J. M. Daly, Car Accountant of the Illinois Central is Chairman, was made to a committee of general superintendents, of which C. L. Ewing, General Superintendent of the Illinois Central is Chairman. The data on which it is based were collected by the Car Efficiency Committee. A committee of mechanical department officials, representing the Chicago Car Foremen's Association, after going into the question thoroughly, also recommended to Mr. Ewing's committee that a joint arrangement be made.

The conditions at the Union Stock Yards are perhaps unique, and the committee thought that this would be a favorable point at which to make the first trial of the proposed system in Chicago.

About 2,500 cars are interchanged daily at the Union Stock Yards between the Chicago Junction Railway on one side and nearly all the railways entering Chicago on the other, not including loaded stock cars in, and empty stock cars out, which are accounted for on a trackage basis and are not interchanged. The arrangements of the tracks of the various railways is illustrated by the accompanying drawing. The Chicago Junction Railway receives from all lines in its Ashland avenue yard. It delivers to seven western roads at its 47th street yard, and to all others—mostly eastern roads—at its Loomis street yard. The 47th street and the Loomis street yards are about a block apart, while the Ashland avenue yard is about a mile distant from these and is so situated that most of the trains of western roads pass through it in taking cars from the receiving tracks at 47th street and Loomis street to the yards of the railways themselves.

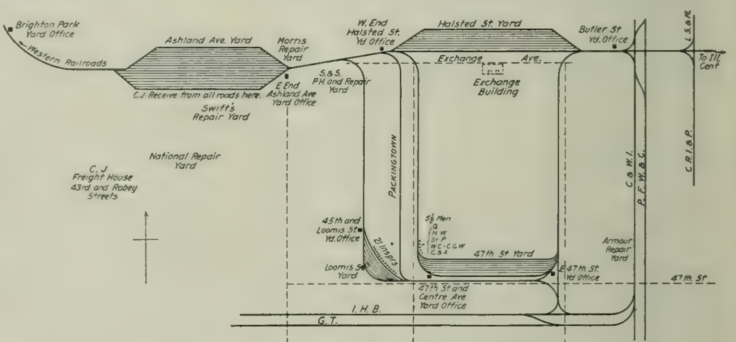
With few exceptions everything except live stock going to the Union Stock Yards district is delivered to the Chicago Junction, which in turn delivers the cars to the industries in that vicinity. Loads originating at the 160 industries in the territory and destined to points beyond its limits are hauled by the Chicago Junction from the loading tracks and placed on the receiving tracks of the several roads. The switching charge is paid and a reclaim is allowed to the Chicago Junction for each load that is brought in; and this is doubled when a car is reloaded out. The Chicago Junction employs 14 yard clerks, one or more being on duty both day and night at the leads of important yards. Separate clerks are employed by it to take records and to re-seal cars requiring seals.

In the case of cars moving from the Chicago Junction to the trunk lines the practice is for the various roads to notify the Chicago Junction when light repairs to cars are necessary before they can be moved, and the C. J. decides whether to repair them where they stand or to require their removal to its repair track, which is nearby. Light repairs required on cars belonging to the packers are brought to the attention of the owners, who, unless transfer of the contents is necessary, usually repair cars where they stand, for which purpose they keep a force of repairers near at hand.

The data gathered show that the inspectors of the roads other than the Chicago Junction are inspecting an average of 36½ cars a day each. This is about one-third of their capacity and the cost per car is about 6 1-5 cents. On the other hand, the inspectors of the Chicago Junction inspect each about 100 cars a day at a cost of about 2½ cents per car. The excessive expense to the trunk lines is not due to greater cost of labor or materials, but to independent inspection by each road regardless of the number of cars handled. Despite the fact that nearly two-thirds of the average capacity of the inspectors employed by the railways is not utilized, the large lines are liable at any time to receive more cars than can be inspected properly within the time available. As much of the freight received from the Chicago Junction is perishable and is hauled long distances in fast trains, the most thorough inspection is needed.

The investigation showed that the inspectors for the mechanical departments and the yard clerks of the various trunk lines, take the numbers of all cars received and keep a complete record of them. The yard clerks who are usually located in the same or an adjoining room, take exactly the same record, except that they omit defects and note seals. This well illustrates the amount of duplication of work.

It was ascertained that hardly two roads had the same system of compiling and disseminating information. The reports to car accountants were found to be more or less incomplete and inaccurate as to number, initials and dates. The reports to the mechanical departments were found to be more satisfactory. Three roads which inspect cars when delivered at Ashland avenue exchange records with the Chicago Junction. They thus incur the expense of inspection and yet settle on the Chicago Junction's records. With few exceptions the roads are dependent on the reports of the Chicago Junction for data regarding the hours of both deliveries and receipts of interchange at night, although this is the critical time under per diem rules.



Chicago Stock Yards—Railway Track and Connections.

The committee believes that a reduction might be immediately effected in the number of employees under a plan of joint interchange and inspection that would save the roads an aggregate of at least $1,000 a month, and it believes that additional economies could later be affected. What is more important, the work would be much better done.

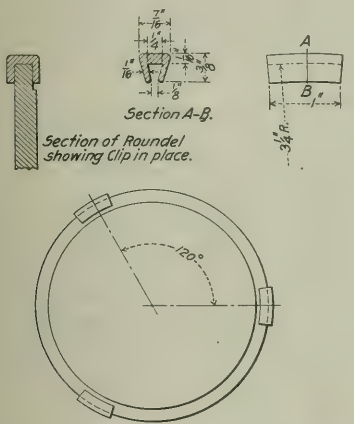
Some of the features of the bureau plan proposed are as follows: (1) All employees are to be employed by the manager. (2) All clerical work will be taken from inspectors and provided for in the bureau office, except that they will be required to keep their present book record, to which will be added a record of seals and of hours cars are received. (3) Inspectors' reports will be the basis for all per diem and record purposes. (4) A book record will be kept in the bureau office covering all cars interchanged which will answer for both the mechanical and the transportation departments. (5) Inspectors' records will be collected at frequent intervals.

day and night, and per diem reports will be ready for mailing at the close of each day. (6) Inspectors' reports to the bureau of the date and hour cars are placed on the tracks of one road by the engine of another will serve as a basis for per diem reports for both receiving and delivering roads, thus avoiding discrepancies and also furnishing data for defect cards. (7) The bureau will issue defect cards when due. This important work will be simplified and much clerical work, especially by the Chicago Junction, dispensed with because of the fact that records for all interchange within the district will be at one point.

It is believed that under the bureau plan, with close checking of available equipment, some arrangement can be made by the roads whereby the Chicago Junction will either switch the empties from one road to another or permit the roads themselves to do so to fill requisitons by the industries located in the district from empty cars already standing in the yards there.

Rubber Clip for Signal Light Roundels.

The accompanying engraving shows a device recently developed and adopted by the signal department of the Chicago, Rock Island & Pacific to obviate the use of putty for holding



signal roundels in place. It consists of a small rubber clip of dimensions as shown. Three of these are required for each roundel. They are easily and quickly applied and are a great convenience, especially in cold weather, when putty solidifies and fingers are numb.

New Subway Proposal in New York.

The Bradley-Gaffney-Steers Company has presented to the State Public Service Commission an offer to build with private capital the Broadway-Lexington avenue subway from the Battery to the Bronx, a two-track connecting subway in Canal street, the Lafayette avenue-Broadway route in Brooklyn and two spurs of the Broadway-Lexington avenue route along Jerome avenue and 138th street in the Bronx. The estimated cost of this work is $83,000,000. The company also offers to operate the bridge loop subways and the Fourth avenue (Brooklyn) subway if built by the city.

The company stipulates that the city complete the bridge loop subway and build with its own money the first section of the Fourth avenue subway to Ashland Place, Brooklyn, and eventually complete the Fourth avenue route to 40th street, as already planned.

The proposed routes are as follows:

Section A—Extending from the Battery, through Church and Vesey streets, with double tracks, to Broadway; thence, with a four-track double-deck system, northerly along Broadway to 10th street; thence through private property to Irving Place; thence northerly along Lexington avenue, under the Harlem river, to Mott avenue and its juncture with 149th street, following substantially the line, plans and specifications of the Broadway-Lexington avenue subway, as laid out by the Commission.

Section B—Two tracks in the existing subway known as the subway loop, now nearing completion, and thence across the Manhattan and Williamsburg bridges, with necessary connections, and a terminal in City Hall Park.

Section C—A two-track subway, connecting with Sections A and B, along Canal street.

Section D—Two tracks in a subway from the eastern terminal of the Manhattan bridge, along Flatbush avenue extension and Fulton street, to Ashland Place, in the borough of Brooklyn, this being a portion of the route laid out by the Commission, known as the Fourth avenue subway.

Section E—A two-track subway along Fulton street from Ashland Place to Lafayette avenue, thence easterly along Lafayette avenue to Reid avenue; thence northerly along Reid avenue to Broadway (Williamsburg); thence westerly along Broadway to the Williamsburg bridge.

Section F—A two-track subway or elevated railroad northerly along Jerome avenue, substantially as established by the Commission in its proposed Broadway-Lexington avenue route.

Section G—A two-track subway or elevated railroad easterly from Mott avenue, in the borough of the Bronx, along 138th street and northeasterly, substantially as established by the Commission in its proposed Broadway-Lexington avenue route.

Section H—The Fourth avenue subway, from the intersection of Ashland Place and Fulton street southerly, in the borough of Brooklyn, as laid out by the Commission.

Not only does the company offer to build with its own money; it also says it will take the city in as a partner and divide the profits after deducting operating expenses, maintenance charges, amortization payments, rentals, interest on cost of construction and equipment, etc.

Travis H. Whitney, secretary of the Public Service Commission, is quoted as authority for the statement that the B.-G.-S. Company has good financial backing, and Chairman Willcox of the Commission is quoted as saying that the plans for the proposed routes are practically all complete, in every instance the consents of owners have been obtained. The Commission will draw up a form of contract and send the offer promptly to the Board of Estimate and Apportionment for concurrence.

Railway Development in Asia.

More attention has been given to the advance of railroads in Asia Minor than to their development in Greater Asia. Now that Russian enterprise and the momentous issues that were bound up with the building of the Trans-Siberian have retired into the background, no more significant contribution is being made to the world's progress than the railways which are being planned or constructed in the southern part of the continent. Obviously, had commercial considerations dominated the construction of a trans-Asiatic road, the southern route would necessarily have been preferred. Here there is trade and population, and the distance of two thousand miles across the Indian peninsula is already traversed by railway. In Central Asia the Russian railway builder was at work more than a quarter of a century ago. It took Russia ten years to subdue the wild Turcoman tribes of Trans-Caspia, but that done, the work of connecting the Caspian by railway with Mrv, Kokara and Samarcand was promptly undertaken. The first 700 miles of this railway were laid across a howling wilderness on which were but four small oases. It was begun in 1880; was completed to Samarcand and was paying its expenses by 1890. Since then trade and traffic have developed rapidly, and communication with Russia proper has been so far perfected that a traveler from Moscow may reach the Afghan frontier within 60 miles of Herat in five days. Ashkabad, the capital of Trans-Caspia, and an important railway center for the Russian lines, is only 160 miles northwest of Meshed, the capital of the Persian province of Khorassan. Here it seemed as if railway building in that direction were to be permanently barred. Some twenty years ago, when Russia beat England in the struggle for influence at Teheran, the Russian Minister demanded and received from the Shah

the sweeping concession against progress that no railway should be allowed in Persia. As Mr. Truxton Beale, formerly American Minister at Teheran, put the case: "Persia was to lie fallow, free from foreign entanglements, until Russia saw fit to make use of her."

But now that an agreement has been reached between Russia and Great Britain in regard to their respective spheres of influence in Persia, the veto on railway construction has been lifted. As the British sphere is in Southern Persia, the way is at length opened for the construction of an all British railway across Southern Asia to the frontier of China. Some recent developments on the other side of Asia will probably tend to hasten this consummation. A treaty between Great Britain and Siam was signed on the 10th of March, under whose provisions the Federated Malay States, which are under British sovereignty, agree to advance to Siam, on easy terms, $20,000,000 for the purpose of constructing a railway from Bangkok southward to the Malaysian boundary. This line when completed will furnish a through service between Bangkok and Singapore, instead of the tedious sea journey, which is at present the only means of communication. The treaty also provides for a renunciation of the suzerainty exercised by Siam over three states adjoining her northeastern territory in favor of Great Britain, and there is thus established a continuous stretch of British posessions from Singapore to the Persian Gulf. The bearing of this fact on the possibility of an all British South Asiatic railway is sufficiently apparent. The first link of such a system must obviously pass through Arabia, but once it has emerged on the Persian Gulf it only needs the intervening space up to the Indian frontier to be bridged to complete a continuous line to the borders of China, from which a branch will naturally connect with Singapore. France is working up to the Chinese border from Hanoi and Saigon. There is already designated on the French maps a completed railway from Hanoi to Lao-Kai, on the border of the Chinese province of Yunnan, while a line under course of construction is marked running from Lo-Kai to Yunnan-Fu, the capital of the province into which the French railway concession extends. The Government of French Indo-China has been authorized to raise a loan of $10,317,000 in order to meet the expenditure charged to the budget of that dependency in connection with the construction of the Yunnan Railway.—*Journal of Commerce, New York.*

Wholesale Prices in 1908.

The annual report on wholesale prices, published by the bureau of labor, shows that the average price of 258 representative staples for 1908 was 5.2 per cent. below that for 1907 —the year of highest prices during a 19-year period. It exceeded the average for every other year of the period, but was only 0.2 per cent. higher than the average for 1906. As compared with 1897, the year of lowest prices during the period, the advance in 1908 was 36.9 per cent., and as compared with the average for the ten years, 1890 to 1899, the advance was 22.8 per cent.

The decline from the prices shown by the October, 1907, data continued without interruption until August, 1908, with the exception of a slight advance in July. Prices were at their lowest point of the year 1908 during the month of August, when they were 1.1 per cent. below the average for that year and 7.3 per cent. below the average for October, 1907, the highest point in the 19 years covered. The prices in December, 1908, show an advance of 1.8 per cent. over the prices in August.

Of the 258 articles for which wholesale prices were obtained, 162 showed a decrease in the average price for 1908 as compared with 1907, 33 showed no change and 63 showed an increase. In farm products there was a decrease in price of 2.9 per cent. in 1908 below the average for 1907, this decrease being the least of any of the seven groups showing a decrease; food increased 2.4 per cent. in price; cloths and clothing decreased 7.7 per cent.; fuel and lighting decreased 3.1 per cent.; metals and implements decreased 12.6 per cent.; lumber and building materials decreased 9.4 per cent.; drugs and chemicals increased 0.7 per cent.; house furnishing goods decreased 3.8 per cent., and the miscellaneous group decreased 5.7 per cent.

The Canadian Pacific Safety League.

The Canadian Pacific Safety League is the name of an organization of employees of the road named, which has been formed at West Toronto; and at one of its first meetings, a "smoking concert" which was held on May 21, about 300 employees were present. General Superintendent James Oborne and other officers were present, and Mr. Oborne made a felicitious speech. The members are said to have smoked the pipe of peace—though we do not learn that there had been any enmities which needed to be settled—and, as we are informed by a member, there was a splendid program of music and elocution.

The association was started a few months ago at the instance of a few members, of whom S. Jackson was the leader. It is proposed to have frequent meetings for the discussion of good railway practice, and the answering of knotty questions concerning the rules. The members are determined to stick to correct principles in their discussions, and to keep in close touch with the officers, so that all decisions shall be confirmed authoritatively. At the ordinary meetings it is intended that the proceedings shall be kept sufficiently private to encourage all members to speak freely, even if they have complaints to make; and measures will be taken to insure impartial treatment of all matters. It is understood that officers of the company are not to be present, except when invited. In short, this seems to be a scheme to dignify and make useful that ancient American institution the "round house committee." Thirteen meetings for discussion have been held already and the members believe that from them they have received much benefit.

A League has also been formed at Havelock.

The Business of the Express Companies.

During the first five months of the year the four leading express companies have transacted business which shows an advance of from 10 per cent., in the case of one company, to 20 per cent. in the case of some of the others, as compared with the operations of a year ago. The condition of the express companies is one of the best guides to the general conditions of the country. An improvement in commerce and trade is instantly reflected in the returns of the express business, and as a general rule the periods of depression are quickly felt. The most notable exception to this was the crisis of 1907-8, when the express companies were comparatively little affected by the panic conditions and dividends were not diminished.

The present increase in activity, which on the average may be estimated at about 17 per cent., is a fairly accurate barometer of trade and commerce. It is stated by officials of the principal companies that the progress is felt in every department of the express business, not only in the carrying branch but in the money orders, travelers' checks, etc., as well.

The value of express companies' stocks as dividend payers in the past five years is shown in the following table:

	Per cent.				
	1908.	1907.	1906.	1905.	1904.
Adams Express Co....	8	*10	10	10	10
American Express Co.	12	12	9½	8	8
United States Exp. Co.	4	5	4	4	4
Wells, Fargo & Co....	10	10	9	8	8

*Also $200 in bonds.

The fluctuation of market quotations for express stocks is shown in the following table, which gives the lowest point touched during the recent crisis and the highest reached in the present advance:

	Highest.	Lowest.
Adams Express Co..................	199¾	150
American Express Co................	230	175
United States Express Co............	99	70
Wells, Fargo Co.....................	330	250

A curious fact which throws a light upon public opinion of this class of business enterprise is that while the panic fears of 1907-8 were throwing banks and trust companies into confusion, a great many persons, especially in the West, entrusted their savings to the express companies, in the belief that they would be safer there than elsewhere.

The four leading companies are devoting a great deal of

attention to expansion of connections, and the result of all this is considerably greater gross earnings. As an example of this fact it may be mentioned that the United States Co. has recently introduced a through car service between St. Louis and New York, and this is reported to have led to an increase of at least 20 per cent. in the company's business over that section.—*Wall Street Journal.*

A 5,000-Ton Revenue Train Load.

On Monday, June 14, a freight train of the Pennsylvania Railroad loaded with 4,451 tons of coal was run from Altoona, Pa., eastward to Enola (near Harrisburg), 124 miles, in 7 hours, 15 minutes, or at an average speed of 17 miles an hour. One stop was made for water. The train consisted of engine No. 1113, weighing 241,000 lbs.; 85 steel gondola cars and a caboose. The total weight of the train was 6,151 tons, and its length from the pilot of the locomotive to the rear platform of the caboose was 3,000 feet, or about three-fifths of a mile. The company had made a number of road tests previously, but this performance surpassed all others. The other runs were:

Date.	Engine.	No. of cars.	Total weight of train.	Time
June 8	No. 3212	75 steel.	5,307 tons.	10 hrs. 21 min.
" 8	" 2903	75 "	5,348 "	8 " 2 "
" 8	" 451	75 "	5,348 "	10 " 12 "
" 3	" 3212	85 mixed.	4,852 "	12 " 30 "
" 5	" 1641	86 "	4,922 "	9 " 42 "
" 8	" 2905	87 "	4,623 "	10 " 21 "

These runs were made possible by the fact that the company has now reduced all grades and compensated all curves on the Middle division, so that the ruling grade eastward is only .2 per cent., or less than 12 ft. to the mile. The last step in this scheme of improvements was taken lately in the opening to service of the four tracks between Mt. Union and Ryde, 11 miles. Formerly it was necessary to have a pusher over some of the grades. Now a single locomotive unaided accomplishes these record results.

Engine 1113 is class H8b, four pairs of driving wheels and a leading two-wheel truck; diameter of driving wheels, 62 in.; cylinders, 24 in. x 28 in.; steam pressure, 205 lbs. per square inch; heating surface, 3,839 sq. ft.; grate area, 55.12 sq. ft.; tractive power, 42,661 lbs.

On June 18 the same engine took a longer train, 94 cars, over the same course in 7 hours, 31 minutes. The lading of this train weighed 5,042 tons, and the total weight of the train was 6,922 tons. Thus nearly 73 per cent. of the load was revenue tonnage.

Commissioner Lane on Reparation.

Franklin K. Lane, of the Interstate Commerce Commission, in an interview says that the matter of reparation to shippers has not been carefully thought out in the law as it stands. Mr. Lane says in part:

"When we come to amend the law, we ought to abolish all reparation except when the shipper has protested in writing against the rate he has paid. The existing rate is regarded by the law as the lawful rate, and it may not be attacked before a court, but may be attacked before the commission at any time.

"Under the present commerce law we have the power and we have been in the habit of awarding damages to a complainant when an unreasonable rate has been charged down to the basis of what we regard as reasonable, so that a complainant may bring in a claim to-day under a rate that was charged eighteen months ago, and if the commission finds that the rate was unreasonable it may award damages to the shipper, although he may have given no notice to the railway that he thought the rate was unreasonable when it was charged.

"A shipper of machinery from Cleveland to Denver recently made a shipment of a carload of machinery, and other shippers also make shipments of machinery from Cleveland to Denver. One year from now one of the shippers attacks the rate charged him as unreasonable and asks reparation. The commission finds the rate to have been excessive and awards damages in a sum represented by the difference between the excessive rate and a reasonable rate. The other shippers, however, fail to make application, so the railways's books show that one shipper at the end of the two-year period has received a lower rate than other shippers. Such a rate limits or contracts commerce; it gives direction to commerce; it holds back the development of enterprises at one locality and helps them at other places, so that no one can tell the amount of damage that has been caused shippers who do not protest, and no one can estimate to what extent a city or a district loses on account of unreasonable rates, and an award of damages based on the difference between a reasonable rate ordered by the commission and an unreasonable rate imposed by the railways in no way measures the real damages which those shippers or that city or district may have suffered, because their damages are based on the few carloads that moved and not on the many carloads which might have moved if the almost prohibitive rate had not been in effect.

"It seems to me that when the time comes to amend the Interstate Commerce Act it would be reasonable to give consideration to this proposition: That reparation shall be awarded only after protest is made at the time of shipment against the legality of an existing rate."

A Turntable for the Monsters.

At Auburn, California, the Southern Pacific has just put in a turntable for the new "class 4000" locomotives. The pit is more than 100 ft. in diameter. The table proper is 98 ft. long. The truss was carried across the continent on two specially built cars. It looks like a bridge already set up.

Cape Cod Ship Canal.

Work has been begun on this canal, the first shovelful of earth having been turned at Sandwich, Mass., last Tuesday by August Belmont. Work has already been begun on breakwaters at the southern end of the proposed canal.

Nine Passengers Killed on Electric Car in Indiana.

In a butting collision of electric cars on the Chicago, Lake Shore & South Bend at Baileytown, Ind., on the night of June 19, ten persons were killed and about forty injured, the killed including the motorman of the eastbound car. This car, according to the reports, was encroaching on the rights of the westbound car. The westbound car had been brought to a stop before the collision occurred, the motorman having seen the headlight of the other, the line being straight. The eastbound motorman, however, appears to have done nothing to slacken the speed of his car, which was running at 50 miles an hour when it struck the other. The eastbound car had been ordered to wait for the westbound at Wilson, but did not do so. It was impossible to send relief to the injured persons by electric cars because the power wire had been broken, and physicians and nurses were sent from South Bend and Laporte, on the east, and from Whiting and Indiana Harbor, on the west, by express trains of the Lake Shore & Michigan Southern, and these trains also took the injured passengers to hospitals at South Bend and Laporte.

Cape to Cairo.

Two more steps have recently been taken toward the realization of the late Cecil Rhodes' "substantial dream" of a Cape to Cairo railway. It is announced that this month Messrs. Pauling & Co. will start work on the construction of a 400-mile extension northward from Broken Hill. At the other end of the "gap" is Halfaya, 1,340 miles south of Cairo and only separated from Khartum by the Blue Nile, across which a new railway and road bridge is now in course of construction by the Soudan government. As soon as the Soudan government railway administration is able to utilize this temporary bridge for the passage of its freight trains it intends to make a start with the southward extensions of its system at Seunar, a city of the Eastern Soudan on the Blue Nile, 160 miles

southeast of Khartum. From Seunar it is also intended to construct a branch line in a westerly direction, doubling back at almost a right angle to El Obeid, the capital of Kordofan. This railway will cross the White Nile near the village of Goz Albu Guma, about 192 miles south of Khartum, and the contract for the construction of the road and rail bridge at this point has been awarded to the same firm which built the viaduct over the Zambesi at Victoria Falls, the Cleveland Bridge & Engineering Co., Darlington, Eng.—*South African Commerce and Manufacturers' Record.*

Freight Traffic Agents' Association.

The fourth annual convention of the National Association of Freight Traffic Agents was held at Niagara Falls June 22, with 100 agents present. William Hodgdon, Freight Traffic Manager of the Pennsylvania Lines West, delivered an address.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, O.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell Bogalusa, La.
SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

W. J. Gibson was arrested in Chicago, June 21, on a charge of obtaining illegal concessions in rates from the Illinois Central on shipments of fertilizer.

The "Memphis Special" of the Southern Railway, leaving New York over the Pennsylvania at 9.25 p.m., now arrives in Memphis at 7.30 on the second morning, which shortens the former schedule about seven hours.

After a trial of about three weeks, the reduced rate summer tourist fares from Chicago to New York and the sea coast resorts have proved so popular that the roads have decided to continue them throughout the summer.

At Charleston, W. Va., June 22, James Burdett, in the Circuit Court, granted an injunction restraining Attorney-General Conley and the various county prosecutors from enforcing the 2-cent fare act of West Virginia against the Chesapeake & Ohio.

The Chicago, Milwaukee & St. Paul intends to issue its transcontinental freight tariffs independently of the Transcontinental Traffic Association. It is desired to keep this business in such a condition that changes in rates can be made promptly when it is desirable to do so.

Trolley competition has forced the Chicago, Peoria & St. Louis to make a rate of 90 cents for one-way passenger tickets between Peoria and Springfield, or $1.30 for the round trip. The distance is 80 miles. The Chicago & Alton has met the cut, and it is expected that other roads will follow.

The last announcement from the Trunk Line Association committee in connection with westbound freight rates on imported goods is to the effect that on August 1 further reductions will be made from New York and other southern ports to meet the rates which have been made from Boston by the Boston & Maine.

The Grand Trunk Pacific is now running regular daily passenger trains between Winnipeg, Man., and Scott, Sask., 569 miles west of Winnipeg. Hitherto only a "daylight mixed" service has been maintained. According to the *Official Guide* for June, page 71, this daylight service extends to Wainwright, about 100 miles beyond Scott.

The "Shasta Limited" has been put in service over the Southern Pacific between San Francisco, Cal., and Portland, Ore., 772 miles. The train leaves San Francisco at 6 p.m. and arrives at Portland the following day at 9 p.m.; and southbound the time is about the same. Hitherto the fastest through train between these cities has been much slower, taking two nights on the road.

The New York Central announces that on the westbound Lake Shore Limited and Twentieth Century Limited express trains, on which berths are not sold to points east of Buffalo, passengers desiring to take a friend along with them as far as Syracuse can do so if there is room for him in the space which the passenger has paid for, the Syracuse passenger paying the regular fare and the excess fare as follows: Train 19, New York to Albany, $1, to Syracuse, $2; train 25 to Syracuse, $4.

The Lake Shore & Michigan Southern, in connection with the Pittsburgh & Lake Erie, announces a train between Buffalo and Pittsburgh to run through in 5 hours 15 minutes, which is three hours less than the best time now made. This change is the result of the competition between these lines and the other two through routes between these cities—the Buffalo, Rochester & Pittsburgh and the Pennsylvania. The distances between the cities by the different lines are: Buffalo, Rochester & Pittsburgh, 288 miles; Pennsylvania, 271 miles; New York Central Lines, 257 miles.

The Traffic Club of New York.

This club will have an outing and clam bake at Witzel's Point View Island, College Point, L. I., on Saturday, July 24. There will be the usual games, including a ball game between the industrial and the railway and steamship traffic men.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1909.
(See also issues of June 4, 11, and 18.)

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Central Branch	388	$92,390	$23,161	$125,436	$27,097	$26,708	$3,657	$51,357	$3,878	$112,697	$12,739	.....	$9,500	$3,239	‡$37,065
Central New England	294	204,164	24,538	242,660	29,064	18,739	1,995	72,280	3,660	125,738	116,922	.....	5,600	111,322	33,662
Charleston & Western Carolina	340	91,750	20,363	119,045	26,547	8,340	2,607	43,724	4,791	86,209	32,836	.....	4,100	28,736	27,969
Chicago Great Western	818	400,532	144,624	592,526	115,102	142,916	36,051	284,188	32,307	610,564	18,038*	$1,075*	18,029	37,142†	‡90,878
Chicago, Indiana & Southern	329	214,862	16,290	237,428	39,629	46,915	8,445	101,628	7,733	204,350	33,078	508	12,500	21,086	9,399
Chicago, Peoria & St. Louis	255	86,719	21,666	114,912	16,799	26,755	6,331	56,458	4,655	110,998	3,914	.....	3,650	264	6,543
Colorado Midland	338	121,016	25,156	167,835	28,533	35,132	9,944	78,212	5,904	157,726	10,109	456*	7,650	2,003	‡16,138
Detroit & Mackinac	348	70,512	21,765	97,797	13,775	14,770	1,944	28,953	2,696	62,138	35,660	456*	6,850	28,354	‡084
Duluth, Missabe & Northern	282	175,101	34,600	214,682	49,054	76,352	1,744	63,388	14,772	205,310	9,372	5,081*	9,300	5,009†	44,936
Evansville & Terre Haute	310	103,569	44,856	165,443	16,681	14,735	3,977	51,945	6,040	93,378	72,065	274*	9,613	62,178	6,017
Georgia Southern & Florida	395	96,173	47,330	167,631	13,734	26,831	5,216	71,876	8,262	125,919	41,712	1,634	8,058	35,288	44,007
International & Great Northern	1,159	471,656	130,965	653,759	142,559	107,779	20,473	294,395	20,965	586,171	67,588	.....	17,000	50,588	74,782
International Ry of Maine	233	75,109	33,870	115,312	14,295	17,648	4,329	50,663	2,762	89,697	25,615	.....	5,000	20,615	‡10,672
Iowa Central	558	199,115	34,800	245,695	42,468	57,284	9,205	104,835	8,488	222,280	23,415	.....	7,579	15,836	‡17,297
Louisiana Ry. & Navigation	341	84,228	12,027	102,078	21,109	14,951	3,770	38,456	5,576	83,862	18,216	.....	3,750	14,466	‡5,637
Mason City & Fort Dodge	386	108,131	32,377	149,280	22,480	24,034	1,591	60,226	594	108,925	40,355	949	8,937	32,367	‡3,370
Midland Valley	324	67,884	21,115	94,402	16,714	18,490	1,778	28,996	4,467	70,445	23,957	.....	8,000	15,957	‡700
Minneapolis & St. Louis	1,027	205,530	74,234	302,347	70,495	53,261	10,556	123,588	11,825	269,725	32,622	2*	16,356	16,265	13,045
Missouri, Kansas & Texas	3,072	1,338,598	516,914	2,001,752	237,077	226,161	50,726	809,753	76,402	1,400,119	601,633	1,557*	45,203	554,873	315,306
Missouri Pacific	3,492	1,220,250	301,094	1,703,269	355,891	324,789	48,703	727,165	57,548	1,514,096	189,173	1,701*	68,305	119,167	‡287,813
Mobile, Jackson & Kansas City	403	88,786	24,049	122,829	17,787	10,540	1,832	37,719	9,189	77,067	45,762	.....	3,346	42,416	24,773
Nevada & California	422	74,357	25,208	107,088	12,129	12,375	707	33,184	1,856	60,251	46,837	179*	6,200	40,458	55,770
Northwestern Pacific	373	78,986	125,161	222,430	46,437	41,822	2,949	81,345	9,202	181,755	40,675	.....	8,955	31,720	4,336
Pittsburgh & Lake Erie	191	788,416	92,651	912,856	114,069	168,818	13,011	216,964	19,669	532,531	380,325	403*	17,000	362,921	189,526
Quincy, Omaha & Kansas City	262	46,666	15,016	66,311	21,840	11,803	1,347	31,497	3,021	69,508	3,197*	.....	2,450	5,647†	‡1,964
St. Joseph & Grand Island	319	74,044	27,090	110,194	37,210	14,048	5,593	46,200	3,656	106,707	3,487	552	5,142	1,103†	‡42,804
St. Louis, Brownsville & Mexico	454	95,823	40,158	142,486	19,308	11,039	3,716	47,499	6,019	87,581	54,905	5	4,000	50,900	22,749
St. Louis, Iron Mountain & Southern	2,608	1,311,430	378,338	1,859,370	272,882	311,155	49,531	610,989	65,921	1,310,478	548,892	2,448*	54,150	492,294	88,853
Southern Indiana	236	91,257	12,449	106,151	10,735	10,282	1,546	26,790	6,348	55,701	50,450	.....	6,929	43,521	37,392
Texas & New Orleans	450	169,168	74,184	261,282	53,258	39,377	5,839	112,543	7,845	218,862	42,420	1,855	11,600	32,675	11,923
Texas Central	268	51,334	26,996	84,949	27,200	18,255	1,858	30,538	5,060	82,911	2,038	.....	4,195	2,157†	27,876
Trinity & Brazos Valley	455	100,619	11,515	115,299	38,700	28,438	4,100	63,756	12,251	147,245	31,946*	.....	3,000	34,946†	4,088
West Jersey & Seashore	356	127,064	259,419	412,130	75,754	49,949	10,190	160,807	8,336	305,036	107,094	1,731	26,680	82,145	12,911
Western Maryland	543	293,513	56,922	471,390	63,316	66,974	7,093	152,761	13,363	303,507	167,883	.....	16,500	151,383	‡8,971
Wheeling & Lake Erie	442	363,089	37,635	426,716	40,967	116,974	7,705	162,539	15,634	343,819	82,897	6,515	21,267	68,145	74,142
Wisconsin, Minn. & Pacific	271	32,117	13,741	50,347	13,333	7,965	278	21,693	312	43,581	6,766	.....	3,443	3,323	‡1,594

TEN MONTHS OF FISCAL YEAR.

Name of road.	Mileage operated at end of period.	Operating revenues — Freight.	Operating revenues — Passenger.	Operating revenues — Total, inc. misc.	Operating expenses — Maintenance — Way and structures.	Operating expenses — Maintenance — Of equipment.	Operating expenses — Traffic.	Operating expenses — Transportation.	Operating expenses — General.	Operating expenses — Total.	Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Central Branch	388	$1,063,850	$278,101	$1,443,288	$229,612	$198,919	$33,478	$508,451	$38,371	$1,008,831	$434,457	.....	$95,000	$339,457	‡$5,943
Central New England	294	1,699,063	273,047	2,093,939	313,026	204,458	18,653	712,496	29,917	1,278,550	815,389	.....	56,000	759,389	425,219
Charleston & Western Carolina	340	909,370	222,608	1,204,056	233,619	141,091	24,835	435,806	36,417	871,768	332,288	.....	41,000	291,288	71,565
Chicago Great Western	818	4,764,617	1,572,909	6,859,312	928,401	1,376,505	364,117	3,077,457	320,374	6,066,854	792,458	$5,538*	185,247	601,673	‡366,534
Chicago, Indiana & Southern	329	2,089,161	198,483	2,363,470	268,171	462,004	77,177	931,591	69,316	1,808,259	555,211	13,321	137,542	430,990	79,539
Chicago, Peoria & St. Louis	255	998,828	268,411	1,331,517	184,622	300,404	61,206	572,923	47,479	1,166,634	164,883	.....	44,000	120,883	39,118
Colorado Midland	338	1,370,570	303,270	1,929,648	248,679	281,431	98,578	823,198	59,053	1,510,939	418,709	3,803*	75,549	339,357	‡6,357
Detroit & Mackinac	348	666,283	238,585	959,651	148,771	152,503	18,144	314,649	27,020	661,087	298,564	3,181*	71,645	223,738	‡18,446
Duluth, Missabe & Northern	282	6,848,562	303,579	7,199,056	674,220	733,601	13,551	1,037,554	125,578	2,584,504	4,614,552	26,472	293,910	4,347,114	‡505,629
Evansville & Terre Haute	310	1,110,066	491,264	1,780,123	229,660	232,550	37,185	561,652	62,813	1,123,860	656,563	3,044*	91,916	561,603	‡10,835
Georgia Southern & Florida	395	960,488	508,284	1,669,473	148,389	276,865	51,304	628,630	84,994	1,190,182	479,291	14,928	82,551	411,668	191,984
International & Great Northern	1,159	5,039,785	1,430,734	6,914,953	1,194,801	1,086,994	163,954	2,803,959	206,015	5,455,723	1,459,230	.....	191,000	1,268,230	1,038,877
International Ry. of Maine	233	620,308	215,481	904,379	152,723	175,486	39,754	424,071	29,291	821,325	83,054	.....	50,000	33,054	‡35,740
Iowa Central	558	1,997,589	426,065	2,544,530	248,112	483,800	88,628	1,124,738	86,658	2,031,936	512,594	.....	73,982	438,612	‡305,440
Louisiana Ry. & Navigation	341	758,050	110,274	930,895	240,163	126,304	34,045	399,071	53,338	852,921	77,974	.....	34,500	43,474	66,552
Mason City & Fort Dodge	386	1,147,973	362,017	1,605,282	181,429	249,050	16,965	682,615	6,984	1,137,043	468,239	6,563	71,746	403,056	‡63,006
Midland Valley	324	548,564	219,946	816,639	190,354	183,210	17,691	272,761	44,371	708,387	108,252	.....	76,083	32,169	‡149,421
Minneapolis & St. Louis	1,027	2,369,814	892,924	3,512,650	346,688	479,062	100,772	1,300,211	120,846	2,347,579	1,165,071	301*	158,236	1,006,534	69,034
Missouri, Kansas & Texas	3,072	14,531,353	5,860,682	21,619,520	2,901,187	3,063,129	486,323	7,994,512	693,078	15,138,229	6,481,291	8,732*	921,968	5,550,591	‡243,654
Missouri Pacific	3,492	12,954,929	3,307,261	18,018,269	2,655,257	2,801,584	474,241	7,524,105	590,207	14,045,394	3,972,875	14,311*	762,250	3,196,314	‡213,734
Mobile, Jackson & Kansas City	403	960,440	256,990	1,303,592	204,393	150,952	16,820	406,106	89,992	868,263	435,329	.....	33,911	401,418	195,967
Nevada & California	422	624,393	217,935	916,807	115,290	114,837	7,788	346,365	19,421	603,701	313,106	3,831*	64,667	244,608	‡273,267
Northwestern Pacific	373	958,612	1,284,161	2,442,243	507,007	366,716	23,016	885,620	93,212	1,875,571	566,672	.....	90,650	476,022	73,818
Pittsburgh & Lake Erie	191	8,409,670	992,181	9,708,954	1,175,710	1,013,938	131,939	2,331,525	207,566	4,860,678	4,848,276	3,362*	165,526	4,679,388	‡470,599
Quincy, Omaha & Kansas City	262	453,230	175,487	680,664	173,377	119,185	15,504	318,975	29,843	656,884	23,780	.....	25,010	1,230†	16,884
St. Joseph & Grand Island	319	920,212	318,876	1,342,533	222,008	146,946	52,284	457,503	36,974	915,715	426,818	2,364	41,647	387,535	‡116,202
St. Louis, Brownsville & Mexico	454	666,892	326,051	1,060,325	173,905	128,622	29,826	379,801	55,303	767,457	292,868	618	43,361	250,125	60,022
St. Louis, Iron Mountain & Southern	2,608	14,117,653	3,797,580	19,573,638	2,773,562	2,709,648	443,974	6,481,952	599,859	13,008,995	6,564,643	23,368*	625,119	5,916,156	811,402
Southern Indiana	236	831,946	132,832	987,792	127,135	160,457	16,691	283,525	62,503	650,311	337,481	.....	69,285	268,196	‡170,358
Texas & New Orleans	450	2,071,066	699,760	2,962,048	539,818	431,448	59,772	1,225,575	82,571	2,339,184	622,864	3,982*	96,245	522,637	604
Texas Central	268	627,771	336,463	1,031,061	166,498	147,120	11,224	352,538	44,627	722,007	309,054	.....	25,197	283,857	52,128
Trinity & Brazos Valley	455	1,552,427	137,673	1,719,444	347,366	256,820	43,327	821,861	116,332	1,585,706	133,738	.....	31,399	102,339	506,056
West Jersey & Seashore	356	1,234,406	2,646,880	4,113,016	660,217	563,925	101,900	1,736,589	79,213	3,141,844	971,172	55,725	190,259	836,638	‡89,343
Western Maryland	543	4,066,734	668,925	4,959,890	540,571	730,013	69,620	1,609,563	122,125	3,071,892	1,887,998	.....	165,000	1,722,998	122,017
Wheeling & Lake Erie	442	3,947,042	410,830	4,639,577	506,045	1,110,987	59,281	1,636,931	147,953	3,461,197	1,178,380	21,509	216,396	983,493	257,653
Wisconsin, Minn. & Pacific	271	386,253	148,562	578,097	122,241	61,340	3,474	222,404	2,944	412,403	165,694	50	28,960	136,784	11,142

*Deficit. †Loss. ‡Decrease.

Summary of Monthly Reports of Revenues and Expenses of Railways for April.

Item	1908 Amount.	1908 Mile of line.	1908 Ratio p. ct.	1909 Amount.	1909 Mile of line.	1909 Ratio p. ct.
Rail operations:						
Freight revenue ..	$114,340,089	$527	68	$131,464,249	$600	69
Pass'ger revenue...	39,560,693	182	23	42,291,934	193	22
Other transp. rev..	13,194,200	60	8	14,151,285	64	7
Non-transport. rev.	1,521,855	7	1	1,708,271	7	1
Unclassified rev...	16,194	..	..	16,950	..	..
Total oper. revs.	$168,633,032	$777	100	$189,632,690	$866	100
Maint. way & strs..	$22,760,298	$104	13	$26,214,571	$119	14
Maint. of equipmt.	25,257,175	116	15	29,102,982	132	15
Traffic expenses ..	3,637,844	16	2	4,024,767	18	2
Transp. expenses...	63,064,647	290	37	64,526,779	294	34
General expenses .	4,850,964	22	3	5,077,770	23	3
Unclasified exp.....	17,617	..	..	17,050	..	..
Total oper. exp..	$119,588,547	$551	71	$128,963,921	$589	68
Net oper. rev...	$49,044,485	$226	29	$60,668,769	$277	32
Outside operations:						
Total revenues ...	$2,881,951	$13	..	$4,044,139	$18	..
Total expenses ...	2,487,130	11	..	3,805,168	17	..
Net revenue ...	$394,821	1	..	$238,970	$1	..
Total net rev....	$49,439,306	$227	..	$60,907,739	$278	..
1-12th annual taxes..	6,856,860	31	..	7,050,766	32	..
Operating income.	$42,582,446	$196	..	$53,856,972	$246	..
No. of reports......	731			770		
Mileage operated ...	216,947			218,935		

Car Surpluses and Shortages.

Arthur Hale, General Agent of the American Railway Association, says: "Bulletin No. 49 gives a summary of surpluses and shortages by groups from February 19, 1908, to June 2, 1909. The total for this report is 277,559, an increase of 3,669 since our last report. Box cars increased 5,661 and coal and gondolas 2,400; these increases being partially offset by decreases in surplus flats and miscellaneous. The results by groups were proportionate with the grand total excepting in group 4 (South Atlantic), which shows a considerable decrease, and group 6 (Northwestern), where the increase was the greatest."

The accompanying table gives the surpluses and shortages for the period covered by the report, and the chart shows surpluses and shortages for 1907, 1908 and 1909.

Car Surpluses and Shortages, February 19, 1908, to June 2, 1909, Inclusive.

	Number of roads.	Surpluses. Box.	Surpluses. Flat.	Surpluses. Coal, gondola and hopper.	Surpluses. Other kinds.	Surpluses. Total.	Shortages. Box.	Shortages. Flat.	Shortages. Coal, gondola and hopper.	Shortages. Other kinds.	Shortages. Total.
June 9, 1909	161	123,918	12,865	99,406	41,370	277,559	170	51	5	59	285
May 26, 1909	158	118,257	14,940	97,006	43,687	273,890	83	99	1,011	47	1,240
May 12, 1909	158	113,601	16,574	105,684	48,620	284,479	78	4	22	83	187
April 28, 1909	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249

STATE COMMISSIONS.

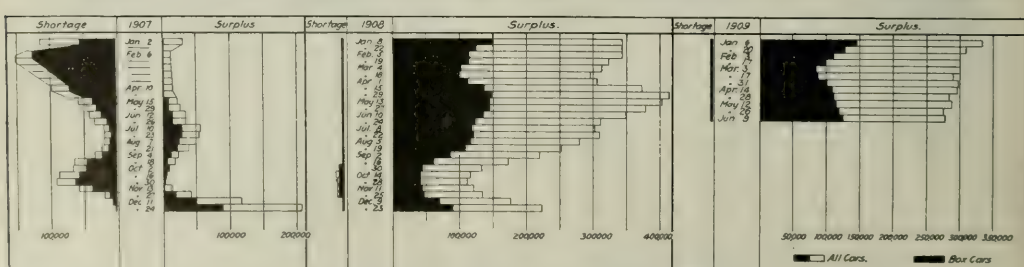
The Railroad Commission of Georgia has denied the petition of Beck & Gregg Hardware Co. to make a reduction in rates from seaports to Atlanta and other interior points on imported goods. The majority of the Commissioners hold that regulation of these rates would amount in effect to a regulation of interstate rates through a disturbance of the general rate fabric. Two of the five commissioners dissented.

The State Corporation Commission of Oklahoma has bought a gasolene motor car, capable of carrying six persons and of traveling on a railway track at 40 miles an hour, with which to make an inspection of the railways of that state, which are said to aggregate 5,695 miles. An engineer has been engaged to inspect the railways for the purpose of making an official valuation of their property, and he will use this car.

The State Railroad Commission of Texas has issued an order to the effect that logging railways will hereafter be recognized as common carriers, provided they are operated under charters duly filed with the Secretary of State. This change, if carried out, may add 400 miles to the railway record of the state, and will also put the logging roads in a position to make through joint rates with other railways.

The Indiana State Railroad Commission has received already a considerable number of complaints of infractions of the full-crew law, and proposes to forward these to the proper prosecuting officers of the counties in which the violations occurred. This plan was adopted on the receipt of the letter of the governor of the state criticising the action of the commission in deciding that trifling technical infractions ought not to be punished.

The State Railroad Commission of Louisiana has called upon the railways of the state to be more strict in posting bulletins at stations when trains are late, in keeping stations clean, in furnishing drinking water and in other matters con-



Car Surpluses and Shortages in 1907, 1908 and 1909.

cerning which the Commission has issued orders; and to advise the Commission what they are doing. The Commission takes this action because it has received complaints, yet the complainants have mentioned no specific cases.

The New York State Public Service Commission, First district, has denied the request of the New York Central for leave to close its station on the Harlem division at 183d street, New York City. This station, between Fordham and Tremont, was opened only a few years ago. The request for permission to abandon the station is based on a falling off in business, due presumably, to diversion of traffic to the street car lines. The real estate interests who assisted in building the station protested against its abandonment.

New York: Without Jurisdiction.

Railroad Improvement Association of Nyack v. Erie. Opinion by Commissioner Decker.

The service between New York, via Jersey City and the Bergen tunnels, and Nyack, N. Y., is complained of. The defendant claims that this service is limited by the capacity of the Bergen Hill tunnels and to increase this service would interfere with through business. The commission finds that it is without authority to issue an order in the case because, although originating and terminating in New York, the service passes through New Jersey and is therefore interstate commerce and subject to federal authority.

Nebraska: Comparative Rates on Grain and Flour.

Updike Milling Co. v. Union Pacific. Opinion by Chairman Clark.

The complaint charges that the defendant's rates on wheat are higher from certain points in Nebraska to Omaha than the rates on flour from the same points to Omaha. In some cases the difference is as much as 10 per cent. in favor of flour. Rates from other points in the state to Omaha are the same on flour and wheat or are higher on flour. The defendant does not satisfactorily explain how these rates that are complained of came to be adjusted, and the Commission decides that whatever may have been the original reason for charging more for the transportation of grain than for flour (and this reason apparently was to build up milling businesses at the different points where the low flour rate is charged) the reason no longer exists and orders that the rates on flour and grain be made the same.

COURT NEWS.

A jury in the federal court at Walla Walla, Wash., has awarded J. L. Dumas, of Columbia County, Washington, judgment for $6,750 damages for losses suffered by Dumas through the failure of the Oregon Railway & Navigation Co. to furnish him enough cars for the transportation of his apple crop in 1908. Dumas is the largest individual apple grower in Washington. He sued originally for $11,128 damages.

In the Federal court at Philadelphia, June 16, the Philadelphia & Reading was indicted by the grand jury for accepting freight at less than the published rates. The indictment has to do with shipments imported from Germany, on which the railway participated in through ocean and rail rates which had not been published. It is said that the government intends to prosecute the road on the ground that, in the eye of the law, Philadelphia, and not the European point, is the original shipping point.

In the Kentucky State Court of Appeals last week the Southern Pacific Company won its case in the suit in which the state sought to tax about $300,000,000 of stocks, bonds and other intangible property held by the company, which is incorporated under the laws of Kentucky, asserting that the situs of the property is in Kentucky. The court holds that only such property as represents investments on high seas, consisting of ships, etc., is taxable in that state. This amounts to about $8,000,000 and will be taxed one-half of 1 per cent. annually, beginning five years back, which tax the company will have to pay.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Blewett Lee has been elected the General Solicitor of the Illinois Central, with office at Chicago, and the office of General Counsel has been abolished.

Operating Officers.

Charles F. Gary has been appointed an Assistant Trainmaster of the Missouri Pacific, with office at Fort Scott, Kan.

S. J. Jones has been appointed the Superintendent of Transportation of the Georgia, Florida & Alabama, with office at Bainbridge, Ga. The office of Master of Trains has been abolished.

W. C. Nixon, General Manager of the St. Louis & San Francisco, has not resigned nor has he any intention of resigning. This corrects an erroneous statement appearing in these columns last week.

George B. Beale, recently appointed Superintendent of the Buffalo division of the Pennsylvania, was born May 27, 1861. He graduated from the University of Pennsylvania in 1881 and began railway work in September of that year as rodman on the second-track extension of the Baltimore & Potomac of the Pennsylvania. In November the next year he was made levelman and transitman, and after having left the employ of the Pennsylvania in July, 1883, returned in February, 1884, as rodman on the Pittsburgh division. Two years later he was appointed Assistant Engineer of the New York division, and in 1889 was appointed Assistant Supervisor of subdivision A of the New York division. The next year he was promoted to Supervisor, and in 1894 was appointed Assistant Engineer of the Middle division of the Philadelphia & Erie. A year later he was made Assistant Engineer of the Middle division of the Pennsylvania, and in 1899 was transferred as Assistant Engineer to the New York division. In 1902 he was appointed Superintendent of the Bedford division, and in 1903 was transferred as Superintendent to the Chautauqua division, which position he held until June 1.

Traffic Officers.

H. D. Henvis has been appointed a Traveling Passenger Agent of the Erie, with office at Seattle, Wash.

C. M. Agnew has been appointed a Traveling Freight Agent of the Southern Railway, with office at Kansas City, Mo., succeeding P. B. Doddridge, resigned to accept service with another company.

C. A. De Saussure, Division Passenger Agent of the Southern Railway, has been appointed an Assistant General Passenger Agent, with office at Memphis, Tenn. C. C. Stewart succeeds Mr. De Saussure, with office at Memphis.

C. W. Strain has been appointed the General Passenger Agent of the St. Louis & San Francisco lines in northern Texas and Assistant General Passenger Agent of the lines from Houston, Tex., to New Orleans, La., with office at Beaumont, Tex.

E. F. Hollis has been appointed a General Agent, Freight department, of the St. Louis Southwestern, succeeding to the duties of J. E. Allen, Assistant General Freight Agent, resigned. The office of Assistant General Freight Agent has been abolished.

F. H. Smith, Soliciting Freight Agent of the Seaboard Air Line at Norfolk, Va., has been appointed a Contracting Freight Agent, with office at Norfolk, succeeding F. W. Elliott, resigned to accept service with another company. J. E. White succeeds Mr. Smith, with office at Norfolk.

T. P. Toland, Soliciting Freight Agent of the Seaboard Air Line at Jacksonville, Fla., has been appointed a Commercial

Agent, with office at Jacksonville, succeeding J. H. Peters, resigned, E. B. Freeman, Soliciting Freight Agent at Tampa, Fla., succeeds Mr. Toland, with office at Jacksonville, and E. C. Staley succeeds Mr. Freeman, with office at Tampa.

Effective July 1, the Grand Trunk will assume the supervision of the solicitation in the West of the traffic for the following fast freight lines: Commercial Express Line (via Erie), Grand Trunk Despatch (via West Shore), Lackawanna Grand Trunk Line (via D., L. & W.), Milwaukee & Michigan Line (via N. Y. C. & H. R.), Reading Despatch (via Lehigh Valley), National Despatch-Great Eastern Line (via Central Vermont, Boston & Maine and Maine Steamship Co.). The office of Manager of these lines is to be discontinued and the operation of these fast freight lines for the routing and handling of through freight eastbound and westbound will be continued under the direct supervision of the railways interested. Correspondence relating to the accounting affairs of these lines should be addressed to Ira W. Gantt, who has been appointed Treasurer pro tem, with office at 403 Main street, Buffalo, N. Y.

Frederick S. Holbrook, whose election as Chairman of the Official Classification Committee has been announced in these columns, was born September 25, 1864. He began railway work in 1881 as a clerk on the Ogdensburg & Lake Champlain, now part of the Rutland. In 1886 he was made chief clerk in the General Freight office at Ogdensburg, N. Y., and three years later was made agent for the Ogdensburg & Lake Champlain, the Central Vermont and the Canada Atlantic, with office at Rouse's Point, N. Y. In 1890 he became cashier of the Ogdensburg Transit Co., at Chicago, and in 1894 was made cashier of the Central Vermont with office at New York, serving at the same time as Commercial Agent. In February, 1900, he was appointed Assistant General Freight Agent of the West Shore (part of the New York Central & Hudson River), and a year later was made First Assistant General Freight Agent of the New York, New Haven & Hartford at Boston, and on July 15, 1901, was made General Freight Agent, with office at New Haven. On September 1, 1908, he was made Chairman of the Committee on Uniform Classification, with office at Chicago, and held this position until May 1, when he became Chairman of the Official Classification Committee, with office in New York.

H. C. Martin, Chief of Tariff Bureau of the Grand Trunk lines west of Detroit and St. Clair rivers, has been appointed the Second Assistant General Freight Agent, with office at Chicago, and placed in charge of Tariffs and Percentage divisions of lines west of Detroit and St. Clair rivers. He will report to Assistant General Freight Agent R. L. Burnap, Chicago. His former title has been abolished. Ira W. Gantt, Division Freight Agent at Toledo, Ohio, has been appointed an Assistant General Freight Agent, with office at Buffalo, N. Y., having charge of traffic from connecting railways at the Niagara frontier, from connecting railways from points south of the Michigan-Indiana state line destined to points east of the Detroit and St. Clair frontiers, and will also have supervision over commercial agencies at Buffalo, N. Y.; Toledo, Ohio; Cincinnati, Ohio; Pittsburgh, Pa., and Philadelphia. His former office has been abolished. H. E. Graves has been appointed a Commercial Agent, with office at Chicago. T. A. Chappell has been appointed an Assistant Commercial Agent, and C. F. Rogers an Assistant Commercial Agent, both with office at Chicago. Henry W. Ploss, Contracting Freight Agent at Milwaukee, Wis., has been appointed a Commercial Agent, with office at Milwaukee. Allan Wallace has been appointed a Commercial Agent, with office at Omaha, Neb. W. H. Spicer, A. J. Mullins and C. E. Wagner have been appointed Commercial Agents, with offices at Detroit, Mich., Grand Rapids and Saginaw respectively. These three offices are new. C. J. Haigh has been appointed a Commercial Agent, with office at Philadelphia. This is a new office. All of these appointments are effective July 1.

Engineering and Rolling Stock Officers.

William M. Saxton has been appointed the Master Mechanic of the North Coast Railroad, with office at Spokane, Wash.

C. H. Temple, Master Mechanic of the Central division of the Canadian Pacific, has been appointed Assistant Superintendent of Motive Power, with office at Winnipeg, Man.

M. F. McCarra has been appointed the General Foreman of the Kingsville shops of the St. Louis, Brownsville & Mexico, with office at Kingsville, Tex., succeeding A. J. Conrad, resigned.

C. Z. Moore has been appointed the Supervisor of Division No. 4, of the Philadelphia division of the Eastern Pennsylvania Division, of the Pennsylvania, with office at Middletown, Pa., succeeding R. L. Baird, granted leave of absence.

W. E. Fowler, Master Car Builder of the Canadian Pacific and a past President of the Master Car Builders' Association, has resigned on account of ill health. R. W. Burnett, Assistant Master Car Builder, Eastern Lines, succeeds Mr. Fowler.

F. J. Hemphill, Signal Supervisor of the Illinois division of the Chicago, Rock Island & Pacific, has been appointed the Signal Supervisor of the Choctaw and Southern districts, with office at El Reno, Okla., succeeding J. J. Evans, transferred. S. Miskelly succeeds Mr. Hemphill, with office at Rock Island, Ill. A. G. Nutting has been appointed the Acting Supervisor of the Central district west of Davenport, and of that part of the Des Moines Valley division between Des Moines, Iowa, and Sibley, with office at Des Moines.

M. E. Hamilton, whose appointment as General Air Brake Inspector of the Atchison, Topeka & Santa Fe was recently announced in these columns, was born October 20, 1870, at Marshall, Ill. After a common school education he began railway work as fireman on the Chicago, Kansas & Nebraska, now part of the Chicago, Burlington & Quincy. In June, 1888, he was made engineman, and in May of the next year he was made a brakeman. In October, 1889, he went to the Atchison, Topeka & Santa Fe as brakeman, and in September of the following year became a conductor. In September, 1891, he went to the Gulf, Colorado & Santa Fe as conductor. In November, 1900, he became engineman and later shop foreman on the Mexican Central. In 1903 he became shop foreman on the Galveston, Houston & Henderson. In October, 1903, he was appointed shop foreman of the Gulf, Colorado & Santa Fe, and in May, 1906, was appointed Air Brake Instructor on the Atchison, Topeka & Santa Fe, which office he held until June 1.

M. E. Hamilton.

Special Officers.

Colonel L. J. Polk, Traveling Freight Agent of the Gulf, Colorado & Santa Fe, has been appointed the General Agent for the several departments of the company, with jurisdiction over the entire line, and with office at Galveston, Tex.

OBITUARY.

Caleb J. Camp, formerly President of the Connecticut Western, now the Central New England, died at his home in Winsted, Conn., in the early part of the week.

It is said that the Mongyana Railway is about to build an extension from Sao Jose do Rio Preto, Brazil, to Santo Antonio da Barra, on the frontier of the State of Minas Geraes.

Railroad Construction.

New Incorporations, Surveys, Etc.

ADA TERMINAL.—An officer writes that a contract has been given to J. R. Alley and work is to be started at once on a terminal line from the Oklahoma Central into the city of Ada, Okla. D. Carter and G. W. Reder, of Pursell, may be addressed. (June 11, p. 1229.)

ARIZONA & COLORADO.—This road has been extended from Pearce, Ariz., southward 16.5 miles, to Blacks.

ATCHISON, TOPEKA & SANTA FE.—According to press reports, an amendment to the charter of the Pecos & Northern Texas has been approved and filed for record. The change of charter provides for the construction of about 550 miles in western Texas, as follows:

From Texico, N. Mex., near the eastern end of the Belen cutoff, southeast through Parmer, Bailey, Lamb, Hockley, Lubbock, Lynn, Garza, Scurry, Fisher, Nolan, Taylor and Coleman counties, to Coleman, about 300 miles, where connection is to be made with the Gulf, Colorado & Santa Fe. (June 18, p. 1328.)

From Canyon City, Tex., south through Randall, Swisher, Hale and Lubbock counties, to a connection with the Texico-Coleman line, 105 miles, in operation to Plainview. Contract let to Moore & Harris to complete the line to Lubbock, 47 miles. (May 21, p. 1099.)

Branch from Plainview, southeast through Hale, Floyd, Crosby and Dickens counties, about 70 miles.

Branch from a point on the Coleman line near the center of Lubbock county, west through Hockley and Cochran counties to the New Mexico state line, about 75 miles.

ATLANTIC COAST LINE.—On the third division, the Jacksonville-Newberry line has been extended from Wilcox, Fla., northwest to Perry, 57 miles. (March 19, p. 651.)

CANADIAN NORTHERN.—A large amount of work is said to be under way on this road between the Great Lakes and Winnipeg by a force of nearly 1,000 men. Between Fort William, Ont., and Fort Frances the line is being reballasted and the present steel will be replaced with 80 and 85-lb. rails. The grade from Kakabeka Falls to Slate will be greatly reduced, and Stanley hill will be cut off from the main line, but is to be taken in by the Duluth extension, which it is proposed to build in connection with the Duluth, Rainy Lake & Winnipeg.

In British Columbia four survey parties are said to be in the field on the section between Tete Jaune Cache and Vancouver. When complete surveys will have been made between the Yellowhead Pass and the mouth of the Fraser river by way of the Upper Fraser river to Tete Jaune Cache, and by Cranberry and Albreda lakes to the head waters of the North Thompson river, thence down the North Thompson river to Kamloops to the South Thompson river, following the river to the Fraser river at Lytton, thence along the Fraser river to the seaboard.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHESTER, PERRYVILLE & STE. GENEVIEVE.—The Saline Valley Railroad has been extended from Tlapek, Mo., west to Coffman, two miles.

CHICAGO, MILWAUKEE & PUGET SOUND.—Through freight and passenger service was inaugurated June 15 to all points on the road. (May 28, p. 1144.)

CHICAGO, ROCK ISLAND & GULF.—An officer writes that on the cut-off being built under the name of the Tucumcari & Memphis from Amarillo, Tex., west to Tucumcari, Mex., 110 miles, work is under way on 53 miles to Tucumcari. Maximum grades will be $^6/_{10}$ per cent. and maximum curvature 3 deg. The J. A. Ware Construction Co., of St. Louis, Mo., has the contract. (May 14, p. 1051.)

COLORADO & SOUTHERN.—On the Northern division, the Clear Creek district has been extended from Silver Plume, Colo., south to Mount McClellan, 16 miles.

GRAND TRUNK.—Surveys are said to be made for a more convenient connection between the Midland line and the main line between Port Hope, Ont., and Cobourg. Nothing definite has yet been decided as to the location or construction.

GULF, COLORADO & SANTA FE.—See Atchison, Topeka & Santa Fe.

HOUSTON, FOSTORIA & NORTHERN.—Incorporated in Texas with $50,000 capital and headquarters at Fostoria. An officer writes that the plans call for a line from Midline, where connection is to be made with the Houston East & West Texas, north via Fostoria on the Gulf, Colorado & Santa Fe, and San Jacinto, to Cold Springs, thence west to a connection with the International & Great Northern, near Elmina, 50 miles. The line from Midline, north to San Jacinto, 19 miles, is to be opened for freight and passenger traffic on July 1, and the section from San Jacinto to Cold Springs, four miles, is to be opened about September 1. A large force is at work between Cold Springs and Elmina, from the latter place east, about 16 miles of narrow gage line is now built, with which a connection is shortly to be made, and the completed portion changed to standard gage. E. C. Smith, of Fostoria, is the contractor. Thos. S. Foster, Pres., Houston, and G. R. Wansbrough, Gen. Mgr., Fostoria.

HUDSON & MANHATTAN.—See an item regarding this company under General News.

INTERSTATE RAILWAY.—An officer writes that about 80 per cent. of the right-of-way has been secured and partial financial arrangements made to build from Kansas City, Mo., north via Dearborn to St. Joseph, 48½ miles. Contracts are to be let about June 30 or July 15. The maximum grade is to be 1 per cent. and the maximum curves 3 deg. E. D. Martin, V.-Pres., and T. P. Martin, Sec., room 735, New York Life building, Kansas City.

MILLER CREEK.—Organized in Kentucky to build a four-mile line, including a steel bridge on concrete piers, about 400 ft. long, over the Big Sandy river to Coal Fields, near Paintsville, Ky. Address L. L. Malone, Gen. Mgr. of the Consolidated Coal Company, Fairmont, W. Va.

MILWAUKEE WESTERN (ELECTRIC).—Press reports say that contract has been given to the Chapman Construction Company, Chicago, to build from Milwaukee, Wis., northwest to Beaverdam, 55 miles, with a branch from Sussex south to Waukesha, 10 miles. (Mar. 19, p. 655.)

MOUNT HOOD RAILROAD.—This company now has in operation 17 miles of line from the city of Hood River, Ore., south through the lower valley of the Hood river fruit district to Dee, at which place the Oregon Lumber Company is operating a large electric saw mill. The road is being extended from Dee to the upper Hood river valley, 5.6 miles. It is expected that the grade will be finished and ready for track laying about September 1. E. T. Johnson & Company, Portland, Ore., has the grading contract. J. W. West, Ch. Engr., Hood River.

NEW YORK CENTRAL & HUDSON RIVER.—The New York Public Service Commission, Second District, has issued an order authorizing the elimination of grade crossings in the village of Ossining, N. Y. The highways are to be carried over the railway tracks by bridges having a minimum clearance of 16 ft. from the top of the rail. A roadway from Broadway to Secor street is to be included in the work. The estimated cost is $220,000, the railways to pay one half, the state one quarter and the village one quarter.

An order has also been issued for the elimination of grade crossings on Dock street and Washington avenue, in Hastings-on-Hudson. Dock street is to be closed and a new street laid out. This includes building an overhead bridge 30 ft. wide over the tracks, 220 ft. north of the present Dock street crossing, to have a height of 16 ft. from the top of the rail. At Washington avenue a similar bridge is to be built over the railway tracks, to be approached from the east by a viaduct. The cost of improvements at Hastings-on-Hudson will be $118,300, to be apportioned as at Ossining. (Mar. 19, p. 656.)

A press despatch from Pittsburg says the New York Central & Hudson River is to build a line from Port Vue, a suburb of Pittsburgh, to Clymer, Pa., on the Pittsburgh & Clearfield division of the N. Y. C. & H. R., about 70 miles.

NEW YORK SUBWAYS.—See item on this subject under General News.

OKLAHOMA ROADS.—The Ardmore Commercial Club has accepted the proposition of Oscar O. Ayres, representing C. F. Clarke & Co., of Philadelphia, Pa., to build a line to use steam or electricity as its motive power, from Ardmore, Okla., north through Springer, thence northwest along the south side of the Arbuckle mountains to Chichasha, about 80 miles. As soon as the line is in operation to a point three miles beyond Springer, where it is proposed to put up a cement plant, residents of Ardmore are to pay $25,000, and an additional $25,000 when the grading is finished to Chichasha. The towns of Duncan and Lawton are negotiating and offering inducements to have the line run through those towns. H. G. Spaulding, Sec., Ardmore Commercial Club, can give information.

PARIS & MOUNT PLEASANT.—Organized in Texas with $75,000 capital, to build from Paris southeast to Mount Pleasant, 50 miles. Location surveys are now being made, and much of the right-of-way and terminal facilities have been secured. R. F. Scott, Pres., Paris.

PECOS & NORTHERN TEXAS.—See Atchison, Topeka & Santa Fe.

PITTSBURG, SHAWMUT & NORTHERN.—According to press reports, a contract has been given to the Miller Construction Company of Lock Haven, Pa., for building 11 miles of an extension in Pennsylvania. An officer writes that the only foundation for the above at present, is that the Receiver is building 12 miles between Coryville, Pa., and State Line.

PORTLAND RAILWAY, LIGHT & POWER COMPANY.—An officer writes that the improvements to be made this year are only extensions of present city lines, the work being mostly short sections of track. (June 4, p. 1187.)

QUANAH, ACME & PACIFIC.—Track laying is said to have been started on the extension building from Acme, Tex., southwesterly. (May 7, p. 1008.)

SALINE VALLEY.—See Chester, Perryville & Ste. Genevieve.

SHAW & SOUTHWESTERN.—Organized in Mississippi, with $50,000 capital, to build from Shaw, in Boliver county, on the Yazoo & Mississippi Valley, southwesterly via Busey to Wilczinski, about 25 miles. The promoters include J. C. Walker and other local residents.

SOUTHERN PACIFIC (MEXICO).—An extension of the Cananea, Yaqui River & Pacific has been opened for business from Cumuripa, Sonora, north to Tufanito, 18 miles. (March 19, p. 661.)

The Southern Pacific Railroad of Mexico is now open for business on the extension from Culiacan, Sin., south to Mazatlan, 137 miles. (April 30, p. 961.)

SOUTHERN PACIFIC RAILROAD OF MEXICO.—See Southern Pacific.

SOUTHERN RAILWAY.—On the Murphy division, the Fontana branch has been opened for business from Bushnell, N. C., west to Fontana, 14 miles. (March 19, p. 658.)

SPOKANE & INLAND EMPIRE (ELECTRIC).—According to press reports this company is considering plans for a branch from the main line near Ochlare, Wash., east to Plummer, Idaho, 20 miles. (Jan. 8, p. 89.)

TOLEDO, BOWLING GREEN & SOUTHERN TRACTION.—An officer writes regarding the report that an extension is to be built from Findlay, Ohio, south to Kenton, 30 miles, that nothing definite has been done. The company made a proposition to finance and build the line if the residents furnished the right-of-way.

TUCUMCARI & MEMPHIS.—See Chicago, Rock Island & Gulf.

VALLEY RAILROAD.—Incorporated in Arkansas, with $100,000 capital, to build from Houston, Ark., on the Chicago, Rock Island & Pacific, southwest to Perryville, about 10 miles. The incorporators include J. E. Rose, A. F. Leigh, G. H. Brockingham, J. H. Bowen, J. L. Hill and S. V. Taylor.

WISCONSIN & NORTHERN.—An amendment to the charter has been filed permitting a change of route and building about 10 miles additional on the extension into Langlade and Forest counties, Wisconsin. A portion of the original survey is to be abandoned. (April 23, p. 918.)

Railroad Financial News.

ATCHISON, TOPEKA & SANTA FE.—At the close of business June 16, $15,406,000 of the outstanding $49,711,000 4 per cent. and $3,953,000 of the $26,056,000 5 per cent. convertible bonds had been exchanged for common stock. The total stock outstanding now amounts to $235,488,230, of which $114,173,730 is preferred and $121,314,500 common. Since stockholders have the right to subscribe to new convertible 4 per cent. bonds to the extent of 12 per cent. of their holdings of stock at the close of business June 16, the amount of bonds that they may subscribe to is $28,258,000 of the authorized issue of $35,000,000. (June 11, p. 1230.)

CENTRAL OF GEORGIA.—The formal transfer of the $5,000,000 stock bought in 1907 by E. H. Harriman and held in a voting trust for two years by Oakleigh Thorne and Marston J. Perry has been made to the Illinois Central. Some time after the sale of the stock by Southern Railway interests to Mr. Harriman he stated that he was holding it in the interest of the Illinois Central.

CINCINNATI, HAMILTON & DAYTON.—The Federal court has authorized Judson Harmon, receiver, to make an arrangement with the holders of receiver's certificates to extend the certificates until August 15. The interest due is to be paid July 1. The receiver's term of office has also been extended to August 1.

More than 95 per cent. of the $15,000,000 4½ per cent. notes have been deposited with the noteholders' protective committee, J. N. Wallace, chairman, and two-thirds of the depositors of the notes have consented to the reorganization plan. (June 4, p. 1188.)

COLORADO & NORTHWESTERN.—See Denver, Boulder & Western.

DENVER, BOULDER & WESTERN.—This company is the successor to the Colorado & Northwestern and, it is said, has made a mortgage securing $800,000 bonds, $700,000 of which are to be issued to pay for the property taken over and $100,000 to be issued to pay for extension, betterments and additional rolling stock. The line of the Colorado & Northwestern runs from Boulder, Colo., to Eldora, with branches making a total of 54 miles.

ERIE.—The Public Service Commission, Second district, has been asked for authority to issue $1,000,000 general lien 4 per cent. bonds of 1895-1996. There are now outstanding $35,885,000 of these bonds in the hands of the public.

FLORIDA EAST COAST.—It is understood that J. P. Morgan & Co. have formed a syndicate to underwrite $10,000,000 bonds of the Florida East Coast. It is reported that the bonds will bear interest at 4½ per cent. and mature in 50 years. The proceeds are to be used for refunding purposes. The company has about $5,000,000 three-year 6 per cent. notes secured by first mortgage bonds and due Aug. 10, 1910. It is understood that George W. Perkins, of the firm of J. P. Morgan & Co., is to be elected a director.

GREENBRIER & IRON MOUNTAIN.—Press despatches say that H. L. Van Sickler and D. C. T. Davis have been appointed receivers. The line of this company runs from White Sulphur Springs north into Greenbrier county, 30 miles.

ILLINOIS CENTRAL.—See Central of Georgia.

KANSAS CITY, MEXICO & ORIENT.—A. E. Stilwell, President, is offering at par, with bonus of 40 per cent. in common stock and 40 per cent. in preferred stock, $1,500,000 first mortgage 4 per cent. 50-year bonds.

LOUISVILLE & NASHVILLE.—A semi-annual dividend of 3 per cent. on the $60,000,000 stock outstanding has been declared payable August 10. This compares with 2½ per cent. paid in February, 1909, and August, 1908, and 3 per cent. paid semi-annually previously since February, 1905.

METROPOLITAN STREET RAILWAY (NEW YORK).—The 4 per cent. refunding mortgage bondholders' committee, Edwin S. Marston, chairman, have sent out a circular to bondholders stating that in their opinion the Metropolitan Street Railway, which operates part of the surface railways in New York, under present conditions and laws is not able to

earn the interest on either the outstanding $12,500,000 5 per cent. general and collateral trust bonds or on the outstanding $16,604,000 4 per cent. refunding bonds. They suggest that unless present conditions and laws can be changed it may be to the interest of bondholders to sell the property directly subject to their lien and thus disrupt the street railway system of New York. A decree of foreclosure of the general and collateral trust mortgage securing the $12,500,000 5 per cent. bonds has been entered and the sale of the property has been fixed for November 15, 1909.

MISSISSIPPI CENTRAL.—Harvey Fisk & Sons, New York, are offering the unsold portion (about $1,500,000) of the present issue of $4,100,000 first mortgage 5 per cent. bonds of July 1, 1909-1949, principal and interest guaranteed by the United States Lumber Co. at 97½. The company acquired through consolidation the property of the Natchez & Eastern and owns and operates a line running from Natchez, Miss., to a point 14 miles southeast of Hattiesburg, Miss., 164 miles. A circular issued by the bankers describes the property and is accompanied by a map.

NATCHEZ & EASTERN.—See Mississippi Central.

Opportunities for Exporting Ties to France.

The French customs duty on ties in their natural state, not having been tarred or otherwise prepared, and imported direct from an American to a French port, is, on condition that they exceed 3.1496 inches in diameter, 19.3 cents per 220.46 lbs. gross. If the ties are imported into France via another European port or country, as, for instance, via London, Antwerp or Rotterdam, the foregoing rates are augmented by a surtax of 69.5 cents per 220.46 lbs. gross. Ties treated with tar, creosote or other substances pay the foregoing rates plus 20 per cent. The surtax, however, remains the same. Railway ties are among the comparatively few articles admitted from the United States into France under the minimum tariff. In reply to communications from a United States consular office to all the French railway companies, and to the leading contractors, inquiring whether they would be disposed at this time to purchase American ties, the following have been received: The Northern Railway (Chemin de Fer du Nord) replied that it would consider offers of unprepared beech and oak ties to be delivered free on cars, duty paid, either at Dunkirk, Calais, Boulogne or Rouen, but at no other ports. The other railway companies also insist on free delivery on cars, duty and other charges paid, at one of the points on their respective lines. The Paris-Lyon Mediterranean company says that it will not consider quotations exceeding $1.18 per tie. The French state railways, as a general rule, use only ties of domestic origin; but recently purchases have been made of Baltic redwood and Black Sea beech ties. The management attaches great importance to the place of origin of the species of wood supplied, and it should invariably be stated. Moreover, it will accept only wood which has been cut after the growing season, i.e., from October 15 to March 15. The wood must also be sound and free from all defects. Beech ties which cannot be easily injected or have red heartwood will be refused. The ties are usually treated with creosote, and occasionally with a mixture of creosote and chloride of zinc. Unprepared American ties would be acceptable. Stress is laid on the point that the dimensions of the ties and the species of wood of the present or coming campaign should be accurately described, and the prices quoted free on car at Havre, duty paid. Quotations may be given on a shipment of from 50,000 to 100,000 ties. The approximate age of the trees, the method of cutting the ties (two or four per log section), and the proportion and distribution of sapwood and heartwood in the section should also be stated. Should the offers appear to be advantageous the company would then request shippers to send them two or three ties as samples before giving an order. The French state railway management prefers for its soft-wood ties the species of pine trees (Pinus, Baltic redwood) to the species of fir trees (Abies vel picea excelsa, red pine or spruce fir), and it prizes more highly those in which sapwood predominates than those which have a greater quantity of heartwood.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Houston, Fostoria & Northern is in the market for one locomotive.

The Texas Central has ordered, it is said, three 10-wheel passenger locomotives from the American Locomotive Co. This item is not confirmed.

The Canadian Pacific has ordered, it is said, one switch engine from its Angus shops, and 15 mixed traffic locomotives, D-10, from the Montreal Locomotive Works. This item has not been confirmed.

CAR BUILDING.

The Houston, Fostoria & Northern is in the market for 80 flat cars.

The Erie is figuring on 100 composite steel and wood passenger cars.

The Pullman Company is building for itself, for service on the Pennsylvania, 500 steel sleeping cars.

The Texas & New Orleans is said to be in the market for new equipment. This item has not been confirmed.

The Cienfuegos, Palmira & Cruces, electric, Cuba, is in the market for two 30-passenger motor cars. T. N. Motley & Co., 30 Church street, New York.

The Boston & Maine has ordered 50 coaches from the Laconia Car Company. Of these, eight will be vestibule type and 42 will have open platforms.

The Wells-Fargo Express Co. is in the market for 25 refrigerator cars, passenger equipped, with steel underframes, to be duplicates of the ten ordered last year from the American Car & Foundry Co.

The Lehigh Valley, as noted in the *Railroad Age Gazette* of May 21, has ordered 15 all-steel passenger coaches from the Standard Steel Car Co. They are to weigh 106,000 lbs. and measure 68 ft. 5½ in. long, 9 ft. 9¼ in. wide and 14 ft. 7/8 in. high, over all.

The Western Pacific, reported in the *Railroad Age Gazette* of May 14 as being in the market for passenger cars, has ordered 40 baggage cars from the American Car & Foundry Co., 60 passenger cars from the Pullman Co., and a number of dining and buffet cars from the Barney & Smith Car Co.

The Pennsylvania, as noted in the *Railroad Age Gazette* of June 11, is asking bids on 214 steel passenger cars of the following classes:

71 "P-70" coaches.
78 "P-54" coaches.
15 "PB-70" combined cars.
18 "PB-54" combined cars.
5 "B-70" baggage cars.
27 "MS-60" postal carriage cars.

The St. Louis & San Francisco, as noted in the *Railroad Age Gazette* of June 11, has ordered 250 fifty-ton steel underframe oil tank cars from the American Car & Foundry Co. They have a capacity of 10,000 gallons. The tank measures 28 ft. long and the frame 7 ft. 8½ in. wide inside, and the tank 33 ft. long and the frame 8 ft. ½ in. wide over all. The special equipment includes the following:

Axles	M. C. B. 100,000-lb. standard
Bolsters, body	Steel
Bolsters, truck	Cast steel
Couplers	Latrobe, 5 in. x 7 in. shank
Draft gear	Cardwell type-D friction
Trucks	Railroad standard
Wheels	Cast iron

IRON AND STEEL.

The Chicago & Alton is in the market for 10,000 angle bars.

The Texas & New Orleans is said to be in the market for rails.

The Iowa Central has ordered 3,000 tons of rails from the Indiana Steel Co.

The Chesapeake & Ohio has ordered 4,300 tons of rails from the Indiana Steel Co.

The Minneapolis & St. Louis has ordered 4,200 tons of rails from the Indiana Steel Co.

The Cienfuegos, Palmira & Cruces (Electric), Cuba, recently closed a contract with the U. S. Steel Corporation for 5,000 tons of rails.

The Chicago, Milwaukee & St. Paul is in the market for about 12,000 tons of structural steel for bridges in Wisconsin, Idaho and Montana.

The North Coast has ordered 7,500 tons of rails from the Colorado Fuel & Iron Co. for immediate use on its Yakima Valley line between the Columbia river and North Yakima, Wash.

The Rock Island Southern (Electric) has given the contract for the Cedar Creek bridge north of Monmouth, Ill., to the Wisconsin Bridge & Iron Works, involving about 185 tons of structural steel.

The Northern Pacific has divided an order for 25,000 tons of rails between the Indiana Steel Co. and the Lackawanna Steel Co. This is in addition to the 15,000 tons reported in the *Railroad Age Gazette* of June 18.

General Conditions in Steel.—Prices on steel have tended to become firmer and a representative of one of the large steel companies is quoted as saying that it is now certain that the price of standard section rails will remain unchanged at $28 a ton. Steel conditions are improving gradually and the upward trend seems likely to continue. The fact that railways are ordering equipment more freely is regarded as the best indication of future betterment. Charles M. Schwab, president of the Bethlehem Steel Corporation, who returned from Europe Tuesday, says regarding the steel situation: "All the blast furnaces and steel plants of the Bethlehem Steel Corporation, with the exception of the ordnance works, are in full operation. I have not been in the country long enough to make a definite statement as to steel conditions. However, from what I have heard, the steel industry is improving and will continue to improve."

RAILROAD STRUCTURES.

Arnprior, Ont.—Bids are wanted up to July 3 by Macallum & McAlister, Continental Life building, Toronto, for a steel bridge on concrete piers and abutments.

Chicago.—The Chicago & North Western has given a contract for its new power house to the George A. Fuller Co., Chicago.

Clovis, N. Mex.—The Wells-Fargo Express Co. is having plans made for a one-story stone and brick combined station and office building, 30 ft. x 55 ft., on Santa Fe right of way.

Hastings-on-Hudson, N. Y.—See New York Central & Hudson River under Railroad Construction.

Houghton, Mich.—The Mineral Range will build a viaduct connecting its properties, and other improvements are to be made later.

Kansas City, Mo.—The Wells-Fargo Express Co. is having plans made for two four-story buildings 100 ft. x 200 ft., to be used as a warehouse and stable.

Marcus, Wash.—The Great Northern will build a roundhouse, turntable and additional tracks.

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Co. is said to have started grading work on a site of 33 acres on McKinley boulevard, from Thirty-fifth to Fortieth streets, preparatory to constructing car shops, yards and repair works. The shops will not be completed for several years. (Dec. 4, p. 1503.)

An ordinance has been introduced providing for the purchase by the city of land bounded by Wells, Cedar, Fifth and Sixth streets as a site for a union interurban railway station, to cost $100,000. (Dec. 4, p. 1503.)

The Chicago, Milwaukee & St. Paul, it is understood, will build a new passenger station at Lincoln avenue, in Bay View, to replace the present station at Becher street. Construction work is to be commenced as soon as the track elevation is completed.

See Chicago, Milwaukee & St. Paul under Iron and Steel.

Monmouth, Ill.—See Rock Island Southern under Iron and Steel.

Montreal, Que.—The Canadian Pacific will pay $6,000 towards the reconstruction of the bridge over St. Catherine street east if certain pillars supporting the bridge shall be built so as to give the company more room for its tracks at that point.

Muskogee, Okla.—The Wells-Fargo Express Co. is building a frame combined station and office building 24 ft. x 35 ft. on Midland Valley right of way.

New Orleans, La.—An officer of the Texas & Pacific writes that an arrangement for using the Illinois Central passenger station has been made and the company will not build a passenger station in New Orleans at the present time. (June 11, p. 1232.)

An officer of the Illinois Central writes, regarding freight terminals to be put up at New Orleans, that the company has bought property and introduced an ordinance which, if carried, will call for spending a large amount of money for freight and terminal facilities. No definite plans have been prepared pending the passage of the ordinance.

Oklahoma City, Okla.—The Wells-Fargo Express Co. is having plans made for a two-story combined station and office building 50 ft. x 100 ft. on Santa Fe right of way.

Ossining, N. Y.—See New York Central & Hudson River under Railroad Construction.

Quebec, Que.—The Quebec Bridge Commission, it is understood, has decided to erect the new bridge on the same site as the old bridge which collapsed during construction. It is expected the plans will be finished early in July. (June 11, p. 1233.)

San Antonio, Texas.—The Wells-Fargo Express Co. is building a brick combined station and office building 50 ft. x 70 ft. on the Galveston, Harrisburg & San Antonio right of way.

Windsor, Ont.—The Michigan Central will begin work early in July on the construction of a 20-stall roundhouse and a passenger station.

Winnipeg, Man.—Contract is to be let to Davidson Brothers, of Winnipeg, for putting up 47 stations at various points on the National Transcontinental (Grand Trunk Pacific) between Winnipeg, Man., and Lake Superior junction.

Woodward, Okla.—The Wells-Fargo Express Co. will build a combined station and office building 24 ft. x 45 ft. on Santa Fe right of way.

The consumption of railway ties in France averages 14,126,400 cu. ft. annually. Oak, beech and pine are the only species of wood used for this purpose, and the supply has been in recent years entirely of domestic origin. France imports considerable quantities of railway ties, as shown by the following figures for the years 1906, 1907 and 1908: 17,438 tons, 20,026 tons and 23,854 tons, respectively. The ties used in France are as a general rule treated with creosote or sulphate of copper, but a large proportion are laid without having undergone any special treatment. In most cases the railway companies contract for ties in their natural state and have them treated under the supervision of their own engineers. The most usual dimensions are the following: Length, 8 ft. 7 in.; width, 10 in.; thickness, 5½ in.; but the specifications vary somewhat with the different companies. The editor of the *Timber Trades Journal* states that the Paris-Lyon-Mediterranean Railway purchased their supply for the year on the basis of 86.8 cents each for oak ties and 67.5 cents each for beech ties.

Supply Trade News.

The Illinois Malleable Iron Co., Chicago, Ill., has increased its capital stock from $452,900 to $1,500,000.

The combination pressure and vapor heating system of the Gold Car Heating & Lighting Co., New York, has been specified for the 15 coaches ordered by the Lehigh Valley.

The A. B. C. Train Operating Co., Chicago, Ill., has been incorporated, with a capital stock of $100.000. The incorporators are: George Heidman, Norman A. Street and E. Kernwein.

The Tientsin-Pukow Railway of China is asking sealed bids for supplying 8,500 prime quality Oregon pine ties, bids to be closed on July 15. (United States Bureau of Manufactures.)

The Safety Lock & Signal Co., Kansas City, Mo., has been incorporated with a capital stock of $75,000. The incorporators are: Frank B. Dolsen, H. A. Humphrey and Walter L. Lumpkin.

The Jones & Laughlin Steel Co., Pittsburgh, Pa., bought coal lands recently in Washington county, Pa., valued at $4,000.000. This purchase was to insure a supply of coal and coke for the new Jones & Laughlin plants at Aliquippa.

The Jones & Laughlin Steel Co., Pittsburgh, Pa., has notified its employees that since June 1 their wages have been raised 10 per cent. This restores the wage scale that was in effect previous to April, when a 10 per cent. reduction was made.

The Armstrong Spark Arrester Co., Cincinnati, Ohio, has recently been incorporated with a capital stock of $100,000. The incorporators are: C. C. Armstrong, Albion F. McCarthy, Albert H. Morrill, L. A. Branse, John Rhonda and George T. Welsh.

The Hanlon Locomotive Sander Co., Winchester, Mass., announces that the Hanlon sander has been specified on the 71 engines now being built by the American Locomotive Co. for the New York Central Lines and on the 50 for the Boston & Maine, which are also being built by the American Locomotive Co.

The Atlas Locomotive Ashpan Co., Ft. Wayne, Ind., the incorporation of which was announced in the *Railroad Age Gazette* of June 11, will have its main office at 1011 Rockhill street, Ft. Wayne, Ind. The officers of the company are as follows: J. A. Swartz, President; T. P. Whelan, Secretary and Treasurer; N. C. Myers, Vice-President.

TRADE PUBLICATIONS.

Chicago & North Western.—The company is distributing a pamphlet giving a list of the national conventions in the west and northwest with dates and places of meeting and information on railway fares.

Fuel Reference Tables.—Tate, Jones & Co., Inc., General Offices, Pittsburgh, Pa., have just issued through their advertising department some valuable "Ready Reference Tables" for those using natural gas as a fuel. The tables are compiled in pamphlet form, which is being distributed gratis to those interested.

Rolled Steel Wheels.—An attractive and well illustrated catalogue, published by the Standard Steel Works Co., Philadelphia, has just been issued. It describes and illustrates the various types and sizes of wheels made by this company and also gives illustrations of various cars and locomotives fitted with "standard" rolled wheels. Drawings of axles and quite full axle data are a part of the catalogue.

El Tovar Hotel.—This hotel, under the management of Fred Harvey, of Atchison, Topeka & Santa Fe fame, is described in a most interesting fashion in a little booklet published by Fred Harvey. The hotel is situated on the rim of the Grand Canyon, Arizona, and the illustrations in the booklet showing the hotel and surrounding country are particularly charming. The pages are also decorated with sketches of western and Indian life.

The Boston & Maine has published a pamphlet of 132 pages describing New Hampshire and its business opportunities. The towns and cities of New Hampshire are taken up separately and the physical characteristics of each are described and the business and manufacturing opportunities in each are concisely given. The publication is a mine of information for any one who is interested either in a business way or for other reasons in New Hampshire.

Denver & Rio Grande.—A folder has been issued containing information regarding Denver, Colo., with illustrations and descriptions of nearby resorts and scenic attractions and information regarding railway fares. There is also a map of the central portion of the city of Denver and a map of the Denver & Rio Grande lines. The company is also distributing a beautiful illustrated pamphlet describing the wonderful thousand mile tour through the Rocky Mountains.

Rockwell Furnaces.—The Rockwell Furnace Co., with office at 26 Cortlandt street, New York City, and factory at Jersey City, has issued a pamphlet 16¼ in. x 11 in., containing 63 finely printed half-tone views of all sorts of installations of the oil, coal and gas furnaces made by the company. Apparently every imaginable use of small and moderate sized furnaces is here illustrated, and the pictures alone afford the reader a good course of instruction in melting, annealing and other heating processes.

Chicago & North Western.—The 1909 tourists' guide to the summer resorts and fishing and hunting grounds reached by the North Western is a handsome publication. It contains 13 full-page maps of various sections of this region, and a key map in the front, giving the locations of the sections covered by the large-scale maps. The letter-press is in colors and is surrounded with marginal half-tone and pen-and-ink illustrations. Information covering the summer trains, and a complete list of hotels, with their locations, rates, capacity, etc., are given.

Alaska-Yukon-Pacific Exposition.—The American Locomotive Co., New York, in pamphlet No. 10,035, illustrates and describes the joint exhibit of that company and the Atlantic Equipment Company, New York, at the exposition now in progress at Seattle, Wash. The exhibit consists of a rotary snow plow, built for the C. M. & P. S.; two locomotives, representing new standard designs; one 6-coupled tank locomotive for logging service; a four-wheel saddle tank contractor's locomotive; an electric motor and trailer built for the Southern Pacific Company, and the new model Atlantic steam shovel.

Lightning Arresters.—The General Electric Co., New York, has recently issued Bulletin No. 4663, covering lightning arresters, for both alternating and direct-current circuits. The lightning arresters described were designed after careful consideration of the great variety of conditions and phenomena produced by lightning, including all effects of abnormal voltage. These arresters, designed upon an elaboration by Prof. Elihu Thomson's fundamental patents, consist of a series of spark gaps shunted by graded resistances, but without series resistance. The bulletin gives detailed information with regard to the construction and design of the various types of multigap arresters, together with curves, illustrations, dimensions and connections. These cover not only the arresters, but also the auxiliary apparatus, including disconnecting switches, choke coils, horn gaps, etc. The bulletin also covers lightning arresters for direct-current service.

The Use of True Refined Linseed Oil to Protect Iron and Steel.

BY JAMES TODD.

Linseed is undoubtedly the best oil of which to make a paint, but unfortunately in the condition in which it comes from the crusher it contains a large proportion of acid and mucilaginous materials which are soluble in water. On exposure these dissolve out of the coating, and, of course, leave it pitted with flaws through which water and air enter; and then corrosion begins. These impurities in an unadulterated oil come principally from two sources, the harvesting of foreign seeds with the flax and from the flax itself, by reason of the powerful presses used by the crusher developing heat. The complaint that it is

impossible to get as good linseed oil as was ordinarily obtainable a generation or more ago is because in those days the crushing was done with comparatively light power and the seed was pressed cold. Now the seed is heated with steam and subjected to tremendous pressure, and the result is that the yield of oil from a given amount of seed is greatly increased, but in wringing the last particles of oil from the seed a quantity of mucilaginous matter comes with it, and consequently we have an ever increasing trouble from irregularities and porosity in ordinary linseed oil.

These impurities detract from the value of the oil as their non-drying character prevents the proper and thorough drying of the paint; but what is more serious is the fact that they are soluble in water and naturally dissolve out of the coating and leave breaks and flaws through which destructive agents enter and bring about disastrous results. The ordinary refined oils offered for sale are merely boiled, or air blown, or else are chemically treated and are not to be taken seriously. In considering such it is only necessary to know that the impurities which should be removed often amount to 20 per cent. of the bulk and that such refined oils are generally sold for from two to five cents a gallon above the price of ordinary oil. But if a true refined oil alone is used all porosity and solubility are gone and the result is an impervious and elastic coating of paint which will remain good for years after an ordinary paint has practically become useless.

Oscillating Measuring Chute for Locomotive Coaling Pockets

Several recent installations of locomotive coaling pockets have been equipped with a new type of "Hunt" measuring chutes and valves. The illustration (Fig. 1) shows a pocket as installed for the Pennsylvania Railroad, at Greenville, N. J., and equipped with an oscillating "Hunt" measuring chute and valve, in order that the coal might be drawn from the pocket and loaded into the locomotive tender with an accurate knowledge of the quantity of coal thus used. The measuring chute is supported by hangers bolted on stringers on the under side of the pocket and placed in such a position that when the chute is in a horizontal position the coal flows from the pocket into the measuring chute, filling it entirely with coal.

When it is desired to fill the locomotive tender, the measuring chute is tilted from its horizontal plane to an inclined plane of say 45 deg., and the coal flows from the chute into the locomotive tender. When the chute is moved from its horizontal position, the coal outlet of the coaling pocket is automatically closed by the body of the measuring chute, thus preventing any spilling of coal.

The chute as here illustrated has a capacity of one ton of coal, and is operated by means of compressed air as the time element at this coaling pocket is an important factor.

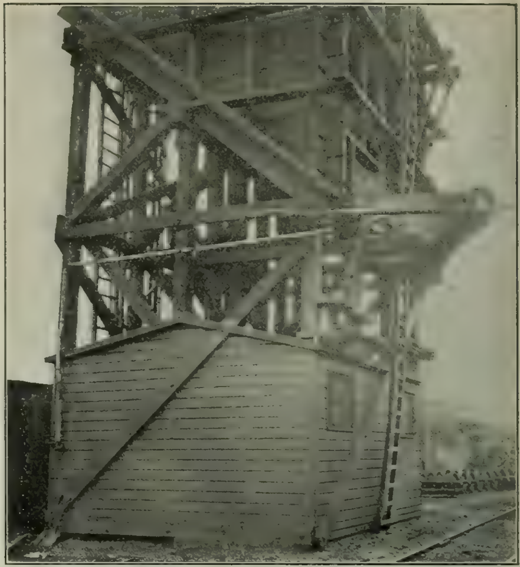


Fig. 1—Hunt Measuring Chute on Coaling Pocket.

The illustration (Fig. 2) shows another adaptation of this measuring chute and valve, as installed at the locomotive coaling pockets of the Chesapeake & Ohio at the Fulton yards, Richmond, Va. This pocket is divided into compartments for sand and coal, and the arrangement is such that six locomotives may simultaneously be furnished with the sand and coal required. From experiments made at these pockets, the coal, by means of the measuring chute and valve, is measured with accuracy. It was found that on taking an average weight of several loads that the weight was remarkably close to the scale weight.

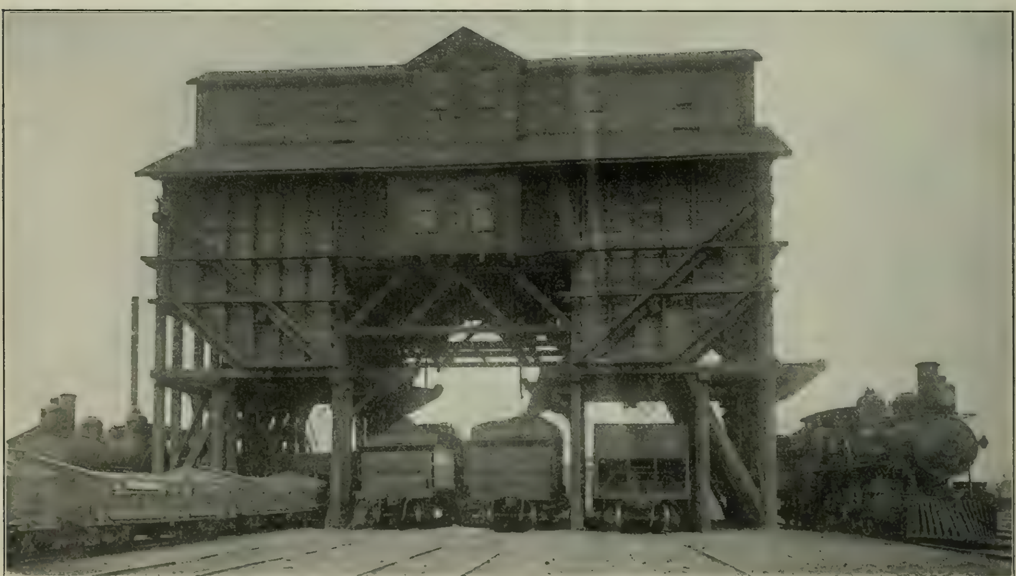


Fig. 2—Hunt Measuring Chute. Chesapeake & Ohio Yards, Richmond, Va.

These chutes are furnished and installed by the C. W. Hunt Company, 45 Broadway, New York City.